NGWEDI (MOGWASE) SUBSTATION & ASSOCIATED TRANSMISSION POWER LINE TURN-INS PROJECT

ENVIRONMENTAL IMPACT ASSESSMENT

DRAFT EIA REPORT

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GLOSSARY OF ACRONYMS

ASAPA	Association of South African Professional Archaeologists
BID	Backgrounds Information Document
CAA	Civil Aviation Authority
CV	Curriculum Vitae
DEA	Department of Environmental Affairs
DEAT	Department of Environmental Affairs and Tourism
DM	District Municipality
DSR	Draft Scoping Report
Dx lines	Distribution lines
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assesment
EIR	Environmental Impact Report
EMF	Electromagnetic Field
EMP	Environmental Management Plan
FEIR	Final Environmental Impact Report
FSR	Final Scoping Report
GDP	Gross Domestic Product
HIA	Heritage Impact Assessment
I&APs	Interested and Affected Parties
IBA	Important Bird Areas
IDP	Integrated Development Plans
kV	Kilovolt
LM	Local Municipality
MTS	Main Transmission Substation
Mtx lines	Main Transmission lines
NWDACERD	North West Department of Agriculture, Conservation, Environment and Rural Development
PTM	Platinum Group Metals (Pty) Ltd
PoS	Plan of Study
PPP	Public Participation Process
PS	Power Station
RBA	Royal Bafokeng Administration
ROA	Record of Authorisation

ROD	Record of Decision
SAHRA	South African Heritage Resources Agency
SANBI	South African National Biodiversity Institute
SIA	Social Impact Assessment
SDF	Spatial Development Framework
SOER	State of Environment Report
ToRs	Terms of References
VIA	Visual Impact Assessment
WESSA	Wildlife and Environment Society of South Africa

DEFINITIONS

Alternative: A possible course of action, in place of another, that would meet the same purpose and need defined by the proposed development. Alternatives considered in the EIA process can include location and/or routing lines, layouts, process and/or design options, scheduling options or input options.

Ecological footprint: the amount of land required for the proposed development and thus altered as a result of the proposed development.

Electromagnetic Field (EMF): are invisible lines of force associated with the production, transmission, and use of electric power such as those associated with high-voltage transmission lines, secondary power lines, and home wiring and lighting.

End State: This refers to the final design of the network if the forecast load were to materialise as per plans.

Environmental Impact Assessment (EIA): An EIA refers to the process of identifying, predicting and assessing the potential positive and negative social, economic and biophysical impacts of a proposed development. The EIA includes an evaluation of alternatives; recommendations for appropriate management actions for minimising or avoiding negative impacts and for enhancing positive impacts; as well as proposed monitoring measures.

Environmental Impact Report: A report describing the process of examining the environment effects of a development proposal, the expected impacts and the proposed mitigating measures.

Impact: A description of the potential effect or consequence of an aspect of the development on a specified component of the biophysical, social or economic environment within a defined time and space.

Load Centre: This is an area that has load and a potential to be the main growth point that would require an electricity injection.

Loop in – Loop Out: This is when a section of the main power line is broken and connected to a substation and then taken out of the substation to join back into the main power line.

Mitigation Measures: These are the management measures that are to prevent negative impacts or enhance positive impacts associated with a proposed project.

Turn –in / Turn – out: used synonymously with Loop-in – Loop-out.

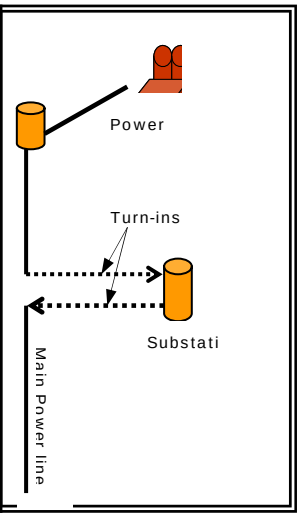
Step down Substation: Substation that transforms electricity from a high to a lower voltage and increases current for distribution and commercial distribution.

Definitions

Loop in – Loop Out: This is when a section of the main power line is broken and connected to a substation and then taken out of the substation to join back into the main power line.

Turn –in / Turn – out: used synonymously with Loop in – Loop out.

Turn –ins: Abbreviation of Turn-in/ Turn-out.



Step – up Substation: A substation that transforms power supply from a lower voltage to a higher one whilst also reducing the current. This makes for bulk power transfer.

NAME CHANGE

Please note that the names of the substations involved in this project are to change to the following:

- **MOGWASE substation will change to NGWEDI substation**
- **DELTA substation will change to MASA substation**
- **EPSILON substation will change to SELOMO substation**

It should be noted that the applicant requested that the original names continue to be used in this Environmental Impact Report to avoid confusion. There may however be inadvertent usage of the new names in the DEIR hence reference to this explanatory box should be made.

EXECUTIVE SUMMARY

1. INTRODUCTION

Eskom proposes to construct Ngwedi (Mogwase) Main Transmission Substation (MTS) and associated transmission power line turn-ins in the vicinity of Sun City, in order to meet the expected future load growth for the greater Rustenburg area. The proposed project, in accordance with the National Environmental Management Act (NEMA), is a scheduled activity and therefore has to be subjected to a detailed EIA process. To this end, Eskom has appointed an independent Environmental Assessment Practitioner (EAP), Margen Industrial Services (Margen) to undertake the EIA study. Margen will work jointly with PBA International (PBAI) to deliver the study.

As part of the application for the environmental authorisation for the proposed project, a two-tiered process comprising of Scoping and the technical EIA phase was required. This report presents the outcomes of the technical EIA phase. The main objectives of this phase are to:

The objectives of the EIA investigations are to:

- Provide an understanding of the receiving environment.
- Examine relevant statutory requirements applicable to the implementation and operation of this project.
- Identify and assess project related impacts.
- Assess project alternatives (substation sites and power line route alignments) and make a recommendation of the least impacting alternative.
- Identify suitable measures that are to address the project related impacts.
- Develop an Environmental Management Plan (EMP) that will be used to guide the implementation and maintenance process.
- Consult with interested and affected parties about all project related matters.
- Report to the mandated authorities about the process followed and the Study findings.

The EIA investigations involved the following specialists:

- Public Involvement Process Team
- Technical EIA and Project Management Team
- Avifauna
- Biodiversity
- Geotechnical
- Heritage
- Social
- Visual
- Floodlines

The listed activities as per the EIA regulations included in the application to the Department of Environmental Affairs (DEA) are as follows:

EIA Regulation GN R 386 sections:

- **1(m):** "construction of facilities or infrastructure for any purpose in the one in ten year flood or within 32 metres from a bank of a river or a stream or where the flood line is unknown ……"
- **7:** construction of "above ground storage of a dangerous good including petrol, diesel, liquid petroleum gas or paraffin, in containers with combined capacity of 30 cubic meters but less than 1000 cubic meters……."
- **12:** "transformation or removal indigenous vegetation of 3 ha or more or of any size where the transformation or removal would occur within a critically endangered or endangered ecosystem listed in terms of section 52 of the National Environmental Management: Biodiversity Act, 2004 (Act No.10 of 2004)"
- **14:** "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 15m and lower exclusively used by (i) radio amateurs; or (ii) for lightening purposes (b) flagpoles; and (c) lightening conductor poles".
- **15:** " the construction of a road that is wider than 4 metres or that has a reserve wider than 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(b):** " the transformation of undeveloped, vacant or derelict land to…residential, mixed, retail, commercial, industrial or institutional use where such a development does not constitute infill and where the total area to be transformed is bigger than 1 ha".

EIA Regulation GN R 387 sections:

- **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 120kilovolts 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 ha or more".

