PROPOSED MOOKODI-MAHIKENG 400KV POWERLINE, NORTH WEST PROVINCE

DRAFT EIA REPORT

DEA REFERENCE: 14/12/16/3/3/2/1056

JUNE 2018

PREPARED FOR: ESKOM HOLDINGS (SOC) LTD

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Title and Approval Page

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Amendments Page

Date:	Nature of Amendment	Amendment Number:
2018/06/13	First Draft for Client Review	01

Executive Summary

Project Background and Motivation

Nemai Consulting was appointed by Eskom Holdings (SOC) Ltd as the Independent Environmental Assessment Practitioner (EAP) to undertake the EIA for the proposed Mookodi-Mahikeng 400kV Powerline. The proposed Mookodi-Mahikeng 400kV Powerline requires authorisation in terms of the National Environmental Management Act (NEMA) (Act No. 107 of 1998), and the EIA was undertaken in accordance with the 2014 EIA Regulations (as amended on 07 April 2017). This document serves as the Draft EIA Report for the aforementioned project.

The North West Province sources its generation supply from Matimba and Grootvlei power stations, as well as from the Apollo DC converter station. Within the province, the two Customer Load Centres (CLSs) are Rustenburg and Carletonville. The Carletonville CLC consists of Hermes, Pluto, Midas, Watershed substations as well as the newly-built Mookodi substation. However, the existing Watershed substation is currently un-firm and has insufficient capacity to support the forecasted load in the area, which includes Lichtenburg and extends to Mahikeng town. There is also anticipated load growth in the Mafikeng area indicating a need for further enhancement of capacity in the area.

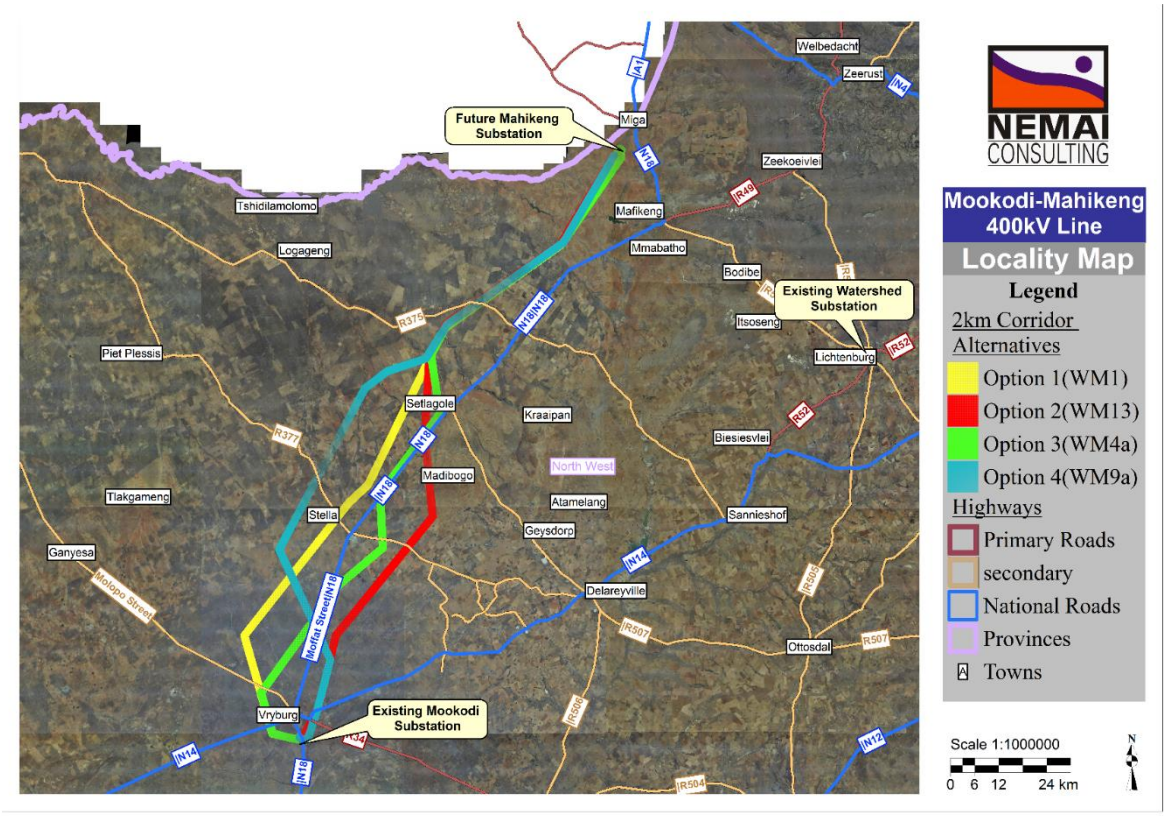
Hence there is a need for further network expansion through establishing a new transmission substation in Mahikeng. There are several projects underway to alleviate the constraint problems and this is referred to as the Watershed Strengthening Scheme. As part of establishing the site for the proposed Mahikeng substation, Mahikeng substation will be designed with an end state of 3x 500MVA 400/132kV transformers and install 2x 500MVA 400/132kV transformers initially. A 1x 160km Pluto – Mahikeng 400kV line will also be established. These two project components are currently undergoing a separate Environmental Impact Assessment (EIA) Process. The EIA Process for this project is for the proposed approximately 180km Mookodi - Mahikeng 400kV Powerline project.

Project Location

The proposed project falls within the jurisdiction of the Naledi Local Municipality (LM), Kagisano-Molopo LM, Ratlou LM, and Mahikeng LM in the North West Province. Four alternative routes have been considered for the EIA Process, namely:

- Option 1 (WM1);
- Option 2 (WM13);
- Option 3 (WM4a); and
- Option 4 (WM9a)

The proposed route alternatives for the powerline start in Vryburg at the existing Mookodi substation, and travel in a north-east direction where the line ends near Mahikeng at the proposed Mahikeng substation site.



Locality Map

Project Description

The scope of the project includes a transmission line, approximately 180km in length, from the existing Mookodi Substation in Vryburg and travels in a northeast direction ending near Mahikeng at the proposed Mahikeng substation site.

A 2km corridor has been applied for all four route alternatives. The 2km corridor consist of 1km on each side of the centreline. This extended study area allows for any possible deviations from the current proposed alignment of the power lines within this corridor, which may be necessary due to findings of the Specialist Studies, concerns raised during the Scoping and EIA Process, technical requirements and the outcome of Eskom negotiations with landowners. Following a contractual agreement with a landowner, an application for registration of the 55m servitude is lodged with the Provincial Deeds Office against the property deed.

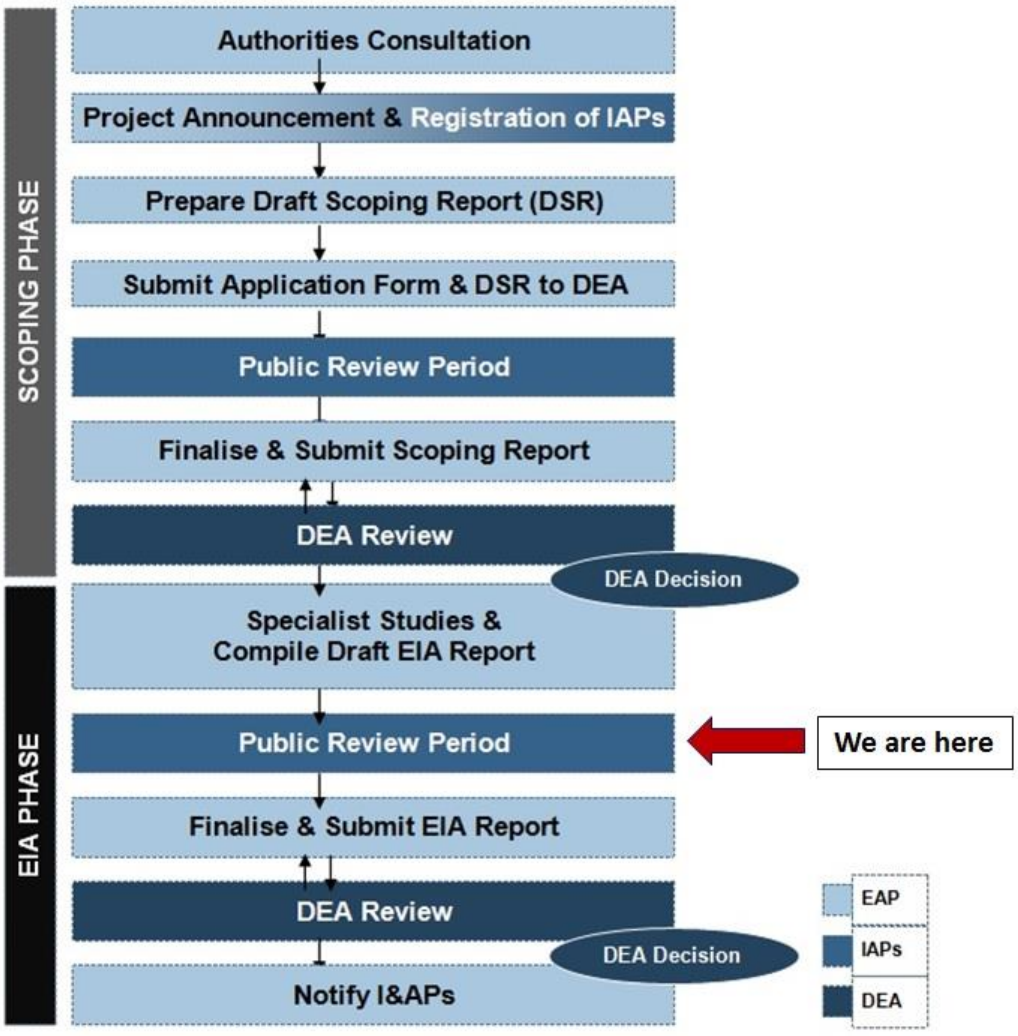
The selection of a tower types depends on several factors, including terrain, costs and recommendations from specialists (where relevant). The tower types have not been finalised as yet, as the type of structure is dependent on the aforementioned factors as well as the final route of the power line.

Legislation and Guidelines Considered

The pertinent environmental legislation that has bearing on the proposed development is considered in the EIA Report. The proposed Mookodi-Mahikeng 400kV Powerline requires authorisation in terms of the NEMA, and the EIA was undertaken in accordance with the 2014 EIA Regulations (as amended on 07 April 2017). A description of the policy and legislative context within which the development is proposed includes an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment process.

Scoping and EIA Process

In terms of the Regulations, the lead decision-making authority for the Scoping and EIA is the Department of Environmental Affairs (DEA) as the project proponent is Eskom Holdings (SOC) Ltd. The EIA Process is divided into two phases, namely: 1) Scoping and 2) EIA. An outline of the Scoping and EIA Process for the proposed Mookodi-Mahikeng 400kV Powerline is provided below.



Scoping and EIA Process

Profile of the Receiving Environment

The EIA Report provides general description of the status quo of the receiving environment in the project area. This serves to provide the context within which the Scoping exercise was conducted. It also allows for an appreciation of sensitive environmental features and possible receptors of the effects of the proposed Mookodi-Mahikeng 400kV Powerline.

The following environmental features have been considered:

1. Climate
2. Geology
3. Soil
4. Topography
5. Surface Water
6. Flora
7. Fauna
8. Land Capability
9. Land Use
10. Heritage
11. Air Quality
12. Noise
13. Visual Quality
14. Existing Infrastructure
15. Traffic
16. Socio-Economic

Summary of Specialist Studies

A crucial element of the Plan of Study for the EIA prepared during the Scoping phase was to provide the Terms of Reference for the requisite Specialist Studies triggered during Scoping. The requisite Specialist Studies 'triggered' by the findings of the Scoping Process, aimed at addressing the key issues and compliance with legal obligations, include:

1. Terrestrial Ecological Impact Assessment;
2. Avifaunal Impact Assessment;
3. Agricultural Impact Assessment;
4. Phase 1 Heritage Impact Assessment;
5. Social Impact Assessment;
6. Economic Impact Assessment; and
7. Visual Impact Assessment.

Impact Assessment

The EIA Report focuses on the pertinent environmental impacts that could potentially be caused by the proposed Mookodi-Mahikeng 400kV Powerline during the pre-construction, construction and operational phases of the project.

Impacts were identified as follows:

- Impacts associated with Listed Activities contained in Government Notice (GN) No. R. 983, R. 984 and R. 985 of the 2014 EIA Regulations (as amended on 07 April 2017), for which authorisation has been applied for;
- An appraisal of the project activities and components;
- Issues highlighted by environmental authorities;
- Comments received during public participation;

- An assessment of the receiving biophysical, social, economic and technical environment; and
- Findings from Specialist Studies.

The impacts and the proposed management measures are discussed on a qualitative level and thereafter quantitatively assessed by evaluating the nature, extent, magnitude, duration, probability and ultimately the significance of the impacts. The assessment considered impacts before and after mitigation, where in the latter instance the residual impact following the application of the mitigation measures is evaluated.

The proposed mitigation of the impacts associated with the project includes specific measures identified by the technical team (including engineering solutions) and environmental specialists, stipulations of environmental authorities and environmental best practices. The Environmental Management Programme (EMPr) provides a comprehensive list of mitigation measures for specific elements of the project, which extends beyond the impacts evaluated in the body of the EIA Report. Cumulative impacts are discussed in relation to the proposed Lanseria WwTW.

Analysis of Alternatives

The EIA Report provides an appraisal of all the environmental and technical considerations associated with the various alternatives through a comparative analysis to eventually distil the Best Practicable Environmental Option (BPEO).

No fatal flaws were identified by any Specialist Studies. Based on the recommendations of the Specialist Studies, technical considerations and the comparison of the impacts, Route Option 2 (WM13) was identified as the BPEO for the Mookodi-Mahikeng 400kV Powerline.

Public Participation

The EIA Report provides a full account of the public participation process that was followed for the EIA Phase for the proposed project. The public review period of the Draft EIA Report took place for a 30-Day review period from 26 June 2018 to 25 July 2018.

All authorities and registered Interested and Affected Parties (IAPs) will be notified via email or SMS after having received written notice from DEA on the final decision for the project. Advertisements will also be placed as notification of the Department's decision. These notifications will include the appeal procedure to the decision and key reasons for the decision.

EIA Conclusion and Recommendations

Attention is drawn to specific sensitive environmental features (with an accompanying sensitivity map) for which mitigation measures are included in the EIA Report and EMPr.

An Environmental Impact Statement is provided and critical environmental activities that need to be executed during the project life-cycle are also presented.

With the selection of the BPEO (Option 2), the adoption of the mitigation measures include in the EIA Report and the dedicated implementation of the EMPr, it is believed that the significant environmental aspects and impacts associated with this project can be suitably mitigated. With

the aforementioned in mind, it can be concluded that there are no fatal flaws associated with the project and that authorisation can be issued, based on the findings of the specialists and the impact assessment, through the compliance with the identified environmental management provisions.

The EIA Report is concluded with key recommendations, which may also influence the conditions of the Environmental Authorisation (if granted).

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List of Abbreviations

BID	Background Information Document
BOSA	Botswana – South Africa
BPEO	Best Practicable Environmental Option
CARA	Conservation of Agricultural Resources Act
CBA	Critical Biodiversity Area
CRR	Comments and Responses Report
DAFF	Department of Agriculture, Forestry and Fisheries
DEA	Department of Environmental Affairs
DMR	Department of Mineral Resources
DSR	Draft Scoping Report
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EMF	Electromagnetic Field
EMPr	Environmental Management Programme
ESA	Ecological Support Area
FSR	Final Scoping Report
GA	General Authorisation
GIS	Geographic Information System
GN	Government Notice
IAP	Interested and Affected Party
IBA	Important Bird and Biodiversity Area
IDP	Integrated Development Plan
km	Kilometre
LM	Local Municipality
m^3	Cubic Metre
MCDM	Multi-criteria Decision-Making Model
mm	Millimetre
MPRDA	Mineral and Petroleum Resources Development Act
NEMA	National Environmental Management Act
NEM:AQA	National Environmental Management: Air Quality Act
NEM:BA	National Environmental Management: Biodiversity Act
NEM:WA	National Environmental Management: Waste Act
NWA	National Water Act
NWPHRA	North West Provincial Heritage Resources Authority
NWREAD	North West Department of Rural, Environment and Agricultural Development

OHS	Occupational Health and Safety
PES	Present Ecological State
QDS	Quarter Degree Square
SAHRA	South African Heritage Resources Agency
SAHRIS	South African Heritage Resources Information System
SANBI	South African National Biodiversity Institute
SDF	Spatial Development Framework
ToR	Terms of Reference
WMA	Water Management Area
WUL	Water Use License
WULA	Water Use License Application

1 DOCUMENT ROADMAP

This document serves as the Draft Environmental Impact Assessment (EIA) Report for the proposed Mookodi-Mahikeng 400kV Powerline, in the North West Province. In order to provide clarity to the reader, a document roadmap is provided in **Table 1** below. The document roadmap provides information on the requirements of the 2014 EIA Regulations, as amended (07 April 2017), as stipulated in Appendix 3 of Government Notice (GN) No. R. 982, as promulgated in terms of the National Environmental Management Act (NEMA) (Act No. 107 of 1998) as well as a guide on the content of each chapter. Please note that in some cases more information is provided than required in the EIA Regulations in which case there will be no correlating section to these EIA Regulations.

Table 1: Document roadmap

Chapter	Title	Correlation with Appendix 3 of GN No. R. 982	
1.	Document Roadmap	-	-
2.	Purpose of this Document	-	-
3.	Environmental Assessment Practitioner (EAP)	3 (1)(a)	Details of – iii) the EAP who prepared the report; and iv) the expertise of the EAP, including a curriculum vitae.
4.	Project Background and Motivation	3 (1)(f)	A motivation for the need and desirability for the proposed development including the need and desirability of the activity within the context of the preferred development footprint within the approved site as contemplated in the accepted scoping report.
5.	Project Location	3 (1)(b)	The location of the development footprint of the activity on the approved site as contemplated in the accepted scoping report, including – i) The 21 digit Surveyor General code of each Cadastral land parcel; ii) Where available, the physical address and farm name; and iii) Where the required information in terms of (i) and (ii) is not available, the coordinates of the boundary of the property or properties.
		3 (1)(c)	A plan which locates the proposed activity or activities applied for at an appropriate scale, or if it is – i) A linear activity, a description and coordinates of the corridor in which the

Chapter	Title	Correlation with Appendix 3 of GN No. R. 982	
			proposed activity or activities is undertaken; and ii) On land where the property has not yet been defined, the coordinates within which the activity is to be undertaken.
6.	Project Alternatives	3 (1)(h)	A full description of the process followed to reach the proposed development footprint within the approved site as contemplated in the accepted scoping report, including: i) Details of the development footprint alternatives considered; ix) If no alternative development footprints for the activity were investigated, the motivation for not considering such.
7.	Project Description	3 (1)(d)	A description of the scope of the proposed activity, including – i) All listed and specified activities triggered and being applied for; and ii) A description of the associated structures and infrastructure related to the development.
		3 (1)(g)	A motivation for the preferred development footprint within the approved site as contemplated in the accepted scoping report.
		3 (1)(t)	Where applicable, details of any financial provision for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts.
		3 (1)(r)	Where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required and the date on which the activity will be concluded and the post construction monitoring requirements finalised.
8.	Legislation and Guidelines Considered	3 (1)(e)	A description of the policy and legislative context within which the development is located and an explanation of how the proposed development complies with and responds to the legislation and policy context.
9.	Scoping and EIA Process	3 (1)(u)	An indication of any deviation from the approved scoping report, including the plan of study, including- i) any deviation from the methodology used in determining the significance of potential environmental impacts and risks ii) a motivation for the deviation

Chapter	Title	Correlation with Appendix 3 of GN No. R. 982	
		3 (1)(v)	Any specific information that may be required by the competent authority.
10.	Assumptions and Limitations	3 (1)(p)	A description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed.
11.	Need and Desirability	3 (1)(f)	A motivation for the need and desirability for the proposed development including the need and desirability of the activity within the context of the preferred development footprint within the approved site as contemplated in the accepted scoping report.
12.	Profile of the Receiving Environment	3 (1)(h)	A full description of the process followed to reach the proposed development footprint within the approved site as contemplated in the accepted scoping report, including: iv) The environment attributes associated with the development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects.
13.	Summary of Specialist Studies	3 (1)(k)	Where applicable, a summary of the findings and recommendations of any specialist report complying with Appendix 6 to these Regulations and an indication as to how these findings and recommendations have been included in the final assessment report.
14.	Impact Assessment	3 (1)(h)	A full description of the process followed to reach the proposed development footprint within the approved site as contemplated in the accepted scoping report, including: v) The impacts and risks identified including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts – a. can be reversed; b. may cause irreplaceable loss of resources; and c. can be avoided, managed or mitigated. vi) The methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks. vii) Positive and negative impacts that the proposed activity and alternatives will have on the environment and on the

Chapter	Title	Correlation with Appendix 3 of GN No. R. 982	
			community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects. viii) The possible mitigation measures that could be applied and level of residual risk.
		3 (1)(i)	A full description of the process undertaken to identify, assess and rank the impacts the activity and associated structures and infrastructure will impose on the preferred development footprint within the approved site as contemplated in the accepted scoping report through te life of the activity, including - i) A description of all environmental issues and risks that were identified during the environmental impact assessment process; and ii) An assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures.
		3 (1)(j)	An assessment of each identified potentially significant impact and risk, including- (i) Cumulative impacts; (ii) The nature, significance and consequences of the impact and risk; (iii) The extent and duration of the impact and risk; (iv) The probability of the impact and risk occurring; (v) The degree to which the impact and risk can be reversed; (vi) The degree to which the impact and risk may cause irreplaceable loss of resources; and (vii) The degree to which the impact and risk can be mitigated.
15.	Comparative Analysis of Alternatives	3 (1)(h)	A full description of the process followed to reach the proposed development footprint within the approved site as contemplated in the accepted scoping report, including: (x) A concluding statement indicating the location of the preferred alternative development footprint within the approved site as contemplated in the accepted scoping report.
		3 (1)(n)	The final proposed alternatives which respond to the impact management measures, avoidance, and mitigation

Chapter	Title	Correlation with Appendix 3 of GN No. R. 982	
			measures identified through the assessment.
16.	Public Participation	3 (1)(h)	A full description of the process followed to reach the proposed development footprint within the approved site as contemplated in the accepted scoping report, including: ii) Details of the public participation process undertaken in terms of regulation 41 of the Regulations including copies of supporting documents and inputs; and iii) A summary of the issues raised by IAPS and an indication of the manner in which the issues were incorporated or the reasons for not including them.
17.	EAP Conclusion and Recommendations	3 (1)(l)	An environmental impact statement which contains - i) A summary of the key findings of the environmental impact assessment: ii) A map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred development footprint on the approved site as contemplated in the accepted scoping report indicating any areas that should be avoided, including buffers; and iii) A summary of the positive and negative impacts and risks of the proposed activity and identified alternatives.
		3 (1)(m)	Based on the assessment, and where applicable, recommendations from specialist reports, the recording of proposed impact management outcomes for the development for inclusion in the EMPr as well as for inclusion as conditions of authorisation.
		3 (1)(o)	Any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation.
		3 (1)(q)	A reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation.
18.	Oath of EAP	3 (1)(s)	An undertaking under oath or affirmation by the EAP in relation to-

Chapter	Title	Correlation with Appendix 3 of GN No. R. 982	
			(i) The correctness of the information provided in the reports; (ii) The inclusion of comments and inputs from stakeholders and I&APs; (iii) The inclusion of inputs and recommendations from the specialist reports where relevant; and (iv) Any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested or affected parties.
-		3 (1)(w)	Any other matters required in terms of section 24(4)(a) and (b) of the Act.

The following is included in the Appendices to meet the requirements of the 2014 EIA Regulations, as amended:

Appendix of EIA Report	Title	Correlation with GN No. R. 982
7	Environmental Management Programme (EMPr)	Appendix 4
6	Specialist Studies	Appendix 6

2 PURPOSE OF THIS DOCUMENT

The EIA Report concludes the final phase of the EIA Process. The EIA Report aims to outline the final process to be undertaken in line with the approved Plan of Study for the proposed Mookodi-Mahikeng 400kV Powerline as well as to set out the environmental impacts, mitigation, closure outcomes, and the residual risks of the proposed activity.

According to Appendix 3 of GN No. R. 982 of the 2014 EIA Regulations, as amended, the objectives of the EIA Process are, through consultation, to:

a) Determine the policy and legislative context within which the activity is located and document how the proposed activity complies with and responds to the policy and legislative context;
b) Describe the need and desirability of the proposed activity, including the need and desirability of the activity in the context of the preferred location;
c) Identify the location of the development footprint within the preferred site based on an impact and risk assessment process inclusive of cumulative impacts and a ranking process of all the identified development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects of the environment;

d) Determine the-
    a. Nature, significance, consequence, extent, duration and probability of the impacts occurring to inform identified preferred alternatives; and
    b. Degree to which these impacts-
        aa) Can be reversed;
        bb) May cause irreplaceable loss of resources, and
        cc) Can be avoided, managed or mitigated;
e) Identify the most ideal location for the activity within the preferred site based on the lowest level of environmental sensitivity identified during the assessment;
f) Identify, assess, and rank the impacts the activity will impose on the preferred location through the life of the activity;
g) Identify suitable measures to avoid, manage or mitigate identified impacts; and
h) Identify residual risks that need to be managed and monitored.

To date, the Scoping Phase for the project is complete. The Final Scoping Report (FSR) and Plan of Study for the EIA were approved on 03 May 2018 by the Department of Environmental Affairs (DEA), who is the Competent Authority in respect to this proposed development. The Draft EIA Report will be made available to Interested and Affected Parties (IAPs) and Authorities for a 30-Day review period from 26 June 2018 to 25 July 2018. All comments received will be assessed in the Final EIA Report and Comments and Responses Report (CRR).

3 ENVIRONMENTAL ASSESSMENT PRACTITIONER

Nemai Consulting was appointed by Eskom Holdings (SOC) Ltd as the Independent Environmental Assessment Practitioner (EAP) to undertake the EIA for the proposed Mookodi-Mahikeng 400kV Powerline. In accordance with Section 3(a) of Appendix 3 of GN No. R. 982 of the 2014 EIA Regulations (as amended), this section provides an overview of Nemai Consulting and the company's experience with EIAs, as well as the details and experience of the EAPs that form part of the Scoping and EIA team.

Nemai Consulting is an independent, specialist environmental, social development and Occupational Health and Safety (OHS) consultancy, which was founded in December 1999. The company is directed by a team of experienced and capable environmental engineers, scientists, ecologists, sociologists, economists and analysts. The core members of Nemai Consulting that are involved in the Scoping and EIA Process for the proposed project are captured in **Table 2** below, and their respective Curricula Vitae are contained in **Appendix 1**.

Table 2: EIA core team members

Name	Qualification	Responsibility
Mrs N. Naidoo	BSc – Eng (Chem)	Project Manager and Environmental Engineering

Name	Qualification	Responsibility
Ms K. Robertson	MSc – Environmental Sciences	Project Leader and EAP for EIA Process, Scoping and EIA Report, and Public Participation
Mr D. Henning	MSc – River Ecology	Assistant EAP
Mr C. Van Der Hoven	Honours – Environmental Sciences	Public Participation

4 PROJECT BACKGROUND AND MOTIVATION

The North West Province sources its generation supply from Matimba and Grootvlei power stations, as well as from the Apollo DC converter station. Within the province, the two Customer Load Centres (CLC) are Rustenburg and Carletonville. The Carletonville CLC consists of Hermes, Pluto, Midas, Watershed substations as well as the newly-built Mookodi substation.

However, the existing Watershed substation is currently un-firm and has insufficient capacity to support the forecasted load in the area, which includes Lichtenburg and extends to Mahikeng town. The Watershed substation has technical constraints as it has insufficient transformation capacity and poor voltage profile in the 20 year planning horizon, starting from year 2016 till year 2036. The substation experiences capacity and voltage regulation constraints on the 275kV in-feeds to the Watershed substation. There is also anticipated load growth in the Mahikeng area, the forecast shows potential for other economic drivers in Carletonville (particularly in the Watershed/Mahikeng area) such as industrial, commercial and electrification to re-introduce positive load growth trends, thus indicating a need for further enhancement of capacity in the area.

Hence there is a need for further network expansion through establishing a new transmission substation in Mahikeng. There are several projects underway to alleviate the constraint problems and this is referred to as the Watershed Strengthening Scheme. As part of establishing the site for the proposed Mahikeng substation, Mahikeng substation will be designed with an end state of 3x 500MVA 400/132kV transformers and install 2x 500MVA 400/132kV transformers initially. A 1x 160km Pluto – Mahikeng 400kV line will also be established. These two project components are currently undergoing a separate EIA Process. The proposed project as part of this EIA Process is for the approximate 180km Mookodi - Mahikeng 400kV Powerline. The integration of Mahikeng substation comprises establishment of a Pluto-Mahikeng 400kV line and the Mookodi-Mahikeng 400kV line (**Figure 1**).

Figure 1: Mahikeng substation integration via Pluto and Mookodi substations

The proposed Pluto-Mahikeng 400kV line and Mahikeng substation would be constructed before the Mookodi-Mahikeng 400kV line. The Mookodi-Mahikeng 400kV Line is thus required to transmit electricity to the new Mahikeng Substation, in which the proposed Pluto – Mahikeng 400kV line will improve reliability of the Watershed Substation constraints which are not sufficient to support and supply the demand growth in Mahikeng town.

