DRAFT
ENVIRONMENTAL IMPACT ASSESSMENT (EIA) REPORT
for
THE PROPOSED
ESKOM HENDRINA – PRAIRIE – MARATHON TRANSMISSION LINES

Prepared for:

ESKOM TRANSMISSION
P. O. Box 1091
Sunninghill
Johannesburg 2157

Submitted to:

DEPARTMENT OF ENVIRONMENTAL AFFAIRS AND TOURISM
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Prepared by:

STRATEGIC ENVIRONMENTAL FOCUS (PTY) LTD
P.O. Box 74785
LYNWOOD RIDGE 0040
Tel. No.: (012) 349-1307
Fax No.: (012) 349-1229
E-mail: sef@sefsa.co.za

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ENVIRONMENTAL ASSESSMENT PRACTITIONER

Strategic Environmental Focus (Pty) Ltd is undertaking the Environmental Impact Assessment (EIA) process for the Eskom Hendrina – Prairie – Marathon transmission lines and associated substations. The Environmental Assessment Practitioner (EAP) is represented by Mr. Reuben Heydenrych.

Professional affiliation(s)	Registered as a Professional Landscape Architect with the SA Council for the Landscape Architectural Profession (Registration Number 98089). Referee for the Interim Certification Board for Environmental Assessment Practitioners of South Africa (EAPSA)
Expertise of the EAP to carry out the Scoping Process	• 13 years experience with environmental impact assessment processes, including processes undertaken in terms of the Environment Conservation Act, 1989 and the National Environmental Management Act, 1998. • Experience in similar large linear infrastructure projects, including the following: o Eskom Kudu Transmission line (400km 400kV Transmission Line); o SANRAL upgrade of the N1 through eastern Pretoria; o Pipeline for the Vaal River Eastern Subsystem Augmentation Project (185km pipeline)

The EIA process requires the undertaking of specialist studies to inform the Scoping Report and the EIA Report. The following specialists are involved with the above-mentioned application:

Name	Organization	Specialist assessment
Willem Lubbe Lael Buckham	Strategic Environmental Focus (Pty) Ltd.	Terrestrial Ecology Impact Assessment
Milicent Solomons Jessica de Beer	Strategic Environmental Focus (Pty) Ltd.	Social Impact Assessment
Hennie Stoffberg	Strategic Environmental Focus (Pty) Ltd.	Visual Impact Assessment
Nino Welland	Moore Spence Jones	Geotechnical Impact Assessment
Garry Paterson	Agricultural Research Council	Soil and Agricultural Potential Assessment
Johnny van Schalkwyk	National Cultural History Museum	Heritage Impact Assessment
Lukas Niemand	Pachnoda Consulting	Avifauna Impact Assessment

Contact Details of Environmental Assessment Practitioner

Mr. Reuben Heydenrych
Strategic Environmental Focus (Pty) Ltd
PO Box 74785
Lynnwood Ridge
Pretoria
0040

Tel +27 12 349 1307
Fax +27 12 349 1229
Cell +27 83 450 0628
Email reuben@sefsa.co.za

EXECUTIVE SUMMARY

INTRODUCTION

Strategic Environmental Focus (Pty) Ltd (SEF), as independent environmental assessment practitioners, has been appointed by Eskom Transmission to facilitate the Environmental Impact Assessment (EIA) process for the construction of the following:

- A 400 kV Transmission Line of approximately 85 km between Hendrina and Prairie substations;
- A 400 kV Transmission Line of approximately 100 km between Prairie and Marathon substations;
- Two new 400 kV substations, one each near the existing Prairie and Marathon substations; and
- Associated works to integrate the substations into the transmission grid.

The transmission lines and their associated substations are located in the Mpumalanga Province. The substation at Hendrina is located near the Arnot Power Station, whilst the substation at Prairie is located at the Assmang Plant south of Machadodorp along the road to Carolina. The Marathon substation is located near Nelspruit along the road to Sabie.

A new servitude of 55m wide will have to be created to cater for each new transmission line. This report deals with the application for the construction of the transmission lines only and not with the substations. It is important to note that two related EIA applications have been submitted: one for the transmission lines (the subject of this EIA report) and another for the substations (the subject of another EIA report). The public participation processes for these applications is being conducted as a single process, but the reporting is separated due to the fact that the need for construction of the substations is much more urgent than the need to construct the transmission lines. The schedule for the substation application is therefore ahead of that of the transmission lines.

ENVIRONMENTAL IMPACT ASSESSMENT REQUIREMENTS

The Environmental Impact Assessment (EIA) process was conducted in terms of the EIA Regulations of 2006 (Government Notices R. 385, 386 and 387 of 2006) under the National Environmental Management Act, 1998 (Act No. 107 of 1998) [NEMA]. The proposed development involves 'listed activities', as defined by the abovementioned regulations. Listed activities are activities that may have potentially detrimental impacts on the environment and therefore require environmental authorisation from the relevant authorising body. The proposed development occurs in the Mpumalanga Province and thus the provincial authority is the Mpumalanga Department of Agriculture and Land Administration (MDALA). However, the approving authority in this case is the Department of Environmental Affairs and

Tourism (DEAT) as a result of Eskom being a parastatal. This application is required to undergo a Scoping and EIA application as per the listed activities of Government Notice R. 387 of 2006.

PROJECT DESCRIPTION

The existing substations are located as follows:

- Hendrina substation is located on Hendrina Power Station, approximately 17 km north-west of Hendrina and KwaZamokhule;
- Prairie substation is located on Portion 4 of the Farm Schoongezicht 364 JT, approximately 5 km south of Machadodorp (next to the Assmang plant); and
- Marathon substation is located on Remainder of Portion 3 of the Farm Marathon 275 JT, approximately 10km northwest of Nelspruit along the road to Sabie.

It is proposed to construct new substations near the Prairie and Marathon substations – these have been designated as Prairie B and Marathon B. No new substation is required at Hendrina.

The proposed transmission lines are proposed to run parallel to existing transmission lines between the existing Hendrina and Prairie Substations (a distance of approximately 85km) and between Prairie and Marathon substations (a distance of approximately 100 km).

PROJECT MOTIVATION

Electrical supply system operates on a demand-supply structure. However, electricity can not be stored. Therefore, power is generated and transmitted at the moment it is required. Kilometres of high voltage transmission lines transmit power, mainly from the power stations located at the Mpumalanga coal fields (such as Hendrina Power Station) to major substations around the country. At these substations, the voltage is reduced for distribution to industries, businesses, homes and farms throughout the country. Electrical supply constitutes a complex system of generation facilities, substations, transmission and distribution power lines.

Eskom has to supply power reliably to meet the increasing needs of end-users. Therefore, Eskom has to expand and establish its infrastructure of transmission lines and substations on an ongoing basis. It is anticipated that the following sectors will enhance economic growth in the Highveld North and Lowveld regions in this instance, which will result in an electrical demand load growth:

- The mining industry, particularly around Machadodorp;
- Residential expansion, particularly in the Nelspruit area; and
- Other economic spheres.

The resultant surge in electricity use predicted for the next five years makes it imperative for Eskom Transmission to take urgent action in order to ensure that sufficient supply reaches the end-users. There is a definite need to overcome

potential voltage collapse and unstable transformation problems on the existing transmission network.

APPROACH TO THE PROJECT

The EIA Report uses the Scoping Report as a basis for the key issues and concerns that were identified during the scoping phase of the project. The identification of the key issues and concerns were guided by the relevant authorities, interested and affected parties (I&APs) and professional judgement by the Environmental Assessment Practitioner (EAP). The EIA Report further includes the results of the specialist studies, a full assessment of impacts, associated mitigation measures and proposed alternatives.

PUBLIC PARTICIPATION

The principles of NEMA govern many aspects of the EIA processes, including consultation with interested and affected parties (I&APs). These principles include the provision of sufficient and transparent information to I&APs on an ongoing basis, to allow them to comment, and ensure the participation of historically disadvantaged individuals, including women, the disabled and the youth.

ALTERNATIVES

The EIA legislation stipulates that an environmental assessment needs to consider feasible alternatives for any proposed development. Therefore, it is required that a number of possible proposals or alternatives for accomplishing the same objectives should be identified and investigated. The various alternatives were assessed in terms of both environmental and technical acceptability. A preferred alternative for both sections of the route has been identified based on the environmental impacts and technical feasibility. The identification of the preferred alternative is a synthesis of the technical and environmental factors. The specialist team indicated their preferences in terms of alternatives in their reports. Alternative locations were re-interrogated in an iterative manner by an additional site visit in November 2007 and by a second flight over the study area in February 2008. Specialists also provided their inputs with regards to alternatives at an integration meeting in January 2008. The following alternatives are discussed and highlighted in this EIA report:

- Route alternatives;
- Pylon alternatives;
- Electricity generation alternatives;
- Underground cabling;
- Scheduling alternatives; and
- No-go alternatives.

ASSESSMENT OF IMPACTS

The key environmental issues that are identified have been based on the experience of the EAP (on similar developments which entail environmental scoping and public participation processes) as well as information obtained from the site visit. The

specialist integration meeting and consultation with I&APs had also contributed to the identification of key environmental issues related to the proposed development.

The potential impacts and key issues identified include:

- Loss of soils with high agricultural potential;
- Suitability of geological and soil conditions for construction of the proposed infrastructure;
- Soil and water (surface and groundwater) contamination;
- Soil erosion and pollution;
- Catchment processes in terms of wetlands and watercourses;
- Destruction of flora and displacement of fauna;
- Impacts of the infrastructure / equipment on the bird life;
- Visual impacts;
- Impacts of features with historical and cultural value;
- Socio-economic and tourism impact;
- Noise impacts during construction phase; and
- Safety and security of the transmission lines.

The cumulative impacts are related to the combined effect of this project as well as a number of other linear projects that are currently being planned for the Crocodile River valley west of Nelspruit. These projects include the following:

- The proposed N4 ring road around Nelspruit;
- The proposed Petroline fuel pipeline;
- Other residential development proposed within the study area; and
- Impact on tourism and aesthetic value of this region.

The impact of the transmission lines and substations also need to be considered together to gain an understanding of the cumulative impacts.

CONCLUSIONS AND RECOMMENDATIONS

The construction and operation of the proposed transmission lines has the potential to have significant negative impacts on the environment. These new transmission lines will run through a variety of properties and their associated land uses. However, the nature and scale of the negative impacts are relatively small in comparison to the scale of the entire project, and the benefits to be delivered by the project. Provided that the route alternatives as recommended in this report are implemented, the project will result in an environmental impact on the environment that is acceptable to society as a whole. Although there are certain individual landowners that may be significantly affected, their loss must be appropriately mitigated by Eskom through compensation.

The recommended route of the transmission lines is as follows:

- From Hendrina to Prairie Substation, route HP1 is recommended; and
- From Prairie to Marathon Substation, route PM 1 along the southern side of the Elands River Valley is recommended.

- It is recommended that a walkdown assessment of the route, particularly the sensitive portions, should be undertaken prior to ensure that the placement of the pylons causes the least possible negative impact.

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LIST OF ABBREVIATIONS

ARC	-	**A**gricultural **R**esearch **C**ouncil
CMMC	-	**C**ommunity **M**anagement and **M**onitoring **C**ommittee
DEAT	-	**D**epartment of **E**nvironmental **A**ffairs and **T**ourism
DWAF	-	**D**epartment of **W**ater **A**ffairs and **F**orestry
EAP	-	**E**nvironmental **A**ssessment **P**ractitioner
ECA	-	**E**nvironment **C**onservation **A**ct, 1989 (Act No. 73 of 1989)
EIA	-	**E**nvironmental **I**mpact **A**ssessment
EMP	-	**E**nvironmental **M**anagement **P**lan
ESKOM	-	**E**lectricity **S**upply Commission
GIS	-	**G**eographical **I**nformation **S**ystems
HIA	-	**H**eritage **I**mpact **A**ssessment
I&APs	-	**I**nterested and **A**ffected **P**arties
IEM	-	**I**ntegrated **E**nvironmental **M**anagement
kV	-	**K**ilo **V**olt
MDALA	-	**M**pumalanga **D**epartment of **A**griculture and **L**and **A**dministration
MVA	-	**M**ega **V**olt **A**mpere
NEMA	-	**N**ational **E**nvironmental **M**anagement **A**ct, 1998 (Act No. 107 of 1998)
NSBA	-	**N**ational **S**patial **B**iodiversity **A**ssessment
POS	-	**P**lan **o**f **S**tudy
SAHRA	-	**S**outh **A**frican **H**eritage **R**esources **A**gency
SANBI	-	**S**outh **A**frican **N**ational **B**iodiversity **I**nstitute
SANRAL	-	**S**outh **A**frican **N**ational **R**oads **A**gency **L**imited
SEF	-	**S**trategic **E**nvironmental **F**ocus (Pty) Ltd
SIA	-	**S**ocial **I**mpact **A**ssessment
VIA	-	**V**isual **I**mpact **A**ssessment

GLOSSARY OF TERMS

Alien species
A plant or animal species introduced from elsewhere: neither endemic nor indigenous.