1.1. APPROACH TO THE STUDY

The activities undertaken in the EIA are broadly categorised as follows:

1.1.1 Review of Legislative Framework:

Different pieces of legislation were reviewed in order to determine possible implications for the proposed project. The nature of the proposed project, associated construction and operation related activities and the biophysical components likely to be affected were considered when determining which pieces of legislation are applicable. These fall under the following broad categories:

- Generation and Provision of Energy.
- Environmental rights in terms of the Constitution of South Africa.
- Sustainable development in terms of National Environmental Management Act, its regulations and guidelines.
- Legislation that govern the use, protection, conservation and management of heritage, water, air, land and biophysical resources.

1.1.2 Substation Site and Transmission line Corridor Selection Exercise:

A substation sites and corridors selection and screening exercise was undertaken and was based on the consideration of the following:

- Preliminary geotechnical investigations undertaken by Eskom.
- Site Visits by the EAP.
- Input from various stakeholders.
- Desktop review of Municipal Integrated Development Plans (IDPs) and Spatial Development Frameworks (SDFs).
- Location of proposed site from the load centre.
- Presence of obstacles including geographical and manmade obstacles (e.g. settlements, known sensitive areas etc).
- Availability of adequate space for the proposed developments.
- Accessibility.
- Shortest and straightest possible corridor alignment.
- Where feasible, alignment of the corridor within an area with existing linear infrastructure (e.g. roads, power lines etc)
- Alignment connectivity to the proposed Delta-Epsilon Corridor CB_3 and Corridor D.

GIS and Google Earth mapping exercise was used to present the recommended options spatially and for their analysis which ultimately contributed to the identification of feasible and unfeasible options. The public consultation process was also a crucial contributor in the overall planning of the proposed project.

The screening exercise was also used to determine whether the identified substation sites and corridors were feasible options or not and the results obtained from this exercise were used to rule out those alternatives that were not feasible, therefore not all of the identified sites and corridors were subjected to environmental assessments.

It should be noted that two of the three substation sites recommended to the study by the Client were dropped in the initial stages of the study, following the preliminary screening exercise and specialist investigations. Sites D – M and Corridor 4 and 5 were identified thereafter due to the need for the study to have feasible alternatives. The screening exercise, supported with information obtained from the Delta – Epsilon EIA study and expertise of the EAP, potential environmental issues with respect to the remaining options were determined. The respective specialists assessed these sites in detail in the EIA phase.

2. PROPOSED PROJECT

2.1. BACKGROUND

The proposed project is a component of the Medupi Integration Project. It will entail the construction of a Main Transmission Substation (MTS) called Ngwedi (previously Mogwase) in the Rustenburg area and associated transmission power lines. The massive coalfields in the Waterberg area situated in the Limpopo province are the new generation source that will support the Medupi Integration Project, which is Eskom's new focal for the expansion of its' generation, transmission and distribution capacity. The power generated from the Medupi Power Station, currently under construction, and the surplus capacity from Mmamabula Power Station in Botswana will augment Eskom's generation capacity.

An integrated power line corridor network comprising of 6 x 765kV transmission power lines from Delta (Masa) substation to Epsilon (Selomo) substation, supplemented by 3 x 400kV power lines to Rustenburg and Brits, 2 x 400kV power lines to Polokwane and the existing 400kV network will transmit the generated power to the various load centres spread throughout the country. The 6 x 765kV transmission power lines from Delta (Masa) substation to Epsilon (Selomo) substation are to run in two corridors (Corridor CB_3 and Corridor D) of 3 lines each. The proposed Ngwedi substation will be supplied from one of these two corridors.

2.2. PROJECT MOTIVATION

In 2010, the Rustenburg load peaked at 1880MW and Ararat MTS is currently operating at the maximum design limit, which has placed part of the network under pressure. At the same time, Eskom's investigations have indicated that over the next 20 years, to 2030, the demand for electricity is forecasted to increase by 50% in the Rustenburg area. A large portion will be taken up by the expansion of several mining operations occurring in the area. The proposed Ngwedi substation and associated turn-ins project will de-load Ararat MTS and create additional power to augment the current supply load to Rustenburg and areas between Spitskop and Ararat.

2.3. PROJECT SCOPE

The proposed project will result in the construction of the following (Figure 1):

- Ngwedi Main Transmission Substation on a 600m x 600m plot.
- Install 2 x 500MVA, 400/132kV transformers in a yard terraced for 4 x 500MVA, 400/132kV units.
- Terrace the Ngwedi 400kV yard for an end-state of 5x 400kV feeders.
- Terrace the Ngwedi 132kV yard for an end-state of 10x 132kV feeders.

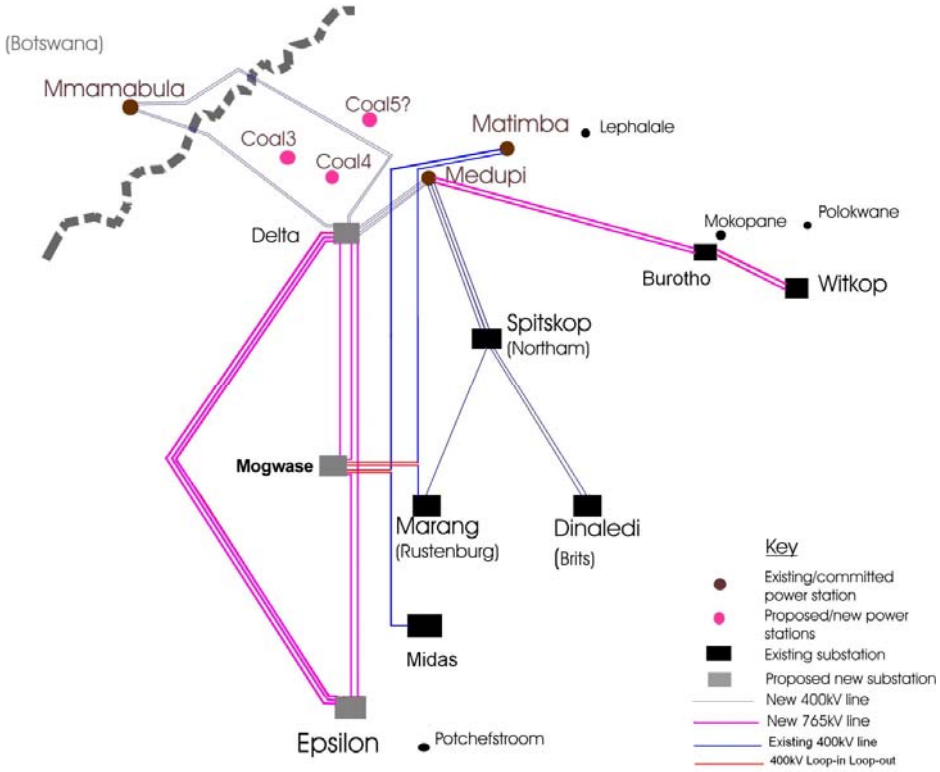


Figure 1: **Schematic for the Medupi Integration Project.**

- Establish the control building, telecommunication infrastructure and oil dam.
- Establish the access road infrastructure to and within Ngwedi MTS.
- Loop in and Loop out the Matimba-Midas 400kV line in and out of Ngwedi MTS by establishing 2 x 400kV turn-ins.
- Loop in and Loop out the Matimba-Marang 400kV in and out of Ngwedi MTS by establishing 2x 400kV turn-ins.
- Operate and terminate a 400kV power line from Delta (Masa) to Ngwedi MTS.
- Loop in and Loop out the 765kV power line from Delta (Masa) substation to Ngwedi MTS and to Epsilon (Selomo) substation. This line will be constructed at 765kV but operated as a 400kV.