The study is dependent on the proposed Mookodi and Ngwedi substations which will de-load Watershed load by approximately 180MW by year 2021, of which 100MW is to Mookodi and 80MW to Ngwedi substation. The load shifts from Watershed creates some relief in load however it is not sufficient in restoring the firm capacity in the 20 year planning horizon. There is however a project to install a 250MVA 275/132kV transformer and capacitor banks on the 88kV and 132kV bus bar by year 2021 which improves Watershed firm capacity in the short term. The load growth at Mahikeng and the limitations of the existing Watershed substation triggers the need for the new transmission injection in Mahikeng substation to be established at the load center to accommodate the new load, de-load Watershed and align with the long term strategic view for regional trade.

5 PROJECT LOCATION

5.1 Geographical Context

The proposed project is situated within the Naledi Local Municipality (LM), Kagisano-Molopo LM, Ratlou LM, and Mahikeng LM in the North West Province (**Figures 2** and **3**). Refer to **Appendix 2** for maps. The proposed alternative routes for the line start in Vryburg at the existing Mookodi substation and travel in a north-east direction where the line ends near Mahikeng at the proposed Mahikeng substation site (**Figures 4** and **5**).

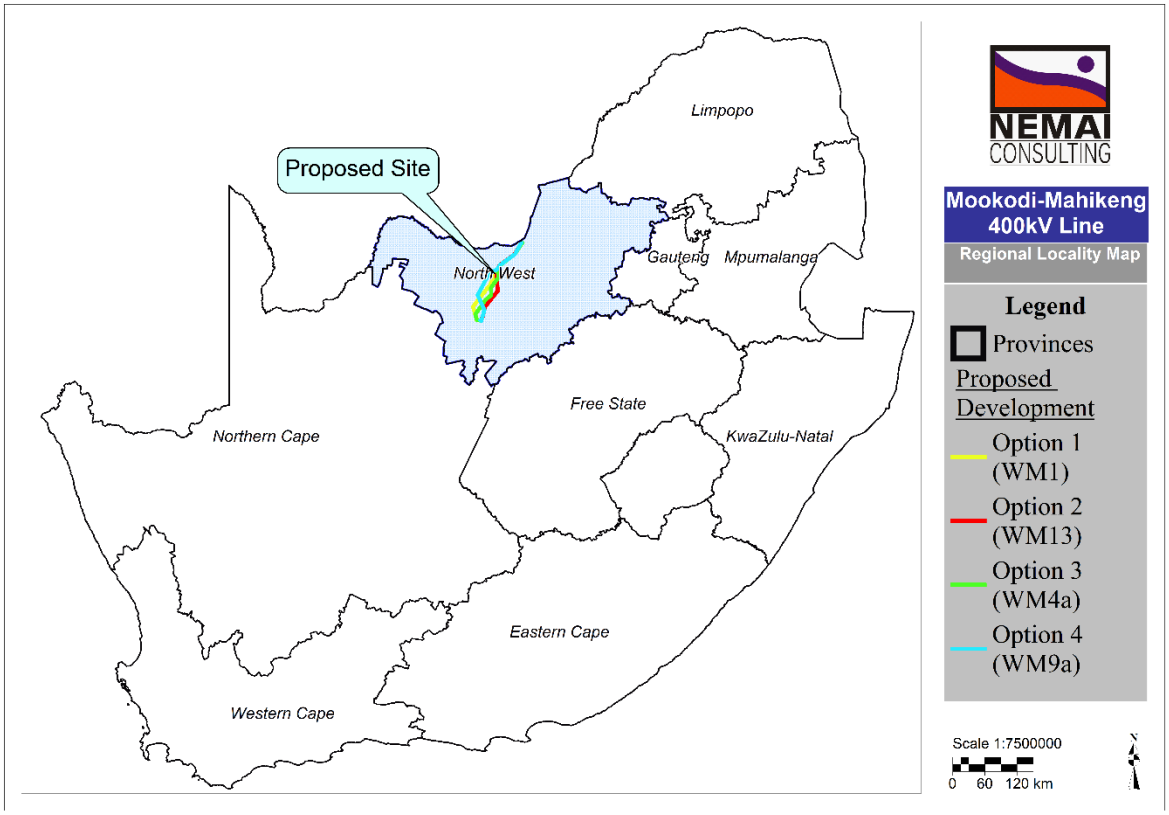


Figure 2: Regional locality map

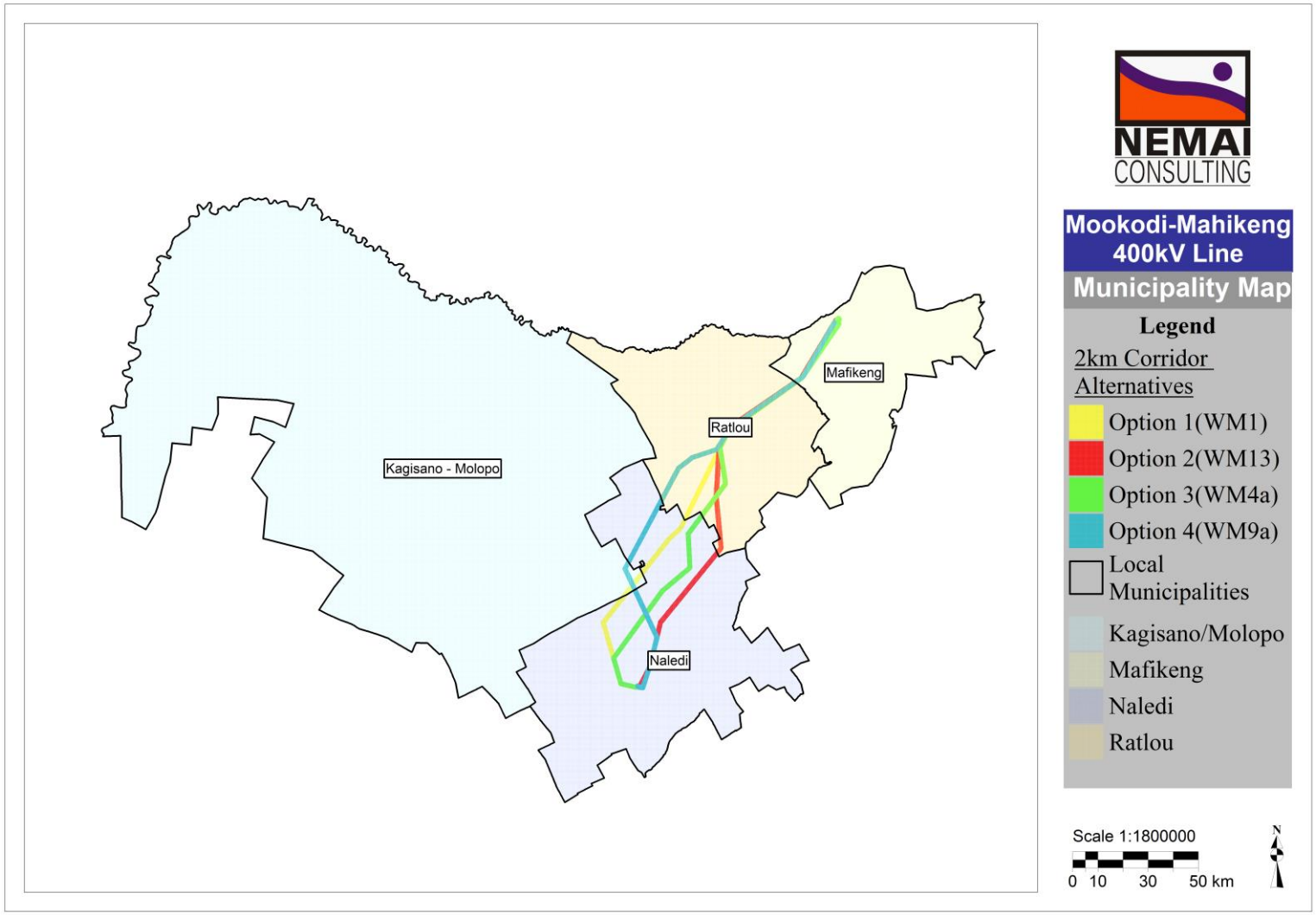


Figure 3: Municipality map

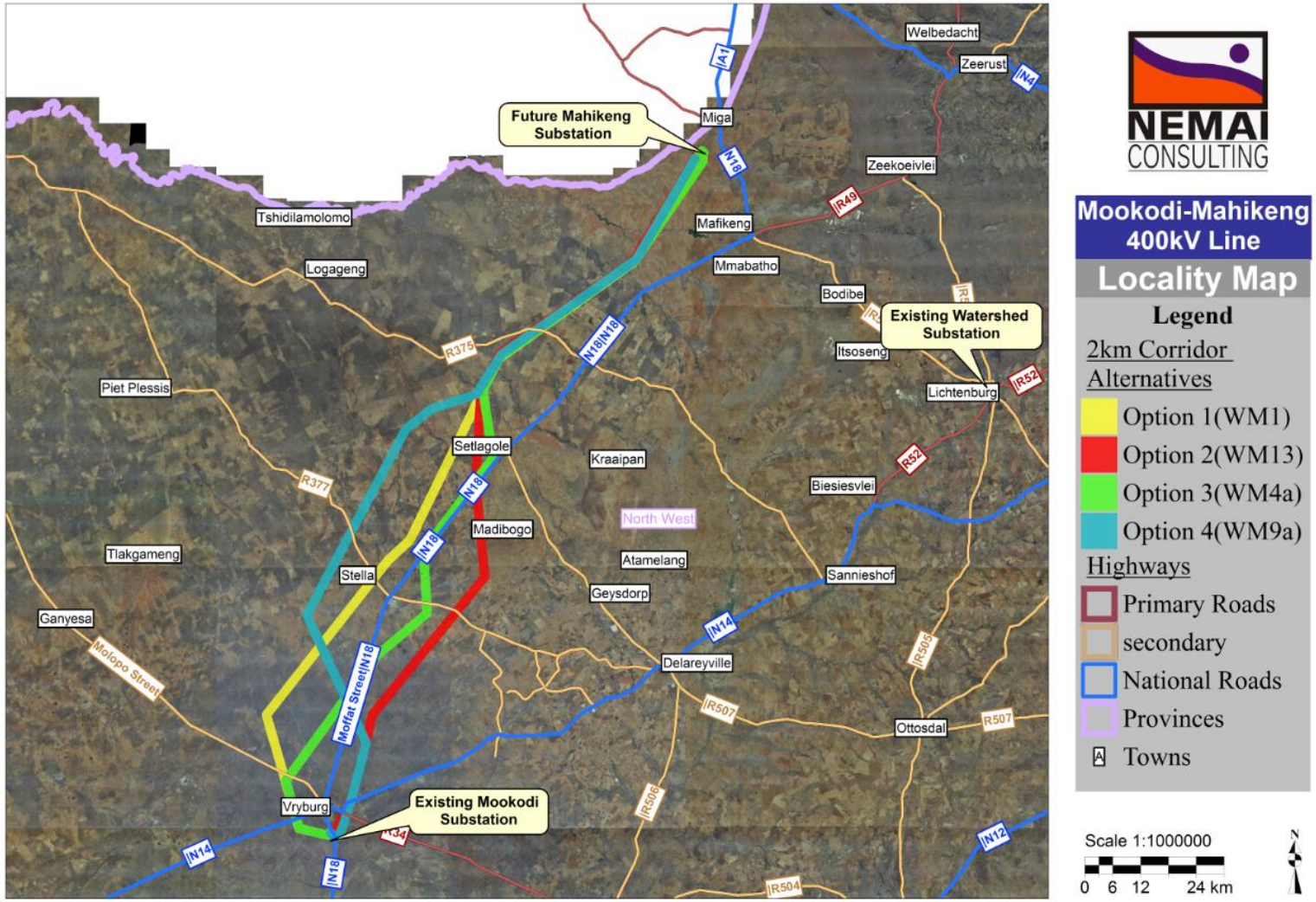


Figure 4: Locality map of the study area

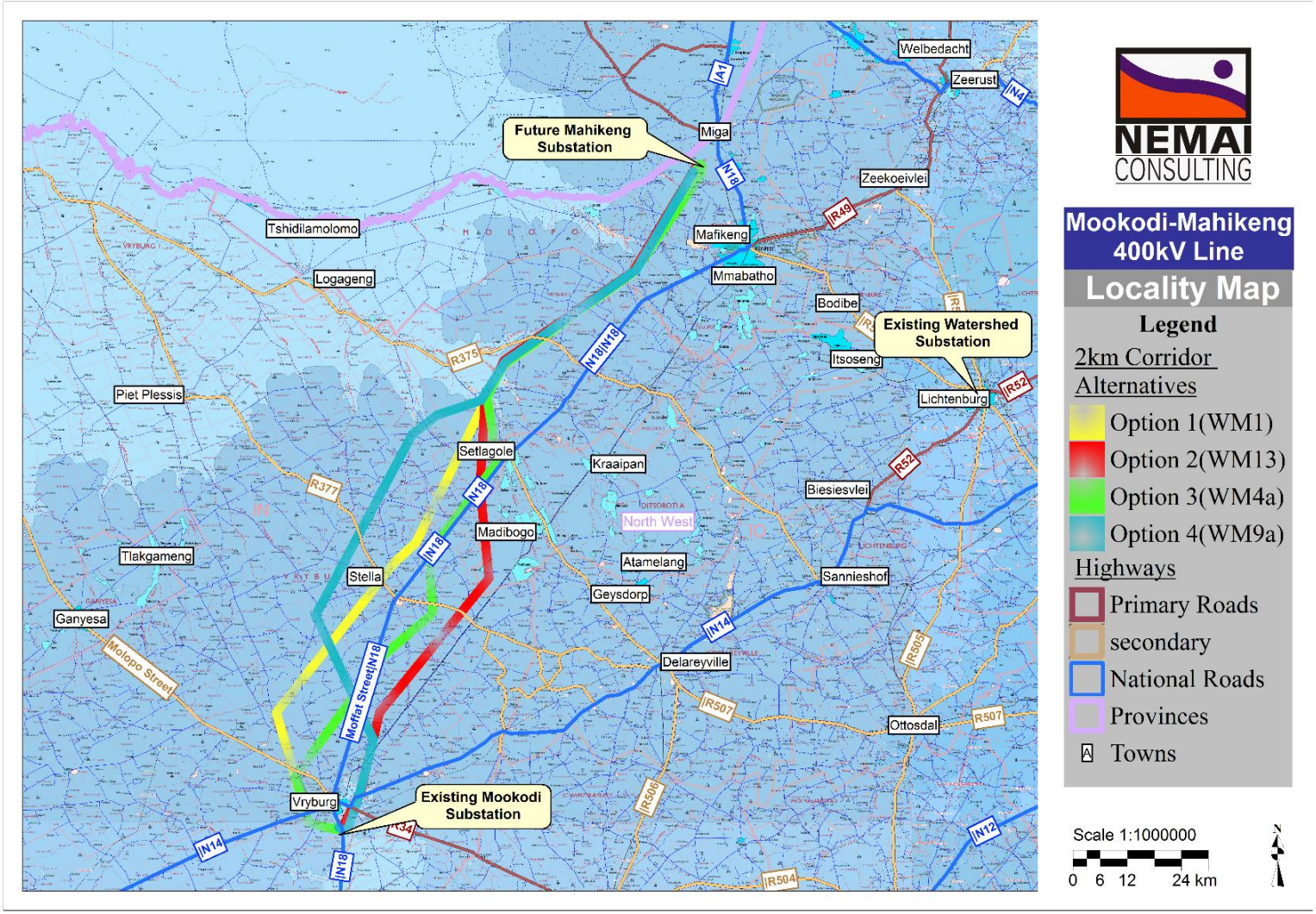


Figure 5: 1 in 250 000 Topographical map of the study area

The start point for the proposed Mookodi-Mahikeng 400kV Powerline is located at the existing Mookodi substation in Vryburg (**Figures 6** and **7**).

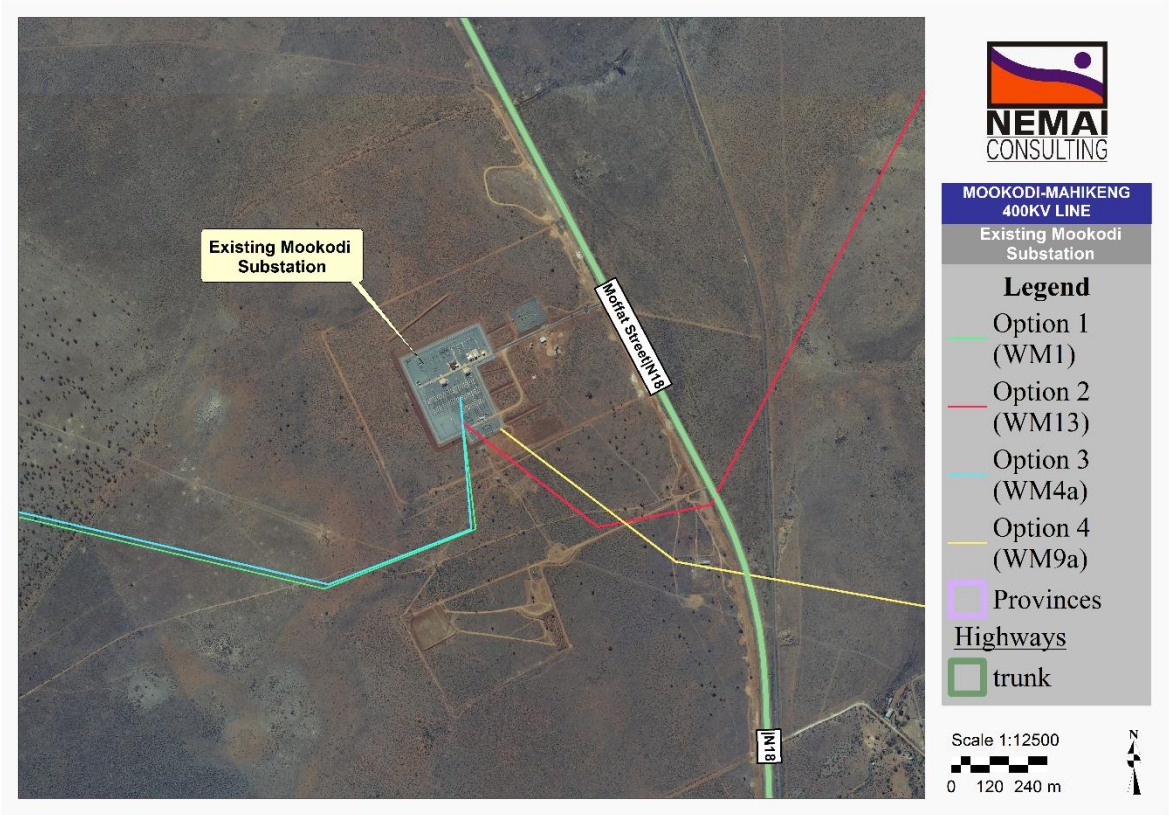


Figure 6: Existing Mookodi substation and start point for the proposed development

Figure 7: Photograph of the Mookodi substation

Figure 8 shows some photographs of the study area along the alternative route options. Refer to **Appendix 3** for additional photographs of the study area.

Figure 8: Photographs of the study area

The end point for the proposed Mookodi-Mahikeng 400kV Powerline is located in Mahikeng where the powerline will tie into the future Mahikeng substation (**Figure 9**).

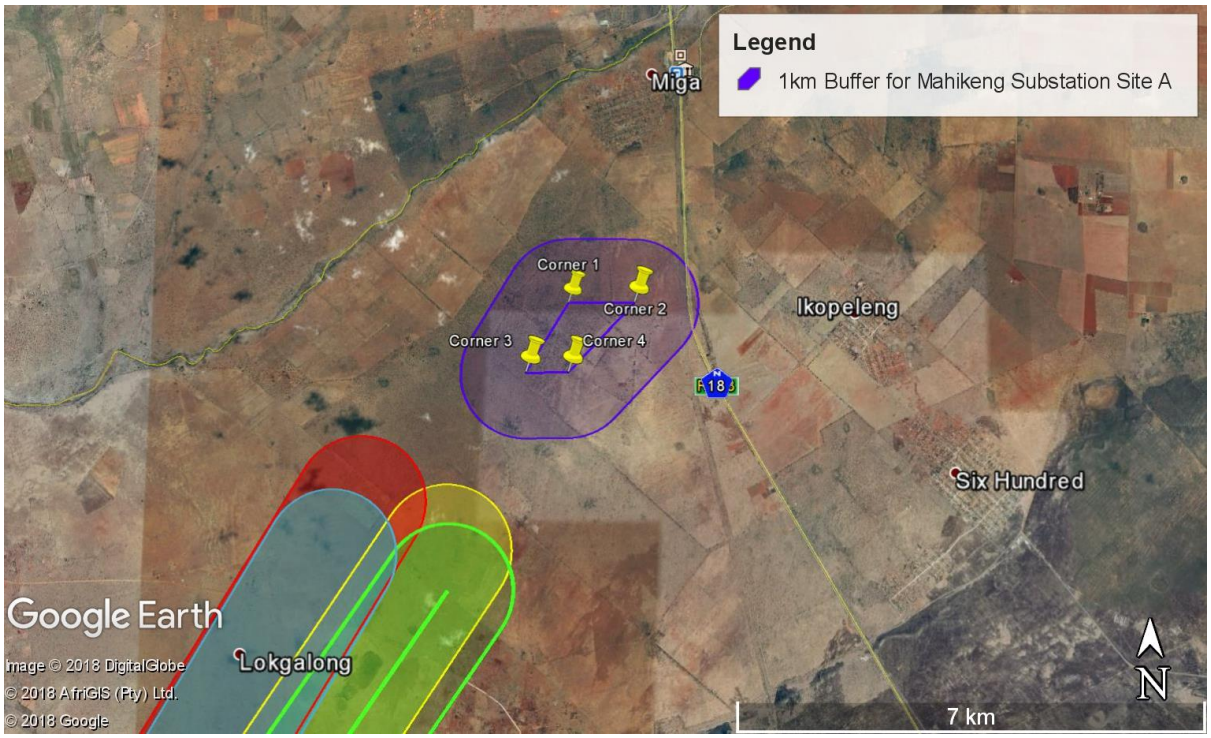


Figure 9: End point for the proposed development

5.2 Affected Properties

The proposed powerline alternative options are mostly located on privately-owned properties that are primarily used for agricultural practices. **Figure 10** shows the cadastral map for the study area, please refer to **Appendix 2** for larger maps. The study area was divided into four sections (**Figure 11**) to provide zoomed-in maps of the affected properties. **Figures 12** to **15** show the affected farm names and portions by the four proposed alternative route options.

Details of the properties that are affected by the 2km corridor for each alternative route are contained in the Landowner Database in **Appendix 5**.