Anthropogenic
Change induced by human intervention.

Applicant
Any person who applies for an authorisation to undertake an activity or to cause such activity to be undertaken as contemplated in the National Environment Management Act, 1998 (Act No. 107 of 1998).

Arable potential
Land with soil, slope and climate components where the production of cultivated crops is economical and practical.

Critically endangered
A taxon is Critically Endangered when it is facing an extremely high risk of extinction in the wild, in the immediate future.

Ecology
The study of the inter relationships between organisms and their environments.

Environment
All physical, chemical and biological factors and conditions that influence an object and / or organism

Environmental Impact Assessment
The assessment of the effects of a development on the environment

Environmental Management Plan
A legally binding working document, which stipulates environmental and socio-economic mitigation measures that must be implemented by several responsible parties throughout the duration of the proposed project

Local relief
The difference between the highest and lowest points in a landscape. For the purposes of this study, the local relief is based on a scale of 1:50 000.

Study area
Refers to the entire study area encompassing the total area as indicated on the study area map.

1 INTRODUCTION

Strategic Environmental Focus (Pty) Ltd (SEF), as an independent environmental assessment practitioner, has been appointed by Eskom Transmission to facilitate the Environmental Impact Assessment (EIA) process for the construction of the following:

- A 400 kV Transmission Line of approximately 85 km between Hendrina and Prairie substations;
- A 400 kV Transmission Line of approximately 100 km between Prairie and Marathon substations;
- Two new 400 kV substations, one each near the existing Prairie and Marathon substations; and
- Associated works to integrate the stations into the transmission grid.

The Transmission lines and their associated substations are located in the Mpumalanga Province. The substation at Hendrina is located near the Arnot Power Station. The substation at Prairie is located at the Assmang Plant adjacent to Machadodorp, whilst the Marathon substation is located west of Nelspruit along the R37 road to Sabie.

A new servitude 55m wide will have to be registered to cater for the transmission lines. In this respect, it is important to note that two related EIA applications have been submitted: one for the transmission lines (the subject of this EIA report) and another for the substations (the subject of another EIA Report). The public participation processes for these applications is being conducted as a single process, but the reporting is separated.

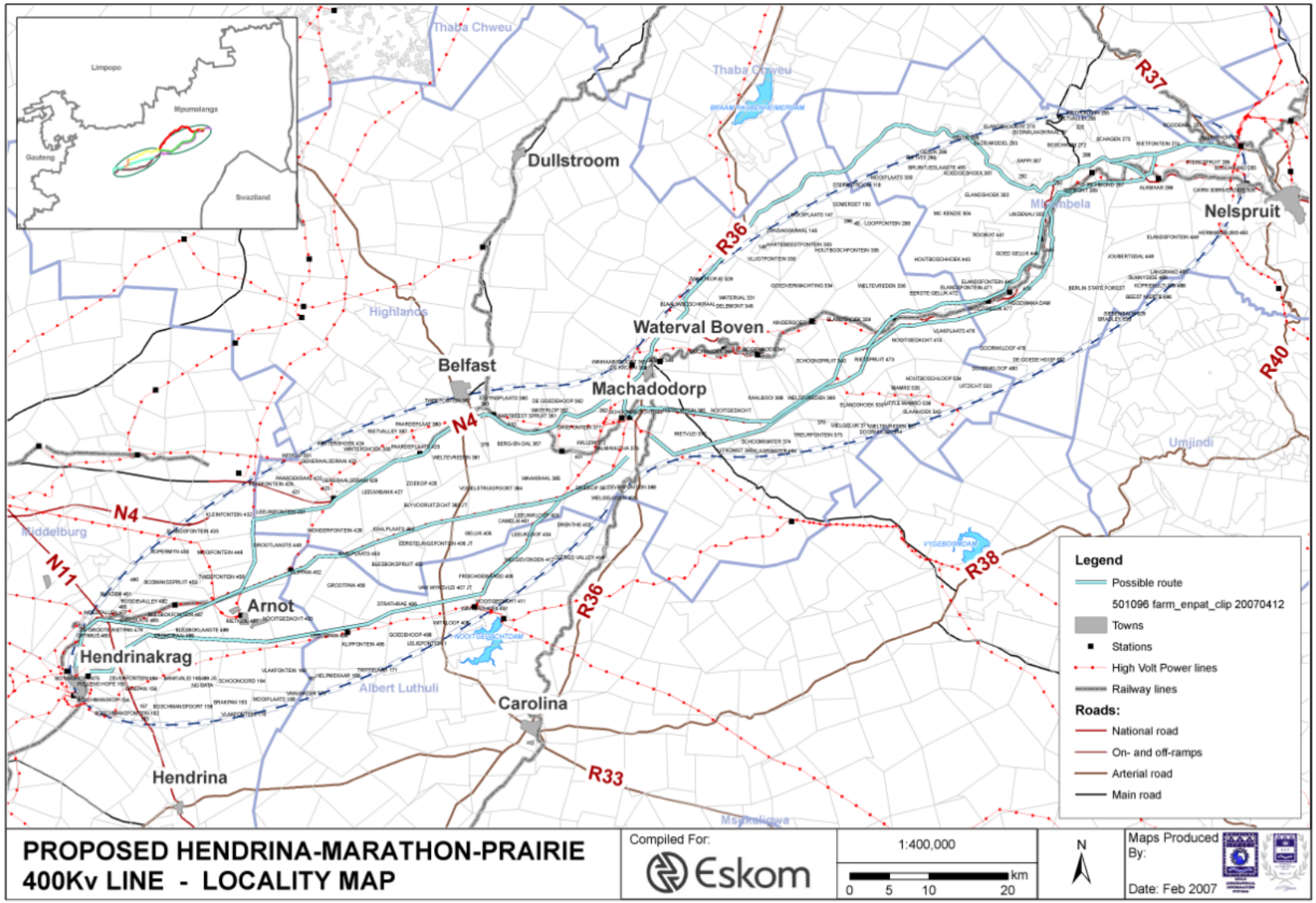

Figure 1: Locality Map

1.1 LEGAL REQUIREMENTS

The aim of this component of the report is to provide a brief overview of the pertinent policies as well as legal and administrative requirements applicable to the proposed development.

1.1.1 Environmental Impact Assessment Requirements

The Environmental Impact Assessment (EIA) process followed is in compliance with the National Environmental Management Act, 1998 (Act No. 107 of 1998) [NEMA], and the EIA Regulations of 2006 (Government Notice No's R385, 386 and 387 of 2006). The proposed development involves 'listed activities', as defined by the abovementioned regulations. Listed activities are activities, which may have potentially detrimental impacts on the environment and therefore require environmental authorisation from the relevant authorising body. The proposed development occurs in the Mpumalanga Province and thus the provincial authority is the Mpumalanga Department of Agriculture and Land Administration (MDALA). However, the approving authority in this case is the Department of Environmental Affairs and Tourism (DEAT) as a result of Eskom being a parastatal body.

Basic Assessment Process

The proposed development (considering both the transmission lines and Substations together) may involve the following listed activities as stipulated in Government Notice R. 386 (Basic Assessment process) of the EIA Regulations of 2006:

1. (m) The construction of facilities or infrastructure, including associated structures or infrastructure, for any purpose in the one in ten year flood line of a river or stream, or within 32 metres from the bank of a river or stream where the flood line is unknown, excluding purposes associated with existing residential use, but including:

- *(i) canals;*
- *(ii) channels;*
- *(iii) bridges;*
- *(iv) dams; and*
- *(v) weirs.*

7. The above ground storage of a dangerous good, including petrol, diesel, liquid petroleum gas or paraffin, in containers with a combined capacity of more than 30 cubic metres but less than 1 000 cubic metres at any one location or site.

12. The transformation or removal of indigenous vegetation of 3 hectares or more or of any size where the transformation or removal would occur within a critically endangered or an endangered ecosystem listed in terms of section 52 of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004).

14. *The construction of masts of any material or type and of any height, including those used for telecommunication broadcasting and radio transmission, but excluding:-*
    (a) masts of 15 metres and lower exclusively used
        (i) by radio amateurs; or
        (ii) for lighting purposes
    (b) flag poles; and
    (c) lightning conductor poles.
15. *The construction of a road that is wider than four (4) metres or that has a reserve wider than six (6) metres excluding roads that fall within the ambit of another listed activity or which are access roads of less than 30 metres long.*
16. *The transformation of undeveloped, vacant or derelict land to establish infill development covering an area of 5 hectares or more, but less than 20 hectares.*

Scoping / EIA Process

The proposed development may also involve the following listed activities as stipulated in Government Notice R. 387 (Scoping / EIA process) of the EIA Regulations of 2006:

1. (I) *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 kilovolts or more.*
2. *Any development activity, including associated structures and infrastructure, where the total area of the developed area is, or is intended to be, 20 hectares or more.*

In view of the fact that the proposed development includes activities falling within the ambit of both Basic Assessment and Scoping and EIA processes, this application is required to be conducted as a **Scoping and EIA** application as per the listed activities of Government Notice R 387 of 2006.

1.1.2 Other Legal Requirements

The following list of legislation may also apply to the proposed development activities.

National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)

The purpose of the Biodiversity Act is to provide for the management and conservation of South Africa's biodiversity within the framework of the NEMA and the protection of species and ecosystems that warrant national protection. As part of its implementation strategy, the National Spatial Biodiversity Assessment was developed.

National Spatial Biodiversity Assessment

The National Spatial Biodiversity Assessment (NSBA) classifies areas as worthy of protection based on its biophysical characteristics, which are ranked according to priority levels.

National Environmental Management: Protected Areas Act, 2003 (Act No. 57 of 2003)

The purpose of this Act is to provide for the protection, conservation and management of ecologically viable areas representative of South Africa's biological diversity and its natural landscapes.

National Forests Act, 1998 (Act No. 84 of 1998)

This Act provides for the management, utilisation and protection of forests through the enforcement of permitting requirements associated with the removal of protected tree species, as indicated in a list of protected trees (first promulgated in 1976 and updated since). Permits are administered by the Department of Water Affairs and Forestry (DWAF).

National Water Act, 1998 (Act No. 36 of 1998)

The National Water Act, 1998 (Act No. 36 of 1998) aims to provide management of the national water resources to achieve sustainable use of water for the benefit of all water users. This requires that the quality of water resources is protected as well as integrated management of water resources with the delegation of powers to institutions at the regional or catchment level. The purpose of the Act is to ensure that the nation's water resources are protected, used, developed, conserved, managed and controlled in responsible ways. The Act aims to regulate the use of water and activities, which may impact on water resources through the categorisation of 'listed water uses' encompassing water extraction, flow attenuation within catchments as well as the potential contamination of water resources, where DWAF is the administering body in this regard.

National Heritage Resources Act, 1999 (Act No. 25 of 1999)

The National Heritage Resources Act legislates the necessity for cultural and heritage impact assessment in areas earmarked for development, which exceed 0.5 hectares (ha) and where linear developments (including power lines) exceed 300 metres in length. The Act protects allows for destruction of existing sites in specific cases if it is supported by the appropriate mitigation as recommended by a heritage specialist.

1.1.3 Provincial Policies/Guidelines

Protected species – Provincial Ordinances

Provincial ordinances were developed to protect particular plant species within specific provinces. The protection of these species is enforced through permitting requirements associated with provincial lists of protected species. Permits are administered by the provincial departments responsible for environmental affairs.

1.2 DETAILS OF THE APPLICANT

Eskom Holdings Limited is split according to the following divisions:

- Eskom Generation;
- Eskom Transmission; and
- Eskom Distribution.

Eskom Generation is responsible for Power Stations as this division is involved with the generation of electricity. Eskom Transmission is involved with the transmission of electricity from the Power Stations to Substations. Eskom Distribution is responsible for distribution of electricity to clients such as local municipalities and other smaller customers. The responsible party in this instance is Eskom Transmission. The details of the project applicant are indicated as follows.