The associated turn-ins from Matimba – Marang and Matimba – Midas 400kV lines are to ensure that electricity that is supplied is of adequate capacity and is reliable. In addition, between four and six transmission power lines will connect Ngwedi substation to several distribution substations in the vicinity.

2.4. PROJECT ALTERNATIVES

2.4.1 No- Go Alternative

This would imply that the proposed project would not be implemented. The immediate implications are:

- The power supply servicing the Rustenburg and surrounding areas will continue to operate under pressure.
- Limited opportunity to make new connections especially of customers requiring a large amount of electricity.
- Hamper prospect of growth of numerous developments including that of the platinum mines within the project area ultimately this will translate into no new job opportunities and diminishing output over time.
- The likely consequential biophysical and social impacts will however not occur.

2.4.2 Substation Site Alternatives

The study identified a total of 13 potential sites for the proposed substation and of these, 5 substation sites were further assessed in the EIA phase and will be discussed in detail. The other sites were dropped from the study based on the findings of both the preliminary screening exercise and scoping phase specialist studies. Table 1; Figure2 provides a summary of substation site alternatives.

Site C

Site C is located on farm Goedgedacht 110 JQ (portion 0) and is owned by Royal Bafokeng Nation (RBN). It lies north-east of Chaneng and close to existing Paul Traction Substation. The site is being leased by Anglo Platinum and mining is the main landuse. The vegetation of this site comprises relative pristine open Acacia savanna on open plains. A relative high grazing factor is noted.

Site D and E

Sites D and E are within Frischgewaagd 96 JQ and are operated by Platinum Group Metals (PTM SA). The two sites lie north-west of Chaneng and are located east of R565. Matimba – Marang transmission powerlines run next to these sites. From the northern side runs the Elands River. Surrounding areas are relative pristine, comprising open *Acacia* savanna. A relative high grazing factor is noted.

Site L

This site is situated on farm Elandsfontein 102 JQ (Portion 12) and is operated by PTM SA. R565 runs east of this site. It is characterised by natural/ pristine woodland with a relative high diversity. A moderate level of habitat variation is also noted. Woody species frequently encountered include *Olea europaea, Searsia* species, *Sclerocarya birrea, Boscia albitrunca* and *Acacia* species.

Site M

This site is situated on Boschhoek 103JQ (Portion 89). Agriculture is the dominant landuse. It contains woodland plains comprising degraded *Acacia* veld with *Dichrostachys cinerea* infestation in parts. The site is characterised by red soils. The vegetation is dominated by *Acacia* species, but some *Sclerocarya birrea* individuals are present in the surrounds. While no sensitive habitat is noted on the site, rocky outcrops and hills are noted towards the north-west. Details of the proposed substation sites are reflected in Table 1 and Figure 2 below.

Table 1: Summary of Proposed Substation Sites

Site	East	South	Farm Name	Landowner	Zoned Land Use
C	“27°9'49.3"	“25°24'17.2"	Goedgedacht 110 JQ (portion 0)	Royal Bafokeng Nation	Mining
D	“27°5'9.43"	“25°23'45.18"	Frischgewaagd 96 JQ (portion 10)	PTM SA	Agriculture
E	“27°5' 16.639"	“25°24' 27.185"	Frischgewaagd 96 JQ (portion 10	PTM SA	Agriculture
L	“27°4’0.22”	“25°26’55.16”	Elandsfontein 102 JQ (Portion 12)	PTM SA	Agriculture
M	“27°4’42.48”	“25°28’12.29”	Boschhoek 103JQ (Portion 89)	Mr. M. Scheepers	Agriculture

2.4.3 Power line Corridor Alternatives

Five Corridors in total were identified and were assessed in detail during EIA Phase.

Corridor 1

The proposed corridor is the north most of the four corridors running from the east of the study area from Matimba – Midas 400kV line to the west. To the furthest site on the eastern side (Site C), the corridor crosses over 58 farm portions which are within the main farms of Bultfontein204JP, Kleingenoeg 174JP, Vlakfontein 207JP, Palmietfontein 208JP, Mahobieskraal 211JP, Zandrivierspoort 210-JP, Koedoesfontein 94JQ, Frischgewaagd 96JQ, Styldrift 90JQ, Rhenosterspruit908JQ and Goedgedacht 110JQ. It passes through two small settlements situated on Farms Vlakfontein 207 JP and Mahobieskraal 211JP, before it aligns along the eastern boundary of Ledig Township. It also lies just south of the Pilanesburg Nature Reserve and north of the Swartkop Mountains.

Corridor 2

Corridor 2 lies south of corridor 1 and it is located just south of the Swartkop Mountain. It traverses through approximately 58 farm portions from Matimba – Midas 400kV power line connection to Site C. The main farms are Vlakfontein 207JP,Vlaklaagte 215JP,Zwartdoorns213JP, Mahobieskraal 211JP, Zwartkoppies 212 JP, Mimosa 81JQ, Koedoesfontein 94 JQ, Frischgewaagd 96JQ, Styldrift 90JQ, Rhenosterspruit 908JQ and Goedgedacht 110JQ. It also passes in close proximity of Phatsima Township.

Corridor 3

Corridor 3 lies south of Corridor 1 and Corridor 2. It traverses through approximately 46 farm portions to the proposed substation Site C from Matimba – Midas power line. The main farms are namely; Vlaklaagte 215JP, Hoogeboomen 232JP, Grootwagendrift 233JP, Onderstepoort 98JQ, Frischgewaagd 96JQ, Styldrift 90JQ, Rhenosterspruit908JQ and Goedgedacht 110JQ. The corridor encloses Elands River for the majority of its length.

Corridor 4

Runs in a southerly direction along the Matimba- Marang transmission power lines, west of Chaneng township, and turns into a westerly direction along the border of farms Frischgewaagd 96 JQ and Elandsfontein 102 JQ, towards site L and turns in a southerly direction between portion 12 and portion 1 of farm Elandsfontein 102 JQ to the proposed site M.

Corridor 5

Originates from Delta (Masa) – Epsilon (Selomo) Corridor D at the west of farm Elandsfontein 102JQ portion 12 and runs in a south – east direction where in merges into Corridor 5.

Details of the proposed corridors are reflected in Table 2. The proposed alternatives are illustrated in Figure 2

Table 2: Details of Proposed Corridors

Name	Width of Corridor	Length to furthest Site	Affected Farms
Corridor 1	2km	35.92km to site C.	See Appendix A
Corridor 2	2km	33.93km to site C.	See Appendix B
Corridor 3	2km	32.36km to Site C.	See Appendix C
Corridor 4	450m	6km to Site L 8.8km to Site M	See Appendix D
Corridor 5	270m	1.5km to Site L 4.5km to Site M	See Appendix E