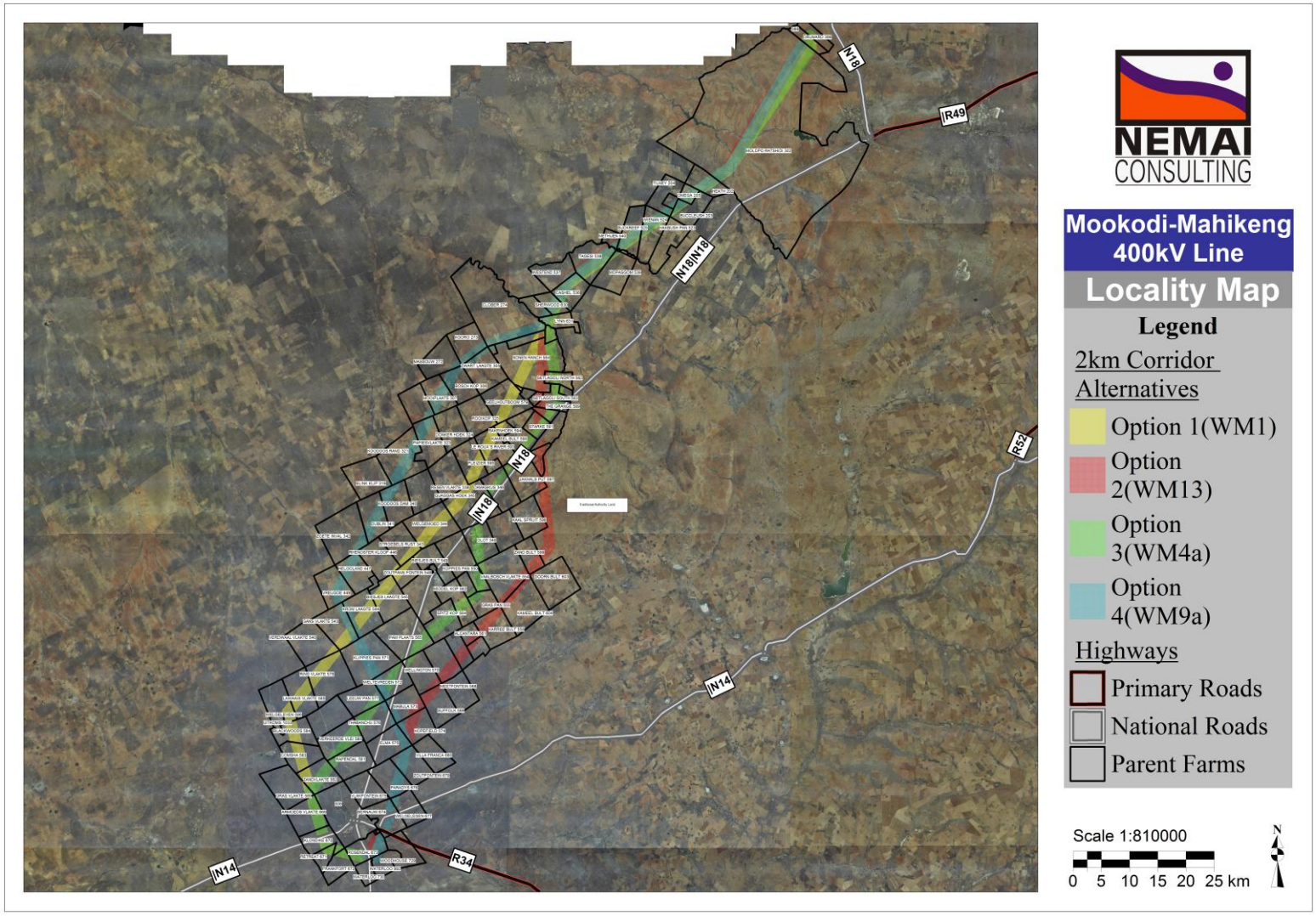


Figure 10: Cadastral map of the study area

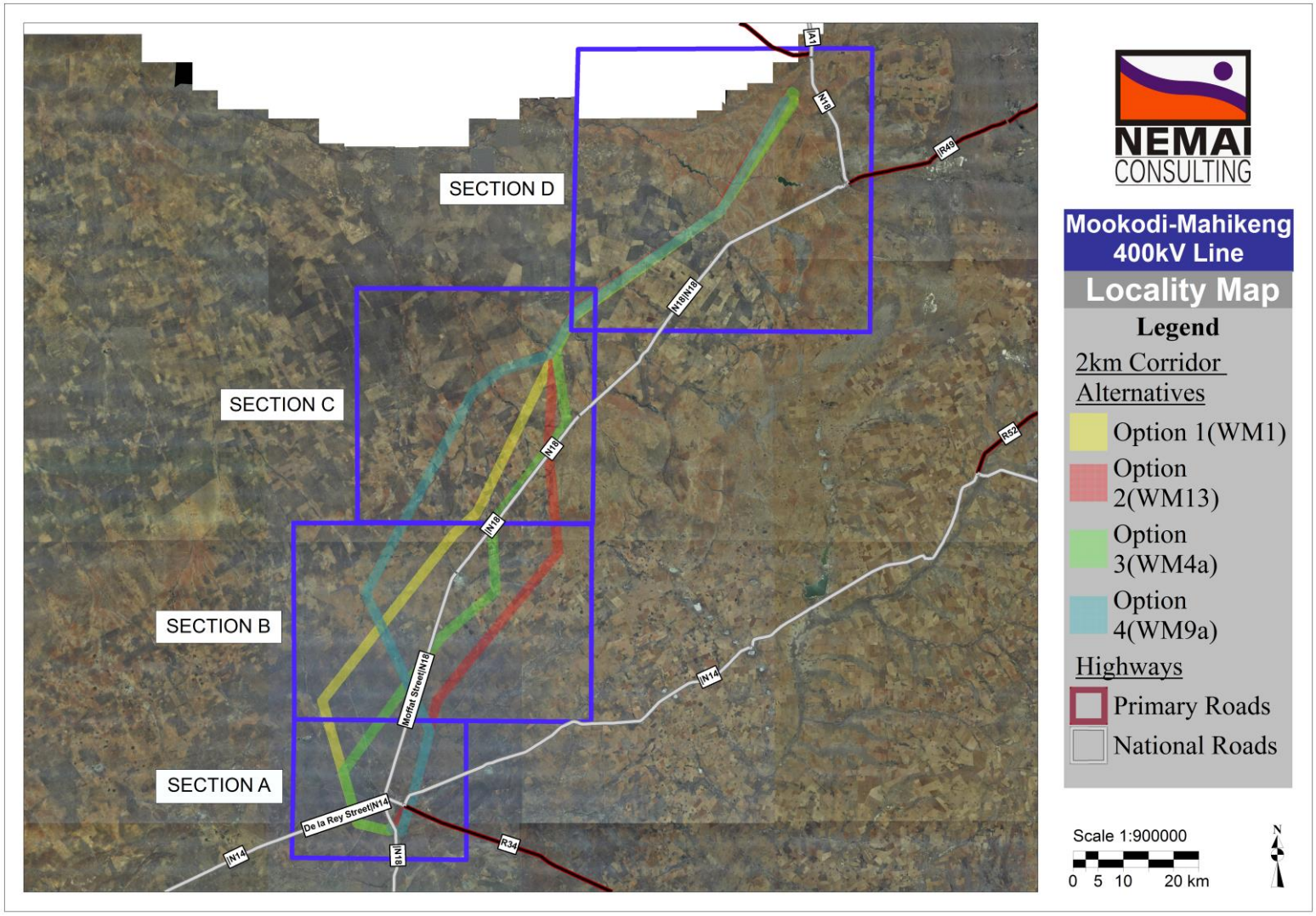


Figure 11: Sections of the study area to be zoomed-in

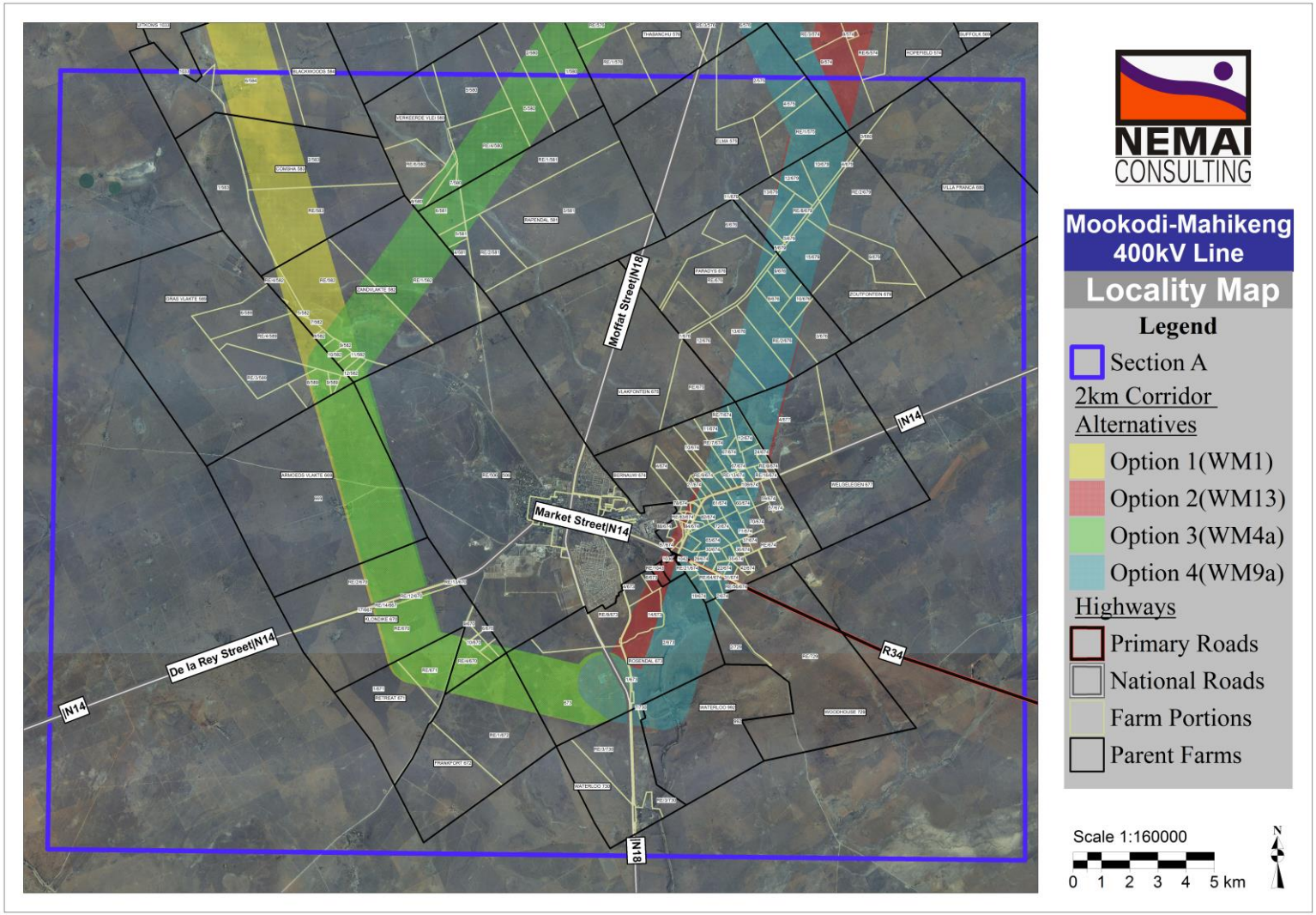


Figure 12: Section A farm portions

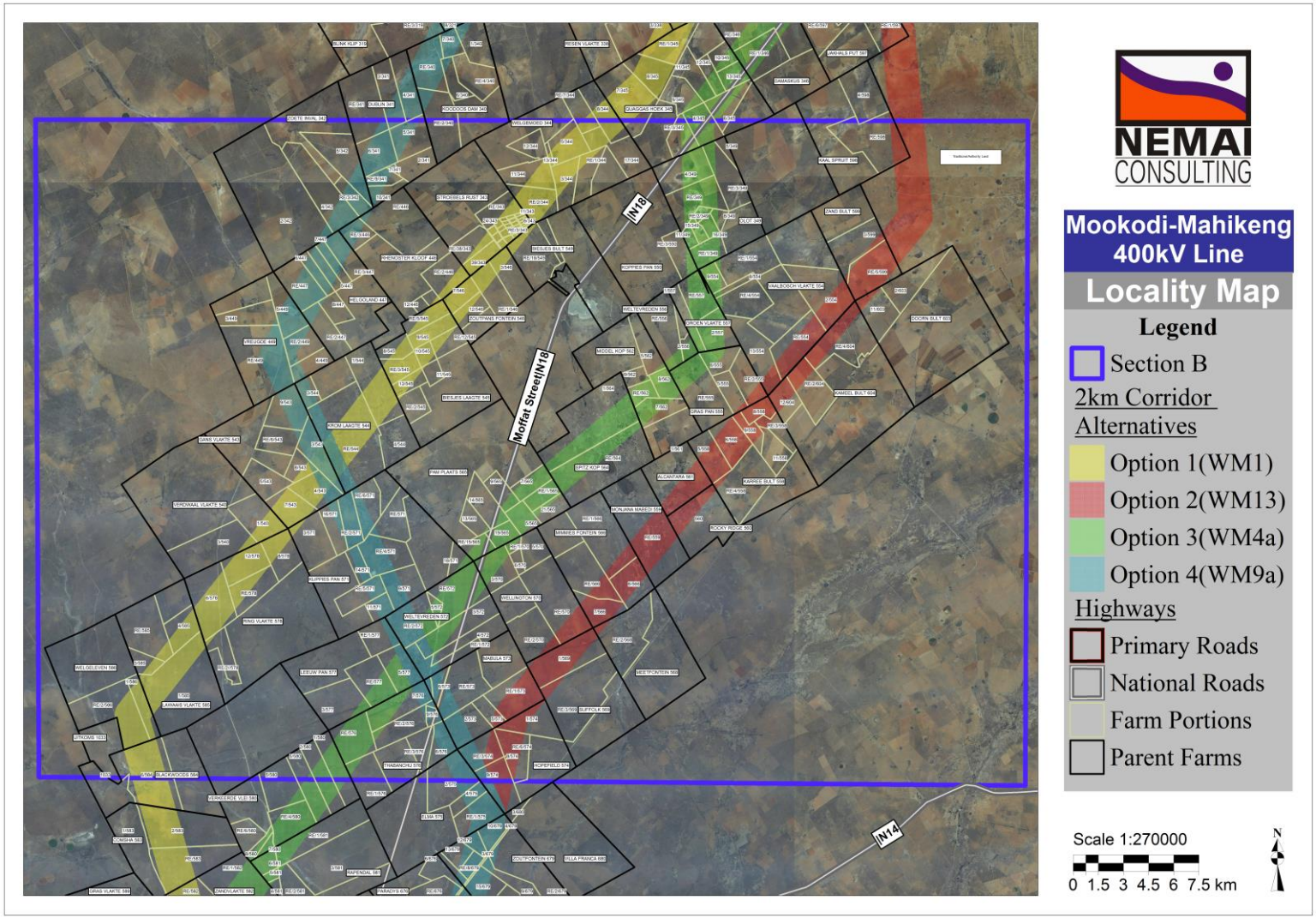


Figure 13: Section B farm portions

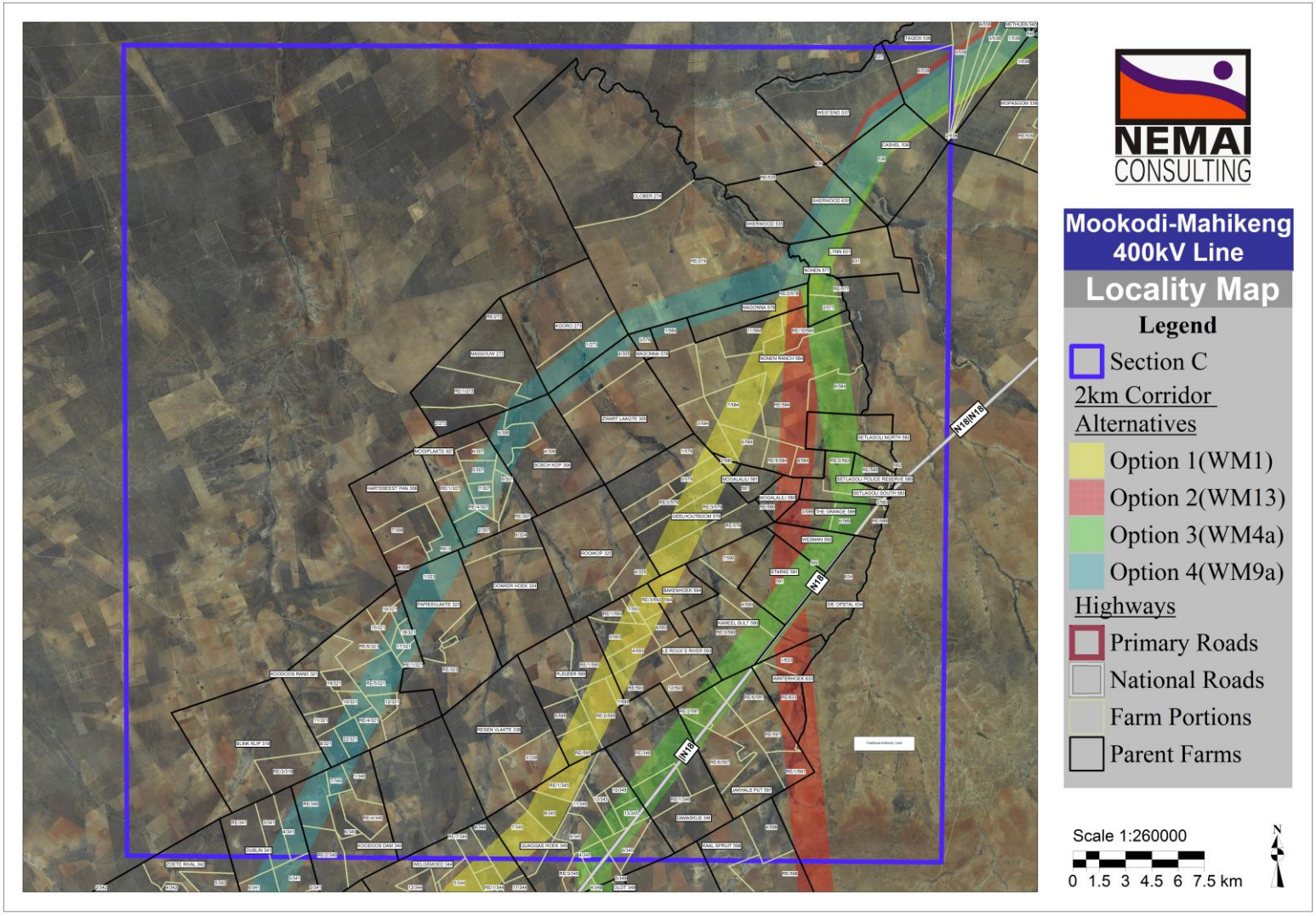


Figure 14: Section C farm portions

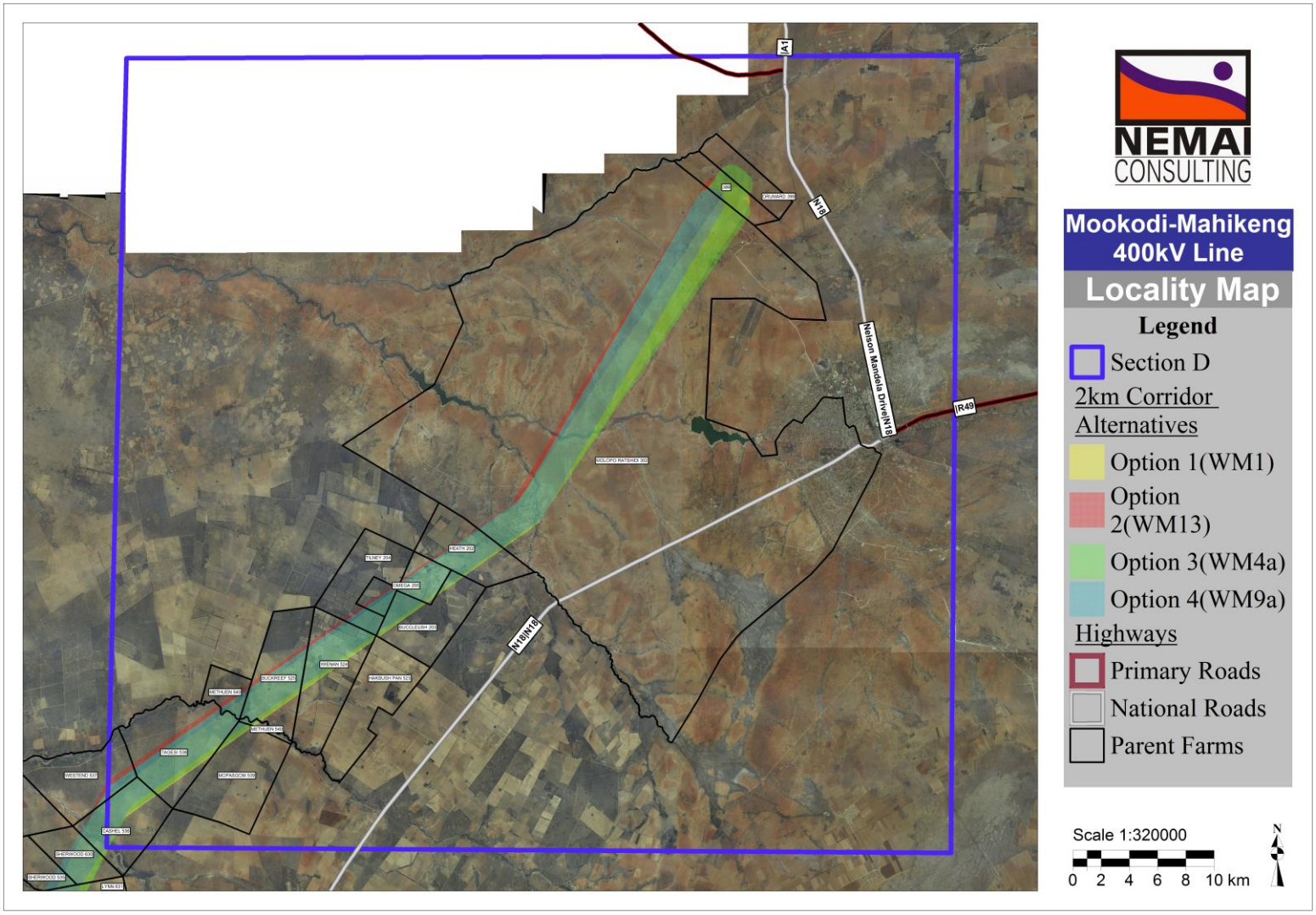


Figure 15: Section D farm portions

6 PROJECT ALTERNATIVES

The 2014 EIA Regulations (as amended) require that feasible project specific alternatives are identified (including the "no-go" option). The Regulations define alternatives as the following:

Different means of meeting the general purpose and requirements of the activity, which may include alternatives to:

- *Property on which or location where the activity is proposed to be undertaken;*
- *Type of activity to be undertaken;*
- *Design or layout of the activity;*
- *Technology to be used in the activity; or*
- *Operational aspects of the activity; and*
- *Includes the option of not implementing the activity.*

The sub-sections to follow discuss the project alternatives considered during the Scoping Process. The EIA Process will provide a detailed comparative analysis of the feasible alternatives from environmental (including specialist input) and technical perspectives.

By conducting the comparative analysis, the Best Practicable Environmental Option (BPEO) can be selected with technical and environmental justification. Münster (2005) defines BPEO as the alternative that "provides the most benefit or causes the least damage to the environment as a whole, at a cost acceptable to society, in the long term as well as in the short term".

In terms of the 2014 EIA Regulations (as amended) under NEMA, the fundamental purpose of the Scoping exercise is the consideration of viable and reasonable alternative sites, processes, and technologies of achieving the objectives of the project. The aim of this comparative environmental analysis is to make the necessary environmental input in the decision making processes in selecting a route for the powerline that is environmentally sustainable, socially acceptable, and economically viable.

6.1 Transmission Line Corridor Route Selection Process

As part of the Botswana – South Africa (BOSA) transmission interconnector project, a report was compiled on the Transmission Line Corridor Route Selection Process (2017) by Aurecon South Africa (Pty) Ltd. The transmission line corridors considered in the report include the Mahikeng substation (referred to as Watershed B in the report) to Mookodi and Pluto substations, respectively. The utilisation of this process is to deliver a common understanding of the methodology, key concepts, results and outcomes of a route selection process and provides benefit both in terms of enhancing stakeholders skills in the route selection process methodology, and achieves an outcome of a structured and verifiable improved understanding of the Mahikeng line corridors, for application within the broader BOSA project context.

The Transmission Line Corridor Route Selection Process Report (2017) documents the route selection, Multi-criteria Decision-Making Model (MCDM) and route optimisation processes for the selected line routes. Preferred routes to link the revised general location for the Mahikeng substation to Mookodi and Pluto have been selected as a consequence of following the methodology described in the report. These preferred routes have been used for the Scoping and EIA Process as alternative routes, as required in the 2014 EIA Regulations (as amended). The route selection process undertaken by Aurecon South Africa (Pty) Ltd is discussed below.

6.1.1 Identification of Potential Routes

The selection of the best route is an optimisation exercise, which aims to minimise the impacts on the environment and people, while accommodating technical challenges in the most cost-effective way. A rigorous process was followed to identify a range of potential route alignment corridors. The best practice base information used to inform these potential route alignments included the following factors:

1. Topography and slope
    - Slope and topography affects ease of construction and access for construction and maintenance;
    - Areas with the flattest topography should be selected as far as possible, to allow the straightest line possible to reduce costs and minimise the need for angle poles;
    - Avoid areas with slope exceeding 1:10; and
    - Slopes steeper than 1:18 are fatal flaws.
2. Water bodies
    - Large bodies of water should be avoided; and
    - The maximum span between the tower structures determines the maximum allowable water crossing.
3. Existing infrastructure and other land uses
    - Line routes should run parallel to roads where possible;
    - Minimise distance that lines run parallel to pipelines and railways to reduce possibility of induced current effects;
    - Where unavoidable to cross, safe clearance distances should be ensured;
    - Ensure line crosses at the shortest route over railway or road and avoid small angles of intersection;
    - Line heights and clearance areas around airports as determined by air traffic regulations;
    - The possibility of cavity or land-falls must be considered in areas with mining activity; and
    - Overhead lines are not permitted through protected areas of military installations.
4. Other power lines
    - If unavoidable, ensure crossing of new line over existing where multiple towers and spans can be installed between existing parallel lines;
    - This reduces the possibility of all power supplies being simultaneously compromised if lines collapse; and

- Consider positioning of wind energy converter and provide suitable clearance between rotors and overhead lines.

5. Urban or residential areas
   - Line corridors must avoid residential areas;
   - Challenging in rural areas, where residential areas are not well demarcated; and
   - Relocation of people and their homes and assets may become necessary, which is time consuming and costly.
6. Biodiversity
   - Avoid protected areas, sensitive aquatic and terrestrial ecological areas and pristine natural vegetation; and
   - Avoid bird flight paths, Important Bird areas and bird breeding and feeding areas.
7. Heritage resources
   - Avoid sites with known archaeological, historical, religious or cultural value; and
   - Avoid tourist attractions.

Based on the above, 16 potential linkages between the proposed Mahikeng and Mookodi substations were identified (**Figure 16**). It should be noted that these route alignment corridors include buffer areas to allow for the exact siting to be informed by detailed assessment of the study route.

6.1.2 Screening Process

The screening for potential routes identified by Aurecon South Africa (Pty) Ltd was applied at a very coarse scale to identify any routes not fatally flawed by factors such as:

- Bird sensitive areas (especially problematic for transmission lines);
- Known sites of heritage / cultural significance;
- Large areas of subsistence and formal agriculture (high levels of compensation and possible resettlement);
- Line route too close to settlements and urban areas (potential to constrain future development); and
- Slopes too steep for construction.

A total of 5 corridors as potential routes were further screened by Aurecon South Africa (Pty) Ltd for a more detailed assessment: WM1, WM4a, WM9a, WM13 and WM16a (**Figure 17**).

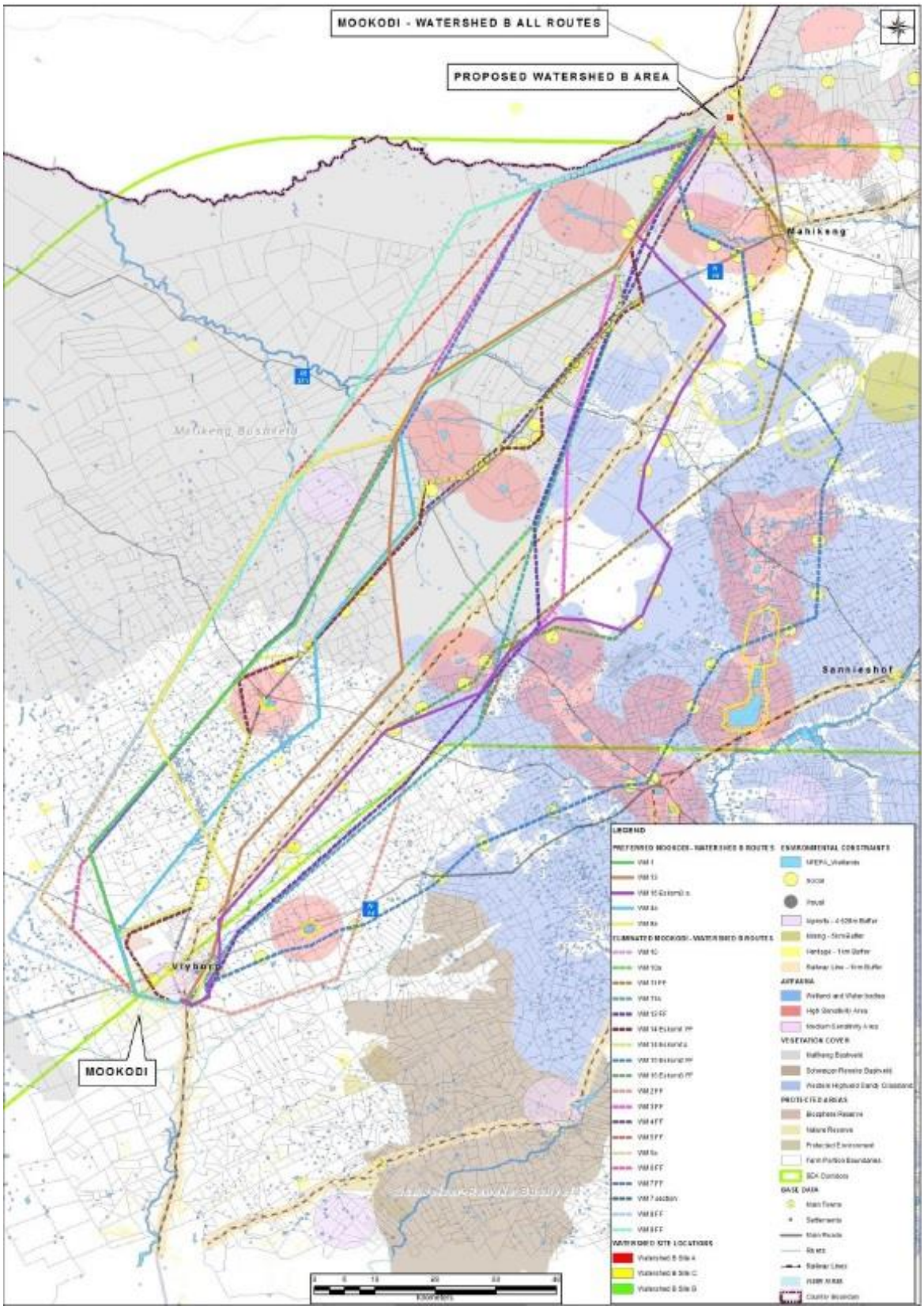


Figure 16: All route options between Mookodi and Watershed B substations, based on the outcomes of the route screening process (Transmission Line Corridor Route Selection Process Report, 2017)

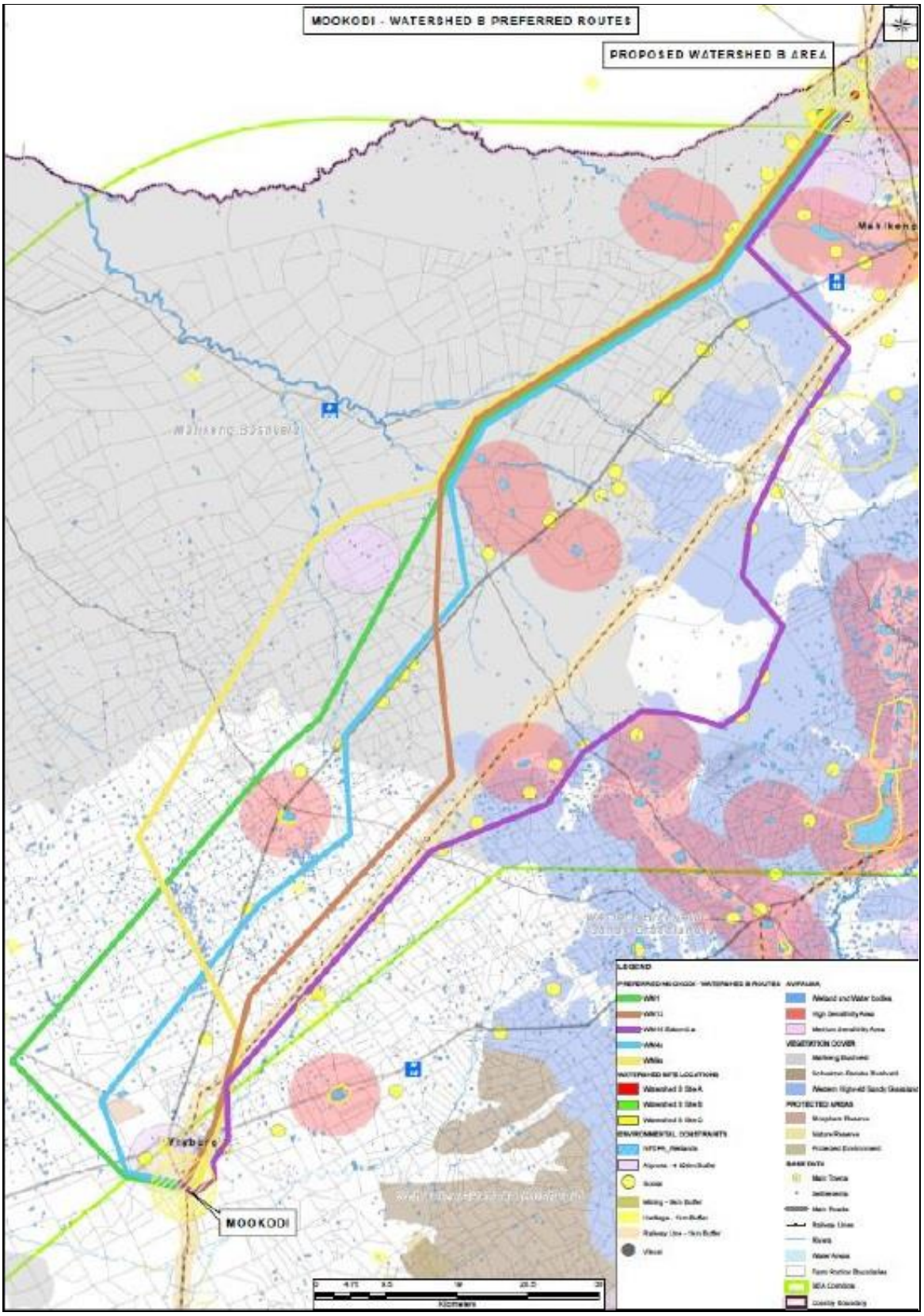


Figure 17: Preferred route options between Mookodi and Watershed B substation for MCDM process (Transmission Line Corridor Route Selection Process Report, 2017)

6.1.3 Multi-criteria Decision-Making Model Process

The MCDM process is a discipline aimed at supporting decision makers who are faced with making numerous and conflicting evaluations. It highlights conflicts and derives a way to reach a compromise in a transparent process. The process of MCDM prioritises options against a set of criteria, specifically for technical, financial, strategic, environmental and social constraints to inform decision making at the earliest possible stages of the proposed project. This enhances the sustainability of the proposed project for its lifecycle and assists in ensuring a smoother transition through the project phases by identifying constraints early and planning for these in the design phase.