Name of Applicant	Contact Details	
Eskom Holdings Limited – Eskom Transmission Division: Land Rights Contact Person: Mrs. Mmamoloko Seabe	P.O. Box 1091 Sunninghill Johannesburg 2157	Tel: (011) 800 2345 Fax: (011) 800 3917 Cell: (082) 801 3911 Email: SeabeJM@eskom.co.za

1.3 APPLICATION SPLIT

Should the proposed activities be authorised, construction of the substations will commence before the transmission lines are constructed. Therefore, with permission from the DEAT, the proposed development application has been split into two: substations on the one hand and transmission lines on the other hand. This EIA report is concerned with the transmission line application, and another EIA report has been prepared for the substations.

2 PROJECT DESCRIPTION AND MOTIVATION

2.1 PROJECT DESCRIPTION

2.1.1 Phases of the proposed Transmission Lines

2.1.1.1 *Design*

Design alternatives for the proposed project relate mainly to the structure of the towers / pylons in relation to the topography. The structures to be considered for this alignment are discussed in Section 2.1.2.

2.1.1.2 *Pre-Construction Phase*

This phase refers to all construction and construction related activities that will occur, within the servitude area, until the project is completed.

The pre-construction activities include the following:

- Erection of campsites for the contractors' workforce;
- Servitude gate installation to facilitate access to the servitude;
- Vegetation clearance to facilitate access, construction and the safe operation of the line;
- Establishing of access roads on the servitude;
- Transportation of equipment, materials and personnel; and
- Negotiations for access roads along the servitude.

It should be noted that the majority of the proposed transmission lines servitudes occur adjacent to existing power lines with existing access routes. Thus, the selection of the preferred route alignment in some cases will not require the construction of new access routes to the transmission lines.

2.1.1.3 *Construction Phase*

The construction of the substations at Prairie and Marathon is critical to the construction activities for the Transmission Lines.

The construction activities include the following:

- Installation of foundations for the towers;
- Tower assembly and erection;
- Conductor stringing and regulation;
- Site de-establishment and clean up;
- Final inspection of the Transmission Line and taking over from Contractor;
- Rehabilitation of disturbed areas;
- Release Contractor from site; and
- Handing and taking over of the servitude from Transmission Services to the Region.

The construction phase will be treated as an integrated whole, or as two distinct components, as dictated by the nature of the activities and impacts under discussion in the EIA report.

2.1.1.4 *Operational Phase*

The Transmission Lines will be in operation immediately after completion of the project and will stay operational for the lifetime of the transmission line. Subsequent maintenance and refurbishment would normally occur during the operational lifetime of the power line. Operation of the power line will require routine maintenance work that necessitates the utilisation of access roads that will be created along the servitude of the Transmission power line.

The transmission lines will be used to ease the pressure on the current system, where it is not possible to connect additional loads onto the existing 275 kV transmission lines as a result of a great demand of electricity within this region.

2.1.2 Technical Specifications

Details of the 400 kV Transmission power line, including the architectural and structural information on the power line are discussed below.

2.1.2.1 *Types of Towers / Pylons*

Any one of the following types of towers or pylons may be used on this project:

- Cross rope suspension tower (Figure 2);
- Self-supporting suspension tower (Figure 3); and
- Guyed suspension tower (Figure 4).

Figure 2 to Figure 4 show diagrammatic representations of the alternative pylon designs that can be used. Plate 1 shows the types of pylons that are currently used within the study area. The final tower type chosen will be dependent on technical and environmental constraints, and may vary from location to location along the route. Specific pylons designs will be finalised during negotiations with landowners, as well as during the walkdown assessment of the route after authorisation has been issued. Landowner and surrounding land uses will be taken into consideration as far as possible. Where necessary a different tower type could be used to address site-specific issues. The advantages and disadvantages of the alternative towers designs are discussed in the alternatives section of this report (Section 6).