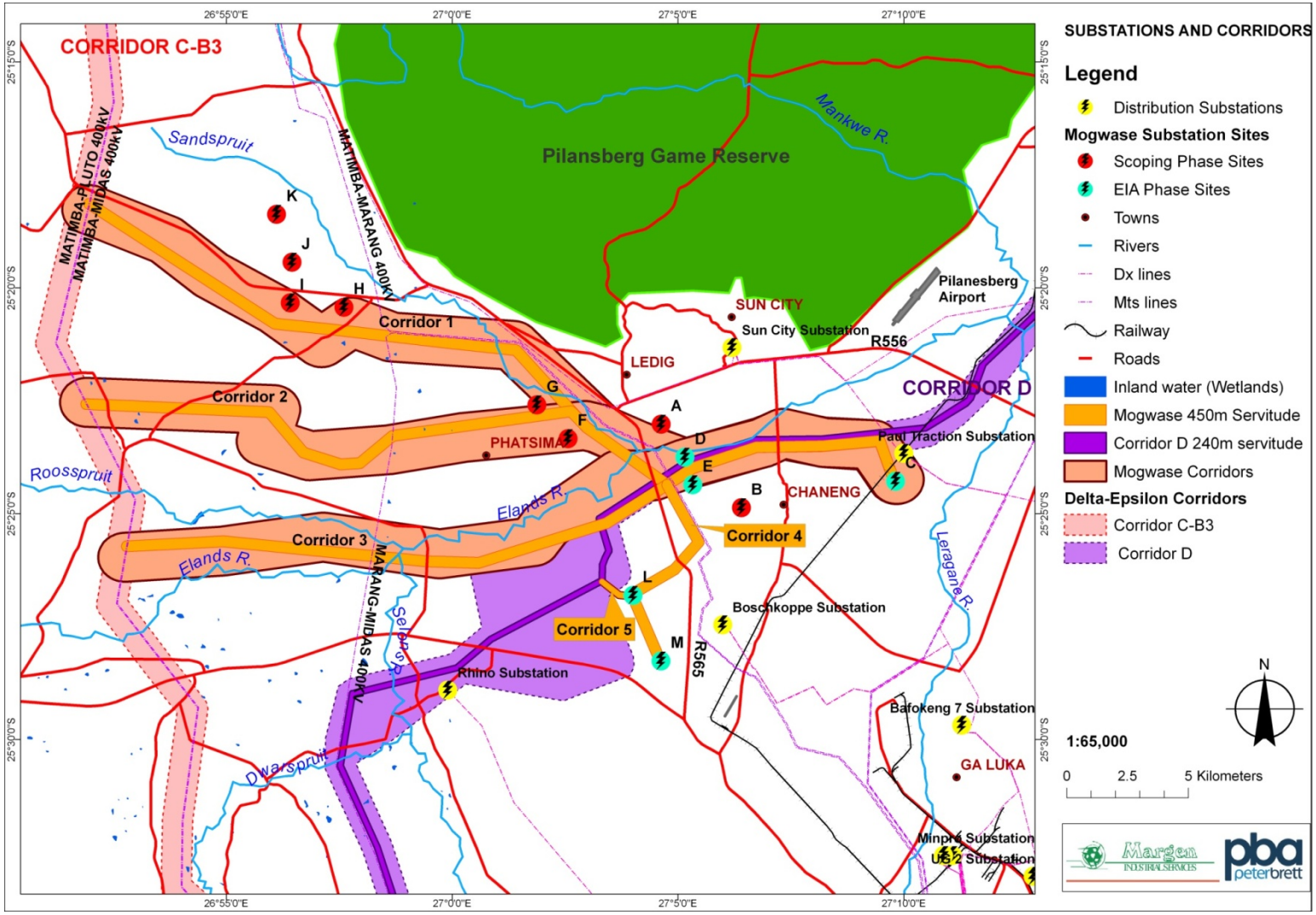


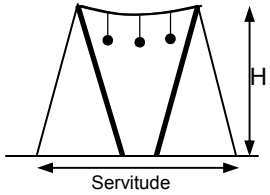
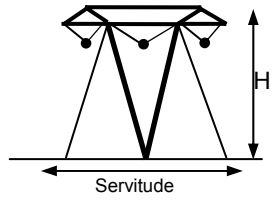
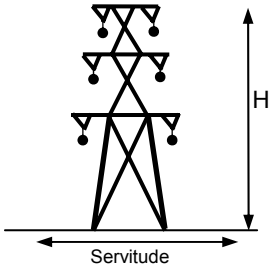
Figure 2: Proposed Substation Sites and Corridor Options Map

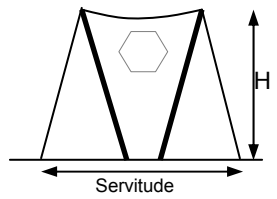
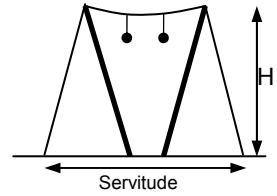
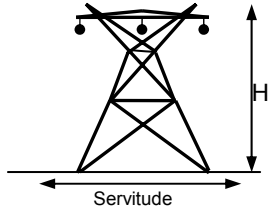
2.4.4 Tower Design Alternative

A total of five possible tower designs are under consideration for the proposed 765kV and 400KV transmission lines (Table 3). The towers for the 400kV power lines would be smaller in size, in terms of their footprint, height and amount of steel that is utilised.

Three of the presented options are single circuit towers, namely the Cross rope suspension, Guyed V and Self-supporting Strain structures. The double circuit designs are the Hexagonal cross – rope and the Self-supporting Strain towers. Double circuit options present an advantage in that they can accommodated more power lines in one tower and therefore require a smaller servitude than if two single circuit towers were used. However in the case of South Africa, these structures have yet to be designed and tested and can therefore result in technical and maintenance problems that would put the electricity network at risk. Given the associated technical risks and the cost implications (as these structures are more expensive), it is unlikely that they will be utilised. The cross rope single circuit tower also has technical problems that are still to be resolved.

Table 3: Tower Design Alternatives

Transmission Structures	Height (H)	Servitude (single line per corridor)	Advantages	Disadvantages	Illustration
765 kV Cross Rope (single circuit)	55m	80m	Less visual impact as less steel used; no place for birds to perch above conductors hence issues such as flashovers and shorting caused by birds are avoided. A cheaper structure.	Live-line maintenance and construction problems still to be resolved. Anchor cables are more difficult in cultivated areas.	
765 kV Guyed-V (single circuit)	55m	80m	Extensively used in the study area. More visual uniformity when following existing lines. The 765kV tower design is tried and tested.	More visible due more steel used for tower. Bird guards required to avoid flashovers. Anchor cables are more difficult in cultivated areas.	
765 kV Double Circuit (Self supporting)	60 to 80m	80m	Two power lines on one tower, hence overall footprint and servitude requirements are less. Is a proven technical solution.	Height of structure (80m) is substantially higher than single circuit hence visual impact will be very high. Expensive structure.	

Transmission Structures	Height (H)	Servitude (single line per corridor)	Advantages	Disadvantages	Illustration
765kV Hexagonal Double Circuit (Cross-rope)	55 to 70m	80m	Two power lines on one tower, Substantially lower visual impact. As above, only one instead of two power lines required hence servitude requirement is less	Potentially high structure (Up to 70m), therefore still a visual impact concern. Technical and maintenance aspects still to be resolved	
HVDC (Cross-rope)	50m	80m	Has the capacity to carry the amount of power generated in the Waterberg area southwards without the need for additional power lines. Visually similar to 765kV AC Cross-Rope design.	Construction and cost issues to be resolved. Operational aspects to be investigated. Possible unsafe field effects have not been resolved;	
765 kV Self Supporting (at turns and termination points)	45-50m	80 - 100m	No anchor cables, and therefore better in cultivated areas. Tried and tested design.	Visually more intrusive due to substantial amount of steel used.	

2.4.5 Underground Power line Alternative

The use of underground power lines is often considered as an alternative to overhead lines and although, this issue was not raised during Scoping, the study felt that it is pertinent that it is addressed. Preference for underground power lines is based on the fact that they would not have visual and aesthetic impacts that are as severe as for overhead lines. The visual impacts of overhead power lines also have consequential social and economic effects, which would also not be realised if underground lines were to be utilised. On the other hand, developments, ploughing or even the growth of vegetation with extensive root systems above underground cables are severely restricted in order to protect the cables from damage. The construction of these lines still causes environmental damage due to the extensive excavations that have to be conducted for the entire length of the proposed line. On the other hand excavations for the over headlines are restricted to the footprint of each pylon.