6.1.3.1 Criteria Considered in MCDM Process

The potential routes were assessed by Aurecon South Africa (Pty) Ltd against the criteria identified below. Specialist input was obtained to draw up the criteria, which are deemed to have most relevance to the selection of route alignments. While there are a number of criteria that need to be considered in the EIA phase when assessing the significance of impacts related to the proposed developments, the only criteria that are considered in route selection are those criteria that differentiate one route against another.

1. Technical category: This relates to the impact of a specific route alignment with regards to achieving the technical goals of the project while reducing cost and increasing ease of both construction and maintenance activities. Criteria include slope (avoid steep slopes more than 1:10), access (constructability and maintainability in terms of construction and access to site), length (line length and associated cost) and corridor width (allows for more than one landowner to facilitate landowner negotiations).
2. Environmental category: This component refers to the need to select a route that minimises the risk to ecosystem functioning and environmental integrity. Therefore, the environmental criterion prioritises the anticipated impacts on the both terrestrial and aquatic fauna (especially avifauna who are negatively impacted by high voltage transmission lines) and flora. Criteria include biodiversity (aquatic and terrestrial ecology and ecological services) and avifauna (flight paths, nesting areas, and focal points).
3. Social category: This aspect considers the impact of route alignment on people. Specifically avoiding residential areas, areas where assets and livelihoods may be affected (e.g. the loss of agricultural land for tower structures, the impact on tourism activities in game farm areas) and the need for compensation. Visual impacts and the impacts on heritage resources is also an important consideration in routing power lines.
    - Heritage: Archaeological and cultural heritage resources;
    - Compensation: Homes or other assets that will require resettlement or other compensation;
    - Communities: Proximity to existing large villages or towns that will remain, distance to communities, agricultural resources; and
    - Visual: Visibility on ridges, potential tourism;
4. Strategic category: This aspect relates to proximity to growth areas.

The criteria were weighted to ensure that criteria more important in terms of site selection were given more significance in the site selection process. The weighting is detailed as follows: 1) Technical 25%; 2) Environmental 35%; 3) Social 35%; and 4) Strategic 5%.

6.1.3.2 Results of MCDM Process

The results of the MCDM for the alignments between Mahikeng and Mookodi substation are discussed below.

Technical:

- Technical criteria consider the cost and ease of both construction and operation, as well as other aspects such as landowner negotiations related to the physical properties of the line, which may increase costs and length of the process involved;
- All routes scored equally for slope, indicating that there was no preference based on this criteria. No visible slope issues on any of the possible line routes. They all cross agricultural land which would pose no major issues to construction;
- Most routes has access via farm roads. Preference was given to route WM4a due to its proximity to major roads. WM16a (197 km). is the longest route and least preferred on this criterion, while WM13 (175 km) is weakly preferred over WM1 (185 km), WM4a (186 km) and WM9a (184 km) and there is a strong preference over WM16a. Routes WM1, 4a, 9a and 13 all scored equally in first place for the criterion of width, allowing for more landowners to be accommodated within the corridor, weakly preferred over WM16a. All routes show no issues with servitude widths and potential to shift line routes during design. Route 16a however comes within close proximity to several settlements which might restrict the corridor width; and
- Overall, Route M4a was considered the best route for the Watershed B-Mookodi corridor from an overall technical perspective, followed extremely closely by WM13. Technical considerations ensure the most cost-effective solution for the lifecycle of the project for the planning stages, through construction and operation to decommissioning;

Environmental:

- Consideration of this aspect early on in the project planning ensures that constraints related to the biophysical environment are incorporated into the project at the earliest possible stage, contributing to environmentally responsible development and preventing project delays at a later stage in the project;
- Ecology
    - Potential impacts on the biophysical environment include loss and alteration of terrestrial and aquatic habitat, loss of protected species and introduction of alien invasive plant species. The significance of the impact of a proposed transmission line is influenced by current level of disturbance along the route and the degree to which the proposed line will increase the levels of disturbance, as well as the uniqueness of the environmental resources that will be affected. Due to the nature of transmission lines, the construction phase is the most environmentally

disruptive and many ecological systems can continue to function under the lines once operational. Limited area is lost through the construction of the towers and access roads. Animals will return to the site following construction. Environments with trees are most compromised by overhead lines as a corridor will need to be cleared and maintained as such to ensure sufficient clearance between the lines and trees. Most wetland areas within 2 km corridors can be avoided in the detailed design;

- WM1 and WM4a both traverse similarly degraded areas of threatened ecosystem habitats wetland clusters, but WM4a avoids an additional future and a current protected area, which WM1 affects. WM9 is similar to WM1 but does not avoid a large wetland (pan) cluster. WM4a, when compared to WM9a, avoids a larger wetland cluster when compared to the wetland cluster it traverses and both traverse similarly degraded areas of threatened ecosystem habitats. WM16a as this avoids all wetland clusters and an additional proposed protected area, while traversing smaller and degraded portions of the Threatened Ecosystem habitats. However, there is a strong preference for WM13 as this avoids all wetland clusters, while traversing degraded portions of the Threatened Ecosystem habitats;

- <u>Avifauna</u>
  - One of the main considerations for high voltage lines is possible bird collisions with the conductors. The collision potential is influenced by the flight behaviour of sensitive species and visibility of the conductors. Breeding areas, roosting and feeding areas and migration routes all influence where there will be high avifaunal activity and which areas will be most sensitive in terms of avifauna. The following aspects were considered when ranking the routes in order of preference:
  - Proximity to vulture breeding areas
  - Proximity to Important Bird Areas (IBA)
  - Proximity to dams (avifaunal focal points)
  - Proximity to vulture restaurants (avifaunal focal points)
  - Proximity to protected areas
  - WM4a is preferred as it traverses degraded areas. WM13 is preferred next as it also passes over degraded habitats and avoids wetlands. All other routes are strongly preferred over WM16a due to bird sensitive areas;
  - The preference from both an ecological and an avifaunal impact perspective was for Route WM13. Environmental considerations ensure a more environmentally sustainable solution for the lifecycle of the project for the planning stages, through construction and operation to decommissioning;

<u>Social:</u>

- Consideration of this aspect early on in the project planning ensures that constraints related to the social environment incorporated into the project at the earliest possible stage, contributing to socially responsible development and preventing project delays at a later stage in the project;
- <u>Heritage</u>

- The rating of the alignments was focussed mainly on the occurrence of possible heritage sites. Due to the homogeneous natural and geographic landscape, it is difficult to attribute a geographic suitability factor to the environment that would dictate settlement patterns. The concentration of social nodes was also taken into consideration due to the possible occurrence of grave and burial sites associated with these communities which are considered heritage sites in themselves. The possible occurrence of Stone Age sites around the natural pans in the area was also considered during the evaluation phase, WM13 is the preferred route, followed by WM1 and then WS19a, while WS16a is the least preferred route;

- Compensation and Communities
  - Both these criteria are influenced by the numbers and density of settlements and dwellings along the route, which must be avoided, as should places of interest along route. Resettlement is considered the most severe of social impacts and is to be avoided wherever possible and it is advisable to avoid physically dividing properties. The shorter the route the better; and
  - Routes WM4a, 9a and 13 were considered to have the same preference and these were all weakly preferred over WM1 and absolutely preferred over WM116a, based on the number of towns, settlements and farm houses and placed of interest along the route, as well as cadastral boundaries, indicating density of settlement;
- Visual
  - Transmission lines can affect the aesthetic quality of a landscape from a visual perspective. The visual impacts are influenced by the length of corridor, the topography (more visual on higher lying areas versus lower lying areas), as well as the proximity to national roads and tourism attractions. From a visual perspective, WM9a is weakly preferred over three of the routes and strongly preferred over WM9a, which is the least preferred route from a visual perspective;
  - The social considerations included the potential impacts on heritage resources, the landscape and community-related aspects. All these aspects combined to show Route WM13 as the most preferred route for the Watershed B-Mookodi corridor. Social considerations ensure a more socially sustainable solution for the lifecycle of the project from the planning stages, through construction and operation to decommissioning;

Strategic:

- All line routes are equivalent as there is no major infrastructure to consider within the proximity of the lines; and
- This criterion considered the proximity of the line to potential growth areas in the future that would allow for potential to tap into the line in the future. All routes scored the same on this criterion and this was therefore not a differentiating factor in the route selection process.

All criteria were integrated to show the best routes overall. The integrated results of the MCDM process are shown below (**Figure 18**) based on the criteria used to assess the route alignment, showing how each alignment scored. The summary result finds an overall preference for Route WM13 for the Watershed-Mookodi linkage, with WM16a least preferred. The same order of route alignment preference was achieved with all criteria having the same weighting, although the degree of preference was minimally altered.

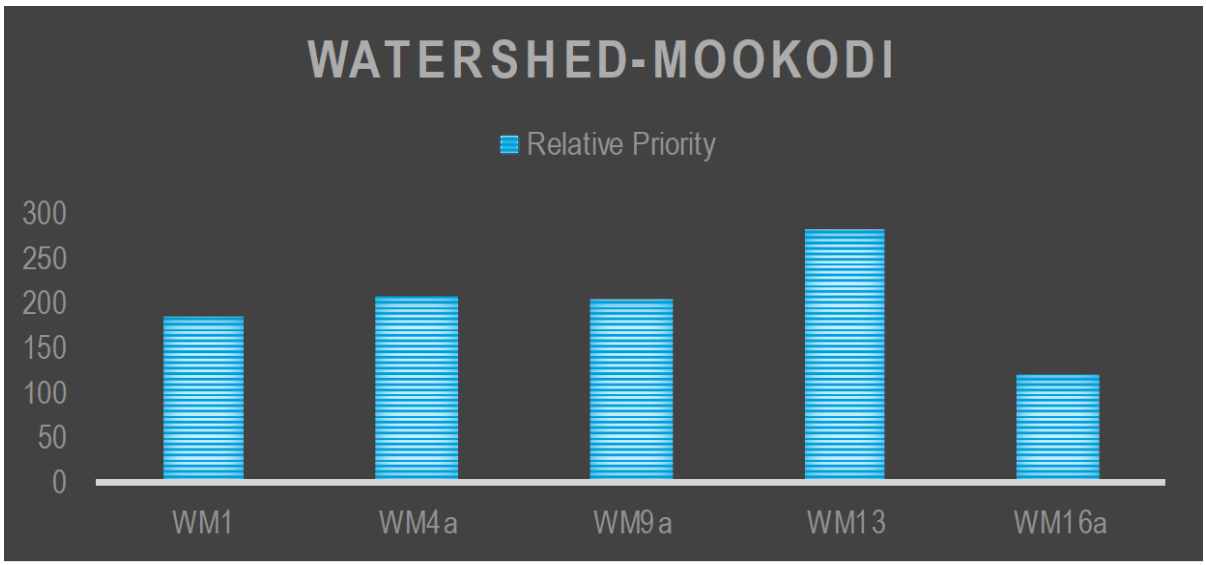


Figure 18: Watershed-Mookodi corridor overall preference

Based on the screening exercise above, Nemai Consulting further eliminated Option WM16a (the least preferred option) as a result of the route falling within the Western Highveld Sandy Grassland which is Critically Endangered.

Nemai Consulting will thus consider the following four alternative routes as feasible alternatives as part of the Scoping and EIA Process:

1. Option 1 (WM1);
2. Option 2 (WM13);
3. Option 3 (WM4a); and
4. Option 4 (WM9a).

Even though the summary result found an overall preference for Route WM13 for the Watershed-Mookodi linkage, all route alternatives will be assessed equally during the Scoping and EIA Process.

6.2 Feasible Route Alternatives

6.2.1 Option 1 (WM1)

Route Alternative Option 1 (WM1) is approximately 186km in length, and travels in a northwest direction from the starting point at Mookodi substation in Vryburg, where it then travels in a northeast direction passing on the western side of Stella, and runs parallel to the western side of the N18. This route involves major road crossings of the N14, R378 (also known as Molopo

Street), R377, R376 and R375. All route alternatives then join and overlap the same footprint between the R376 and R375 road crossing where they run in a northeast direction to end in Mahikeng, at the proposed future substation site. Refer to **Figure 19**.

6.2.2 Option 2 (WM13)

Route Alternative Option 2 (WM13) is approximately 176km in length, and travels in a northeast direction from the starting point at Mookodi substation in Vryburg, passing on the eastern side of Stella. This route runs on the eastern side of the N18 where it then crosses the N18 about half way of the route and then runs on the western side of the N18. This route involves major road crossings of the N18, R34, N14, R377, R376 and R375. All route alternatives join and overlap the same footprint between the R376 and R375 road crossing where they run in a northeast direction to end in Mahikeng at the future substation site. Refer to **Figure 20**.

6.2.3 Option 3 (WM4a)

Route Alternative Option 3 (WM4a) is approximately 187km in length, and travels in a northwest direction from the starting point at Mookodi substation in Vryburg, where it then heads in a northeast direction passing on the eastern side of Stella. This route runs parallel for a small section to the western side of the N18, where it then crosses the N18 and runs on the eastern side of the N18, where it then crosses the N18 again to run back on the western side of the N18. This route involves major road crossings of the N14, R378, N18, R377, R376 and R375. All route alternatives join and overlap the same footprint between the R376 and R375 road crossing where they run in a northeast direction to end in Mahikeng at the future substation site. Refer to **Figure 21**.

6.2.4 Option 4 (WM9a)

Route Alternative Option 4 (WM9a) is approximately 185km in length, and travels in a northeast direction from the starting point at Mookodi substation in Vryburg. This route then travels in a northwest direction where it crosses the N18. This route then runs parallel to the N18 passing on the western side of Stella. This route involves major road crossings of the N18, R34, N14, R377, R376 and R375. All route alternatives join and overlap the same footprint between the R376 and R375 road crossing where they run in a northeast direction to end in Mahikeng at the future substation site. Refer to **Figure 22**.

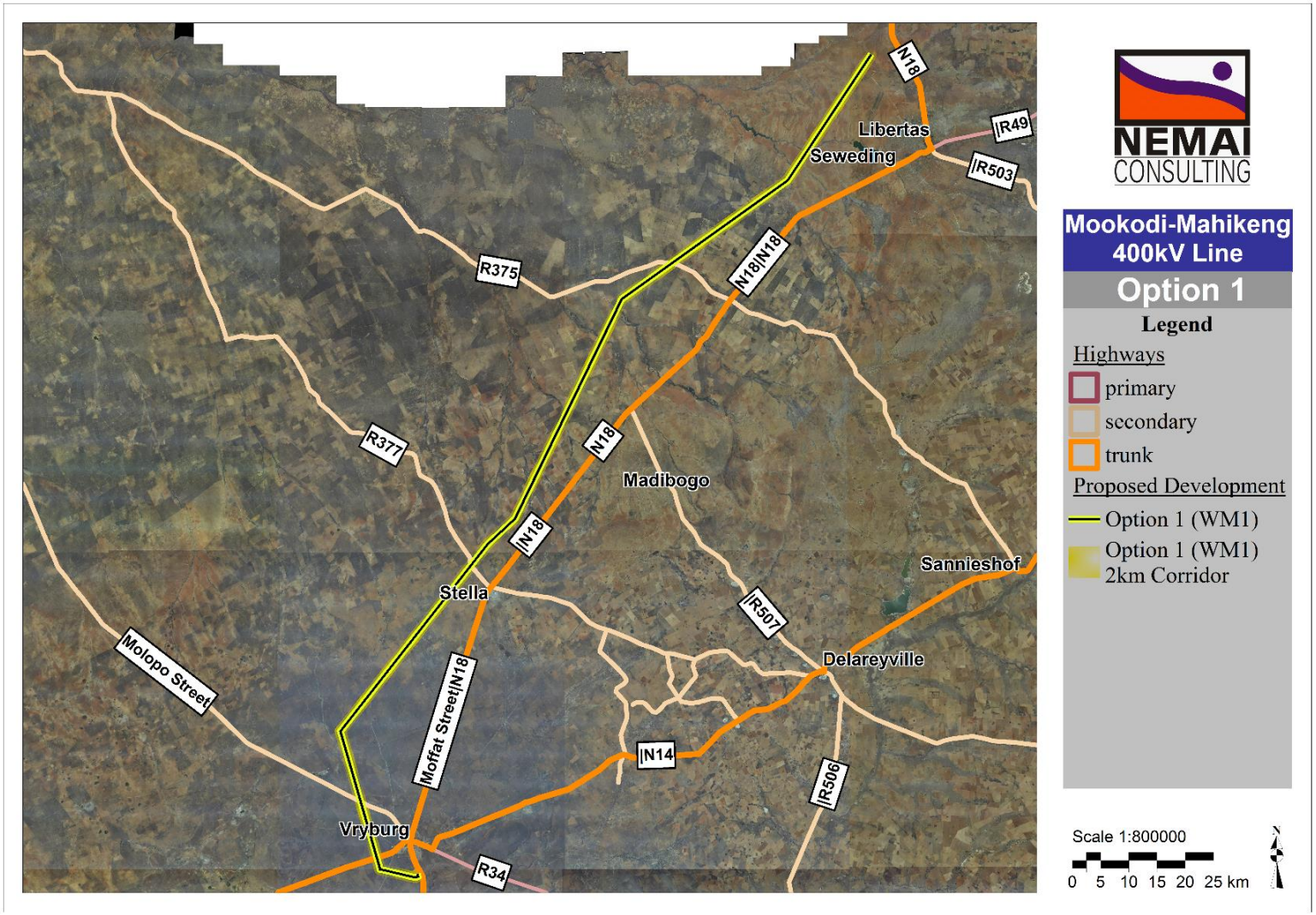


Figure 19: Route Alternative Option 1 (WM1)

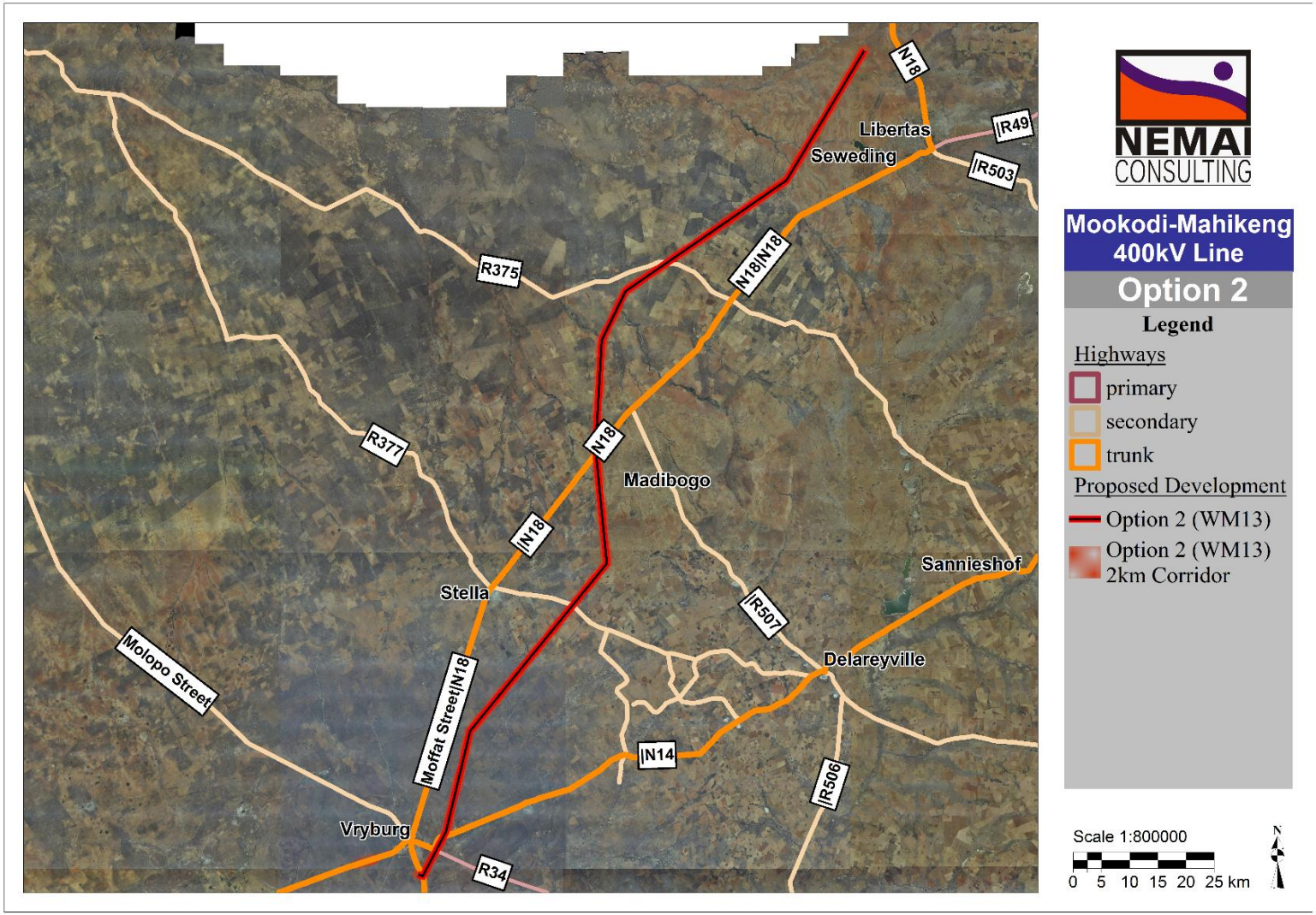


Figure 20: Route Alternative Option 2 (WM13)

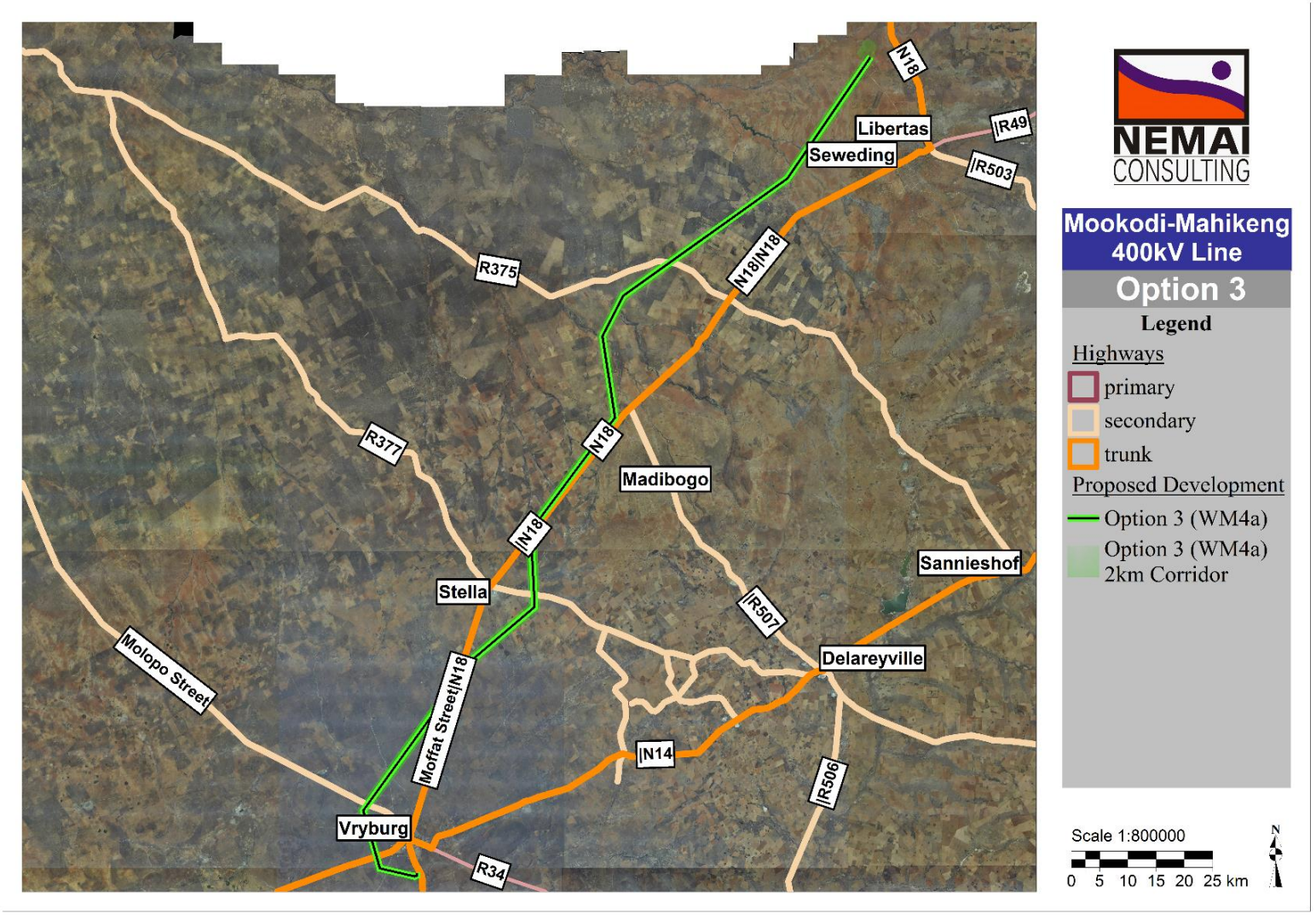


Figure 21: Route Alternative Option 3 (WM4a)

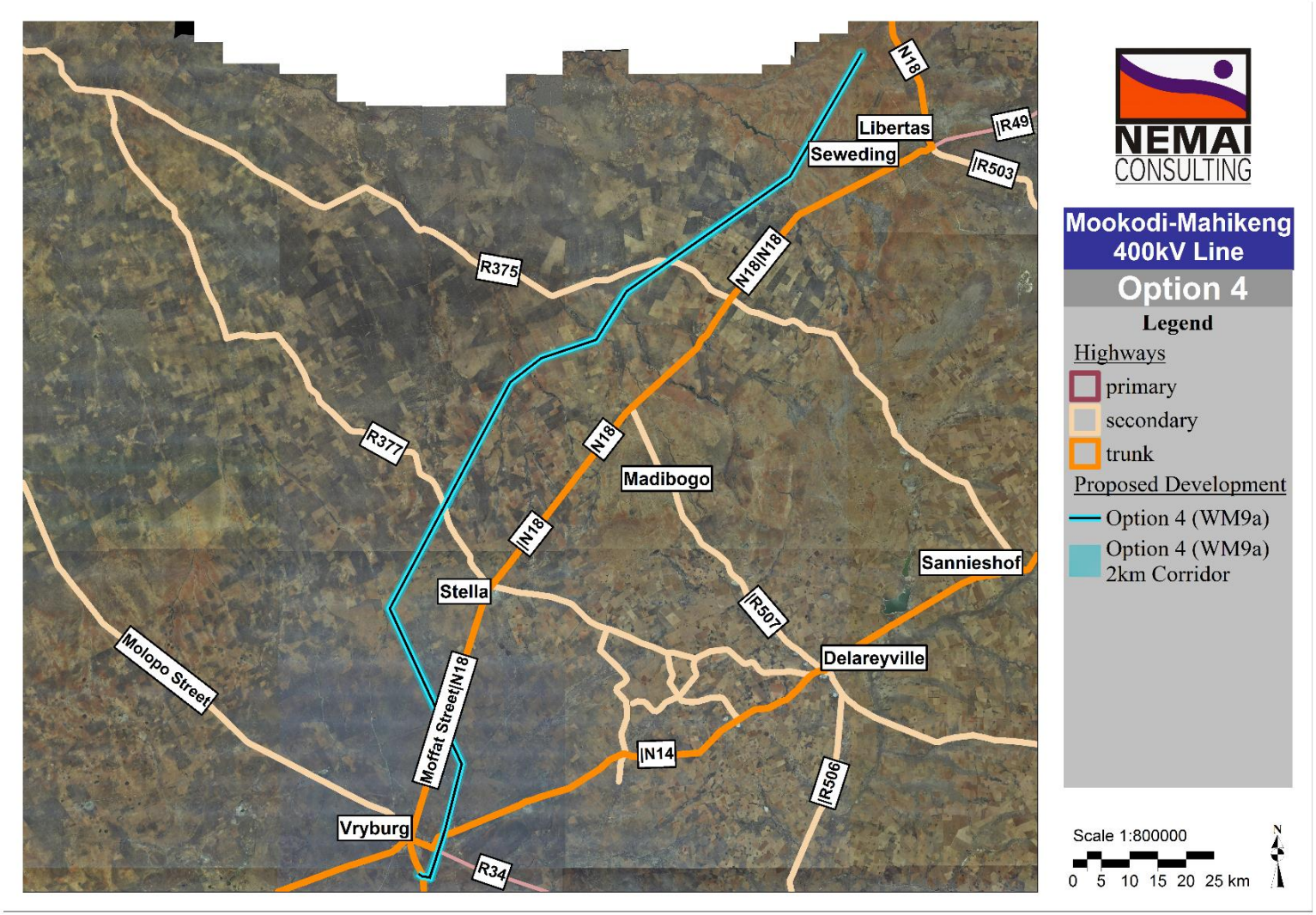


Figure 22: Route Alternative Option 4 (WM9a)

6.3 No-go alternative

The 'no-go' alternative refers to a situation where the proposed Mookodi-Mahikeng 400kV Powerline is not built. This would mean that the area where the proposed powerline is to be located would not change in any way and the environmental conditions within the site would stay the same.