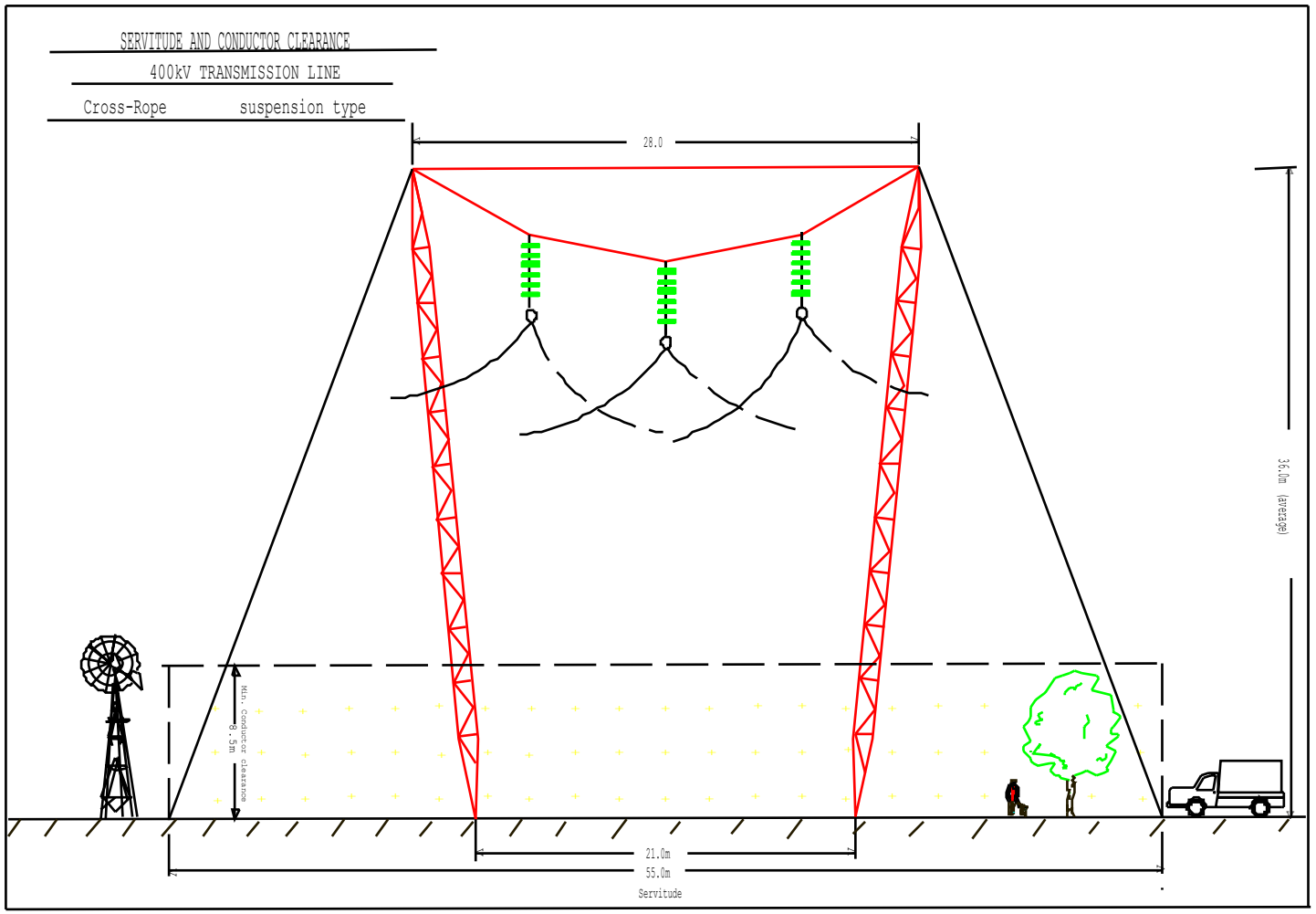

Figure 2: Cross-rope Suspension Tower

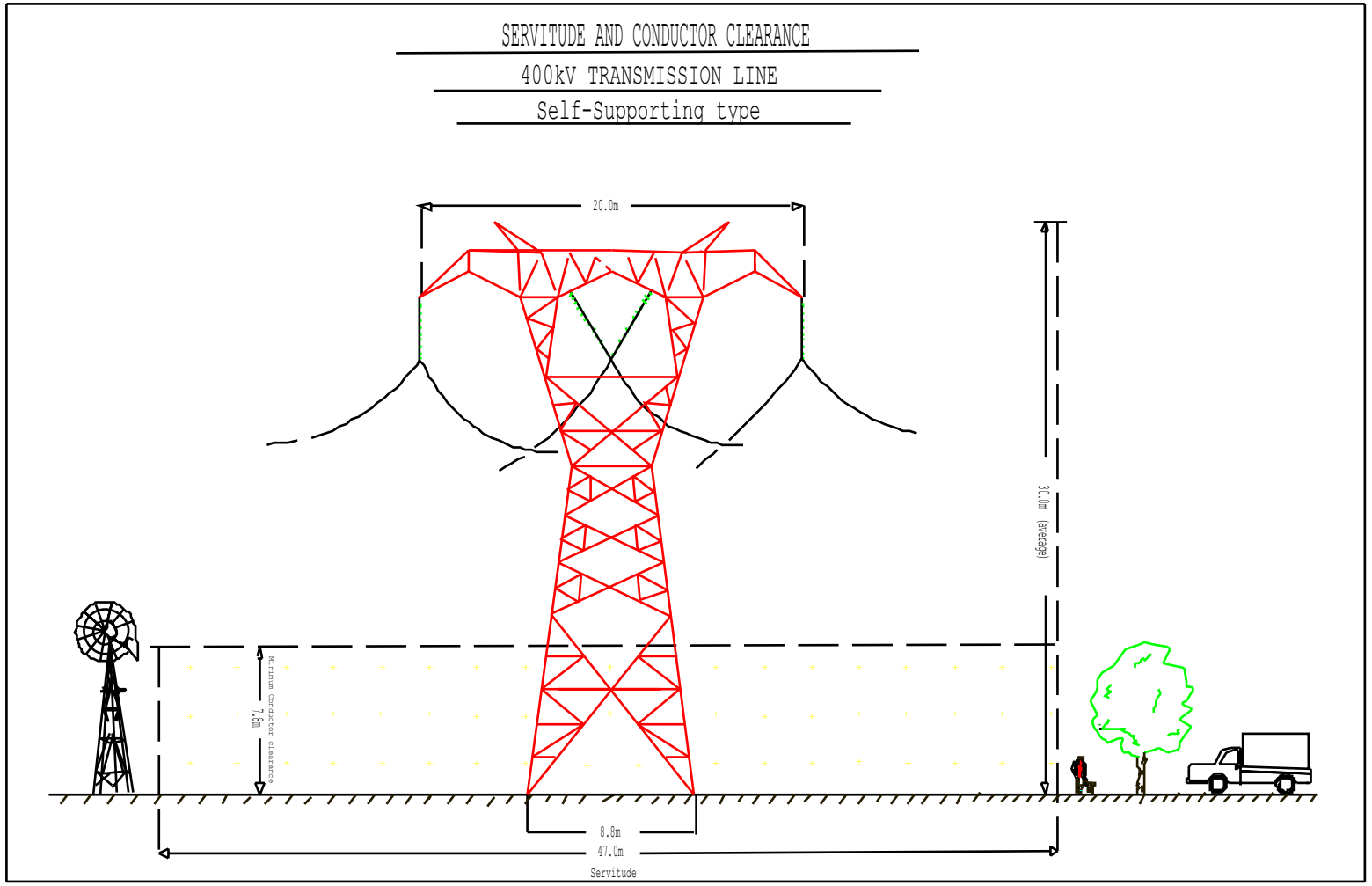

Figure 3: Self-supporting Suspension Tower

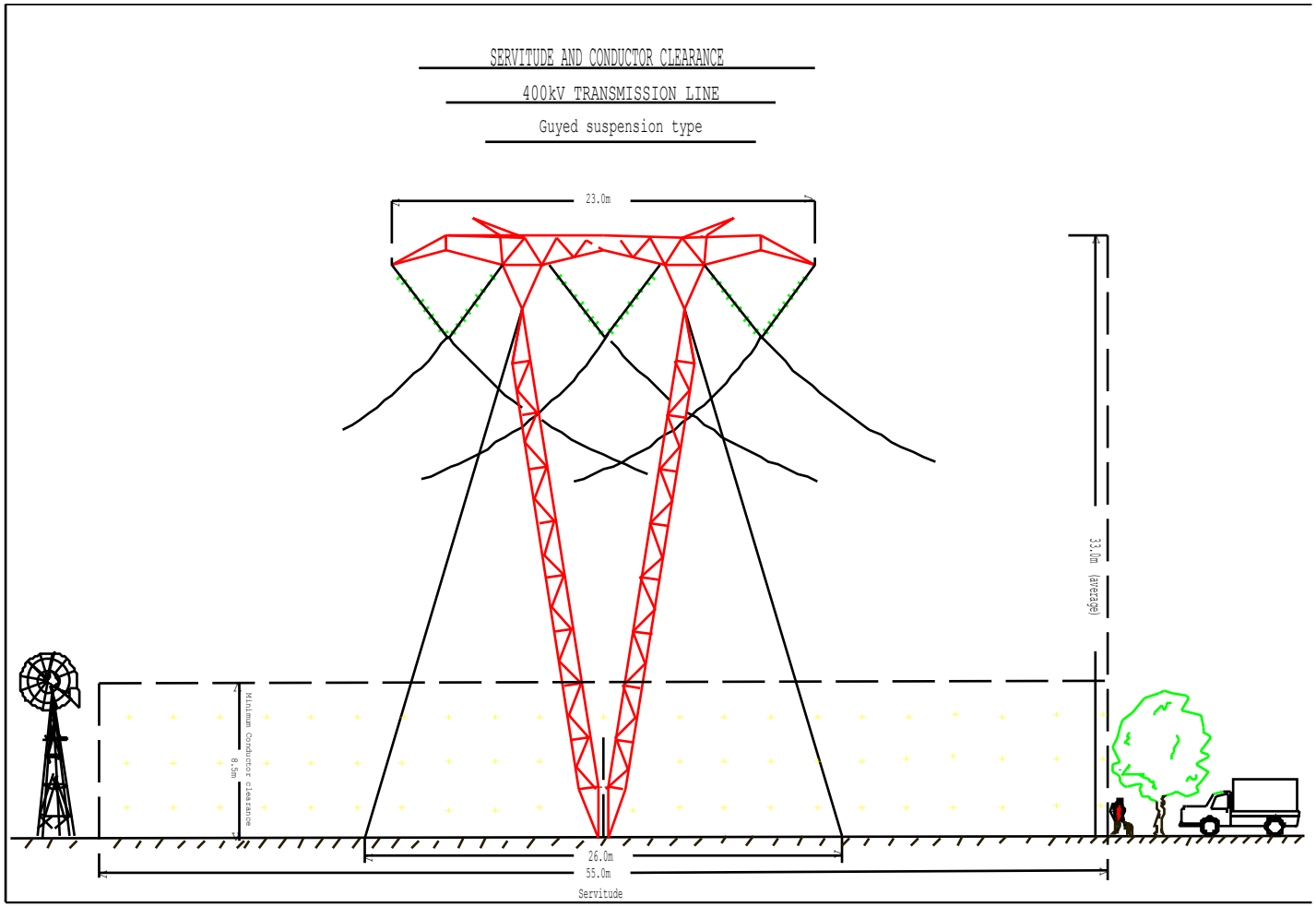

Figure 4: Guyed Suspension Tower

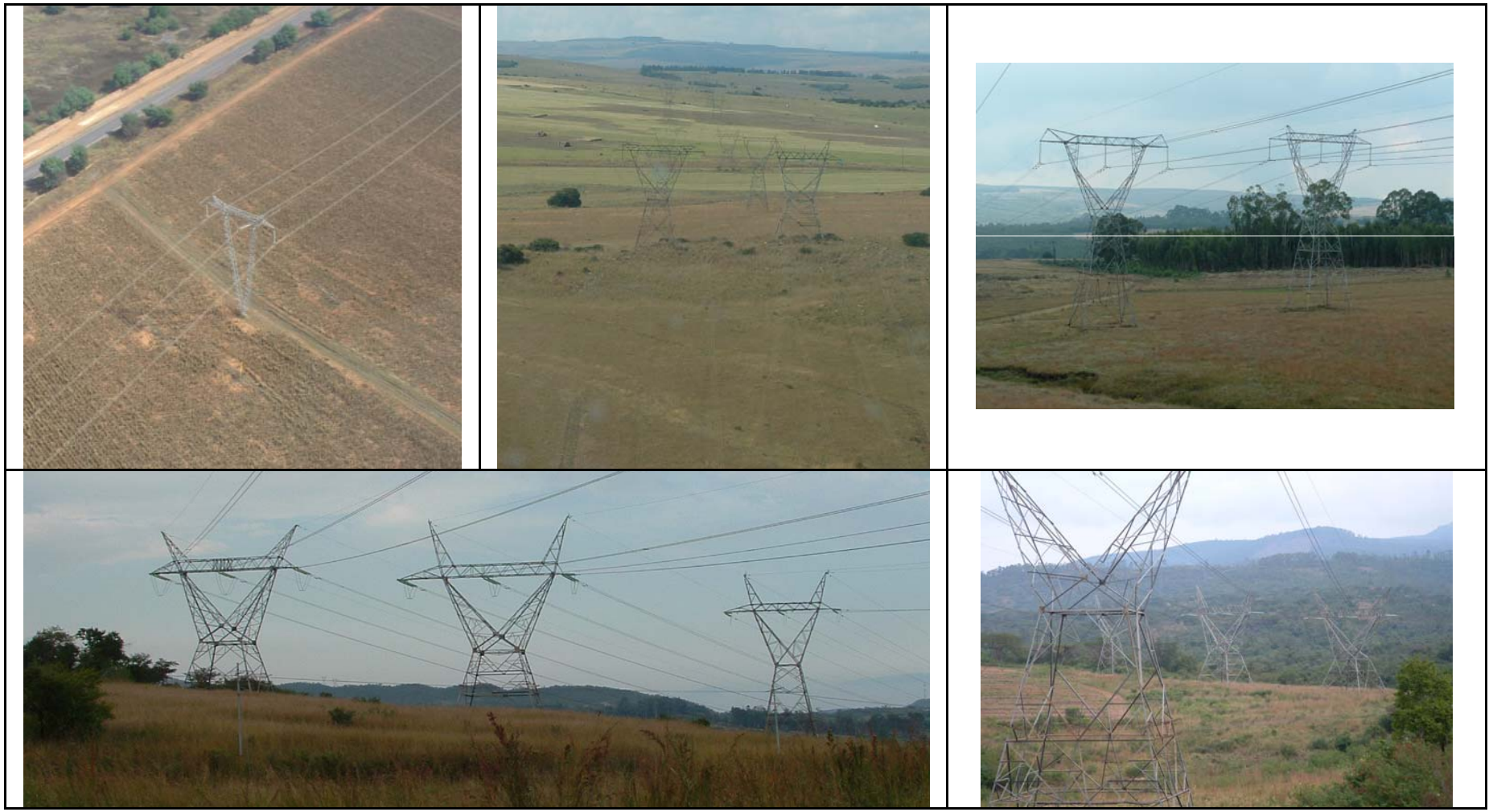

Plate 1: Examples of existing transmission lines in the study area

2.2 TECHNICAL SPECIFICATIONS OF TRANSMISSION LINES

This section deals with information and criteria for design, engineering, supply, fabrication, construction, testing and commissioning of civil and structural work. Details of the 400 kV Transmission power line, including the architectural and structural information on the power line are also discussed.

2.2.1 Standards

The design, manufacture, fabrication, galvanising, testing, construction, materials used for manufacture, erection of station structures, design & construction of foundations and shall conform to the following SABS codes. The latest revisions, with amendments/changes adopted and published, shall be used, unless specifically stated otherwise in the specification.

The material and services covered under these specifications shall be performed as per requirements of the relevant standards / codes mentioned below. Other internationally acceptable standards, which ensure equal or higher performance than those specified, shall also be accepted with permission from the Project Manager.

2.2.1.1 List of SABS; Codes of Practices for Civil Works

SABS 0100	The structural use of concrete
SABS 0161	The design of foundation for buildings
SABS 0162-1:93	The structural use of Steel
SABS 0163	The design of timber structures
SABS 0164	Structural use of masonry
SABS 0400	The application of the national building regulations
SABS 1200	Standardised specifications for civil engineering construction
SABS 471	For Portland cement
SABS 1090	For sand
SABS 1083	For coarse aggregates
SABS 920/1024	Steel reinforcement for reinforced concrete works
SABS 878	Ready mixed concrete
SABS 1431	Steel used for fabrication work
SABS 135/136	For Bolts, Nuts and Washers
SABS 1282	High strength friction grip bolts
SABS ISO 1461	Hot dipped galvanised coating on fabricated iron & steel articles

2.2.2 Design Criteria and Design Philosophy

2.2.2.1 General

The detailed design will include, but not be limited to:

- Verification of all data, criteria and information contained in the Employer's Requirements.
- Generation of all criteria and information required for the completion of work including liaison with the Employer and other Authorities.
- Design and analysis of all structures (towers, beams and equipment support structures), including foundation bolts and preparation of drawings for fabrication.
- Design and stress analysis of foundation for all pylons and equipment support structures, plinth foundations, cable trenches, lighting poles etc., and preparation of all construction drawings (layout, general arrangement, and structural) required for the complete execution of the work. Material selection and material take-off, necessary layouts and details etc shall be developed keeping in view of functional requirements. Sufficient detailing shall be done in all drawings so that the site engineers face no difficulty during execution.
- Design and preparation of all construction drawings, bar bending schedules, material selection and material take-off etc., required for the execution of the work.
- Preparation of a field quality control plan.

2.2.2.2 Road Access for maintenance of the Transmission Line

Road access will be required as part of the servitude along the power line for access to maintain the Transmission Line. This would need to meet specific requirements and appropriate servitude registration for access will be necessary. Where possible, Eskom will make use of existing access roads e.g. if the new transmission line runs parallel to an existing line.

Details regarding the access road can only be provided when the preferred alignment is chosen. These will be included in the Final EIA Report.

2.2.2.3 Structural details of the 400 kV Transmission Line

- **Tower spacing**
  300 m to 500 m
- **Tower height**
  30 m to 38 m (Average) – depending on the type of tower chosen. Maximum height of the Cross-rope suspension pylon is 42m.
- **Conductor attachment height**
  Dependent on the tower type as it is different for each type
- **Conductor type**
  Tern conductor
- **Minimum ground clearance**
  Minimum phase to ground clearance for the self-supporting structure is about 8.5 m.
- **Tower Clearance**

Phase to phase clearances vary from about 5.7 to 7.5 m depending on the type of tower used for that specific transmission line

2.2.2.4 Servitude Required for transmission line

For the purpose of this report, a servitude is a legally registered right over property belonging to a different owner. In this instance, the servitude of 55m allows for the presence of a transmission line and an access road, and places restrictions on the activities that can take place within it e.g. there is a restriction on structures underneath the transmission line.

For this project, trees, buildings and stacked materials may not be closer than 27.5 m from the centre of the servitude. Construction is therefore limited to the 55 m servitude in which the transmission line will be constructed. An area of approximately 6 m to 8 m will be cleared for stringing. Valleys will not be cleared. If requested; the contractor may have to use a helicopter for construction and stringing in certain sensitive areas.

Any extension of the servitude shall be negotiated with the relevant landowner and approved by Eskom. All areas marked as no-go areas within the servitude must be treated with the utmost care and responsibility. The separation between the two 400 kV power lines is 55 m, i.e. the servitudes are adjacent to each other without any spacing in between.

2.2.2.5 Detailed specialist investigations of the approved alignment

In the event that authorisation for the transmission line is granted the ecologist, avifaunal specialist and heritage specialist will undertake a detailed "walkdown" investigation of the authorised alignment. The specialists will confirm environmental sensitivities, and where applicable, recommend further deviations to the alignment on a detailed level in order to avoid and mitigate negative impacts. The EIA report will recommend the authorisation of a corridor of sufficient width to allow small adjustments to be made to the alignment to cater for site-specific sensitive features.

2.2.3 Integration of transmission lines with substations

All three affected substations already have a large number of transmission and distribution lines entering and leaving them (see Plates 2 and 3). Depending on the current layout of these lines, as well as the topography and other physical features such as roads and buildings in the surroundings, it may be necessary for the new lines to cross existing lines or for existing lines to be moved to accommodate the new transmission and distribution lines. The detailed alignments of the proposed transmission lines around the substations have not yet been determined, and will be finalised during detailed design. It is recommended that, should the transmission lines be authorised, Eskom be given flexibility to place the new transmission lines

and/or move existing lines within a 2km radius of the boundary of the substations, provided that:

- New lines are aligned as closely as possible parallel to existing lines;
- Where alignments are likely to affect other parties, Eskom should reach a mutually acceptable agreement with these parties well prior to starting construction of the lines.