The preference for overhead lines on the other hand, is mainly based on the grounds of costs but also on the design and operation of underground lines of this magnitude. The lifespan of the underground cabling is shorter and would therefore need to be replaced more frequently than overhead cables. They also require larger amounts of electrical and insulation material to keep them within the acceptable operating temperature range and consequently, these make the underground alternative a more expensive option. The general guideline internationally is that underground cables may be as much as 20 time or more of the equivalent overhead lines. It is understood that Eskom is not considering the under grounding of the 765kV and 400kV power lines for the above reasons. This alternative will not be considered further in this EIA study (Refer to Appendix 14).

3. ENVIRONMENTAL SETTING

3.1. PROJECT LOCATION

The study area is situated in the North West province in Rustenburg, specifically in the surrounding environs of Sun City. Three Local Municipalities (LM) namely Rustenburg, Moses Kotane and Kgetlengrivier will be affected by the proposed project. The proposed substation sites are situated in Rustenburg LM whilst the corridors traverse through all three LMs. See Figure 3 for the locality map.

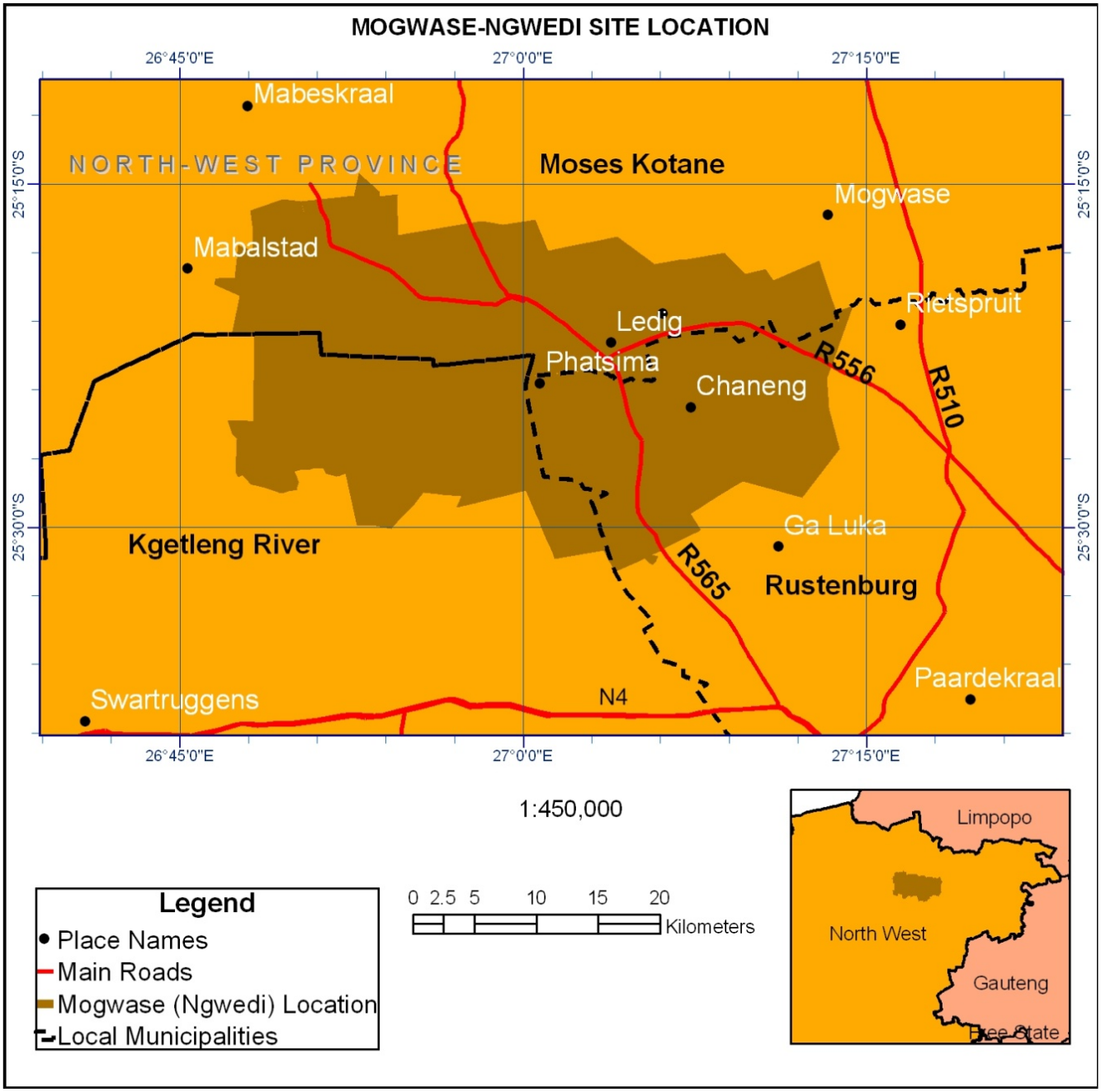


Figure 3: Study Area Location

3.2. CLIMATE

The North West Province has climatic conditions that vary from arid conditions in the west, semi- arid in the central regions to temperate in the east. The study area is situated in the eastern parts of the province and receives an average of 600mm rainfall per annum. Summers are typically hot whilst winters are mild to cold. The temperatures can reach as high as 40°C with daily average temperatures of 32ºC in summer, whilst in winter the average daily minimum temperatures of 9ºC are experienced. Seasonal fluctuations in mean temperatures between the warmest and the coldest months range between 12ºC and 15ºC.

The study area falls within Zone 2 tornado area. This is classified as weak, moderate and strong thunderstorms which generally occur 50 to 80 thunder days per year, and with gust wind speeds at ground level of 25-30m/s.

3.3. LANDUSE

The study area has a mixed land use comprising of the Pilanesburg Nature Reserve situated immediately to the north of the study area. Platinum mining is the dominant land use in the study area. Anglo Platinum, Impala Platinum, Platinum Group metals and Wesizwe Platinum Limited mines are also situated here. Tourism attractions include the nature reserve itself, Sun City, private game lodges and other holiday resorts. The Townships that are located in the area are Chaneng, Ledig and Phatsima. The Moses Kotane LM administrative centre is located in Mogwase, which is also in the environs of the study area.

Other linear infrastructure in the area include the main provincial roads of R565 and R556, local roads, a railway line running in close proximity of Chaneng Township, transmission power lines including the existing 400kV Matimba- Marang transmission power line, distribution power lines and underground water pipelines.

3.4. AVIFAUNA

Open grassland patches, agricultural land and water bodies such as rivers, dams, and wetlands are the main micro – habitats for avifauna within the study area. These occur as small pockets across the study area. The development falls within two Important Bird Areas, the SA 023 Pilansberg National Park and the SA 025 Magaliesberg and Witwatersberg areas. However, the study area is regarded as having low sensitivity to birds and with correct mitigation. The area between these two IBA's is academic as the birds being so mobile could, and probably will, occur within the area not identified as an IBA. The area that is not classified as an IBA is also very narrow and thus the same species are likely to occur in this area. Thus no great advantage is gained from keeping the development out of the IBA's in this area. Birds that use open grassland and agricultural lands within the study area includes Secretary birds, Blue Cranes, Lanner Falcon, Storks and Kohraans. Waterbirds likely to be found in the study area include the African – March Harrier, Yellow – billed Stork, Greater and Lesser Flamingo. Of these species the African – March Harrier, Blue Cranes, the two Flamingo species, Secretary birds and various species of Storks are Red Data species.