This would also mean that the anticipated load growth in the Mahikeng area and the resulting need for further enhancement of capacity in the area would not be met. There would be no further network expansion if the powerline and other related projects are not built. Therefore the Watershed substation would continue to struggle with constraint problems causing current areas of supply to be affected and restricting future growth in these areas.

7 PROJECT DESCRIPTION

7.1 Scope of Work

To adequately consider the impacts associated with the proposed Mookodi-Mahikeng 400kV Powerline, the major activities during each phase of the project life-cycle are discussed below.

7.1.1 Transmission Line

The scope of the project includes a transmission line, approximately 180km in length, from the existing Mookodi Substation in Vryburg and travels in a northeast direction ending near Mahikeng at the proposed Mahikeng substation site. The coordinates of the bend points for the four alternative routes are listed in **Tables 3** to **6**.

Table 3: Coordinates of bend points - route alternative option 1 (WM1)

No.	Latitude	Longitude
1	27° 0'37.52"S	24°44'38.83"E
2	27° 0'50.04"S	24°44'40.46"E
3	27° 0'55.99"S	24°44'23.54"E
4	27° 0'9.18"S	24°40'40.99"E
5	26°47'4.23"S	24°36'30.91"E
6	26°29'19.49"S	24°52'1.21"E
7	26°26'56.48"S	24°54'52.13"E
8	26° 6'6.35"S	25° 6'9.53"E
9	25°54'50.72"S	25°23'37.22"E
10	25°42'57.59"S	25°32'23.02"E

Table 4: Coordinates of bend points - route alternative option 2 (WM13)

No.	Latitude	Longitude
1	27° 0'39.29"S	24°44'38.89"E
2	27° 0'49.79"S	24°44'54.21"E
3	27° 0'47.56"S	24°45'6.79"E
4	26°56'36.39"S	24°47'31.79"E
5	26°47'4.21"S	24°50'4.09"E
6	26°31'10.44"S	25° 4'27.91"E
7	26°20'16.17"S	25° 3'17.14"E
8	26°10'0.19"S	25° 3'56.86"E
9	26° 5'22.61"S	25° 6'27.57"E
10	25°54'51.20"S	25°23'24.61"E
11	25°42'33.99"S	25°31'35.65"E

Table 5: Coordinates of bend points - route alternative option 3 (WM4a)

No.	Latitude	Longitude
1	27° 0'36.95"S	24°44'38.78"E
2	27° 0'50.04"S	24°44'39.95"E
3	27° 0'55.56"S	24°44'24.04"E
4	27° 0'9.67"S	24°40'44.53"E
5	26°54'40.64"S	24°39'0.02"E
6	26°40'21.56"S	24°50'30.06"E
7	26°35'21.56"S	24°57'3.08"E
8	26°28'7.92"S	24°56'39.18"E
9	26°17'25.96"S	25° 5'31.21"E
10	26° 9'41.65"S	25° 4'11.89"E
11	26° 5'53.62"S	25° 6'23.29"E
12	25°54'46.68"S	25°23'39.30"E
13	25°43'16.96"S	25°32'24.00"E

Table 6: Coordinates of bend points - route alternative option 4 (WM9a)

No.	Latitude	Longitude
1	27° 0'40.03"S	24°44'43.35"E
2	27° 0'53.28"S	24°45'2.88"E
3	27° 1'1.40"S	24°45'53.77"E
4	26°50'16.49"S	24°49'15.82"E
5	26°35'33.74"S	24°41'41.45"E

No.	Latitude	Longitude
6	26°14'6.53"S	24°54'22.48"E
7	26°11'50.71"S	24°57'37.83"E
8	26°10'6.45"S	25° 3'25.13"E
9	26° 5'32.02"S	25° 6'35.15"E
10	25°54'38.24"S	25°23'48.56"E
11	25°42'59.94"S	25°31'19.98"E

7.1.2 Powerline Corridor

A 2km corridor has been applied for all four route alternatives. The 2km corridor consist of 1km on each side of the centreline. This extended study area allows for any possible deviations from the current proposed alignment of the power lines within this corridor, which may be necessary due to findings of the Specialist Studies, concerns raised during the Scoping and EIA Process, technical requirements and the outcome of Eskom negotiations with landowners.

7.1.3 Powerline Servitude

Following a contractual agreement with a landowner, an application for registration of the 55m servitude is lodged with the Provincial Deeds Office against the property deed. A registered servitude grants Eskom certain defined rights for the use of the specific area of land, which include:

- Access to erect a transmission line along a specific agreed route;
- Reasonable access to operate and maintain the line inside the servitude area; and
- The removal of trees and vegetation that will interfere with the operation of the line.

The landowner is prevented from erecting any structures or carrying out activities under the line that would interfere with the safe operation of the line. However, certain standard farming practices such as some crop cultivation, grazing and the use of farm roads may continue as normal.

7.1.4 Tower Structures

The selection of a tower types depends on several factors, including terrain, costs and recommendations from specialists (where relevant). The tower types have not been finalised as yet, as the type of structure is dependent on the aforementioned factors as well as the final route of the power line. Three main tower types that are normally used for 400kV lines: Guyed-v (**Figure 23**), Cross- rope (**Figure 24**) and Bend/Strain (**Figure 25**).

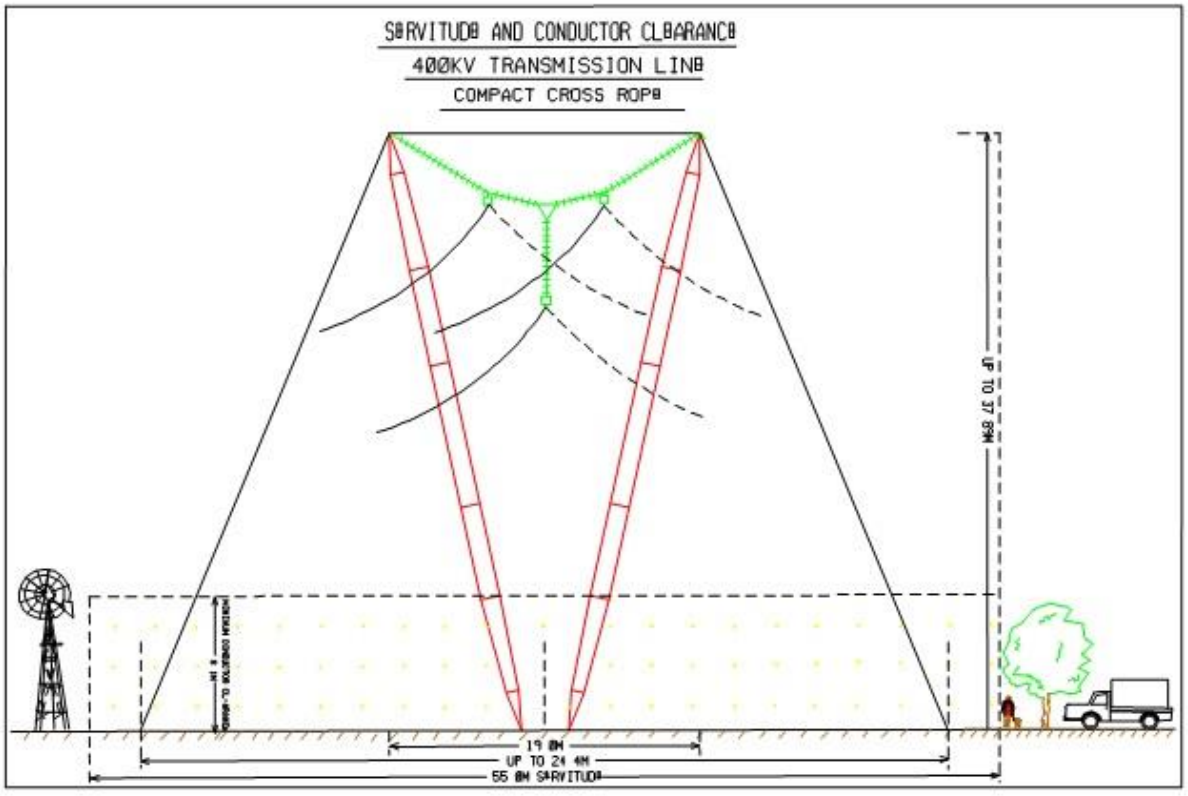


Figure 23: Guyed-Vee suspension tower type

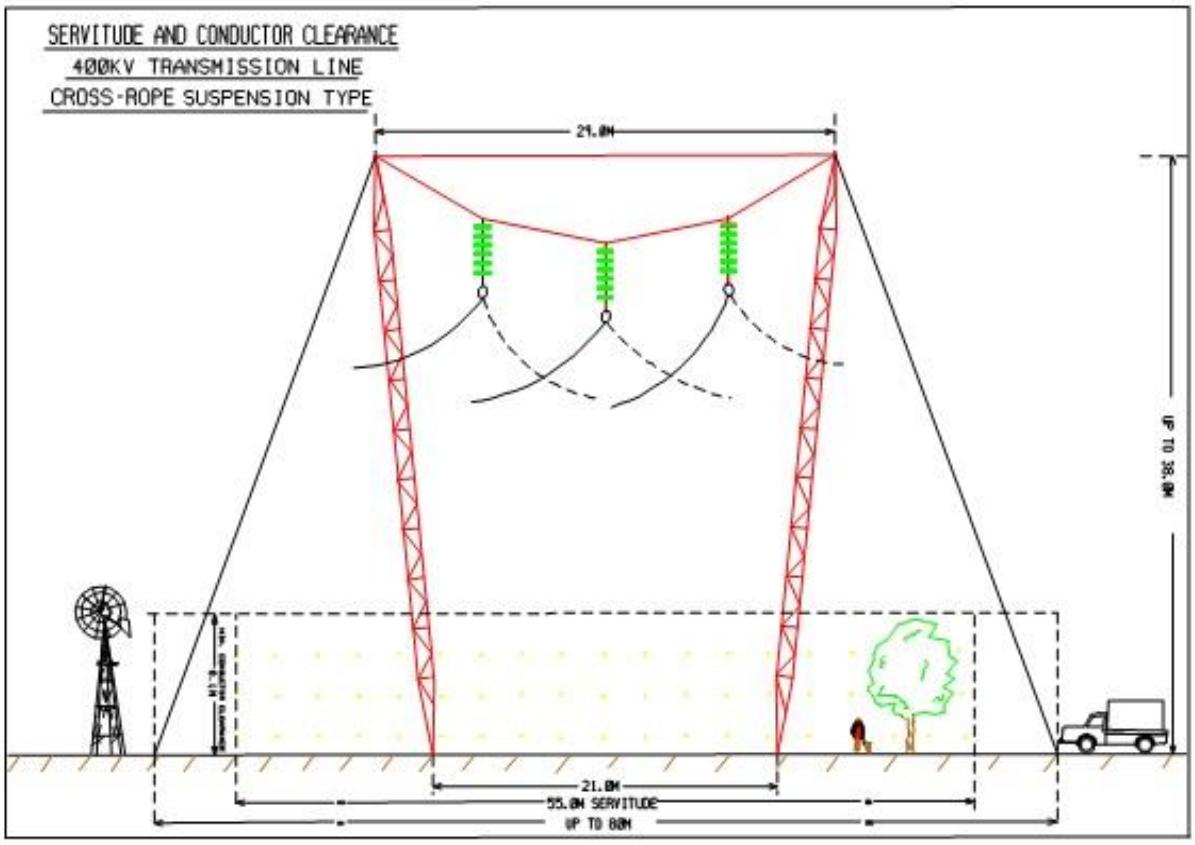


Figure 24: Cross-rope suspension tower type

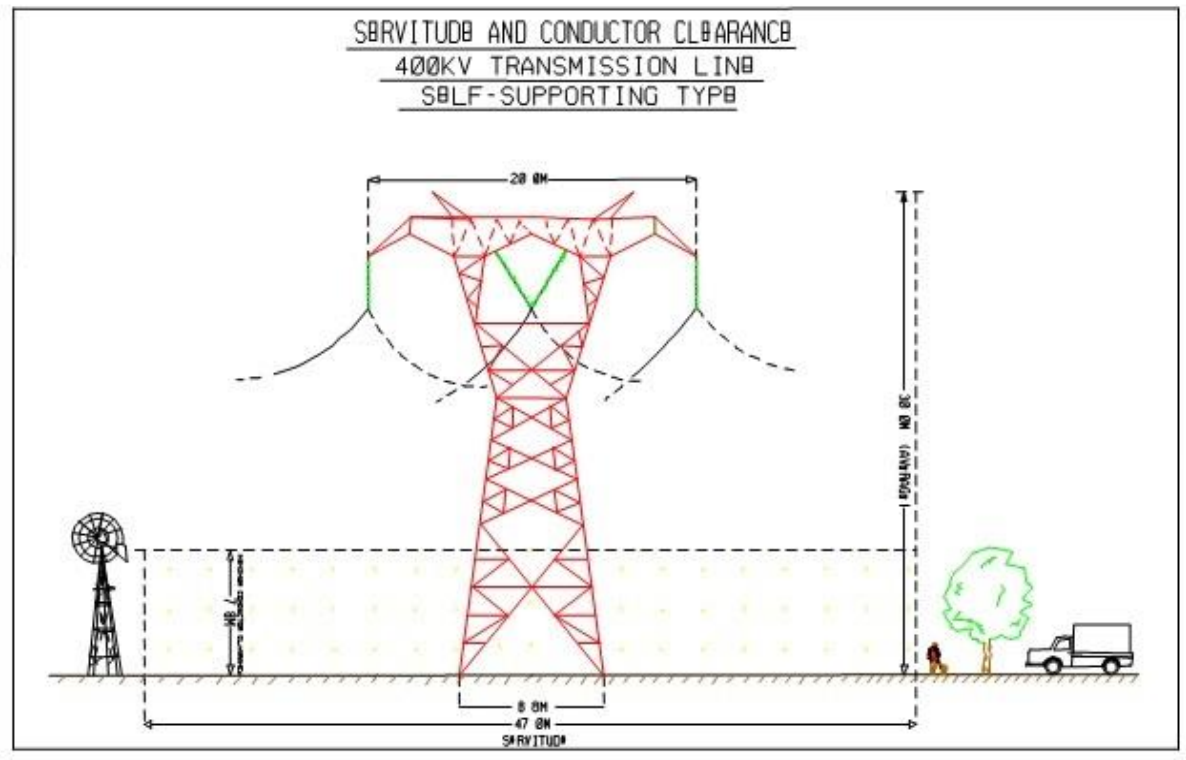
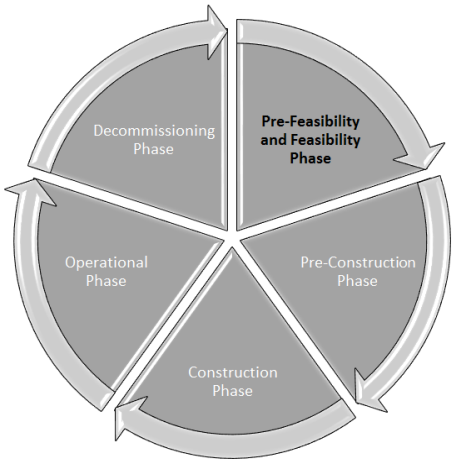


Figure 25: Self-supporting suspension tower type

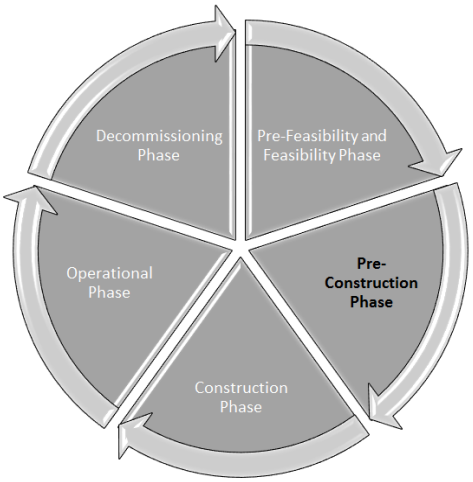
7.2 Project Life-Cycle

The project life-cycle for the proposed Mookodi-Mahikeng 400kV Powerline includes the following primary activities:



Feasibility Studies

This includes selecting a suitable location for the substation and buffer as well as a corridor for the line route, which is assessed as part of the EIA. Servitude negotiations are also initiated during this phase.



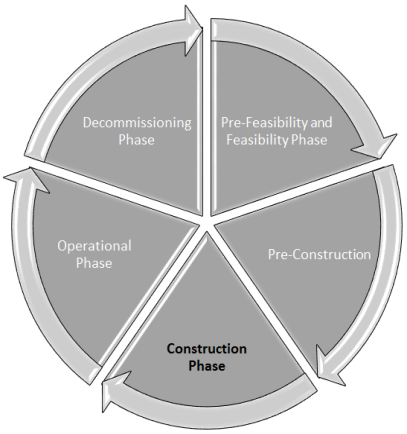
Pre-Construction

This phase, which is only undertaken should environmental authorisation be obtained, includes the following –

- Aerial survey of the route;
- Selection of the most appropriate structures;
- Eskom and environmental specialists (e.g. ecologist, heritage) conduct a walk-down survey to determine the exact locations of the towers, based on sensitive environmental features and technical criteria; and
- Preparation of relevant planning documentation, including technical and design documentation.

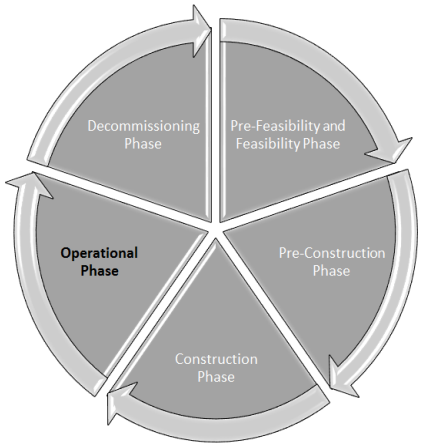
Construction

During the implementation of the project, the construction activities related to the installation of the necessary transmission line infrastructure and equipment is undertaken.



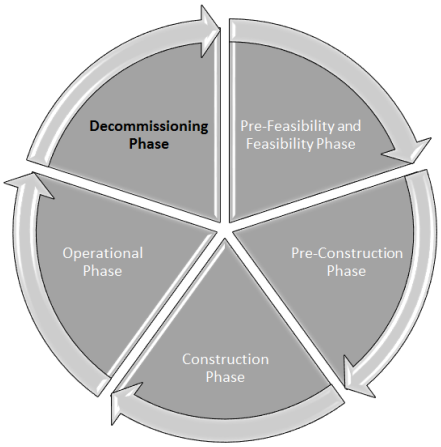
Operation

This includes operational activities associated with the maintenance and control of the transmission line.



Decommissioning

This includes operational activities associated with the maintenance and control of the transmission line.



The sub-sections to follow provide an overview of key activities during selected phases of the project life-cycle.

7.2.1 Construction

The construction period of the Mookodi-Mahikeng 400kv Powerline will take approximately 24 months. It involves the following activities, which are most often undertaken sequentially and by different crews.

7.2.1.1 Vegetation Clearance

The following shall be used as a standard for vegetation clearance for new powerlines with a nominal voltage of 220 to 765 kV for access purposes (inspection, repair and maintenance), safety clearance, and prevention of fires in Servitudes and Wayleaves:

- Servitude building restriction widths (measured from the centre line of the power line) are 22 m to 40 m;
- Clear from the centre of the power line up to the outer conductor, plus an additional 10 meters on either side; and
- Grass and scrubs will be managed in accordance with The Eskom Contract Specification for Vegetation Management Services on Eskom Networks (240-52456757) which is biome and land use dependant.

The Eskom standard Vegetation Management and Maintenance within Eskom Land, Servitudes and Rights of Way (240-70172585) will apply. The following aspects will determine the minimum standards for vegetation clearing and maintenance:

- Where the vegetation poses a safety clearance risk –
  - Vegetation should be controlled where it intrudes on the minimum vegetation clearance distance or will intrude on this distance before the next scheduled clearance as per The Eskom Contract Specification for Vegetation Management Services on Eskom Networks (240-52456757); and
  - Trees and any other vegetation, that could, if they fall over or negatively impact the safe operation of the line or damage the infrastructure, must be identified and managed.
- When access to the Eskom land is hindered –
  - Vegetation should be cleared to allow vehicles access below power lines and related infrastructure as per The Eskom Contract Specification for Vegetation Management Services on Eskom Networks (240-52456757).
- When the vegetation poses a fire risk –
  - Where vegetation poses a potential fire risk to Eskom's infrastructure or to the operation of power lines, there must be a specific fire management programme to reduce this risk and vegetation must be controlled as per The Eskom Contract Specification for Vegetation Management Services on Eskom Networks (240-52456757).
- To comply with legal imperatives –
  - Eskom must clear vegetation if required by any national or provincial legislation as per The Eskom Contract Specification for Vegetation Management Services on Eskom Networks (240-52456757).

It is expected that vegetation clearance for the proposed Mookodi-Mahikeng 400kV Powerline will be minimal, as the natural vegetation is mostly disturbed by historical land use practices such as agriculture, as well as by the construction of existing infrastructure (including roads, fences and powerlines).

7.2.1.2 Tower pegging

Following the necessary access negotiations and arrangements with the affected landowners, a surveyor will peg the transmission central line and then set out the footprint of the development (i.e. transmission line and towers).

7.2.1.3 Construction camp establishment

Suitable site(s) for construction camp(s) still need to be selected. Contractors will negotiate the siting and erection of camps with landowners. These sites must strictly adhere to Eskom Transmission's Generic Environmental Management Plan – Line Construction as well as the mitigation measures contained in the Environmental Management Programme (EMPr) that will form part of the EIA Report.

7.2.1.4 Gate installation

After tower pegging, gates will be installed at the most appropriate locations to allow for future access to the servitude.

7.2.1.5 Access roads

Existing access roads will be utilised as far as possible. For the use of private roads, the requisite negotiations will be conducted with the affected landowners.

7.2.1.6 Excavation for foundations

Excavations will be made for the foundations and anchors of the towers by a team of 10 to 15 people with equipment (i.e. drilling rig, generator). Foundation sizes are dependent on inter alia the tower type and soil conditions. The foundations are ultimately filled with concrete. Contractors are required to safeguard excavations, which may include erecting a temporary wire fence around the excavations to protect the safety of people and animals.

7.2.1.7 Foundation of steelwork

Following the preparation of the excavations, a separate team will position the premade foundation structures into the holes. Thereafter these structures will be tied together for support (**Figure 26**).

Figure 26: Foundation work

7.2.1.8 Concrete works

A new team will then undertake the concrete filling of the foundation. Concrete is sourced via a 'Ready-mix' truck which accesses the site. If the access roads do not permit use by such a heavy vehicle, concrete will be mixed on site. Once the excavations have been filled, the concrete requires approximately 28 days for curing.

7.2.1.9 Erection of steel structures

Approximately 1 month after the foundation has been poured the steelwork is usually delivered to the site via trucks. The tower will then be assembled on site by a team of approximately 50 people. See examples of steel delivery and assembly shown in **Figure 27**.

A new team will then be responsible for the erection of the towers, with the use of a mobile 70-ton crane.

Figure 27: Delivery of steel (left) and assembly of tower (right)

7.2.1.10 Stringing of transmission cables

Cable drums, which carry approximately 2.5 km of cable, will then be delivered to the site. The conductors are made of aluminium with a steel core for strength. Power transfer is determined by the area of aluminium in the conductors. Conductors are used singularly, in pairs, or in bundles of three, four or six. The choice is determined by factors such as audible noise, corona, and electromagnetic field (EMF) mitigation. Many sizes of conductor are available, the choice being based on the initial and life-cycle costs of different combinations of size and bundles, as well as the required load to be transmitted.

Two cable drums, with a winch in the middle, are placed approximately 5 km apart along the route (depending on the overall length of the route). A pilot cable, which is laid with a pilot tractor that drives along the route, is pulled up on to the pylons with the use of pulleys (**Figure 28**). The line is generally strung in sections (from bend to bend). Once the tension has been exacted, the conductor cables are strung. Tension is created, the conductors clamped at the tower and the excess cable cut off.

Figure 28: Stringing with pilot tractor (left) and pulleys (right)

7.2.1.11 Rehabilitation

Site reinstatement and rehabilitation are undertaken for each component of the construction phase, which include the following activities (amongst others):

- Removal of excess building material, spoil material and waste;
- Repairing any damage caused as part of the construction activities;
- Rehabilitating the areas affected by temporary access roads;
- Reinstating existing access roads; and
- Replacing topsoil and planting indigenous grass (where necessary).

7.2.1.12 Inaccessible Sites or Sensitive Areas

For a site that cannot be accessed by vehicle (e.g. kloofs) or where environmental sensitive features are encountered, the following approach is followed:

- Excavations for foundations are done by hand;
- Foundation structures, concrete filling and steel towers (pre-fabricated) are transported and delivered by helicopter; and
- Stringing is performed by helicopter.

This abovementioned approach is an expensive operation and not the preferred method of construction.

7.2.2 Operation and Maintenance

During operations, Eskom needs to reach the servitude via access roads to perform maintenance of the Transmission line. Line inspections are undertaken on an average of 1 – 2 times per year, depending on the area. The servitude will need to be cleared occasionally to ensure that vegetation does not interfere with the operation of the line. This will be conducted in terms of Eskom's Transmission Vegetation Management Guideline, which will be included in the EMPr.

7.3 Resources Required for Construction and Operation

This section briefly outlines the resources that will be required to execute the project.

7.3.1 Water

During the construction stage, the Contractor(s) will require water for potable use by construction workers and water will also be used in the construction of the foundations for the substation and towers. The necessary negotiations will be undertaken with the landowners / local authorities to obtain water from approved sources.

7.3.2 Sanitation

Sanitation services will be required for construction workers in the form of chemical toilets, which will be serviced at regular intervals by the supplier.

7.3.3 Roads

No new access roads are anticipated.

7.3.4 Waste

Solid waste generated during the construction phase will be temporarily stored at suitable locations (e.g. at construction camps) and will be removed at regular intervals and disposed of at approved waste disposal sites. All the waste disposed of will be recorded.

Wastewater, which refers to any water adversely affected in quality through construction-related activities and human influence, will include the following:

- Sewage;
- Water used for washing purposes (e.g. equipment, staff); and
- Drainage over contaminated areas (e.g. cement batching / mixing areas, workshop, equipment storage areas).

Suitable measures will be implemented to manage all wastewater generated during the construction period.

7.3.5 Electricity

Electricity will be obtained from diesel generators or temporary electricity connections during the construction phase.

7.3.6 Construction Workers

The appointed Contractor will mostly make use of skilled labour for the construction of the substation and Transmission powerlines. In those instances where casual labour is required, Eskom will request that such persons are sourced from local communities as far as possible.

8 LEGISLATION AND GUIDELINES CONSIDERED

8.1 Overview of Legislation

Some of the pertinent environmental legislation that has bearing on the proposed development is captured in Table 7 below. More detailed information is provided in **Section 8.2** to **8.16**. This section aims to satisfy 2(1)(e) of Appendix 2 of GN No. R. 982: A description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment process.

Table 7: Environmental legislative framework

Legislation	Relevance
Constitution of the Republic of South Africa (Act No. 108 of 1996)	Chapter 2 – Bill of Rights. Section 24 – environmental rights.
National Environmental Management Act (Act No. 107 of 1998)	Section 24 – EA (control of activities which may have a detrimental effect on the environment). Section 28 – Duty of care and remediation of environmental damage. Environmental management principles. **Authority – DEA.**
GN No. R. 982 of 04 December 2014 EIA Regulations	Process for undertaking Basic Assessment / Scoping and EIA process.
GNs No. R. 983 and 984 of 04 December 2014 EIA Regulations	Activities that need to be assessed through a Basic Assessment process.
GN No. R. 985 of 04 December 2014 EIA Regulations	Activities that need to be assessed through a Scoping and EIA process.
National Water Act (Act No. 36 of 1998)	Chapter 3 – Protection of water resources. Section 19 – Prevention and remedying effects of pollution. Section 20 – Control of emergency incidents. Chapter 4 – Water use. **Authority – DWS.**
National Environmental Management: Protected Areas Act (Act No. 57 of 2003)	Protection and conservation of ecologically viable areas representative of South Africa's biological diversity and natural landscapes. **Authority – DEA.**
National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)	Management and conservation of the country's biodiversity. Protection of species and ecosystems. **Authority – DEA.**
National Environmental Management: Air Quality Act (Act No. 39 of 2004)	Air quality management. Section 29 – pollution prevention plans (Notice 172 of 2014: Greenhouse gases as priority air pollutants) Section 32 – dust control. Section 34 – noise control. Section 35 – control of offensive odours. **Authority – DEA.**

Legislation	Relevance
National Environmental Management: Waste Act (Act No. 59 of 2008)	Chapter 4 – Waste management measures Chapter 5 – licensing requirements for listed waste activities. **Authority – DEA.**
Hazardous Substances Act (Act No. 05 of 1973)	Provisions for the control of substances which may cause injury or ill-health to or death of human beings. **Authority – DEA.**
Occupational Health & Safety Act (Act No. 85 of 1993)	Provisions for Occupational Health & Safety. Major Hazardous Installation Regulations. **Authority – Department of Labour.**
National Heritage Resources Act (Act No. 25 of 1999)	Section 34 – protection of structure older than 60 years. Section 35 – protection of heritage resources. Section 36 – protection of graves and burial grounds. Section 38 – Heritage Impact Assessment for linear development exceeding 300m in length; development exceeding 5 000m2 in extent. **Authority – The North West Provincial Heritage Resources Authority (NWPHRA)**
Conservation of Agricultural Resources Act (Act No. 43 of 1983)	Control measures for erosion. Control measures for alien and invasive plant species. **Authority – Department of Agriculture, Forestry and Fisheries (DAFF).**
National Forestry Act (Act No. 84 of 1998)	Section 15 – authorisation required for impacts to protected trees. **Authority – DAFF.**
Minerals and Petroleum Resources Development Act (Act No. 28 of 2002)	Permit required for borrow pits. **Authority – Department of Mineral Resources (DMR).**

8.2 Constitution of the Republic of South Africa (Act No. 108 of 1996)

The Constitution of the Republic of South Africa (Act No. 108 of 1996) is the supreme law of the land and provides amongst others the legal framework for legislation regulating coastal management in general. It also emphasises the need for co-operative governance. In addition, the Environmental clause in Section 24 of the Constitution provides that:

"Everyone has the right –

to an environment which is not harmful to their health or wellbeing;

to have the environment protected for the benefit of present and future generations through reasonable legislation and other measures that:

Prevent pollution and ecological degradation;

Promotes conservation;

Secure ecologically sustainable development and the use of natural resources while promoting justifiable economic and social development"

The Constitution provides the overarching framework for sustainable development.