2.3 PROJECT MOTIVATION

Electrical supply system operates on a demand-supply structure. However, electricity can not be stored. Therefore, power is generated and transmitted at the moment it is required. Kilometres of high voltage transmission lines transmit power, mainly from the power stations located at the Mpumalanga coal fields (such as Hendrina Power Station) to major substations around the country. At these substations, the voltage is reduced for distribution to industries, businesses, homes and farms throughout the country. Electrical supply constitutes a complex system of generation facilities, substations, transmission and distribution lines.

Eskom has to supply power reliably to meet the increasing needs of end-users. Therefore, Eskom has to expand and establish its infrastructure of transmission lines and substations on an ongoing basis. It is anticipated that the following sectors will enhance economic growth in the Highveld North and Lowveld regions in this instance, which will result in an electrical demand load growth:

- The mining industry, particularly around Machadodorp;
- Residential expansion, particularly in the Nelspruit area; and
- Other economic spheres.

This will result in a growth surge predicted for the next five years. Thus, Eskom Transmission considers it urgent to take action in order to ensure that supply reaches the end users. There is a definite need to overcome potential voltage collapse and unstable transformation problems on the existing Transmission network.

2.3.1 Need for additional capacity

Figure 5 depicts the Lowveld grid network for the supply of electricity. The Lowveld network comprises of the Arnot Power Station, Prairie substation and mainly 275 kV transmission lines. The existing Arnot – Prairie 275 kV Transmission Line that supplies electricity to the Highveld North and Lowveld areas of Mpumalanga cannot reliably support the existing load during power outages. In addition to the current demand in the Highveld North and Lowveld areas, there may be a risk that the demand exceeds the supply. This would ultimately result in load shedding. Therefore, Eskom identified the need to strengthen the existing transmission system between Hendrina and Prairie substations in the Highveld North area through a new 400 kV transmission line between Hendrina and Prairie.

The existing Prairie Substation supplies electricity to the Lowveld area via Marathon Substation. Similar to the Highveld North area, there may be a risk that the demand exceeds supply in the Lowveld area, which would result in load shedding. The proposed Prairie – Marathon Transmission Line is the

only feasible way of ensuring that a continuous supply is achieved in the Lowveld area.

Based on the above and the anticipated growth around the Prairie Substation (particularly the planned expansion of mining projects), there is a need to establish additional 400 kV substations at Prairie and Marathon to ensure continuous supply to the end-users. .

2.3.2 Benefits

By strengthening the electrical supply to the Highveld North and Lowveld regions, the foreseen load growth and the current constraints can be supported in a reliable and economical way. The advantages of the proposed transmission lines and associated substations include:

- Avoiding current and future possible voltage collapse;
- Creation of a more flexible electrical network;
- Improvement in the overall reliability of the electrical systems, which will be of benefit to both Eskom and electricity end-users in the region; and
- Sustaining economic growth in the Highveld North and Lowveld regions.

2.3.3 Phases of Development

The upgrading of the Lowveld and Highveld North networks is being undertaken in a phased approach. Phase 1 is currently undergoing a separate EIA process. This EIA process is focused on Phase 2. This will be followed by Phase 3, which will ensure supply of electricity to cater for future demand. Table 1 and Figure 5 depict the phases proposed for the Lowveld and Highveld North Networks.

Table 1: Phases proposed for the Lowveld and Highveld North Networks

PHASE	DESCRIPTION	EIA PROCESS
Phase 1	Loop in an out Marathon Komatipoort 275 kV into Malelane	Parallel EIA process being undertaken by other consultants
	Install 1 x 250 MVA 275 / 132 kV at Malelane	
	Upgrade 2 x 250 MVA into 2 x 500 MVA at Marathon	
	Upgrade 132 kV busbar at Marathon Substation	
Phase 2	Establish Hendrina-Prairie-Marathon 400 kV line	Parallel EIA process also being undertaken by SEF
	Establish Prairie B Substation close to Prairie Substation (the subject of this Scoping Report)	This EIA process
	Establish Marathon B close to Marathon Substation	
Phase 3	Recycle Arnot-Prairie-Marathon 275kV to 400kV line	Future EIA process
	Establish 2nd Marathon Malelane 275kV line	

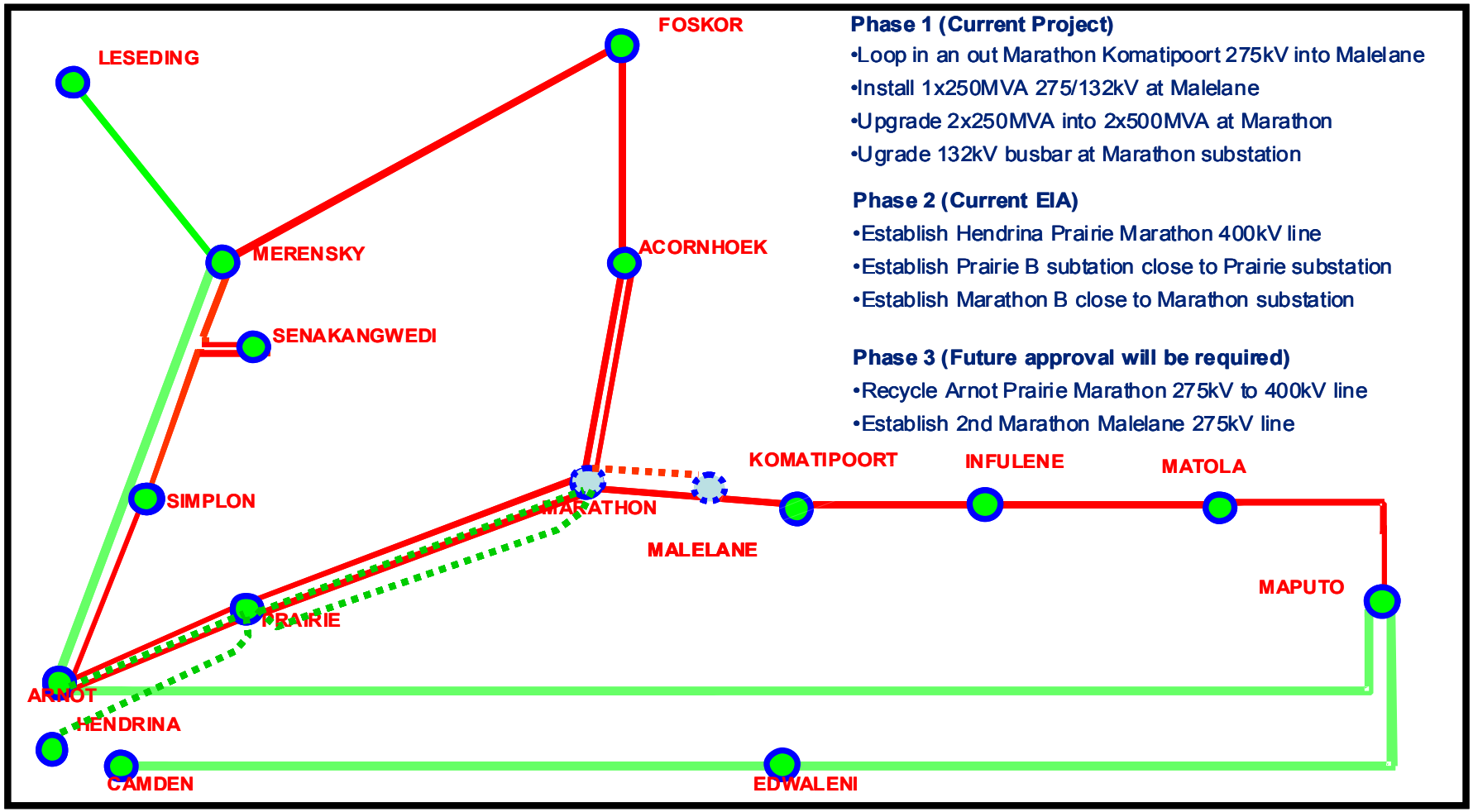

Figure 5: Proposed phases to supply electricity to the Lowveld Network

3 APPROACH TO THE PROJECT

3.1 ENVIRONMENTAL ASSESSMENT PROCESS

3.1.1 Authority Consultation

Authority consultation plays an integral role in any EIA process. The authorities guide the process through highlighting the necessary legislative requirements and key areas of concerns. A meeting was held with Miss Lené Grobelaar of the Department of Environmental Affairs and Tourism (DEAT) on 3 April 2007. It was decided that application for this project be split according to the substations and transmission lines (refer to Section 1.3).

3.1.2 Application for Environmental Authorisation

The application for environmental authorisation for the transmission lines was submitted to DEAT on 20 March 2007. Permission to undertake the scoping process required in terms of the EIA Regulations of 2006 was granted on 26 March 2007 (refer to Appendix 1).

3.1.3 Scoping Process

The Scoping Report represents the initial identification of key issues or concerns as highlighted by the relevant authorities, interested and / or affected parties (I&APs) and professional judgement from the Environmental Assessment Practitioner (EAP). In addition, the Scoping component of the EIA process allows for the identification of the anticipated impacts, particularly those that require specialist investigations.

Subsequent to the legislated public participation process required for the Scoping process, the Final Scoping Report and Plan of Study for EIA was submitted to DEAT on 22 November 2007. Permission to undertake the EIA process required in terms of the EIA Regulations (2006) was granted on 20 December 2007.

3.1.4 Environmental Assessment Process

The EIA Report uses the Scoping Report as a basis for the key issues and concerns that were identified during the scoping phase of the project. The identification of the key issues and concerns were guided by the relevant authorities, interested and / or affected parties (I&APs) and professional judgement by the Environmental Assessment Practitioner (EAP).

The EIA Report further includes the results of the specialist studies, a full assessment of impacts, associated mitigation measures and proposed alternatives. Figure 6 depicts the EIA process in terms of the NEMA.

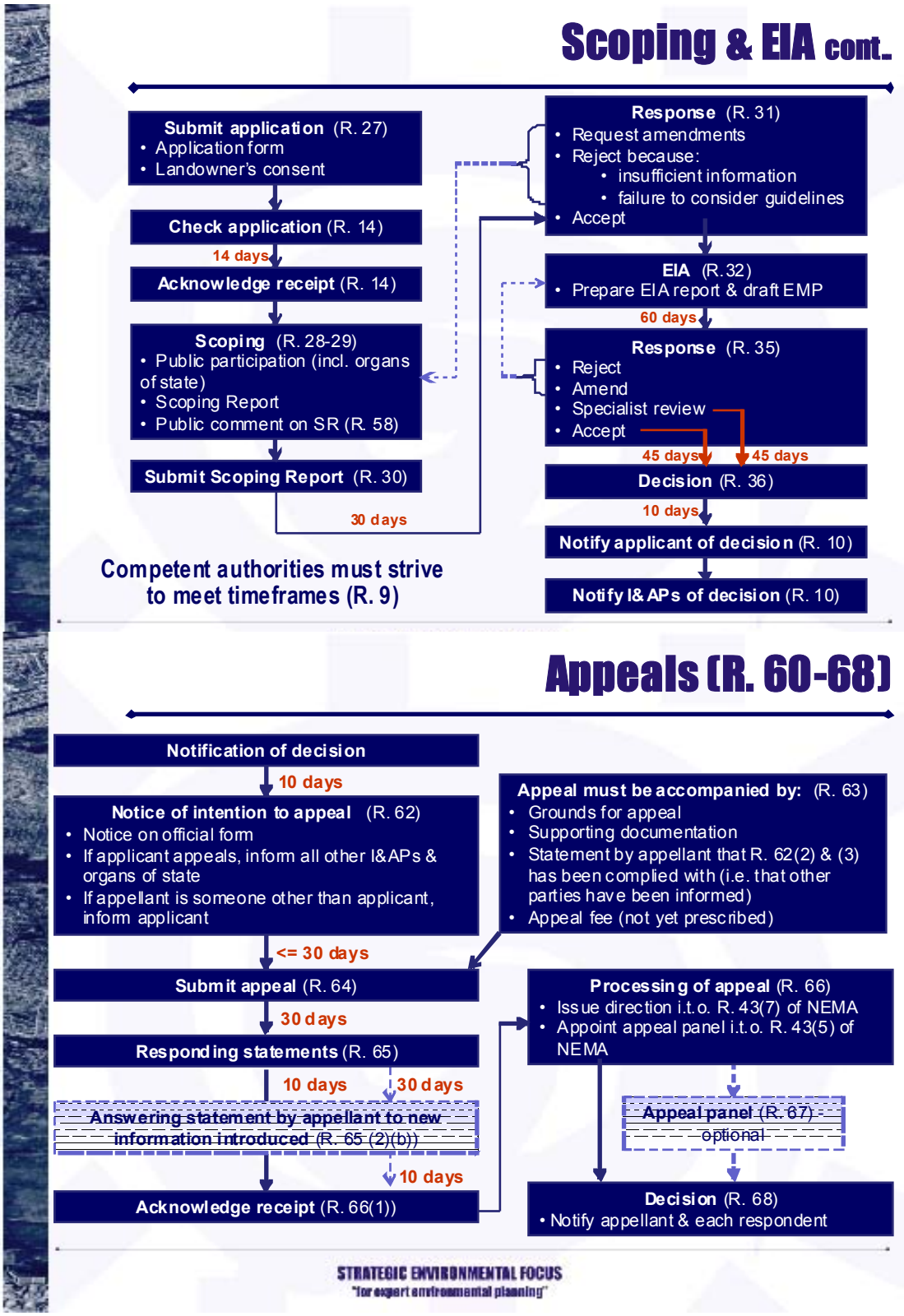

Figure 6: Flow diagram indicating the environmental impact assessment process

3.1.5 Description of the Baseline Environment

The baseline environment (or prevalent environmental status) of the project is the current status of the environmental conditions and environmental resources and existing levels of pollution or degradation prior to the proposed development. Baseline information was determined from a site visit from 18 to 20 April 2007, secondary sources and specialist studies findings.