3.5. BIOPHYSICAL ENVIRONMENT

The vegetation types in the study area include Zeerust Thornveld (Vulnerable) and Gold Reef Mountain Bushveld (Least Threatened). The Elands and Leragane Rivers are present within close proximity to the proposed substation sites and some of the turn-in lines. The study also has several perennial rivers. Protected trees species known to occur in the region of the study area include *Boscia albitrunca* (Shepard's Tree) and *Erythrophysa transvaalensis (*Transvaal Red Balloon).

Cultivation and settlements represent the major land transformation activities in the region. Extensive areas of natural woodland have been transformed to cultivated fields, resulting in the presence of several settlements, numerous large and informal roads, agricultural areas; mining, extensive parts of the region are therefore regarded as degraded.

3.6. HERITAGE

Historically the first recorded people that settled in and around the Pilanesberg Nature Reserve area are the Batlhako, who were later joined by the Bakgatla Ba kgafela. Further south were the Bafokeng who ruled the area north of Rustenburg with the northern border demarcated by Elands River. The Batlokwa were situated south west of the Pilanesberg Mountains.

Known archaeological sites include but are not limited to large Iron Age settlement known as Marothodi, which is a Batlokwa capital and the large Late Iron Age (Sotho-Tswana) settlements in and around Pilwe Hill. Both these sites are situated between Corridor 1 and 2. There are two late Iron Age sites known as Early Moloko sites. These are located on farm Frischgewaagd 96 JQ near Substation site A. The area is heavily affected by mining and agricultural activities such that the cultural landscape is disturbed from its original condition. Most of the heritage sites can be avoided by the proposed power lines, including Marothodi and none of the sites are regarded as “no go” sites.

3.7. SOCIAL ENVIRONMENT

The total population of Bojanala Platinum District Municipality as per the 2001 census was 1 185 325. Rustenburg LM had approximately 395 538 (33.37%) people, Moses Kotane LM with 236 840 people (19.98%) and Kgetlengrivier LM with the least number of people of approximately 36 476 (3.08%). In terms of the ethnic breakdown, the Black African population account for 92.23%, with the White population at 6.92% and the Coloured, Indian and Asian accounting for less that 1% of the population. The majority of the people speak Setswana.

The land is owned by various stakeholders which include the Government, mining houses, private landowners and the tribal authorities such as the Royal Bafokeng Nation, Bakubung Ba Ratheo, Bapo II Ba Mogale, Bakgatla Ba kgafela, Baphalane and the Bakwena Ba Modimosana Ba Mmatau.

The main economic drivers in the province are mining, tourism, community services, trade and agriculture. Mining is the dominant sector of employment in both Rustenburg LM followed by the wholesale and retail sale sector. In the Moses Kotane LM mining and quarrying are the dominant employment sector followed by the community, social and personal services sector. The dominant sector providing employment in Kgetlengrivier is Agriculture, focused in the production of sunflower, groundnuts, maize, wheat and in animal rearing. Mining opportunities include platinum, gold, diamonds, nickel and slate.

As with many parts of South Africa, unemployment is a problem in the area. In Kgetlengrivier LM and Rustenburg LM it is around 30%, which is higher than the national average (23%). But in Moses Kotane unemployment approaches 50%. Weighted annual income is R45,000, R62,000 and R36,000 respectively. Job creation is closely linked to economic growth, and must therefore be a firm objective of the area.

Despite being one of the more productive districts in the north-west, Bojanala DC contributes only 2.5% of the country’s GDP (Demacon, 2009). Mining is the largest sector, contributing over 17% of South Africa’s mining GDP and providing almost 35% of the employment in the district. Agriculture is only 1.8% of the national agricultural GDP, and provides only 6.5% of the employment in the district. It plays a relatively minor economic role in the Rustenburg LM and

Moses Kotane LM. However, it is a more significant part of the economy of the Kgetlengrivier LM.

Manufacturing in the Bojanala DC is a very small contributor to the national manufacturing sector with little more than 1% coming from the district. However, it provides just over 10% of the total employment in the district (almost 4% more than the Agricultural sector). It is apparent that the sector is closely linked to the mining and agricultural sectors.

The trade sector is similarly dependent on the mining and agricultural sectors, and provides over 15% of the total employment in the district. It also contributes 1.7% towards the national GDP in the trade sector.

The tourism industry is not a well defined economic sector in South Africa as it represented across all the above sectors, but there is no doubt about the significance of its role in the South African economy. In 2008 the contribution to the South African GDP was estimated at 8.5%, and it had grown by 19% in that year. This is expected to level off to around 4.3% per annum over the next 8 to 10 years. Approximately 20% of tourism is from the foreign market, the rest being domestic. The North-West Province is the least visited by foreign tourists, with an average length of stay at just over 3 nights per visit and only around 10% of these are at high end facilities (lodges, hotels, guest houses). Direct spend by foreigners in the North-West is the second lowest in the country at around R1.7 billion. Details of the contribution of tourism in the Bojanala DC to the national tourism sector are not known. However, even though the North-West Province appears to play a relatively small role in the national tourism sector, the Pilanesburg national park and Sun City are still two of the nationally important destinations.

Of the different sectors described above, tourism and agriculture are the most likely to be negatively affected by the new substation and power lines. Although some mitigation is possible to reduce the impact on the agricultural sector, mitigation in the tourism sector is harder as much of the tourism based activities are centred on the wilderness experience. Power lines and substations are clearly not compatible with this. Only careful routing of the lines may mitigated the impact, though this is not always possible.

The other sectors are seen to be likely to benefit from the opportunity of better and more reliable supply of electricity that the substation and power lines will bring into the area. They are also seen to be greater contributors to both the local and national economies, as well as potentially offering greater opportunity for job creation in a region where unemployment levels are well above the national average.[1]

3.8. VISUAL

In determining the quality of the visual resource, both the objective and the subjective or aesthetic factors associated with the landscape are considered. Many landscapes can be said to have a strong sense of place, regardless of whether they are considered to be scenically beautiful but where landscape quality, aesthetic value and a strong sense of place coincide - the visual resource or perceived value of the landscape is considered to be very high.

The landscape can be divided into basic landscape character types, each with its own set of physical, visual and aesthetic characteristics. Scenic quality ratings were assigned to each of the landscape units. The *highest* value is assigned to the mountains, main river (Elands River) and the Pilanesberg National Park. The smaller rivers and associated streams (tributaries) as well as the dams are also rated high. The combination of these natural features which is characteristic of the study site and surrounding areas create a more natural and rural

[1] *Reference for all economic information is made to the report by Demacon, 2009. Delta-Epsilon Power Line Economic Assessment: market Research Findings & Recommendations, June 2009.*

environment with a strong sense of place. This scenic quality and sense of place is however diminished by activities with a lower scenic quality such as the towns / townships, infrastructure, mining activities and power lines. The agricultural activities / cultivated lands and farmsteads have a moderate scenic quality.

The landscape types with the lowest scenic quality rating are the existing infrastructure, the R556 and R565, other local and dirt roads and mining related activities and infrastructure. The towns / townships have a moderate to low scenic quality as these areas do not contribute to a higher visual resource quality but actually have more of a negative impact on the environment through activities such as the removal of plants, erosion and overgrazing. It is clear that they do not contribute to the aesthetic value of the area.

3.9. FLOOD RISK

Floodlines report will provide an assessment based on risk by flooding, and potential impact on flood lines for the project. It must be noted that the floodlines developed for this report are for planning purposes only, and should not be used for design functions. This level of assessment is seen as appropriate for assessment of potential impacts, but additional detailed hydraulic analysis may be required at critical locations during the design phase of the power lines or substation.