8.3 National Environmental Management Act (Act No. 107 of 1998)

The proposed Mookodi-Mahikeng 400kV Powerline requires authorisation in terms of NEMA, and the EIA will be undertaken in accordance with the 2014 EIA Regulations, as amended (07 April 2017).

Important aspects of NEMA are sustainability principles such as the “Polluter Pays” and the “Precautionary Principle” which will also be taken into account in the assessment of the impacts of the proposed development.

8.3.1 2014 EIA Regulations, as amended (07 April 2017)

The EIA Regulations consist of the following:

- EIA Procedures - GN No. R. 982;
- Listing Notice 1 - GN No. R. 983;
- Listing Notice 2 - GN No. R. 984; and
- Listing Notice 3 - GN No. R. 985.

The proposed Mookodi-Mahikeng 400kV Powerline triggered activities under Listing Notices 1, 2 and 3, and thus needs to be subjected to a Scoping and EIA Process. The Listed Activities are explained in the context of the project in **Table 8**.

Table 8: EIA Listed Activities triggered by the proposed Mookodi-Mahikeng 400kV Powerline

GN No. R.	Activity	Description as per GN	Applicability to the Project
GN R. 983 of 04 December 2014 (as amended)	12(ii)(a)	The development of— (ii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs— (a) within a watercourse. excluding— (aa) the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour; (bb) where such development activities are related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies; (cc) activities listed in activity 14 in Listing Notice 2 of 2014 or activity 14 in Listing Notice 3 of 2014, in which case that activity applies; (dd) where such development occurs within an urban area; (ee) where such development occurs within existing roads, road reserves or railway line reserves; or (ff) the development of temporary infrastructure or structures where such infrastructure or structures will be removed within 6 weeks of the commencement of development and where indigenous vegetation will not be cleared.	A few of the proposed tower structures may fall within watercourses. The type of towers to be used by Eskom are determined after the walk-down survey has been completed by the Specialists which is usually done only when a route is authorised by DEA so that the tower positions can be determined. However, the maximum footprint of the proposed towers can be provided at this stage, and this is based on if a cross-rope suspension tower type is used: ➢ **80m (anchor width) x 50m (tower length) = 4000 square metres for one tower.** ➢ Towers are spaced approximately 350m to 450m apart. Therefore for a 180km powerline, there would be approximately 515 to 400 towers. ➢ Thus the total project footprint for all towers would be between 1 600 000 to 2 060 000 square metres.
GN R. 983 of 04	19	The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil,	A few of the proposed tower structures may fall within watercourses and will involve the removal of soil within a watercourse of more than 10 cubic metres.

GN No. R.	Activity	Description as per GN	Applicability to the Project
December 2014 (as amended)		sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse. but excluding where such infilling, depositing, dredging, excavation, removal or moving— (a) will occur behind a development setback; (b) is for maintenance purposes undertaken in accordance with a maintenance management plan; (c) falls within the ambit of activity 21 in this Notice, in which case that activity applies; (d) occurs within existing ports or harbours that will not increase the development footprint of the port or harbour; or (e) where such development is related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies.	The type of towers to be used by Eskom are determined after the walk-down survey has been completed by the Specialists which is usually done only when a route is authorised by DEA so that the tower positions can be determined. However, the maximum footprint of the proposed towers can be provided at this stage, and this is based on if a cross-rope suspension tower type is used: ➢ **80m (anchor width) x 50m (tower length) = 4000 square metres for one tower.** ➢ Towers are spaced approximately 350m to 450m apart. Therefore for a 180km powerline, there would be approximately 515 to 400 towers. ➢ Thus the total project footprint for all towers would be between 1 600 000 to 2 060 000 square metres.
GN R. 983 of 04 December 2014 (as amended)	30	Any process or activity identified in terms of Section 53(1) of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004).	The Terrestrial Ecological Study confirmed that the powerline will traverse the Mafikeng Bushveld (Vulnerable), with a very small section of Alternative Route Option 2 (WM13) falling within the Western Highveld Sandy Grassland (Critically Endangered).
GN R. 984 of 04 December 2014 (as amended)	9	The development of facilities or infrastructure for the transmission and distribution of electricity with a capacity of 275 kilovolts or more, outside an urban area or industrial complex excluding the development of bypass infrastructure for the transmission and distribution of electricity where such bypass infrastructure is - (a) temporarily required to allow for maintenance of existing infrastructure; (b) 2 kilometres or shorter in length;	The project involves the proposed construction of a 400kV powerline (outside the urban edge), 180km in length.

GN No. R.	Activity	Description as per GN	Applicability to the Project
		(c) within an existing transmission line servitude; and (d) will be removed within 18 months of the commencement of development.	
GN R. 985 of 04 December 2014 (as amended)	12 (h) (iv, v and vi)	The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan. h. North West: iv. Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority; v. Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority; or vi. Areas within a watercourse or wetland, or within 100 metres from the edge of a watercourse or wetland.	The proposed development will require the clearance of more than 300 square metres within sensitive areas such as threatened ecosystems, watercourses, CBAs and ESAs. The following areas to be cleared for the proposed development include: <u>1) Tower Footprints:</u> The type of towers to be used by Eskom are determined after the walk-down survey has been completed by the Specialists which is usually done only when a route is authorised by DEA so that the tower positions can be determined. However, the maximum footprint of the proposed towers can be provided at this stage, and this is based on if a cross-rope suspension tower type is used: ➢ 80m (anchor width) x 50m (tower length) = 4000 square metres for one tower. ➢ Towers are spaced approximately 350m to 450m apart. Therefore for a 180km powerline, there would be approximately 515 to 400 towers. ➢ **Thus the total project footprint for all towers would be between 1 600 000 to 2 060 000 square metres**. <u>2) Powerline Footprint:</u> The Maximum Vegetation Clearance for 220 to 765kV (in this case 400kV) is between 22m to 40m (this includes clearance from the centre of the powerline up to the outer conductor, plus an additional 10m on either side). **Therefore a maximum of 40m x 180 000m = 7 200 000 square metres.**

GN No. R.	Activity	Description as per GN	Applicability to the Project
GN R. 985 of 04 December 2014 (as amended)	14 (ii)(a)(h)(iv, v and vi)	The development of— (ii) infrastructure or structures with a physical footprint of 10 square metres or more; where such development occurs— (a) within a watercourse h. North West iv. Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority; v. Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority; or vi. Areas within 5 kilometres from protected areas identified in terms of NEMPAA or from the core areas of a Biosphere reserve.	The proposed development may involve tower structures within watercourses which fall within or near sensitive areas such as threatened ecosystems, CBAs and ESAs. The type of towers to be used by Eskom are determined after the walk-down survey has been completed by the Specialists which is usually done only when a route is authorised by DEA so that the tower positions can be determined. However, the maximum footprint of the proposed towers can be provided at this stage, and this is based on if a cross-rope suspension tower type is used: ➢ **80m (anchor width) x 50m (tower length) = 4000 square metres for one tower.** ➢ Towers are spaced approximately 350m to 450m apart. Therefore for a 180km powerline, there would be approximately 515 to 400 towers. ➢ Thus the total project footprint for all towers would be between 1 600 000 to 2 060 000 square metres.

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

The National Water Act (Act No. 36 of 1998) (NWA) regulates water resources of South Africa. Water is considered a scarce commodity and should therefore be adequately protected. Amongst others, the act deals with the protection of water sources, water uses, water management strategies and catchment management, dam safety and general powers and functions. The purpose of the act is to ensure that South Africa's water resources are protected, used, developed, conserved, managed and controlled. The NWA includes the definition of a Water Resource.

The NWA definition for a Water Resource includes:

1. A Watercourse;
2. Surface Water;
3. An Estuary; and
4. An Aquifer.

The NWA defines a watercourse as follows:

- A river or spring;
- A natural channel in which water flows regularly or intermittently;
- A wetland, lake or dam into which, or from which, water flows; and
- Any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse, and a reference to a watercourse include, where relevant, its bed and banks.

The Act also specifies that a wetland is defined as land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil. Section 21 of the NWA provides information on what water uses require approval, i.e. a Water Use License (WUL). These include:

a) Taking water from a water resource;
b) Storing water;
c) Impeding or diverting the flow of water in a watercourse;
d) Engaging in a stream flow reduction activity;
e) Engaging in a controlled activity;
f) Discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea outfall or other conduit;
g) Disposing of waste in a manner which may detrimentally impact on a water resource;
h) Disposing in any manner of water which contains waste from, or which has been heated in, any industrial or power generation process;
i) Altering the bed, banks, course or characteristics of a watercourse;

j) Removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people; and
k) Using water for recreational purposes.

The abovementioned water uses that apply to the proposed Mookodi-Mahikeng 400kV Powerline include: 21 (c and i).

Any development within the riparian habitat or 1:100 year floodline (whichever is the greatest distance from the watercourse), will require an authorisation from the DWS. However, the only way to determine the riparian area is through a riparian habitat delineation.

A General Authorisation (GA) in terms of Section 39 of the NWA (GN No 40229 published in Government Gazette No. 509, dated 27 July 2016) states that a regulated area of a watercourse includes: "*A 500 m radius from the delineated boundary (extent) of any wetland or pan*". A GA can be applied if the use of water in terms of section 21(c) or (i) of NWA within the regulated area of a watercourse has a Risk Class that is Low, as determined by the Risk Matrix (Appendix A of the GA Regulations).

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

The aim of the National Environmental Management: Protected Areas Act (Act No. 57 of 2003) is to provide for the protection and conservation of ecologically viable areas representative of South Africa's biological diversity and natural seascapes. The purpose of a Protected Environment is amongst others to protect a specific ecosystem outside a special nature reserve world heritage site or nature reserve and also to ensure the use of the natural resources in the area is sustainable.

The proposed development does not occur near any formal Protected Areas according to the South African National Biodiversity Institute (SANBI). However, a Municipal Reserve, the Leon Taljaard Nature Reserve, is located close to the proposed route alternatives. This Reserve is discussed further in Section 12. This Act will be considered in the Terrestrial Ecological Assessment (**Appendix 6A**).

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

The National Environmental Management: Biodiversity Act (Act No. 10 of 2004) was promulgated for the management and conservation of South Africa's biodiversity through the protection of species and ecosystems and the sustainable use of indigenous biological resources.

The main implication of this Act is the protection of biodiversity. The potential flora and fauna as well as the terrestrial ecosystems will be discussed further in Section 12. This Act will be considered in the Terrestrial Ecological Assessment (**Appendix 6A**).

8.7 National Environmental Management: Air Quality Act (Act No. 39 of 2004)

The National Environmental Management: Air Quality Act (Act No. 39 of 2004) provides for the setting of national norms and standards for regulating air quality monitoring, management and control and describes specific air quality measures so as to protect the environment and human health or well-being by:

- Preventing pollution and ecological degradation; and
- Promoting sustainable development through reasonable resource use.

It also includes measures for the control of dust, noise and offensive odours that may be relevant to the construction. No Air Emissions License will be required for the proposed development; however, the potential impacts on air quality will be discussed in Section 12.

8.8 The National Environmental Management Waste Act (Act No. 59 of 2008)

The National Environmental Management Waste Act (Act No. 59 of 2008) (NEM:WA) regulates waste management in order to protect the health and environment of South African citizens. This is achieved through pollution prevention, institutional arrangements and planning matters, national norms and standards and the licensing and control of waste management activities.

The latest list of waste management activities that have or are likely to have a detrimental effect (GN No. 921 of 29 November 2013) contains activities listed in Categories A and B that would require licensing from the provincial or national authorities and activities contained in Category C which would require meeting the requirements of various Norms and Standards.

No authorisation will be required in terms of the NEM:WA, as the project will not include any of the listed waste management activities.

8.9 Hazardous Substances Act (Act No. 05 of 1973)

The Hazardous Substances Act (Act No. 05 of 1973) provides for the control of substances which may cause injury or ill-health to or death of human beings by reason of their toxic, corrosive, irritant, strongly sensitizing or flammable nature or the generation of pressure thereby in certain circumstances, and for the control of certain electronic products; to provide for the division of such substances or products into groups in relation to the degree of danger; to provide for the prohibition and control of the importation, manufacture, sale, use, operation, application, modification, disposal or dumping of such substances and products; and to provide for matters connected therewith.

8.10 Occupational Health & Safety Act (Act No. 85 of 1993)

The Occupational Health and Safety Act (Act No. 85 of 1993) provides for the health and safety of people at work as well as the health and safety of persons using plant and machinery.

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

The National Heritage Resources Act (Act No. 25 of 1999) was promulgated for the protection of National Heritage Resources and the empowerment of civil society to conserve their heritage resources.

The proposed construction of the Mookodi-Mahikeng 400kV Powerline will trigger certain categories as listed below that require a Heritage Impact Assessment in terms of Section 38 of the National Heritage Resources Act. These categories are:

(a) the construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length;

(b) the construction of a bridge or similar structure exceeding 50m in length;

(c) any development or other activity which will change the character of a site

(i) exceeding 5 000 m^2 in extent; or

(ii) involving three or more existing erven or subdivisions thereof; or

(iii) involving three or more erven or divisions thereof which have been consolidated within the past five years; or

(iv) the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority;

(d) the rezoning of a site exceeding 10 000 m^2 in extent; or

any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority, must at the very earliest stages of initiating such a development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development.

The Act also makes provision for General Protections, which apply automatically to certain categories of heritage resources such as archaeological and paleontological sites, cemeteries and graves, and structures older than 60 years.

Heritage resources in the study area will be discussed further in Section 12. This Act was considered in the Heritage Impact Assessment (**Appendix 6C**).

8.12 Conservation of Agricultural Resources Act (Act No. 43 of 1983)

The Conservation of Agricultural Resources Act (Act No. 43 of 1983) (CARA) requires the maintenance of riparian vegetation and provides a list of invasive alien vegetation that must be controlled or eradicated.

The proposed Mookodi-Mahikeng 400kV Powerline may traverse high agricultural potential land. The potential impacts of the proposed development will be assessed in the EIA phase as there will be a complete loss of agricultural land. Land Capability is discussed further in Section 12. This Act was considered in the Agricultural Impact Assessment (**Appendix 6E**).

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

In terms of the National Forests Act (Act No. 84 of 1998), trees in natural forests or protected tree species (as listed in Government Gazette Notice 1012 of 27 August 2004) may not be cut, disturbed, damaged, destroyed and their products may not be possessed, collected, removed, transported, exported, donated, purchased or sold - except under licence granted by the DAFF.

This Act was considered during the Terrestrial Ecological Assessment (**Appendix 6A**).

8.14 Minerals and Petroleum Resources Development Act (Act No. 28 of 2002)

The Mineral and Petroleum Resources Development Act (Act No. 28 of 2002) (MPRDA) sets out the requirements with which applicants for prospecting rights, mining rights and mining permits must comply in Sections 16, 22 and 27 of the MPRDA.

A Mining Permit will not be required as there will be no material required from newly opened borrow pits for the proposed Mookodi-Mahikeng 400kV Powerline.

8.15 Guidelines

- Integrated Environmental Management Information Series, in particular Series 2 – Scoping (DEAT, 2002);
- Guideline on Alternatives, EIA Guideline and Information Document Series (DEA&DP, 2010a);
- Guideline on Need and Desirability, EIA Guideline and Information Document Series (DEA&DP, 2010b);
- Integrated Environmental Management Guideline Series 5: Companion to the EIA Regulations 2010 (DEA, 2010a);
- Integrated Environmental Management Guideline Series 7: Public Participation in the EIA Process (DEA, 2010b);
- Guidelines for Involving Specialists in the EIA Processes Series (Brownlie, 2005);

8.16 Regional Plans

The following regional plans were considered during the execution of the EIA (amongst others):

- Municipal Spatial Development Frameworks (SDF) (where available);
- Municipal Integrated Development Plans (IDP);
- Relevant provincial, district and local policies, strategies, plans and programmes; and
- North West Biodiversity Sector Plan (2015).

9 SCOPING AND EIA PROCESS

9.1 2014 EIA Listed Activities (as amended)

The proposed Mookodi-Mahikeng 400kV Powerline entails certain activities that require authorisation in terms of NEMA. Refer to Section 8 for a further discussion on the legal framework.

The process for seeking authorisation is undertaken in accordance with the 2014 EIA Regulations, as amended (07 April 2017), promulgated in terms of Chapter 5 of NEMA.

Based on the types of activities involved, which include activities listed in GN No. R. 983, R. 984 and R. 985 (see **Table 8**), the requisite environmental assessment for the project is a Scoping and EIA Process.

9.2 Formal Process

The environmental assessment process is divided into two phases, namely: 1) Scoping; and 2) EIA. An outline of the Scoping and EIA Process for the proposed Mookodi-Mahikeng 400kV Powerline is provided in **Figure 29**.

9.3 Competent Authority

In terms of the Regulations, the lead decision-making authority for the Scoping and EIA is DEA, as the project proponent is Eskom Holdings (SOC) Ltd, which is a state-owned entity.

9.4 Application Form

The Application for EA for the proposed Mookodi-Mahikeng 400kV Powerline was submitted to DEA with the DSR on 08 February 2018. The Amended Application Form was submitted to DEA on 23 March 2018, refer to **Appendix 4** for a copy.

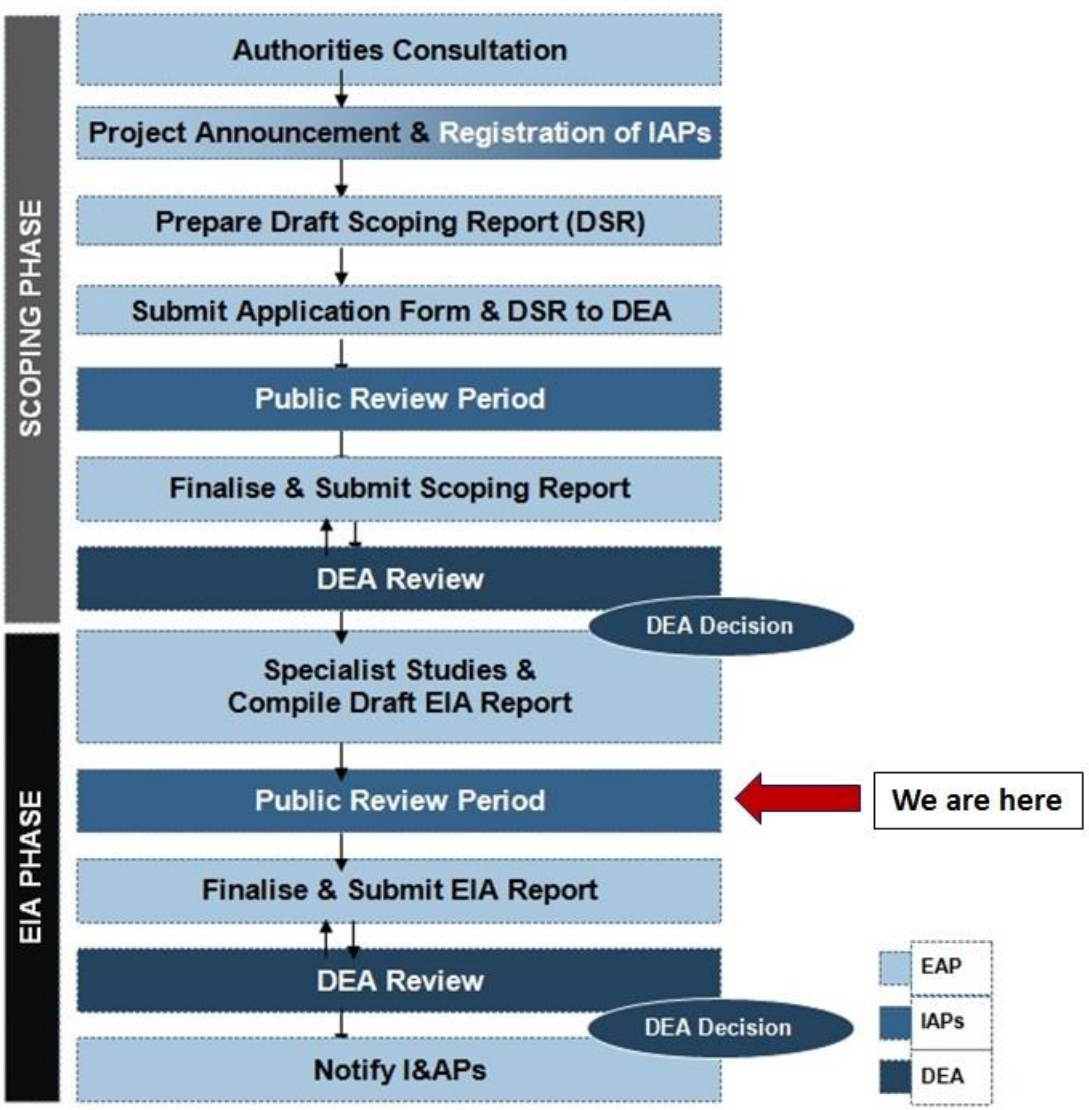


Figure 29: Scoping and EIA Process

The proposed timeframes for the remainder of the EIA Phase is provided below.

Scoping Phase	Proposed Timeframe
DEA Decision on Scoping Report	03 May 2018
Notify Registered IAPs of DEAs Decision and the Draft EIA Report Review Period	June 2018
Draft EIA Report Review Period	26 June 2018 – 25 July 2018
EIA Phase Public Meetings	TBC
Submit Final EIA Report to DEA	10 August 2018
DEA Decision on Authorisation	27 November 2018
Notify Registered IAPs of DEAs Decision	28 November 2018
Allow Appeal Period	29 November 2018 – 10 January 2019

9.5 Scoping Phase

The purpose of Scoping, which constitutes the first phase of the formal EIA Process, was as follows:

1. Introduce the proposed project to all IAPs;
2. Engage with IAPs to allow for participation in the process that is transparent, cooperative, informative and robust. Allow for informed decision-making with regard to the EIA process;
3. Identify the significant issues and impacts to be investigated further during the execution of the EIA phase;
4. Consider suitable and feasible alternatives for achieving the project's objectives; and
5. Determine the scope of the ensuing EIA phase in terms of specialist studies, public participation, assessment of impacts, and appraisal of alternatives.

In order to meet the above, the DSR provides the following information:

- Motivation on the Need and Desirability of the proposed development;
- Clarity on the roles and responsibilities of the various stakeholders in the project;
- Information on the Public Participation Process;
- Information on the Scoping and EIA processes;
- Description on how the proposed development will be undertaken (if approved);
- Information on the legislation that has been considered;
- Information on the Receiving Environment that could be affected by the proposed project;
- Information on Alternatives which are being considered;
- Proposed methodology of assessing the potential impacts during the EIA Phase;
- Findings on the type of Specialist Studies required in the pending EIA Phase; and
- Proposed Plan of Study for the pending EIA Phase of the project.

The following milestones have been reached for the Scoping Phase:

- Initial public notification took place in October 2017;
- Several Focus Group Meetings were held in November 2017;
- An Application Form for EA was submitted to DEA on 08 February 2018. Acknowledgement and Acceptance of the Application was received from DEA on 09 February 2018 with the following reference number allocated to the project: 14/12/16/3/3/2/1056;
- The Draft Scoping Report was placed for a 30-Day review period from 12 February 2018 to 13 March 2018;
- Public Meetings were held from 05 March 2018 to 07 March 2018 to present the Draft Scoping Report;

- A CRR was compiled (which was updated during the execution of the Scoping Process), which summarised the issues raised by IAPs and the project team's response to these matters;
- The Final Scoping Report was submitted to DEA on 23 March 2018; and
- DEA approved the Scoping Report on 03 May 2018 (**Appendix 5C**), which allowed the commencement of the EIA Phase.

9.6 EIA Phase

The EIA phase, which constitutes the second phase of the formal EIA Process, serves to follow from the Scoping phase and will provide the following:

- A detailed description of the proposed development and location;
- A description of the environment that may be affected by the activity and the manner in which physical, biological, social, economic and cultural aspects of the environment may be affected by the proposed development;
- The methodology of the stakeholder engagement process will be described;
- The CRR and Stakeholder Database will be provided as an appendix to the EIA Report;
- A description of the need and desirability of the proposed development and the identified potential alternatives to the proposed activity;
- A summary of the methodology used in determining the significance of potential impacts;
- A description and comparative assessment of the project alternatives;
- A summary of the findings of the specialist studies (Copies of all specialist reports appended to the EIA Report);
- A detailed assessment of all identified potential impacts;
- A list of the assumptions, uncertainties and gaps in knowledge;
- An opinion by the consultant as to whether the development is suitable for approval within the proposed site;
- An EMPr that complies with Appendix 4 of GN No. R. 982 of the 2014 EIA Regulations (as amended); and
- Any further information that will assist in decision making by the authorities.

9.6.1 Alignment to the Plan of Study

The Plan of Study, which was contained in the Scoping Report was approved by DEA on 03 May 2018, explained the approach to be adopted to conduct the EIA Phase for the proposed project. The manner in which the EIA Report addresses the requirements of the Plan of Study is shown in **Table 9**.

Table 9: Alignment with Plan of Study

No.	Plan of Study Requirement	EIA Report Alignment/Deviation
1	Key Environmental Issues Identified During Scoping Phase: During the EIA stage, a detailed quantitative impact assessment will be conducted via contributions from the project team and requisite Specialist Studies, and through the application of the impact assessment methodology contained in the Scoping Report. Suitable mitigation measures will be identified to manage (i.e. prevent, reduce, rehabilitate and/or compensate) the environmental impacts, and will be included in an EMPr.	Refer to Sections 13, 14, and 15.
2	Environmental Specialist Studies: The requisite specialist studies 'triggered' by the findings of the Scoping Process, aimed at addressing the key issues and compliance with legal obligations, include: • Terrestrial Ecological Impact Assessment; • Avifaunal Impact Assessment; • Agricultural Impact Assessment; • Phase 1 Heritage Impact Assessment; • Social Impact Assessment; • Economic Impact Assessment; and • Visual Impact Assessment.	Refer to Section 13 and Appendix 6.
4	Public Participation – EIA Phase: • IAPs will be notified of the approval of the Scoping Report and the public review period of the Draft EIA Report at the same time. Registered IAPs will be notified of the approval and review period by emails or SMS. These notices will also include information on the public meeting for the EIA Phase. • The public meeting details during the EIA Phase will be available in the Draft EIA. All registered IAPs will be invited to attend the public meeting. • A 30-day review period will be provided to registered IAPs and authorities to review the Draft EIA Report, and details of the venues will be available in the Draft EIA. • All comments received from IAPs and the responses thereto will be included in the Final EIA Report for submission to DEA. • The IAP Database and CRR is continuously updated throughout the process and thus registered IAPs will have a chance to review this CRR during the 30-Day public and authority review period of the Draft EIA Report. Again, DEA will take the CRR into consideration when making the decision to grant EA or not. • All registered IAPs will be notified via email or SMS after having received written notice from DEA on the final decision. Advertisements will also be placed in local and regional newspapers regarding the Department's decision. These notifications will include the appeal procedure to the decision.	IAPs were notified of the approval of the scoping report and the review period for the EIA Report in June 2018. Refer to Section 16 for public participation details.