3.2 METHODOLOGY

3.2.1 Site Visits

An initial site visit was undertaken from 18 to 20 April 2007. The existing substation sites and the alternatives identified were surveyed on the ground as well as from the air (via helicopter). In addition, the alternative route alignments for the transmission lines were also surveyed via helicopter. This site visit was attended by specialists who undertook the following studies:

- Ecological assessment;
- Bird assessment;
- Visual Impact Assessment;
- Heritage Impact Assessment (aerial survey undertaken in August 2007) ; and
- Geotechnical Impact Assessment.

A second site visit was undertaken on 12th November 2007, primarily to re-inspect substation sites and alternative alignments that had been suggested by interested and affected parties. This was followed by a second flyover on 6 February 2008, during which the alternative transmission routes were surveyed from the air.

3.2.2 Integration Meetings

An initial Integration Meeting was held on 25 May 2007 to establish the main concerns based on the preliminary site visit and desktop studies that were undertaken by the specialists. A second Integration meeting was held on 16 January 2008. The specialists identified whether there are any fatal flaws with regards to the routes of the transmission lines, and indicated preferred alignments for the transmission lines with the least possible environmental impact.

3.2.3 Specialist Studies

The EIA process requires the identification and the undertaking of specialist studies to inform the Scoping Report and the EIA Report. Table 2 shows the specialist studies that have been undertaken for the proposed development.

Table 2: Specialist studies undertaken

Specialist assessment	Name	Organisation

Specialist assessment	Name	Organisation
Terrestrial Ecology Impact Assessment	Willem Lubbe	Strategic Environmental Focus (Pty) Ltd.
	Lael Buckham	
Social Impact Assessment (SIA)	Milicent Solomons	Strategic Environmental Focus (Pty) Ltd.
	Jessica de Beer	
Visual Impact Assessment (VIA)	Hennie Stoffberg	Strategic Environmental Focus (Pty) Ltd.
Geotechnical Impact Assessment	Nino Welland	Moore Spence Jones
Soil and Agricultural Potential Assessment	Garry Paterson	Agricultural Research Council
Heritage Impact Assessment (HIA)	Johnny van Schalkwyk	National Cultural History Museum
Avifauna Impact Assessment	Lukas Niemand	Pachnoda Consulting cc

3.2.3.1 Geological Assessment

Geological maps covering the study area were consulted at a scale of 1:250 000. The geology was then superimposed onto the study area. In addition, the following variation in topographic slope categories was used:

- Gentle (<2°);
- Moderate (2° to 12°); and
- Steep (>12°)

The following geological constraints were identified based on a number of criteria:

- Groundwater;
- Access;
- Foundation condition; and
- Excavatability.

These findings (using desktop analysis) were then confirmed by the site visit.

3.2.3.2 Soil and Agricultural Potential

The land type survey map sheets (at a scale of 1:250 000) of 2528 Pretoria (Schoeman *et al*, 1987) and 2530 Barberton (Schoeman *et al*, 1989) were consulted to determine the soil information for the study area. Each land type is a unique combination of soil pattern, terrain and macroclimate.

Thereafter, the soils were classified according to MacVicar *et al* (1977). The information contained in the land type survey is of a reconnaissance nature and, as such can only represent dominant soils within a specific land type.

3.2.3.3 Ecological Assessment

During the site visit, the following variables were noted by the ecologist:

- Location of sensitive environments;
- Location of plant sensitive species;
- Alien / exotic species; and

- Signs of animal activity.

In order to compile habitat descriptions and geographical distributions, the Mpumalanga C-Plan and Mpumalanga Biobase GIS databases were consulted. The scientific services department of the Mpumalanga Parks Board was also consulted to obtain updated information regarding sensitive flora, fauna and habitats within the study area.

The ecological function and conservation importance of the habitat regions were used to establish the ecological sensitivity of the study area. A GIS desktop analysis was conducted, which lead to the analysis of the following classification systems in order to compile the sensitivity map of the study area:

- Land cover;
- Land use;
- Mpumalanga C-Plan (MDALA, 2006); and
- Vegmap (Mucina & Rutherford, 2006).

3.2.3.4 Avifaunal Assessment

In addition to the site visit, a literature review was conducted for the distribution patterns of bird species and to obtain information on conservation status of all bird species located within the study area.

3.2.3.5 Visual Impact Assessment (VIA)

During the site visit, the following variables were noted by the visual impact assessor:

- A photographic record of the site, views and areas of particular visual quality and / or visual value;
- The landscape character and visual character of the study area was established; and
- The landscape receptors and visual receptors of the study area were identified.

A literature review as discussed in the Visual Impact Assessment (SEF, 2007) was conducted based on similar developments to establish points of similarity and dissimilarity.

3.2.3.6 Heritage Impact Assessment (HIA)

A literature review was carried out in order to gain an understanding of any previous research undertaken within the study area and surrounds. In conjunction with the Heritage Sites Database, the Environmental Potential Atlas, and other databases in the National Archives, aerial photographs, topocadastral maps and other maps were also consulted to inform the HIA.

In addition, an independent site visit was undertaken where the proposed transmission line routes were surveyed from the air (via helicopter). A ground survey was also conducted by means of quadrat sampling. This entails the division of the area into blocks by using natural linear boundaries (e.g. streams and rivers) and anthropogenic linear boundaries (e.g. roads and fences). Thereafter, each block was surveyed by driving across in a number of transects.

3.2.3.7 Social Impact Assessment (SIA)

The SIA employed the following methodology:

- Necessary demographic data was obtained from Statistics South Africa (2001);
- A scoping exercise consisting of an initial site visit and information search was conducted to identify and contact key stakeholders. Key stakeholders included town councils, community representatives, political leaders, representatives of the mining industry, tourism groups, land owners, parks boards and agricultural groups amongst others;
- The initial site visit was followed up with a longer period of field work to obtain additional information and communicate with key stakeholders;
- Information was obtained via focus groups, formal and informal interviews, participatory rural appraisal, observation, the internet and literature reviews. Minutes and notes were kept of all interviews and focus group meetings;
- An interview schedule was utilised instead of formal questionnaires. An interview schedule consists of a list of topics to be covered, but is not as structured as an interview. It provides respondents with freedom to elaborate on their views;
- The SIA focused on current conditions, providing baseline data. Each category discussed the current state of affairs, but also investigated the possible impacts that are likely to occur in future and recommendations to mitigate the impacts were made;
- The SIA had a participatory focus. This implies that the SIA focused strongly on including the local community and key stakeholders; and
- The findings of the public participation process (Section 5) fed into the SIA.

3.3 IMPACT ASSESSMENT METHODOLOGY

In order to provide a detailed assessment of environmental impacts in accordance with the requirements of the EIA regulations (2006), a quantified assessment methodology was used. In order to establish a coherent framework within which all impacts could be objectively assessed, a rating system was used. This has been applied consistently throughout all criteria

and to all environmental impacts. Each aspect was assigned a value ranging from one to five, depending on its definition (Figure 7).

This rating system provides an appraisal of the type of effect the proposed activities can impose on the affected environmental component. The description will include what is affected and how it is affected. An explanation of the impact assessment criteria follows.

3.3.1 Extent

The physical and spatial scale of the impact is classified as:

Description	Explanation	Numerical value
Footprint	The impacted area extends only as far as the activity, such as footprint occurring within the total site area.	1
Site	The impact could affect the whole, or a significant portion of the site.	2
Regional	The impact could affect the area around the site including neighbouring farms, transport routes and adjoining towns.	3
National	The impact could have an effect that expands throughout the country (South Africa).	4
International	The impact has international ramifications that go beyond the boundaries of South Africa	5

3.3.2 Duration

The lifetime of the impact, that is measured in relation to the lifetime of the proposed development.

Description	Explanation	Numerical value
Short-term	The impact will either disappear with mitigation or will be mitigated through a natural process in a period shorter than any of the development phases.	1
Short to medium-term	The impact will be relevant through to the end of the construction phase	2
Medium-term	The impact will last up to the end of the phases, where after it will be entirely negated.	3
Long-term	The impact will continue or last for the entire operational lifetime of the development, but will be mitigated by direct human action or by natural processes thereafter.	4
Permanent	This is the only class of impact that will be non-transitory. Mitigation either by man or natural process will not occur in such a way or in such a time span that the impact can be considered transient	5

3.3.3 Intensity

The intensity of the impact is considered by examining whether the impact is destructive or benign, whether it destroys the impacted environment, alters its functioning, or slightly alters the environment itself. These are rated as:

Description	Explanation	Numerical value
Low	The impact alters the affected environment in such a way that the natural processes or functions are not affected.	1
Medium	The affected environment is altered, but functions and processes continue, albeit in a modified way.	2
High	Function or process of the affected environment is disturbed to the extent where the function or process temporarily or permanently ceases.	3

This will be a relative evaluation within the context of all the activities and the other impacts within the framework of the project.

3.3.4 Probability

This describes the likelihood of the impacts actually occurring. The impact may occur for any length of time during the lifecycle of the activity, and not at any given time. The classes are rated as follows:

Description	Explanation	Numerical value
Improbable	The possibility of the impact occurring is none, due either to the circumstances, design or experience. The chance of this impact occurring is thus zero (0%).	1
Possible	The possibility of the impact occurring is very low, either due to the circumstances, design or experience. The chances of this impact occurring is defined as 25%.	2
Likely	There is a possibility that the impact will occur to the extent that provisions must therefore be made. The chances of this impact occurring is defined as 50%.	3
Highly likely	It is most likely that the impacts will occur at some stage of the Development. Plans must be drawn up before carrying out the activity. The chances of this impact occurring is defined as 75%.	4
Definite	The impact will take place regardless of any prevention plans, and only mitigation actions or contingency plans to contain the effect can be relied upon. The chance of this impact occurring is defined as 100%.	5

3.3.5 Mitigation

The impacts that are generated by the development can be minimised if measures are put in place to reduce them. These measures are mitigation measures to ensure that the development takes into consideration the environment and the impacts that are predicted so that development can co-exist with the environment as a basis for planning.

3.3.5.1 Determination of Significance – Without Mitigation

Significance is determined through a synthesis of impact characteristics as described in the above paragraphs. It provides an indication of the importance of the impact in terms of both tangible and intangible characteristics. The significance of the impact "without mitigation" is the prime determinant of the nature and degree of mitigation required. Where the impact is positive, significance is noted as "positive". Significance is rated on the following scale:

Description	Explanation
Low	The impact is not substantial and does not require any mitigation.
Low to medium	The impact is of little importance, but may require limited mitigation.
Medium	The impact is of importance and is therefore considered to have a negative impact. Mitigation is required to reduce the negative impacts to acceptable levels.
Medium to high	The impact is of great importance. Mitigation of the impact is essential.
High	The impact is of major importance and should mitigation not be applied, it is considered to be a fatal flaw in the project proposal. This could render the entire development option or entire project proposal unacceptable.

3.3.5.2 Determination of Significance – With Mitigation

Determination of significance refers to the foreseeable significance of the impact after the successful implementation of the necessary mitigation measures. Significance with mitigation is rated on the following scale:

Description	Explanation
Low	The impact will be mitigated to the point where it is of limited importance.
Low to medium	The impact is of importance, however, through the implementation of the correct mitigation measures such potential impacts can be reduced to acceptable levels.
Medium	Notwithstanding the successful implementation of the mitigation measures, to reduce the negative impacts to acceptable levels, the negative impact will remain of significance. However, taken within the overall context of the project, the persistent impact does not constitute a fatal flaw.