4. SPECIALIST ASSESSMENTS

The Specialist studies undertaken covered terrestrial biodiversity, heritage, social, visual and flood risk aspects. Avifaunal assessments were undertaken separately from other biodiversity studies due to importance of power line infrastructure to birds. The studies aimed to determine the status of the receiving environment, to establish the presence of sensitive areas, to assess the proposed alternatives with the view to identify suitable sites and mitigation measures to minimise environmental damage. The specific activities undertaken include but were not limited to desktop review of relevant literature and detailed field assessments.

4.1. PUBLIC PARTICIPATION PROCESS:

The PPP is an ongoing process that is effectively carried out throughout the entire EIA study. The PPP activities undertaken were namely:

- Identifying I&APs.
- Developing and managing a stakeholder database.
- Mapping the consultation process.
- Dissemination of project related information through various mediums.
- Addressing stakeholders' queries.
- Undertaking focus and public meetings.
- Providing documentation of captured information.
- Ensuring that issues raised are incorporated into the EIA process.

551 farm portions were identified. 36 farm portions did not have contact details. In summary, approximately 67 percent of the farmers within the project area participated. A deed's search revealed that some farm portions did not exist. Officials at Deeds Office advised that such portions were transferred to one of the owners of the other farm portions. Ownership of farm portions shown as non-existent was confirmed during subsequent meetings.

Through this process, a number of issues were identified. Some of these only required clarification; others were recommendation to the study whilst others were issues that required further investigations. They are summarised in Table 4 below:

Table 4: Issues and Concerns Raised During the Study by I&APs

Issue / Concern	Remark	General Response
Economic	Job creation & Local opportunities	These kinds of projects involve high expertise that requires specialisation; it will create few jobs like clearing of bushes.
Safety & Well being	Veld Fire. Health and safety, Electromagnetic field,	Strategies and programmes for maintaining servitudes exist within Eskom. There is no conclusive evidence on the impact of EMF from power lines on living organisms
Land Issues & Compensation	Compensation & property value reduction	Market related value is paid based on the recommendation of an independent property evaluator.
Aesthetics	Visual impacts, Loss of sense of place	Relevant specialist will undertake impact assessment study and in turn provide recommendations for the mitigation of likely impacts where possible.
Farming Related Issues	Loss of agricultural land	Crop farming and grazing is allowed under the power lines. Only tall plantations and irrigation are not allowed.
Natural Environment & Heritage	Impact on fauna, flora, birds, historical & archaeological sites	Relevant specialists form part of the study team and will give advice on mitigation measures.
Social	Relocation of people & migration of construction workers	Environmental Control Officer (ECO) will liaise with communities to ensure harmonious interaction between local communities & construction workers. Relocation is done only if the line cannot be diverted.
Technical	Underground cabling	There is no technology in SA for putting power lines of this magnitude underground and this will be more detrimental to the environment during construction and maintenance phase.

4.2. AVIFAUNA

Collisions and electrocutions, disturbance of breeding birds and destruction of habitat all impacts that power lines could have on birds. Collisions are seen as the biggest threat posed by transmission lines. Electrocutions are not seen as a problem because of the large size of the clearance between live components of the power lines making it virtually impossible for birds to bridge the air gap between the components.

Destruction and transformation of microhabitats could lead to an alteration of or reduction in suitable habitat that could lead to birds leaving an area. The construction process includes noise and an increase in human population and movement could also impact on breeding activities leading to breeding failure.

The preferred alternative is site is Site E from an avifaunal perspective. The reasons for this include the fact that it is located away from the Elands River, occurs on an area of disturbed land and critically, results in the most ideal transmission line alignment and length. Corridor 1 is the most highly preferred from an avifaunal perspective as it follows an existing transmission line for some of the route, as well as occurring near the road, which will limit the amount of habitat destruction that will be necessary. The other corridors are all possible, as the study area is regarded as having low sensitivity to birds, but are not preferred from an avifaunal perspective.

4.3. BIODIVERSITY

Impacts resulting from power lines on ecological attributes of the study area are largely restricted to the physical impacts on biota or the habitat in which they occur.

- **Direct impacts:** destruction of threatened flora species, protected tree species; impacts on threatened and common fauna species and destruction of sensitive/ pristine regional habitat types;
- **Indirect Impacts: i**nclude floristic species changes within servitudes; poaching and impacts on surrounding habitat/ species;
- **Cumulative Impacts:** impacts on SA's conservation obligations; an increase in local and regional fragmentation/ isolation of habitat; and Increase in environmental degradation.

The Pilanesburg Nature Reserve, water bodies, ridges and mountains are classified as areas with high biodiversity sensitivities. These features are found between Corridor 1, 2 and 3. Extensive areas of low and medium-low biodiversity sensitivities present transformed areas that have plant communities and faunal assemblages that do not represent the original or pristine status. The most preferred corridor from biodiversity impact perspective is Corridor 1.

Due to cultivation, mining and residential developments, extensive areas of natural woodland have been transformed to cultivated fields, resulting in the presence of several settlements, numerous large and informal roads, agricultural areas; mining, extensive parts of the region are therefore regarded as degraded.

The preferred substation site is Site E. The recommendation is driven by the distance from proposed Delta-Epsilon Line D and secondly by the sensitivity of habitat that will be affected by the construction and operation activities. The preference ranking of the substations was done taking the associated line sensitivity into account.

4.4. HERITAGE

Two main types of impacts could occur on heritage resources, namely physical impacts where the construction of power lines impacts directly on heritage resources and a visual impact where power lines affect the aesthetic and visual appearance of historical or natural landscapes. Impacts caused by power lines on heritage sites could be less severe than impacts from more drastic developments such as mining, town development or dam building which have major and permanent effects on the environment.

The large Iron Age settlement known as Marothodi, which is a Batlokwa capital and the large Late Iron Age (Sotho-Tswana) settlements in and around Pilwe Hill are situated between Corridor 1 and 2. The most preferred corridor from the heritage impact perspective is Corridor 3 followed by Corridor 5. Sites C, D, E, and L are preferred substation sites as they occur in open spaces with no associated heritage sites. Two Late Iron Age (LIA) sites are located on a spur at the location of substation Site M. Because the substation is located on top of a spur, mitigation will be difficult, as space for alternative placement is limited. However, the impact of overhead power lines on heritage resources will generally be low as the only footprint left are

the towers which cover a limited area; the power lines can be constructed so to avoid heritage sites and heritage sites can be conserved beneath power lines if pylons are spaced in such a way that they do not affect the sites.

4.5. SOCIAL

Substation sites D and E from a social perspective are situated in an ideal position within the centre of the electricity growth area. This area is also fairly disturbed which from a social perspective is a positive, as the proposed developments would generally not result in severe social disruptions. Site C, L and M are situated in areas that would result in longer transmission and distribution lines and as a result, more people are likely to be affected. Existing power lines and roads render Corridor 1 as the favourable option. The remaining corridors are devoid of linear infrastructure and are therefore not as suitable.

4.6. VISUAL

Features such as mountains, rivers and conservation areas assigned a high scenic value and areas such as mines, areas with infrastructural developments such as power lines, railway and roads have a lower scenic value. The proposed options for the power line corridor and the substations were compared and the result of the comparison is that Corridor 1 is the preferred route for the power line. This is mainly due to the fact that the visual resource value / scenic quality is low and that due to the existing infrastructure the power lines will be less intrusive. The viewers along this corridor are also exposed to the existing infrastructure and already have power lines in the middle ground of their view.