No.	Plan of Study Requirement	EIA Report Alignment/Deviation
5	Proposed Timeframes: The Scoping Report provided proposed timeframes for the EIA Phase.	Refer to Section 9.2 for an updated proposed schedule taking into account the EIA Phase timeframe extension.
6	DEA Requirements as per Approval of Scoping Report Letter (dated 03 May 2018): The Department has evaluated the submitted FSR and the Plan of Study for Environmental Impact Assessment dated March 2018 and it is satisfied that the said documents comply with the minimum requirements of the Environmental Impact Assessment (EIA) Regulations, 2014, as amended. The FSR is hereby accepted by the Department in terms of Regulation 22(1)(a) of the EIA Regulations, 2014, as amended. You may proceed with the environmental impact assessment process in accordance with the tasks contemplated in the Plan of Study for Environmental Impact Assessment as required in terms of the EIA Regulations, 2014, as amended. All comments and recommendations made by all stakeholders and interested and Affected Parties (I&APs) on the Draft SR, and submitted as part of the Final SR, must be taken into consideration when preparing an Environmental Impact Assessment Report (EIR) in respect of the proposed development. Please ensure that all mitigation measures and recommendations in the specialist studies are addressed and included in the final EIR and Environmental Management Programme (EMPr). In addition, the following amendments and additional information are requested for the EIR: a) Wetland delineation (if applicable); Listed Activities b) Activity 30 of GN. 983 (as amended): it has been indicated in the report and application from that the aforementioned activity will be confirmed after the Terrestrial Ecological study has been conducted. Please ensure that the project activity description is amended accordingly in the EIR; Public Participation Process c) Comments on the EIR must be obtained from the Biodiversity and Conservation unit of this Department; d) Please ensure that copies of the original comments received from I&APs and organs of state, which have jurisdiction in respect of the proposed activity are submitted to the Department with the EIR. Should you be unable to obtain such comments, proof should be	All comments from IAPs submitted to date are included in the CRR (Appendix 5D) and have been considered in the EIA Report (Section 14.1.4). All recommended mitigation measures and recommendations have been included in the EIA Report and EMPr (Appendix 7). Additional information requested: a) A desktop assessment of the affected watercourses will only be undertaken during the Scoping and EIA Process. A detailed River Health Impact Assessment and Wetland/Riparian Habitat Delineation will be undertaken as part of the WULA once the exact positions of the towers have been identified as part of the pre-construction walk-down survey to ensure no towers are placed in any watercourses. Eskom will conduct a walk-down survey of the approved route by DEA (i.e. once EA has been granted) because wetlands cannot be delineated for four route alternatives, each with a 2km corridor. This process is usually done during the walk-down survey with the other Specialists (such as Ecological and Heritage) to position the towers outside of these sensitive areas. Then, a WULA Process is only undertaken after the walk-down survey if the towers cannot be placed outside of any identified watercourses. Therefore a Wetland Delineation will not be undertaken as part of the EIA Phase, only a desktop delineation will be undertaken. b) The Terrestrial Ecological Study confirmed that the powerline will traverse the Mafikeng Bushveld (Vulnerable), with a very small section of Alternative Route Option 2 (WM13) falling within the Western

No.	Plan of Study Requirement	EIA Report Alignment/Deviation
	submitted to the Departments of the attempts that were made to obtain the comments; e) All issues raised and comments received during the circulation of the final Scoping Report from I&APs and organs of state, which have jurisdiction in respect of the proposed activity, are to be adequately addressed in the EIR, including comments from this Department, and must be incorporated into the Comments and Response Report; <u>Specialist Studies</u> f) Signed specialist declaration of interest forms, for all specialist studies conducted as part of the proposed development, must be submitted together with the EIR; g) Each specialist study must indicate a preferred transmission route alternative; h) Where specialist studies are conducted in-house or by a specialist other than a <u>suitably qualified specialist in the relevant field,</u> such specialist reports must be peer reviewed by a suitably qualified external specialist in the relevant field. The terms of reference for the peer review must include: i. A CV clearly showing expertise of the peer reviewer; ii. Acceptability of the terms of reference; iii. Is the methodology clearly explained and acceptable; iv. Evaluate the validity of the findings (review data evidence); v. Discuss the suitability of the mitigation measures to address the short comings; vi. Identify any short comings and mitigation measures to address the short comings; vii. Evaluate the appropriateness of the reference literature; viii. Indicate whether a site-inspection was carried out as part of the peer review; and ix. Indicate whether the article is well-written and easy to understand. <u>Environmental Management Programme (EMPr)</u> i) The EMPr must include the plans required as management measures, which include (but are not limited to): i. Emergency Response; ii. Invasive alien plan management; iii. Dust suppression; iv. Waste management; v. Traffic management; and, vi. Site rehabilitation.	Highveld Sandy Grassland (Critically Endangered). Therefore this Listed Activity still applies. The description was amended in the EIA Report (Table 8 and 18). c) The Draft EIA Report will be provided to the DEA Biodiversity and Conservation unit for comments. d) Copies of the original comments received from IAPs and organs of state are contained in Appendix 5C. Proof to obtain comments is contained in Appendix 5B. e) Refer to Appendix 5D for the CRR to see all comments received and how they have been addressed. f) Refer to Appendix 6I for the signed Specialist declaration forms. g) All Specialist Studies (Appendix 6) have indicated their preferred route alternative, refer to Section 13 for the summary of the preferred route for each study. h) Two of the Specialist Studies were conducted in-house therefore refer to Appendix 6A and 6H for the peer reviews that were undertaken on these studies as well as the CVs of the peer reviewers. i) The EMPr (Appendix 7) includes the required management measures. j) The EMPr does not contain any statements such as “should” or “may”. k) All recommendations and mitigation measures from the EIA Report and Specialist Studies have been included in the EMPr. Refer to Appendix 2 for the requested A3 maps. The above ground storage of fuel is not shown on the maps as these locations are unknown at this

No.	Plan of Study Requirement	EIA Report Alignment/Deviation
	j) The EMPr must not contain any ambiguity. Where applicable, statements must contain word "must" instead of "should" or "may"; k) Recommendations and mitigation measures recorded in the reports, including those from specialist studies, must be incorporated as part of the EMPr. The applicant is hereby reminded to comply with the requirements of Regulation 45 of the Environmental Impact Assessment Regulations, 2014 published under Government Notice R982 in Government Gazette No. 38282 dated 04 December 2014, as amended ('the EIA Regulations, 2014'), with regard to the time period allowed for complying with the requirements of the Regulations. Please ensure that the Final EIR includes at least on A3 regional map of the area and the locality maps included in the final EIR illustrate the different proposed alignments and above ground storage of fuel. The maps must be acceptable quality and as a minimum, have the following attributes: • Maps are relatable to one another; • Cardinal points; • Co-ordinates; • Legible legends; • Indicate alternatives; • Latest land cover; • Vegetation types of the study area; and • A3 size locality map. Further, it must be reiterated that, should an application for Environmental Authorisation be subject to the provisions of Chapter II, Section 38 of the National Heritage Act, 1999 (act No. 25 of 1999), then this Department will not be able to make nor issue a decision in terms of your application for Environmental Authorisation pending a letter from the pertinent heritage authority categorically stating that the application fulfils the requirements of the relevant heritage resources authority as described in Chapter II, Section 38(8) of the National Heritage Resources Act, 1999. You are requested to submit two (2) copies of the Environmental Impact Report (EIR) to the Department and at least one electronic copy (CD/DVD) of the complete final report with the hard copy documents. You are hereby reminded of section 24F of the National Environmental management Act, 1998 (Act 1007 of 1998), as amended, that no activity may commence prior to an environmental authorisation being granted by the Department.	stage. However, the Listed Activity for storing fuel has not been applied for, for this project (because it is below the thresholds). The findings of the Heritage Impact Assessment (JLB Consulting, 2018) indicated that heritage resources were found along recommended the 2km corridor route (Option 2). However, the Heritage Specialist recommended that a walk-down survey be undertaken prior to construction to ensure all heritage sites are avoided. The Heritage Specialist also recommended a 20m conservation buffer zones for these heritage sites. Therefore no permits are required by either NW Heritage or SAHRA at this stage. However, both NW Heritage and SAHRA will be provided the EIA Report and HIA to obtain written comment from them during the 30-day review period of the Draft EIA Report, to be included in the CRR of the FEIR to be submitted to DEA.
7	<u>Additional:</u>	The EIA Report and Specialist Studies includes the expanded

No.	Plan of Study Requirement	EIA Report Alignment/Deviation
	During the Scoping Phase, the outcome of a Focus Group Meeting resulted in the expansion of a small section of the 2km corridor for **Option 3** to include the north western section of portion 1 and 2 of Verkeerde Vlei 580 IN. The reasoning for this was so that the powerline could run on the property boundary instead of the centre of the affected property.	corridor area for Option 3 (WM4a), refer to **Figure 30**.
	The Heritage Impact Assessment (JLB Consulting, 2018) recommended that a Desktop Palaeontological Study be undertaken.	Refer to **Appendix 6D** for the Desktop Palaeontological Impact Assessment.

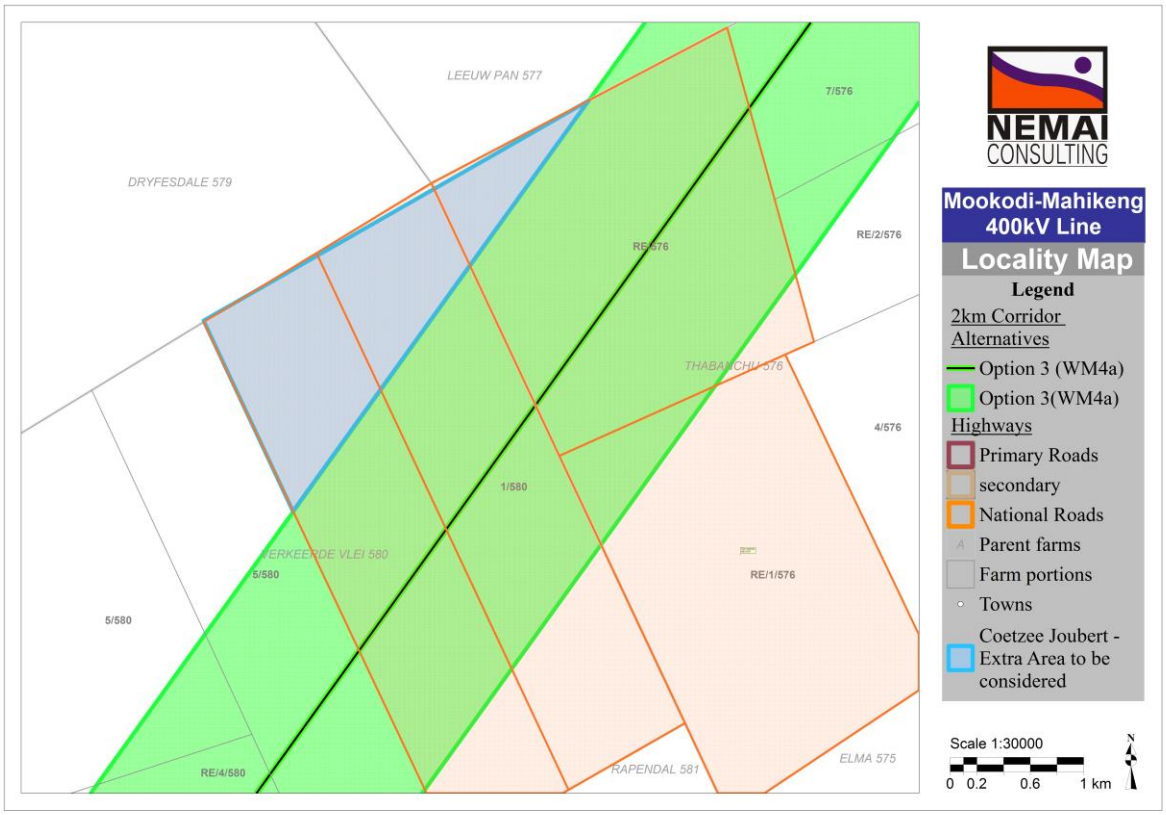


Figure 30: Expanded corridor area for Option 3 (WM4a)

9.7 Landowner Consent

According to Regulation 39(1) of GN No. 982 of the 2014 EIA Regulations, as amended, if the proponent is not the owner or person in control of the land on which the activity is to be undertaken, the proponent must, before applying for an environmental authorisation in respect of such activity, obtain the written consent of the landowner or person in control of the land to undertake such activity on that land.

This requirement does not apply inter alia for linear developments (e.g. pipelines, power lines, roads). Landowner consent was thus not required.

9.8 Landowner Notification

The details of the various properties affected by the project, as well as the details of the affected landowners are included in the IAP Database contained in **Appendix 5**.

Proof of written notification to the landowners / persons in control of the land is included in **Appendices 9** and **10**.

10 ASSUMPTIONS AND LIMITATIONS

The following assumptions and limitations apply to this Scoping exercise:

- The GIS versions of data available for the public are assumed to be the latest information provided by the Departments (such as NWREAD and SANBI);
- As the design of the project components is still in feasibility stage, and due to the dynamic nature of the planning environment, the dimensions and layout of the infrastructure may change during the detailed design phase. Provision is made for a 2km corridor around the powerline alternative options;
- Regardless of the analytical and predictive method employed to determine the potential impacts associated with the project, the impacts are only predicted on a probability basis. The accuracy of the predictions is largely dependent on the availability of environmental data and the degree of understanding of the environmental features and their related attributes;
- The Terrestrial Ecological Impact Assessment noted the following (Nemai Consulting, 2018a):
    - Given the magnitude of the project and the various extent of ervens and portions of farms in the area, some farms/areas were not easily accessible. However, detailed walk down surveys once the tower locations are final will be required to reduce impacts identified in this report;
    - Late wet season surveys were undertaken from 3-6 April 2018, which fall within an optimal time of the season to find sensitive plant and animal species of high conservation priority. Weather conditions during the surveys were favourable for recording both fauna and flora;
    - A separate Avifauna study was compiled by Mathew Ross for this EIA Process;
    - Fauna species directly or indirectly observed during the site visits were augmented with those that are likely to occur in the area based on their distribution and habitat preferences; and
    - Since environmental impact studies deal with dynamic natural systems additional information may come to light at a later stage and Nemai Consulting can thus not accept responsibility for conclusions and mitigation measures made in good faith based on information gathered or databases consulted at the time of the investigation. Detailed walk-down surveys once the tower

locations are finalised will be required in order to reduce impacts identified in this report;

- The Avifauna Impact Assessment noted the following (Enviross, 2018):
    - The conclusions to overall perceived impacts have been based on a desktop survey that was reiterated by ground-truthing through a field survey of the proposed development area. Even though every effort was undertaken to identify ecologically sensitive habitats, the presence of Red Data List and protected species and other pertinent ecological issues relating to the project, the limited time spent on site (limited to a single field survey) necessitated certain assumptions regarding the potential presence or absence of species to be made. These assumptions were largely based on the professional judgement that is supported by similar field experience within similar areas of the specialist;
- The Heritage Impact Assessment noted the following (JLB Consulting, 2018):
    - Access to some private farms was, at times, not possible as entrances to farms were often prevented by locked gates;
    - In addition, heavy rain on the evening of 4 April 2018 made some of the gravel access roads to the route options inaccessible;
    - Due to the rainfall over summer, vegetation and grass cover was thick in most areas making visibility of low lying heritage resources such as archaeological sites and unmarked graves difficult; and
    - As much of the four powerline route options was investigated during the site inspection. The site inspection allowed the specialist to gain a comprehensive understanding of heritage resources in the study area and the potential impact that the powerline could have on these resources;
- The Desktop Palaeontological Impact Assessment noted the following (Banzai Environmental (Pty) Ltd, 2018):
    - The accurateness of Palaeontological Desktop Impact Assessments is reduced by old fossil databases that do not always include relevant locality or geological formations. The geology in various remote areas of South Africa may be less accurate because it is based entirely on aerial photographs. The accuracy of the sheet explanations for geological maps is inadequate as the focus was never intended to be on palaeontological material; and
    - The entire South Africa has not been studied palaeontologically. Similar Assemblage Zones but in different areas, might provide information on the presence of fossil heritage in an unmapped area. Desktop studies of similar geological formations generally assume that unexposed fossil heritage is present within the development area. Thus, the accuracy of the Palaeontological Impact Assessment is improved by a field-survey;
- The Agricultural Impact Assessment noted the following (Index, 2018):
    - The land uses on which the impact is based are as follows:
        - Cultivated (commercial)

- Cultivated (subsistence)
- Fallow / old lands
- Irrigated land
- Poultry houses
- Grazing

- A buffer area of 2 kilometres of the transmission line was assessed when identifying land uses;
- Grazing land will be lost for 50 metres along the path of the transmission line for a maximum period of one year – which is for the duration of the construction and the period that it will take the grazing to recover from the construction process;
- Cultivated land will likewise be lost for 50 metres along the path of the transmission line for a maximum period of one year – which is for the duration of one production season. While a servitude will be registered to allow access to the line by ESKOM, the land can be cultivated post construction. The footprint of the tower will be permanently lost;
- Fallow and old lands is now mostly under pastures or upgraded veld grazing, they are however potentially arable and some of it is likely in a rest period in a cropping rotation;
- Irrigated lands are mostly under centre pivot irrigation systems which has permanent and expensive underground infrastructure that will be replaced elsewhere if other land is available. Fertility of irrigated land is usually built up over time and must also be taken into consideration in the evaluation. Traversing the pivot irrigation system will lead to a permanent loss of not only the directly impacted land, but the total area that the pivot covers. This means that irrigated land will revert to dryland cropping land for the post construction period;
- Housing and farming infrastructure is a cost item but will not directly impact on the farming income, unless it is used as packing sheds, which is then part of the production process. Loss of infrastructure should be dealt with under the social assessment of the EIA;
- Poultry production will suffer a low for the period of construction due to the disturbance to the fowls. Two poultry units were identified, both within the buffer area of Route 3;
- High potential land is defined as follows:
  - means land best suited to, and capable of consistently producing acceptable levels of goods and services for a wide range of agricultural enterprises in a sustainable manner, taking into consideration expenditure of energy and economic resources; and
  - includes:

    (i) land capability Classes I, II and III;

    (ii) unique agricultural land;

(iii) irrigated land; and
(iv) land suitable for irrigation (deep well-drained soils and assuming irrigation water is available);
- Maize yield under irrigation is assumed as 15 tonnes per hectare;

- The Visual Impact Assessment noted the following (Ecoelementum, 2018):
  - Visual perception is by nature a subjective experience, as it is influenced largely by personal values. For instance, what one-viewer experiences as an intrusion in the landscape, another may regard as positive. Such differences in perception are greatly influenced by culture, education and socio-economic background. A degree of subjectivity is therefore bound to influence the rating of visual impacts. In order to limit such subjectivity, a combination of quantitative and qualitative assessment methods were used. A high degree of reliance has been placed on GIS-based analysis viewshed, visibility analysis, and on making transparent assumptions and value judgements, where such assumptions or judgements are necessary; and
  - The viewshed generated in GIS cannot be guaranteed as 100% accurate. Some viewpoints, which are indicated on the viewshed as being inside of the viewshed, can be outside of the viewshed. This is due to the change of the natural environment by surrounding activities as well as natural vegetation that play a significant role and can have a positive or negative influence on the viewshed;
- The Economic Impact Assessment noted the following (Baur, 2018):
  - This study has been developed by developing its assumptions on the current economic environment. If the current environment should change, then the findings of this report should be reassessed; and
  - It must be noted that due to the limitations in data and available information, standard economic analysis tools (e.g., production cost models) capture only a portion of transmission-related benefits, and therefore, much of the estimates made in this study are based on assumptions and proportions;
- The Social Impact Assessment noted the following (Nemai Consulting, 2018b):
  - It is assumed that information obtained during the public participation phase provide a comprehensive account of the community structure and community concerns for the project;
  - The study was done with the information available to the specialist at the time of executing the study, within the available time frames and budget. The sources consulted are not exhaustive and additional information which might strengthen arguments, contradict information in this report and/or identify additional information which might exist. However, the specialist did take an evidence-based approach in the compilation of this report and did not intentionally exclude information relevant to the assessment;
  - It is assumed that no relocation of families or people will take place for this project; and

- The feasibility stage of the project presents four alternative routes which are to be narrowed to one on the basis of the route with less impact and effects on the locality, the assumed impacts and effects may later change during the detailed design phase of the project.

11 NEED AND DESIRABILITY

In terms of 3 (1)(f) of Appendix 3 of GN No. R. 982 of the 2014 EIA Regulations, as amended, this section discusses the need and desirability of the project. The format contained in the Guideline on Need and Desirability (DEA&DP, 2009) has been used in **Table 10**.

Table 10: Need and Desirability of the Mookodi-Mahikeng 400kV Powerline

No.	Question	Response
Need (Timing)		
1.	Is the land use (associated with the activity being applied for) considered within the timeframe intended by the existing approved Spatial Development Framework (SDF) agreed to by the relevant environmental authority? (i.e. is the proposed development in line with the projects and programmes identified as priorities within the IDP).	The Transmission Development Plan (TDP) 2014 – 2023 indicated that the Watershed Strengthening Phase 1, 2 and 3 is one of the major schemes planned. The proposed Mookodi-Mahikeng 400kV Powerline falls part of Phase 3 which states: *"Beyond 2020, further network enhancements are required to address the Watershed insufficient transformation capacity and the poor voltage profile under N-1 contingency of the Pluto- Watershed 275 kV line. There is an additional load of 180 MW expected, approximately 60 km west of Watershed, in Mahikeng. This scheme deloads Watershed substation and introduces 400 kV injection in Mahikeng, via establishment of Pluto-Mahikeng and Mookodi-Mahikeng 400 kV lines and the new Mahikeng (Watershed B) 2 x 500 MVA 400/132 kV substation."* Electricity provision is one of the key development priorities of the IDPs for Naledi LM, Kagisano-Molopo LM, Ratlou LM, and Mahikeng LM in the North West Province.
2.	Should development, or if applicable, expansion of the town/area concerned in terms of this land use (associated with the activity being applied for) occur here at this point in time?	Yes. The Watershed Strengthening Scheme requires that a powerline be constructed between the existing Mookodi substation (in Vryburg) to the future substation in Mahikeng in order to deload the existing Watershed substation.
3.	Does the community/area need the activity and the associated land use concerned (is it a societal priority)? This refers to the strategic as well as local level (e.g. development is a national priority, but within	The existing Watershed substation is currently un-firm and has insufficient capacity to support the forecasted load in the area, which includes Lichtenburg and extends to Mahikeng town. The Watershed substation has technical constraints

No.	Question	Response
	a specific local context it could be inappropriate)	as it has insufficient transformation capacity and poor voltage profile in the 20 year planning horizon, starting from year 2016 till year 2036. The substation experiences capacity and voltage regulation constraints on the 275kV in-feeds to the Watershed substation. There is also anticipated load growth in the Mahikeng area, the forecast shows potential for other economic drivers in Carletonville (particularly in the Watershed/Mahikeng area) such as industrial, commercial and electrification to re-introduce positive load growth trends, thus indicating a need for further enhancement of capacity in the area.
4.	Are the necessary services with appropriate capacity currently available (at the time of application), or must additional capacity be created to cater for the development?	This project is reliant of the Watershed Strengthening Scheme projects. The proposed powerline is part of a much larger transmission network and associated substations in the North West Province.
5.	Is this development provided for in the infrastructure planning of the municipality, and if not what will the implication be on the infrastructure planning of the municipality (priority and placement of services)?	Yes. See response to Item 1.
6.	Is this project part of a national programme to address an issue of national concern or importance?	The development is intended to address North West power requirements.
Desirability (Placing)		
7.	Is the development the best practicable environmental option (BPEO) for this land/site?	The Watershed Strengthening Scheme requires that a powerline be constructed between the existing Mookodi substation (in Vryburg) to the future substation in Mahikeng in order to deload the existing Watershed substation. A number of factors were considered in selecting the alternative routes for the powerline (refer to Section 6.1 of the EIA Report) Refer to Section 15 for the BPEO.
8.	Would the approval of this application compromise the integrity of the existing approved municipal IDP and Spatial Development Framework (SDF) as agreed to by the relevant authorities?	It is not anticipated that the proposed project will contradict or be in conflict with the municipal IDPs and SDFs.
9.	Would the approval of this application compromise the integrity of the existing environmental management priorities for the area (e.g. as defined in EMFs), and if so, can it be justified in terms of sustainability considerations?	The compatibility of the project with the North West Biodiversity Sector Plan (2015) and other environmental management and planning tools were considered in detail during the EIA Phase, following the undertaking of the relevant

No.	Question	Response
		Specialist Studies (Appendix 6), refer to Section 13.
10.	Do location factors favour this land use (associated with the activity applied for) at this place? (this relates to the contextualisation of the proposed land use on this site within its broader context).	Yes, as part of the technical analysis a number of locational factors were considered in selecting the alternative routes for the powerline. The Specialist Studies, as part of the EIA Phase, will further investigate the location based on sensitive environmental features and receptors. See response to no. 7.
11.	How will the activity or the land use associated with the activity applied for, impact on sensitive natural and cultural areas (built and rural/natural environment)?	Refer to Section 14 for an assessment of the project's potential impacts.
12.	How will the development impact on people's health and wellbeing (e.g. i.t.o. noise, odours, visual character and sense of place, etc)?	
13.	Will the proposed activity or the land use associated with the activity applied for, result in unacceptable opportunity costs?	The affected land is rural in nature and primarily used for agricultural purposes. Refer to Section 14 for an assessment of the project's potential impacts.
14.	Will the proposed land use result in unacceptable cumulative impacts?	Refer to Section 14 for an assessment of the project's potential cumulative impacts. The impacts associated with the project can be mitigated to limit any impacts. No fatal flaws were identified by the Specialists.

12 PROFILE OF THE RECEIVING ENVIRONMENT

This section provides a general description of the status quo of the receiving environment in the project area. This serves to provide the context within which the Scoping exercise was conducted. It also allows for an appreciation of sensitive environmental features and possible receptors of the effects of the four route alternatives for the proposed Mookodi-Mahikeng 400kV Powerline.

The study area includes a 2 km corridor for each route alternative (i.e. 1 km on either side of the centre line). This allows for possible relocation or deviation within the corridor, respectively (e.g. avoidance of sensitive features and technical constraints). Where necessary, the regional context of the environmental features is also explained, with an ensuing focus on the local surrounding environment. Refer to Section 13 for more elaborate explanations of the Specialist Studies and their findings for specific environmental features.

A brief overview is also provided of the manner in which the environmental features may be affected (positively or negatively) by the proposed Mookodi-Mahikeng 400kV Powerline during the project life-cycle. The potential impacts to the receiving environment are discussed further in Section 14. The following environmental features have been considered:

1. Climate
2. Geology
3. Soil
4. Topography
5. Surface Water
6. Flora
7. Fauna
8. Land Capability
9. Land Use
10. Heritage
11. Air Quality
12. Noise
13. Visual Quality
14. Existing Infrastructure
15. Traffic
16. Socio-Economic

12.1 Climate

The climate in Vryburg (start point of the powerline) is influenced by the local steppe climate. During the year there is little rainfall. This location is classified as BSk by Köppen and Geiger. The average annual temperature in Vryburg is 17.9 °C and precipitation averages 477 mm (**Figure 31**).

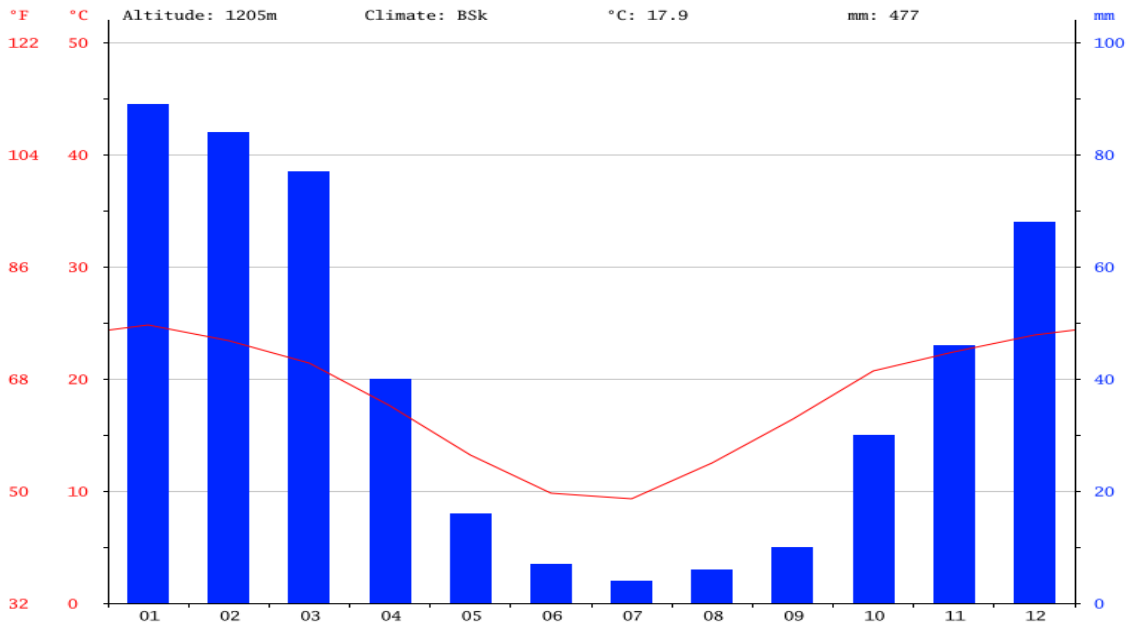


Figure 31: Climate graph – Vryburg (https://en.climate-data.org/region/501/)

The climate in Stella (approximately midpoint of the powerline) is known as a local steppe climate. During the year, there is little rainfall in Stella. This location is classified as BSk by Köppen and Geiger. The average annual temperature is 17.8 °C in Stella and the average annual rainfall is 474 mm (**Figure 32**).