Description	Explanation
Medium to high	The impact is of major importance but through the implementation of the correct mitigation measures, the negative impacts will be reduced to acceptable levels.
High	The impact is of major importance. Mitigation of the impact is not possible on a cost-effective basis. The impact continues to be of major importance, and, taken within the overall context of the project, is considered to be a fatal flaw in the project proposal. This could render the entire development option or entire project proposal unacceptable.

3.3.6 Assessment of significance

Each aspect within an impact description was assigned a series of quantitative values. Such criteria are likely to differ during the different stages of the project's life cycle.

Extent	Duration	Intensity	Probability	Significance Rating (SR)	Mitigation Efficiency (ME)	Significance Following Mitigation (SFM)
Footprint 1	Short term 1	Low 1	Probable 1	Low 0-4	High 0,2	Low 0-4
Site 2	Short to medium 2		Possible 2	Low to medium 5-8	Medium to high 0,4	Low to medium 5-8
Regional 3	Medium term 3	Medium 3	Likely 3	Medium 9-12	Medium 0,6	Medium 9-12
National 4	Long term 4		Highly Likely 4	Medium to high 13-16	Low to medium 0,8	Medium to high 13-16
International 5	Permanent 5	High 5	Definite 5	High 17-20	Low 1,0	High 17-20

Figure 7: Description of assessment parameters

3.3.6.1 Calculating significance Without Mitigation Measures (WOM)

The values assigned to all criteria are totalled, resulting in a value for each impact.

Equation 1:

Significance Rating (WOM) = Extent + Intensity + Duration + Probability

3.3.6.2 Calculating significance With Mitigation Measures (WM)

In order to gain a comprehensive understanding of the overall significance of the impact, it was necessary to quantify the impact upon the implementation of the necessary mitigation measures.

The most effective means of deriving a quantitative value of mitigated impacts is to assign each WOM value a mitigation effectiveness (ME) rating (refer to Figure 7). The allocation of such a rating is a result of the efficiency

and effectiveness, as identified through professional experience and empirical evidence of how effectively the proposed mitigation measures will reduce the significance of the impact.

Thus, the lower the assigned value the greater the effectiveness of proposed mitigation measures and subsequently, the lower the significance of impacts with mitigation.

Equation 2:

Significance Rating (WM) = Significance Rating (WOM) x Mitigation Efficiency

or WM = WOM x ME

The efficiency of the mitigation measure determines the eventual significance of the impact. The level of impact is therefore seen holistically with all considerations taken into account.

3.4 ASSUMPTIONS AND LIMITATIONS

3.4.1 General

The following general assumptions and limitations are applicable to the EIA process:

- The landowner's consent for one of the proposed Marathon B sites at Boschrand was not available at the time that the application was submitted to DEAT in May 2007. This consent has subsequently been submitted to DEAT.

3.4.2 Public Participation

There are no serious assumptions or limitations that would affect the outcome of the EIA Process. Sufficient resources were available for the proper undertaking of the EIA Process. All possible measures were employed in order to notify landowners and other affected parties of the EIA Process, including deeds searches, local and regional press advertising, site notices, "knock and drop" notifications and direct notification of directly affected landowners and adjacent landowners.

Although few members of the public attended the initial meetings, follow up meetings were scheduled with key interested and affected parties to ensure that all interested and affected parties are identified and to ensure that their concerns are heard.

3.4.3 Geotechnical Assessment

No limitations were identified during the study.

3.4.4 Soil and Agricultural Potential

The maps used for the land type survey is of a reconnaissance nature (1:250 000 scale) and, as such can only represent the dominant soils within a specific land type. Areas of different soils are expected to occur, but due to the nature and scale of the survey, they could not be delineated in detail.

3.4.5 Ecological Assessment and Avifaunal Assessment

In order to obtain a comprehensive understanding of ecological processes and the dynamics involved within the communities within the study area, it is suggested that investigations should occur across seasons / years. In addition, replication of investigations should also occur so as to confirm the accuracy and adequacy of the investigations. However, due to time constraints, such long-term studies are not feasible. Therefore, the ecological investigation (including avifaunal investigation) is based on instantaneous sampling sessions.

3.4.6 Visual Impact Assessment

The VIA was undertaken based on the information available at the time. Therefore, the following assumptions were made:

- An exact commencement date for the construction phase is unknown. Construction is expected to commence as soon as public participation is complete and approval is received from the relevant authorities;
- The exact location, size and number of construction camps and material lay-down yards are not specified at this stage of the project. It is anticipated that construction camps will be set up on farms at central locations close to the substation sites. The construction camps will consist of temporary structures such as tents or temporary buildings. Ablution facilities will also be associated with the construction camps and are expected to be portable toilets and shower facilities;
- This level of assessment excludes surveys to establish viewer preference and thereby their sensitivity. Viewer sensitivity is determined by means of a commonly used rating system.

3.4.7 Heritage Impact Assessment

Not all areas within the study area were surveyed owing to private ownership of many large tracts of land such as game farms and ranches. During the site visit, the practitioner encountered dense vegetation, which caused difficulty in locating heritage resources as well as verifying the extent of heritage resources.

There is scarce knowledge about the heritage value of the Schoemanskloof Valley and surrounding area. In addition, sufficient oral traditions are not available for the rural areas to have an insight into the existence of possible heritage sites within the study area.

3.4.8 Social Impact Assessment

The following assumptions and limitations are relevant to the SIA:

- Only key persons in the community were approached for further discussion. Additional information was obtained using existing data, via telephonic communication and on-site interviews;
- The fieldwork for the study was conducted in 2007;
- It is assumed that local employment will be a priority for all operations;
- It is assumed that apart from temporary disruption, most communal grazing areas will be fully accessible after construction;
- It is assumed that the 2001 Census data is not entirely accurate, but it gives a broad reflection of the social environment, and
- It is assumed that the information obtained during the public participation process, which informed the study, was accurate.

3.4.9 Mapping

All mapping was completed using ArcGis 8.3. Most work was completed using GeoWgs84 (Geographic WGS84). However, where calculations were required, a projection of TM27Wgs84 (Transverse Mercator Lo 27, WGS84) was used.

4 DESCRIPTION OF THE BASELINE ENVIRONMENT

4.1 BIOPHYSICAL ENVIRONMENT

4.1.1 Climate

4.1.1.1 Temperature

The highest maximum and lowest minimum temperatures recorded at the closest weather station in Nelspruit, for the period 1961 to 1990 were 40°C and –2°C, respectively. The average maximum temperature for January, the hottest month, is 29°C while the average minimum temperature for June, the coldest month, is 6°C (Figure 8) (Weather Bureau, 2003). The western portion of the study area, being located at a much higher altitude, is considerably cooler than the Nelspruit area.

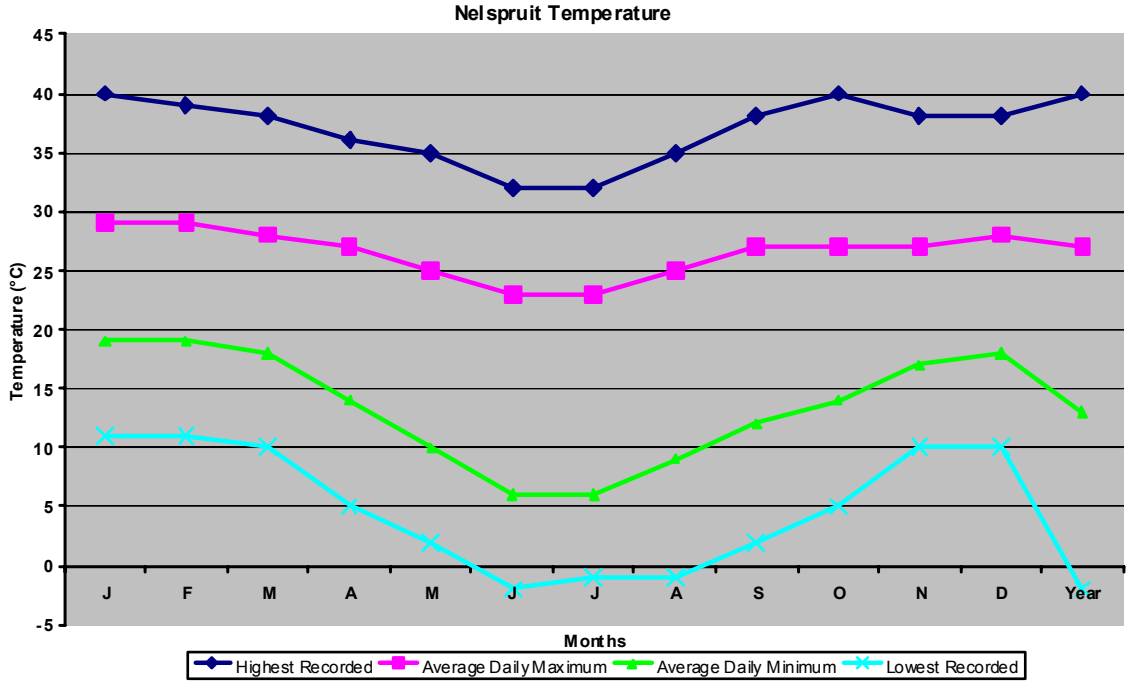

Figure 8: Temperature regime at Nelspruit (Weather Bureau, 2003)

4.1.1.2 Precipitation

Rainfall is strongly seasonal, with an average monthly rainfall of 127 mm in January and 9 mm in July (for the period 1961 to 1990). Most rain occurs as heavy, isolated thundershowers in the summer months occurring between October and March. The average rainfall per annum at Nelspruit is 767 mm. Figure 9 illustrates the rainfall regime at Nelspruit (Weather Bureau, 2003). Rainfall along the escarpment areas, which bisects the study area into the lowveld in the east and the highveld in the west, is much higher, and can exceed 1000mm per annum.

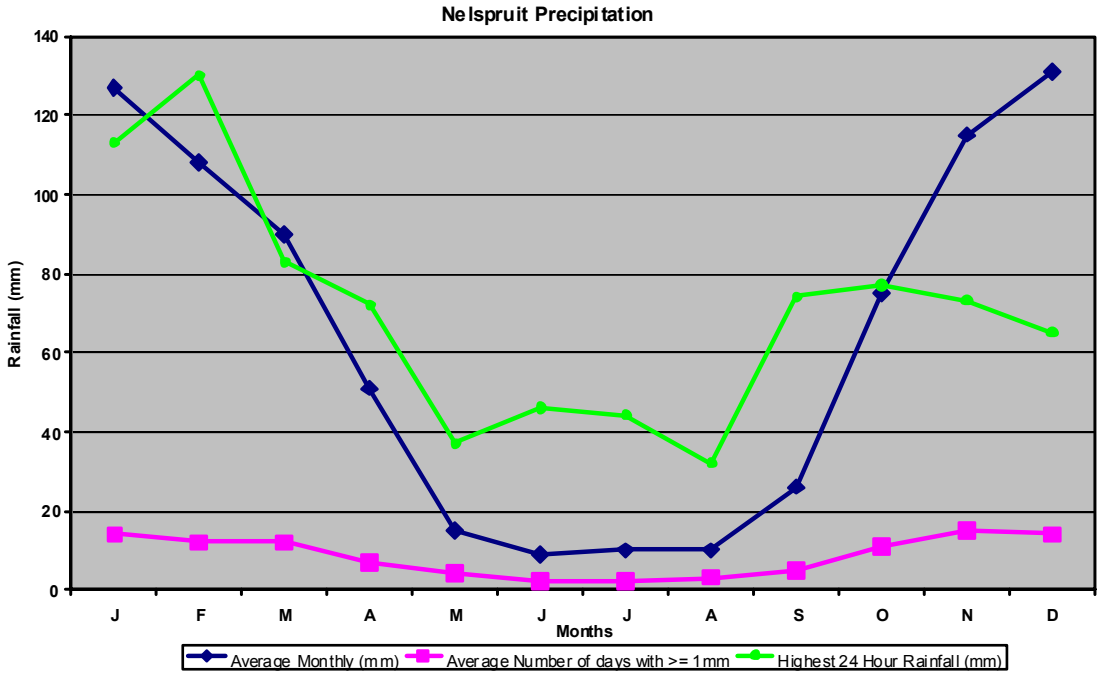

Figure 9: Precipitation regime at Nelspruit (Weather Bureau, 2003)

4.1.2 Topography and Hydrology

The study area comprises of the characteristically flat Highveld, the north-south direction of the Drakensberg Escarpment and the undulating Lowveld as indicated in Figure 10. There are two valleys that are incised into the Escarpment via the two main river valleys within this region. The Crocodile River is located within the Schoemanskloof Valley and the Elands River is located within the Elands River valley along the N4 National Highway. Alternative routes to the Prairie – Marathon Transmission Line are proposed along the bottom of these valleys as the valley bottoms are relatively flat. As a result of the topography, the watercourses flow in a general easterly direction, from the higher lying Highveld region to the lower lying Lowveld region.