According to the impact assessment the intensity as well as the significance of the visual impact of all the alternatives for the substation location will be moderate. The visual impacts will be easier to mitigate as vegetation screens can be planted on the boundaries of sensitive viewer locations. The sensitive viewers vary from residential areas, lodges and guest houses to farmsteads and local farm roads.

As stated above, the impact of the proposed substation would be very similar for each of the proposed sites due to the relative close location of the proposed sites in relation to each other. In the opinion of the author the best proposal would be Site C as this site is located close to the Paul Traction Substation, thus localising the impact of the disturbance / visual intrusion.

4.7. FLOOD RISK

The study has identified that parts of the planned transmission infrastructure may stand within the estimated 100 year flood line on the main rivers of the Sandspruit and Elands River. Where possible, this should be avoided by locating new infrastructure at least 100m from the flood line (or at least 100m from any small watercourse). However, this may not be possible in all cases and it is considered that any location of transmission infrastructure within the 100 year flood line may be achieved with minimal impact on local flood conditions or on the infrastructure itself. The only substation site that appears to be near a substantial watercourse is Substation Site D.

4.8. SUMMARY OF SPECIALIST ASSESSMENTS

Table 5 presents the alternatives that the Specialists recommended as the more suitable options for the proposed development. Corridor 1 and Substation E were the most preferred. Corridor 1 and Corridor 2 are least preferred by the Heritage Specialist because most of the heritage sites were recorded on this option, including the Late Iron Age (LIA) site known as Marothodi. There are also large settlements in and around Pilwe Hill with known archaeological sites and occur on Corridor 2, this makes this option less preferred from heritage perspective. However, the impacts of overhead power lines on these sites can be avoided by constructing towers so to avoid these sites. Substation Site M was least preferred because two LIA sites are located on a spur at the location of this option. Because the substation is located on top of a spur mitigation will be difficult, as space for alternative placement is limited.

As for Visual Specialist, the impact of the proposed substation would be very similar for each of the proposed sites due to the relative close location of the proposed sites in relation to each other. The best proposal, however, would be Site C as this site is located close to the Paul Traction Substation, thus localising the impact of the visual intrusion. The proposed Corridor 1 follows the existing power lines and the R565. Most of the viewers are exposed to existing power lines or infrastructure along this route and therefore the power lines will be less intrusive.

The Biodiversity Specialist recommended Site E as the most preffered because the habitat present within the proposed site is regarded relative low in sensitivity, rendering this site the most preferred option. The use of this option would, similar to Site D, imply crossing of the Elands River, but it is possible to mitigate against significant impacts.

Overall, Corridors 1 and 2 offer the least impact on agricultural land, in particular Corridor 1 where there are fewer cultivated lands. The impact is seen to be low in both cases, provided adequate mitigation is undertaken (mainly the management of the construction and maintenance phases). Impact on Corridor 3 is seen to be moderate if the lines are routed to avoid centre pivot installations.

Flood risk analysis was also undertaken and it revealed that the only substation site that appears to be near a substantial watercourse is Substation Site D. The proposed corridors show the power lines crossing a number of large and small watercourses. The main flood related issues relating to power lines crossing watercourses are:

- Impact on flood conditions due to towers placed in the flood line. This includes the increase of flood conditions in the environment around the tower(s) and any associated impacts.
- Risk of damage of towers during a flood. This would include high velocities, damage to tower base and foundations, debris build-up against the tower (and potential structural failure) and power line conductors touching the water surface

In general these issues can be mitigated by the correct placement of the towers and design of the structures.

Indicated in Table 5 is a summary that indicates the Specialists preferences.

Table 5: Project Alternatives Suitability Table

	Corridor 1	Corridor 2	Corridor 3	Corridor 4	Corridor 5	Site C	Site D	Site E	Site L	Site M
Avifauna	√	X	X	X	X	X	X	√	X	X
Biodiversity	√	X	X	X	X	X	X	√	X	X
Heritage	X	X	√	X	√	√	√	√	√	X
Social	√	X	X	X	X	X	√	√	X	X
Visual	√	X	X	√	√	√	√	√	√	√

√ = Suitable

X = Less Suitable

5. CUMMULATIVE IMPACTS

Cumulative effects are commonly understood as the impacts which combine from different projects and which may result in significant change over time. Past EIA studies have consistently shown that placing a new power line infrastructure next to an existing line results in an overall reduction of the impact of the new line; the same service roads are used, adjacent land practices have adapted to the lines, and the landscape is already altered by the first line. It is estimated that an existing line may reduce the impact of a new line by 20% or more (Delta-Epsilon EIA, 2010).

It is important for Eskom to align all the projects that are planned for the area in order to minimise the potential negative impacts and enhance potential positive outcomes. It is therefore crucial for Eskom to liaise very closely with the various municipalities to mainstream Eskom projects into the Integrated Development Plans (IDPs) and Spatial Development Frameworks (SDFs) of the respective municipalities.

Currently the proposed substation sites and associated turn-ins are located in a fairly developed area within the residential areas, the existing substations, mine shafts and headgears, power lines, roads, railways and the planned 765kV power lines from Delta Substation. The cumulative effect for constructing the electricity infrastructure in this area is thus considered high.

6. CONCLUSIONS AND RECOMMENDATIONS

The study team believes that the process followed for the EIA study fulfils the requirements of the National Environmental Management Act (No 107 of 1998). It is the opinion of the EAP, that sufficient information on the proposed development, associated impacts and analysis thereof and together with the Environmental Management Plan (EMP) which outlines in detail the mitigation measures that will address the associated impacts, will facilitate the decision – making process. The findings and recommendations of the study have been substantiated by detailed specialist investigations and input from the Public Involvement Process.

Extensive consultation with the Local Municipalities, Farmers Associations and landowners within the study area were carried out. The stakeholders understand the need for the proposed project. They have provided sufficient input with respect to the planning of the project.

The construction of the proposed development will have both negative and positive impacts on the biophysical and social environment irrespective of which alternative will be used. However, some alternatives will have lower impacts of which will be further minimised or enhanced by the recommended mitigation measures. This is based on the assumption that good practices will be adopted during the construction and operation of the project and that the Environmental Management Plan (EMP) will be implemented accordingly. In light of the above, the EAP recommends that DEA issues an environmental authorisation for proposed development subject to the conditions indicated above.

The EAP recommends Corridor 1 and substation Site E, based on the following:

- Corridor 1 follows an existing transmission line (Matimba – Marang 400kV) for some of the route, as well as occurring near the road (Bapong to Ledig Road), which will limit the amount of habitat destruction and would also localise the impact of the visual intrusion. Existing access road will be utilised and the construction of a new one will not be required. However, there is a presence of Late Iron Age sites and large settlements within both Corridor 1 and Corridor. These can be mitigated by constructing towers so to avoid these sites.
- The study further recommends that Delta-Epsilon Corridor D should be utilised, instead of corridor CB_3 for connection to Ngwedi Substation because the proposed Site E is within Delta-Epsilon Corridor D. According to the EIA Study for the Delta – Epsilon 6 X 765kV power lines project, Corridor D took into consideration the location of the Ngwedi load centre and was thus placed in close proximity of this load centre.
- Site E is also located close to Matimba-Marang turn-in.
- Most of the specialists have indicated that sensitivity within the proposed Site E is regarded relative low in, rendering this site the most preferred option.
- Overall, Corridors 1 and 2 offer the least impact on agricultural land, in particular Corridor 1 where there are fewer cultivated lands.
- Considering the planned load distribution within the study area, Site E presents the best position for connection to between four and six planned 132 Kv distribution power lines which will connect Ngwedi substation to several distribution substations in the vicinity.