The Hendrina and Prairie substations are located on the Highveld approximately 1650 m.a.s.l., whereas the Marathon substation's location is in the Lowveld, approximately 820 m.a.s.l. The Hendrina substation is located on relatively flat land next to the Hendrina power station (Plate 2). The Leeuspruit River is situated approximately 650 m south-east of the existing Prairie substation site, so the site slopes slightly toward the river (Plate 3). The perennial Nels River is located approximately 1.4 km north of the existing Marathon substation site (Plate 4). Plates 5 to 8 provide typical views of the main landscape types from Hendrina Power Station down to Marathon Substation.

Plate 2: Aerial view of the existing Hendrina Substation

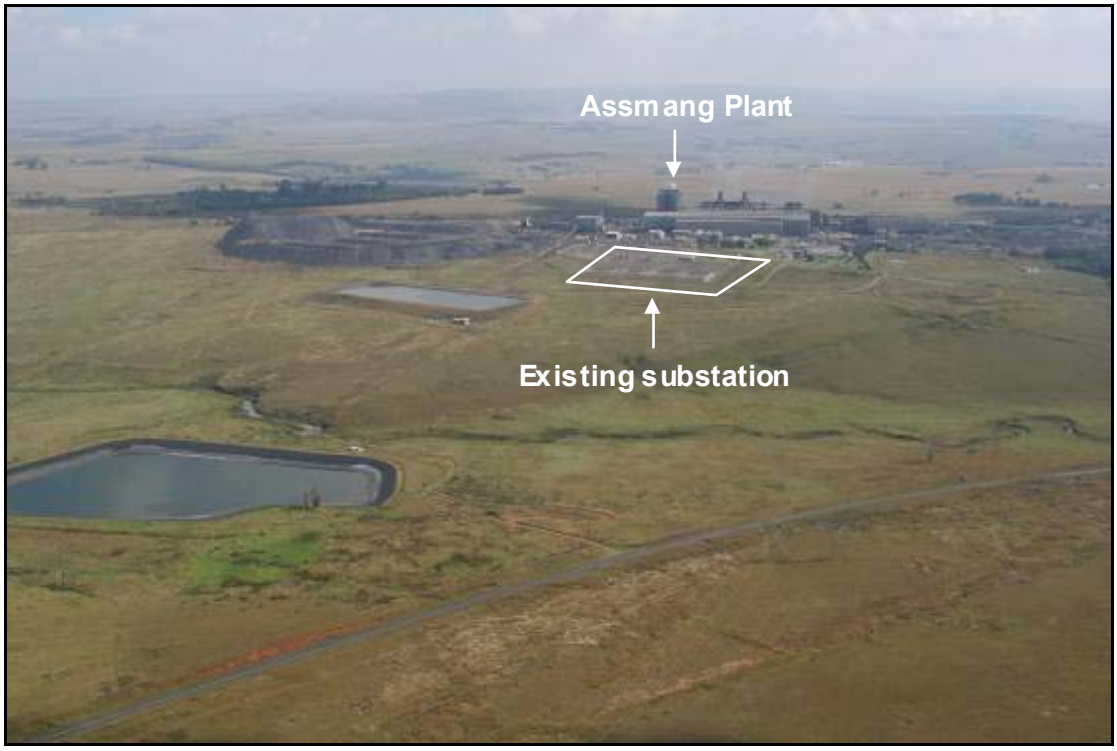

Plate 3: Aerial view of the existing Prairie Substation looking northwest showing the adjacent Assmang processing plant

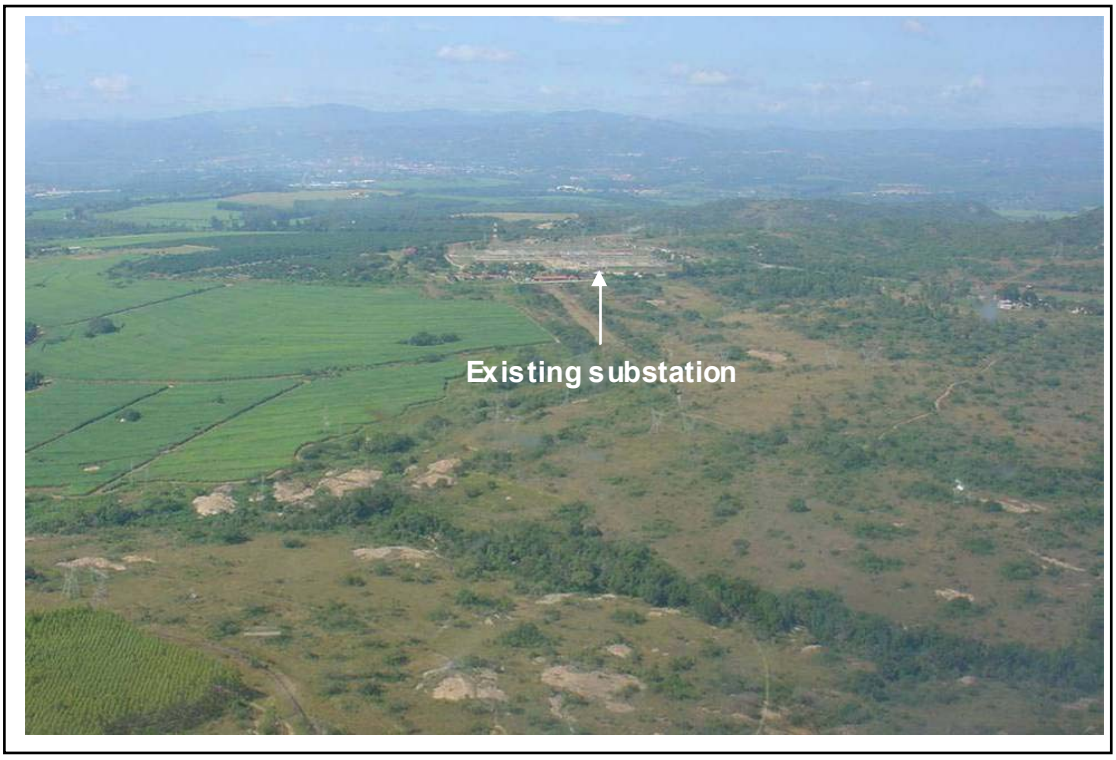

Plate 4: Aerial view of the existing Marathon Substation (looking southeast) with Nelspruit in the far background

Plate 5: Typical view of the flat highveld region showing opencast coal mining activities

Plate 6: View of Machadodorp showing the surrounding open grassland landscape

Plate 7: Typical view of forestry plantations in the escarpment region

Plate 8: View looking east along the N4 highway in the Schagen area of the lowveld showing intensive agricultural activity

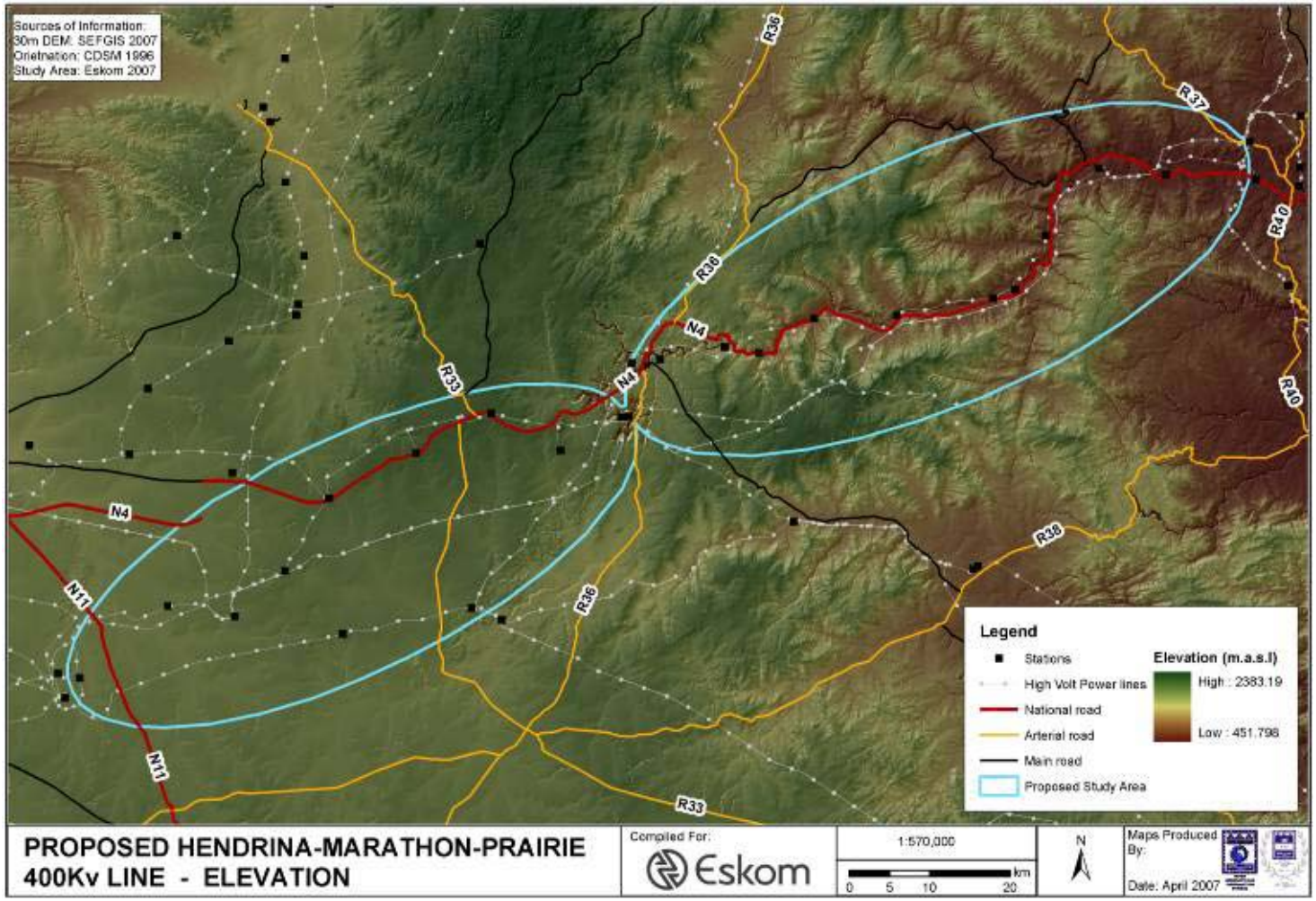

Figure 10: Topography of the study area

4.1.3 Geology and Geotechnical Suitability

A Geotechnical Investigation has been undertaken by Moore Spence Jones. Figure 12 indicates the broad geological patterns of the study area. This shows that the area from Hendrina to Prairie has generally good shallow founding conditions. However, variable to deep founding conditions are prevalent in the area between Prairie and Marathon. There is evidence of Dolomite within this section of the study area and is indicated in green in Figure 12.

The eroded soil produced from the Granite base rock type near Nelspruit has geo-technical constraints for development. However, this can be easily overcome with proper preparation of foundations and structural design.

4.1.4 Soils and Agricultural Potential

Farming in the study area can be broadly categorised into the following zones:

- Maize farming is dominant in the belt between Hendrina Power Station and the Belfast area. This generally area has deep soils suitable for cultivation.
- Farming with stock is dominant in the area around Machadodorp, as this area is closer to the escarpment and is characterised by rocky and shallow soils that are unsuitable for cultivation. There are also many trout farms and associated tourist facilities in this area
- The areas on the crest of the escarpment are characterised by trout farming and forestry, the latter which relies on the high annual average rainfall along the escarpment.
- The lowveld has deep, weathered soils derived from granite, which is used for orchards (citrus, litchis and nuts such as Pecans and Macadamias), as well as sugar cane. This area has soils with high agricultural production potential, with the exception of the shallow-soiled rocky granite outcrops.

The area of potentially the highest agricultural potential is the lowveld, as there is a combination of fertile, deep soil and the availability of water from the Crocodile River. Although soils in the highveld region between Hendrina and Belfast are also suitable for agriculture, the availability of water is a constraint in this region. Farming in the highveld region is also affected by opencast coal mining activities.