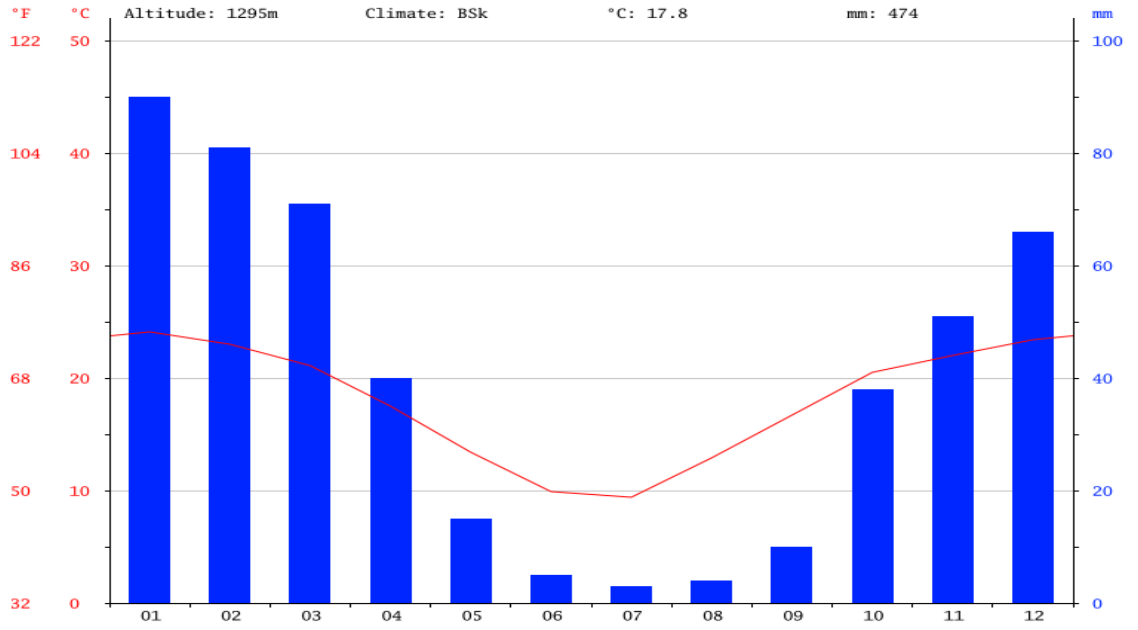


Figure 32: Climate graph – Stella (https://en.climate-data.org/region/501/)

The climate in Mahikeng (end point of the powerline) a local steppe climate. During the year there is little rainfall. This location is classified as BSh by Köppen and Geiger. The temperature here averages 18.5 °C and the average annual rainfall is 541 mm (**Figure 33**).

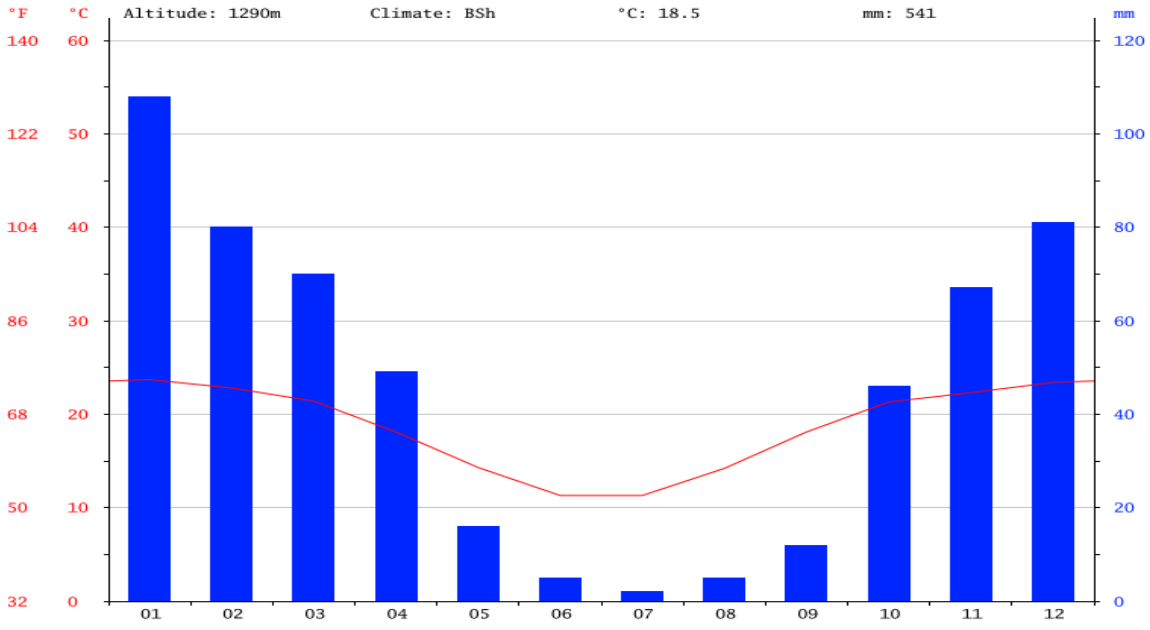


Figure 33: Climate graph – Mahikeng (https://en.climate-data.org/region/501/)

12.2 Geology

The proposed Mookodi-Mahikeng 400kV Powerline is underlain by several types of geology (Refer to **Figure 34**) including:

1. Barberton,murchison,giyani,beit bridge;
2. Kalahari;
3. Meinhardskraal granite,sand river gneiss;
4. Dwyka; Transvaal,rooiberg,griqualand-west; and
5. Ventersdorp.

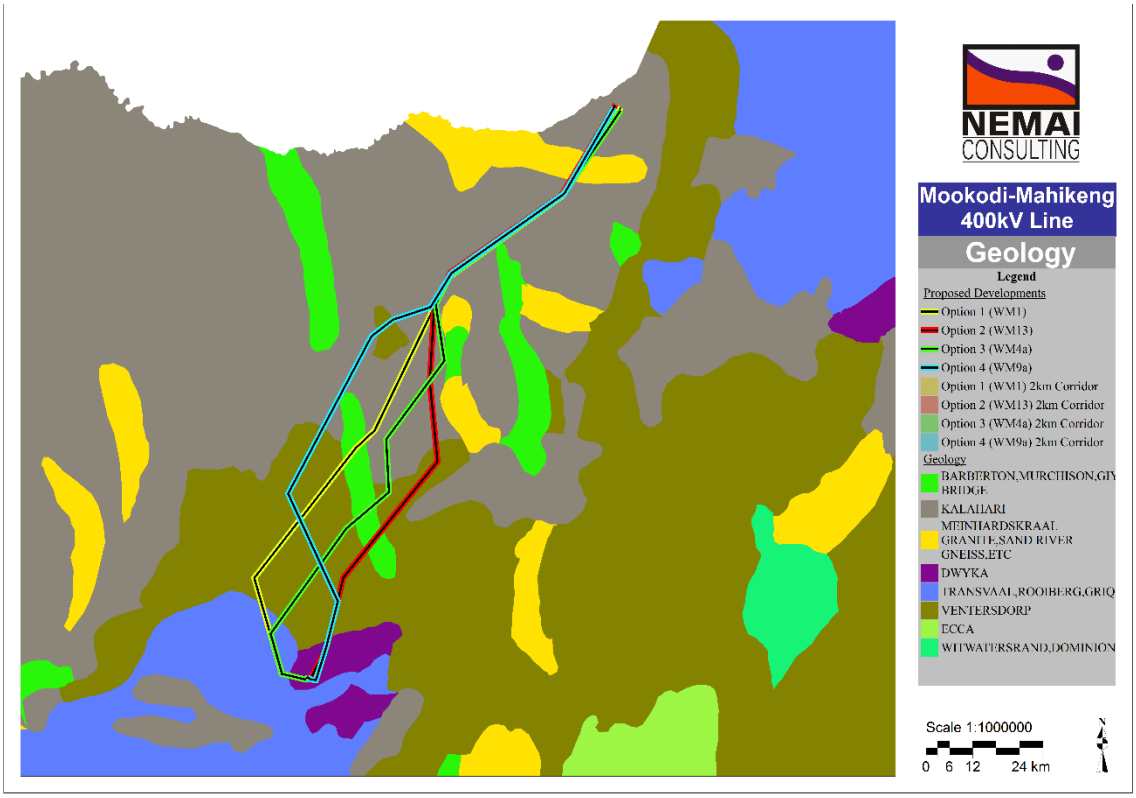


Figure 34: Geology

12.3 Soils

The soil types and depths vary between and along the powerline route alternatives (**Figure 35**). The soil types encountered constitute of:

1. Freely drained, structureless soils;
2. Lithosols (shallow soils on hard or weathering rock); and
3. Red or yellow structureless soils with a plinthic horizon.

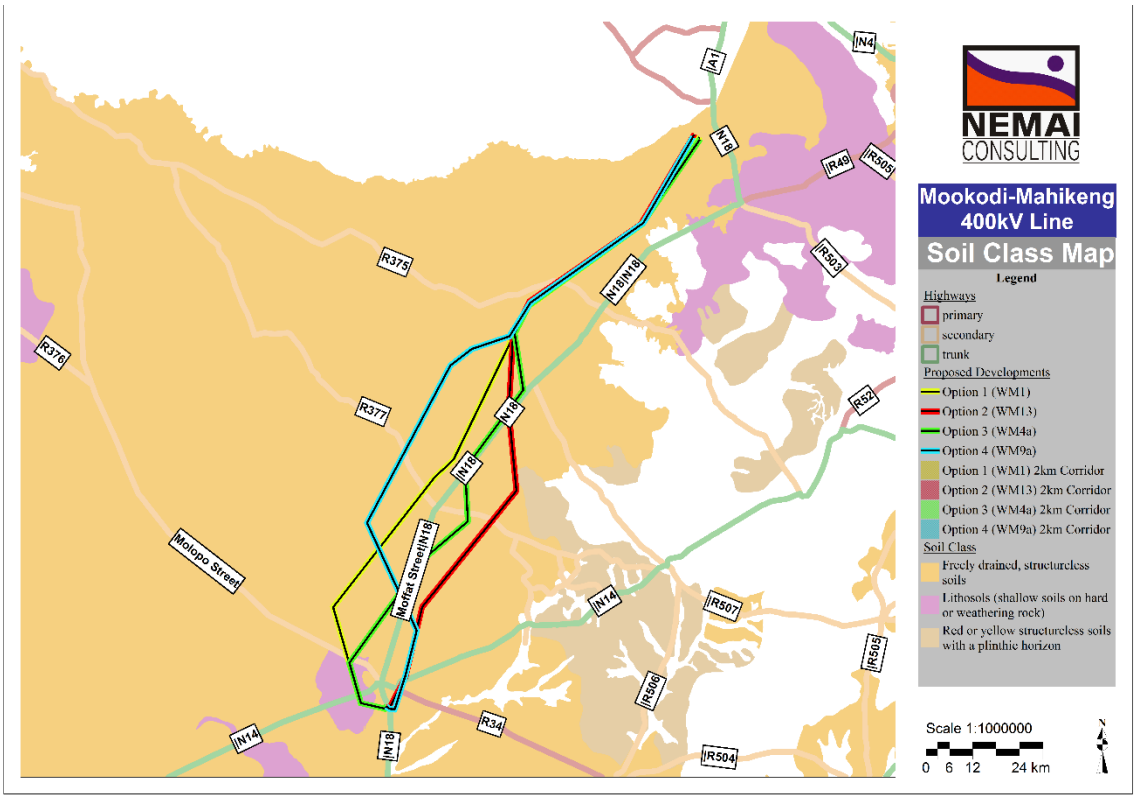


Figure 35: Soil class

12.4 Topography

The terrain of the study area is generally flat with undulating plains (**Figures 36** and **37**).

Figure 36: Photograph of relatively flat terrain on site

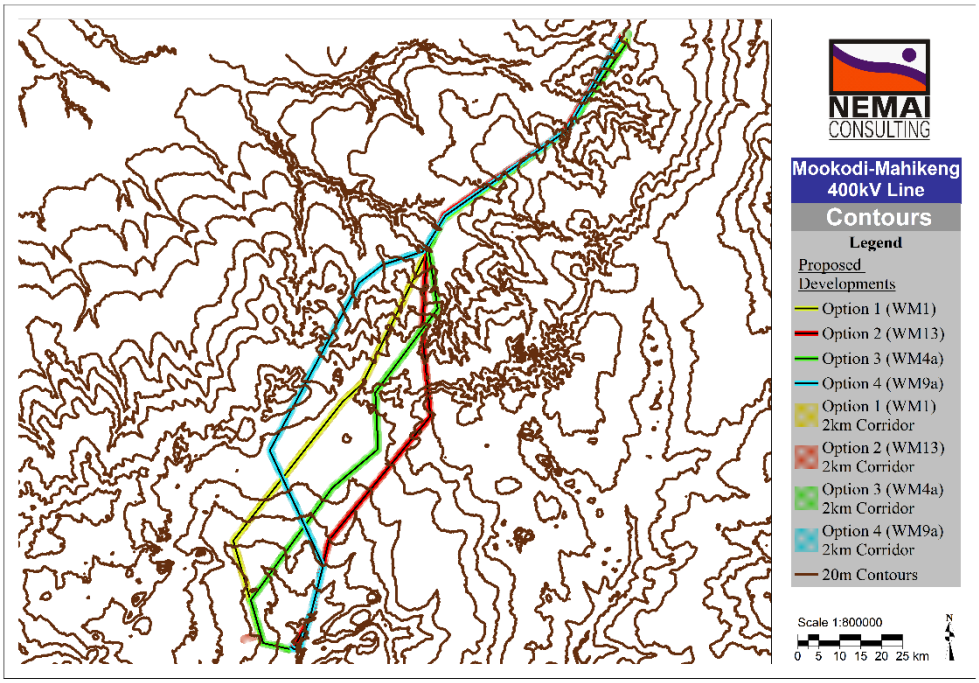


Figure 37: 20m Contour lines

12.5 Surface Water

The proposed Mookodi-Mahikeng 400kV Powerline route alternatives fall within the C32B, C32A, D41B, and D41A quaternary catchments and within the Vaal Water Management Area (WMA) (**Figure 38**).

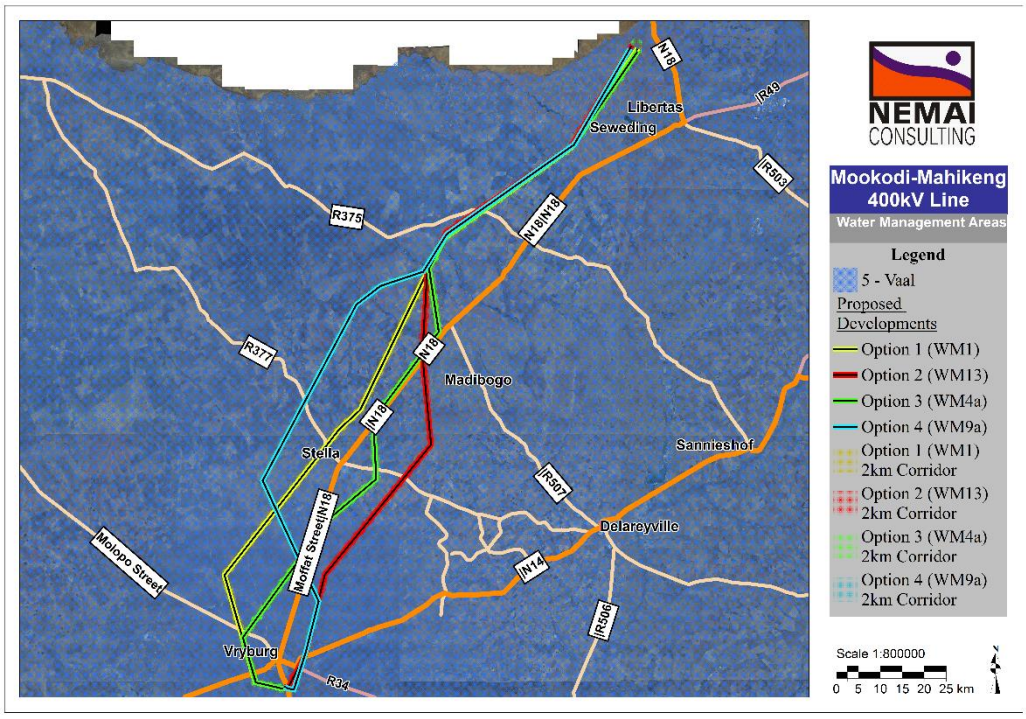


Figure 38: Water management areas

The proposed powerline route alternatives traverse several non-perennial rivers but very few perennial rivers or tributaries (**Figure 39**). There are several wetlands located within 500m of the route alternatives.

The pylons are proposed to not be placed within the 1:100 year floodline of any watercourse, or within any wetlands and their buffer zones.

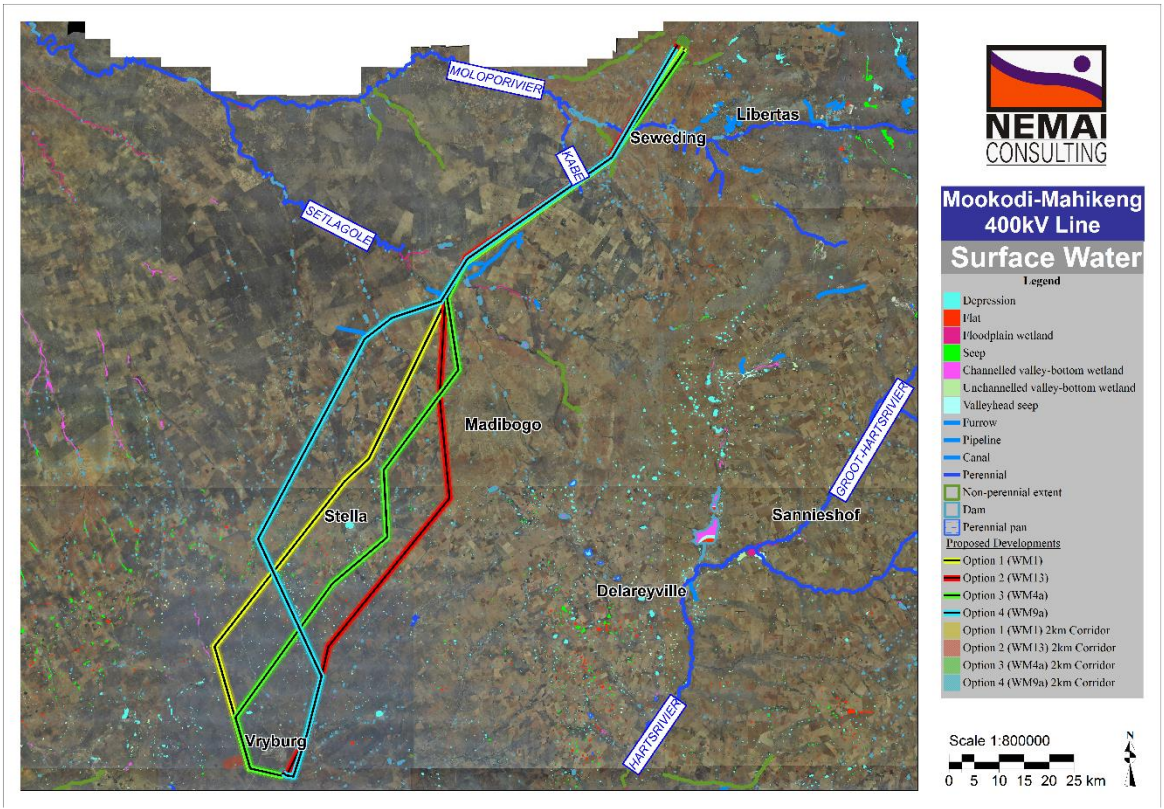


Figure 39: Surface water

12.6 Flora

12.6.1 Biome and Vegetation

The proposed Mookodi-Mahikeng 400kV Powerline route alternatives fall within the Savanna biome. However, a very small section of Alternative Route Option 2 (WM13) also falls within the Grassland biome (**Figure 40**).

According to Mucina and Rutherford, the Savanna and Grassland biomes are the two largest biomes in South Africa. 33% of the vegetation in South Africa is part of the Savanna biome and 27.9% is Grassland (Mucina and Rutherford, 2006).

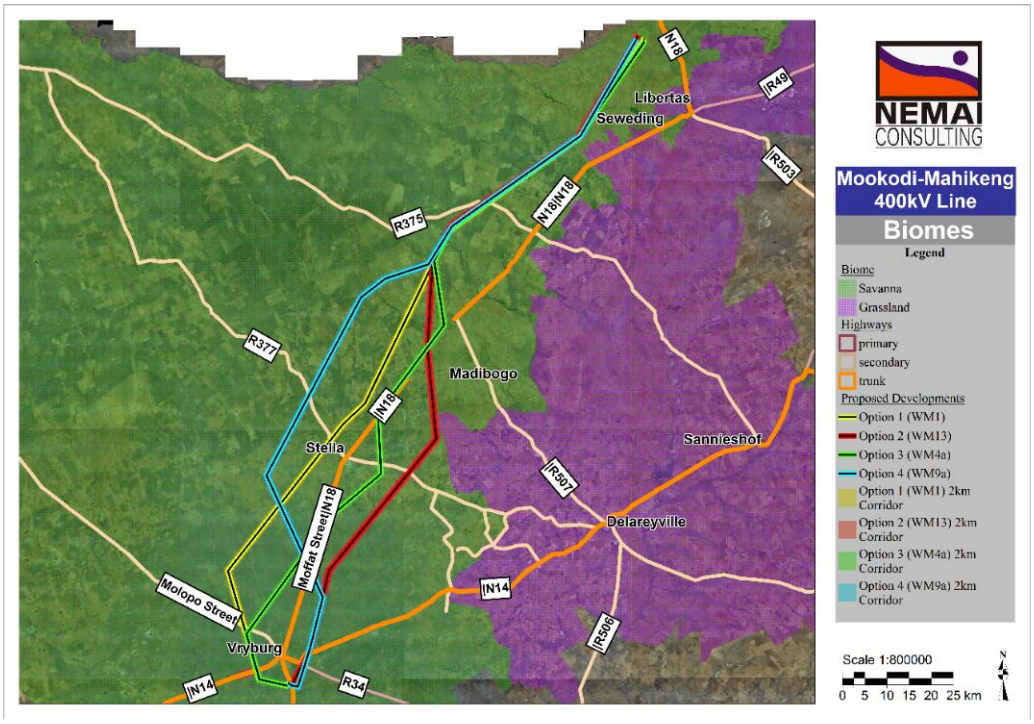


Figure 40: Biomes

The Savanna Biome consists of 87 different vegetation units and the Grassland Biome consists of 72. **Figure 41** shows the vegetation types that are affected.

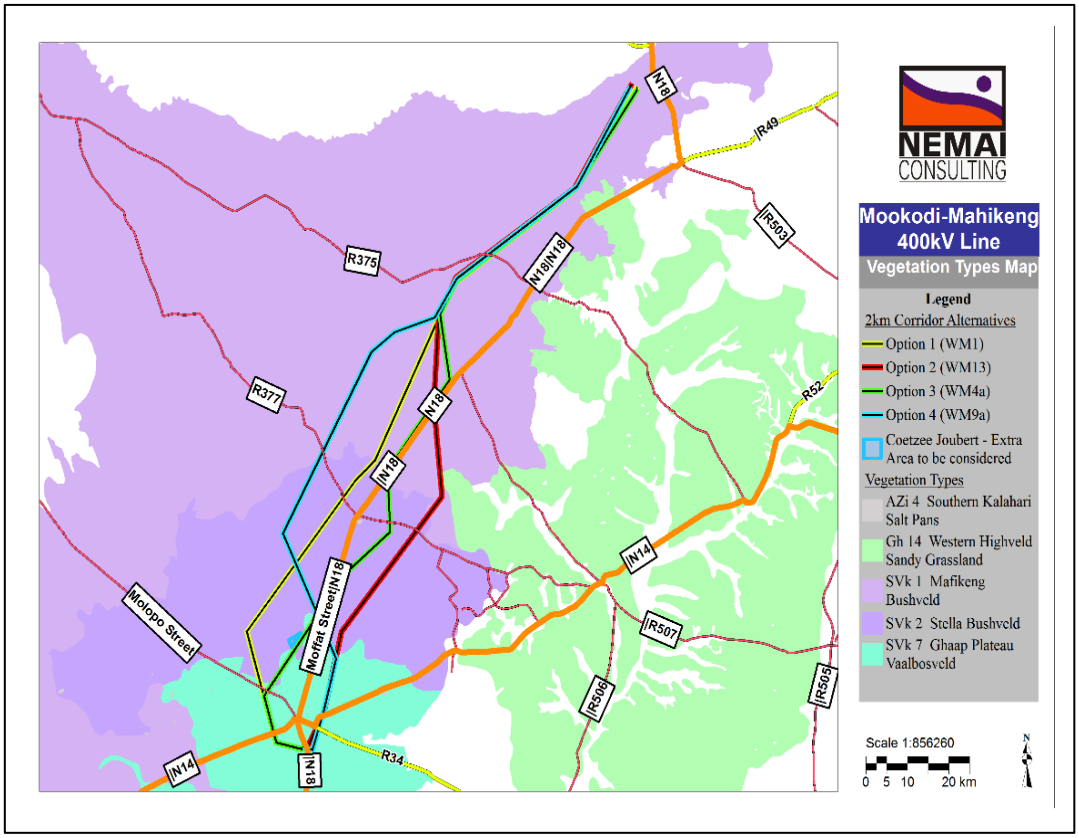


Figure 41: Vegetation type

The following vegetation units are described in more detail below.

- Ghaap Plateau Vaalbosveld (Savanna biome);
- Stella Bushveld (Savanna biome);
- Mafikeng Bushveld (Savanna biome);
- Very small portion of Western Highveld Sandy Grassland (Grassland biome); and
- Southern Kalahari Salt Pans (Azonal vegetation).

Ghaap Plateau Vaalbosveld:

This vegetation type is found in Northern Cape and North-West Provinces. It occurs in flat plateau from around Campbell in the south, east of Danielskuil through Reivilo to around Vryburg in the north. It is listed as Least threatened, with a national target of 16%. None of this vegetation type is conserved in statutory conservation areas. Only about 1% is already transformed.

Stella Bushveld:

This vegetation type is found in North-West Province. It occurs in North of Vryburg around Stella westwards to Louwna and eastwards to about 20 km west of Delareyville. It is listed as Vulnerable, with a national conservation target of 16%. None of this vegetation type is conserved in statutory conservation areas. Some 21% is transformed, almost all by cultivation.

Mafikeng Bushveld:

This vegetation type is found in North-West Province. It occurs West of Mahikeng and south of the Botswana border westwards to around Vergeleë, southwards to Piet Plessis and Setlagole. It is listed as Vulnerable, with a national conservation target of 16%. None of this vegetation type is conserved in statutory conservation areas but very small area conserved in the Mmabatho Recreation Area. About 25% is already transformed, mainly for cultivation and urban development.

Western Highveld Sandy Grassland:

This vegetation type is found in North-West Province. It is found in Mahikeng to Schweizer-Reneke in the south and from Broedersput and Kameel in the west to Lichtenburg and Ottosdal in the east. It is listed as Endangered, with a national conservation target of 24%. Only a very small portion is statutorily conserved (Barberspan Nature Reserve). More than 60% has been ploughed. Nonarable parts are on shallow aeolian soils which become easily overutilised through grazing. About 95% of this land is suitable for cultivation, but the low rainfall makes it a high-risk area for agriculture. Therefore the natural vegetation is often restricted to nonarable bush clumps, shallow soils, aeolian sands and pans.

Southern Kalahari Salt Pans:

This vegetation type is found in Northern Cape and North-West Provinces and neighbouring Kalahari regions of Botswana and Namibia. It is found in a system of endorheic, closed depressions (pans) in the southern. The largest concentrations of such pans in South Africa are found near Groot-Mier in western Gordonia. It is listed as *Least threatened*, with a national

conservation target of 24%. About 8% is statutorily conserved in the Kgalagadi Transfrontier Park. The vegetation of the pans is subject to natural degradation/regeneration cycles controlled by concentration of grazing animals (antelopes in particular) (Mucina and Rutherford, 2006).

12.6.2 Terrestrial Threatened Ecosystems

The South African National Biodiversity Institute (SANBI), in conjunction with the Department of Environmental Affairs (DEA), released a draft report in 2009 entitled "Threatened Ecosystems in South Africa: Descriptions and Maps", to provide background information on the above List of Threatened Ecosystems (SANBI, 2009). The purpose of this report was to present a detailed description of each of South Africa's ecosystems and to determine their status using a credible and practical set of criteria. The following criteria were used in determining the status of threatened ecosystems:

- Irreversible loss of natural habitat;
- Ecosystem degradation and loss of integrity;
- Limited extent and imminent threat;
- Threatened plant species associations;
- Threatened animal species associations; and
- Priority areas for meeting explicit biodiversity targets as defined in a systematic conservation plan.

In terms of Section 52(1) (a), of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004), a national list of ecosystems that are threatened and in need of protection was gazetted on 9 December 2011 (Government Notice 1002). The list classified all threatened or protected ecosystems in South Africa in terms of four categories; Critically Endangered (CR), Endangered (EN), Vulnerable (VU), or Protected. The purpose of categorising these ecosystems is to prioritise conservation areas in order to reduce the rates of ecosystem and species extinction, as well as preventing further degradation and loss of structure, function, and composition of these ecosystems. It is estimated that Threatened Ecosystems make up 9.5% of South Africa, with critically endangered and endangered ecosystems accounting for 2.7%, and vulnerable ecosystems 6.8% of the land area. It is therefore vital that Threatened Terrestrial Ecosystems inform proactive and reactive conservation and planning tools, such as Biodiversity Sector Plans, municipal Strategic Environmental Assessments (SEAs) and Environmental Management Frameworks (EMFs), EIAs and other environmental applications (Mucina *et al*. 2006).

The proposed Mookodi-Mahikeng 400kV Powerline route alternatives fall within the Mahikeng Bushveld (Vulnerable), with a very small section of Alternative Route Option 2 (WM13) falling within the Western Highveld Sandy Grassland (Critically Endangered) (**Figure 42**).

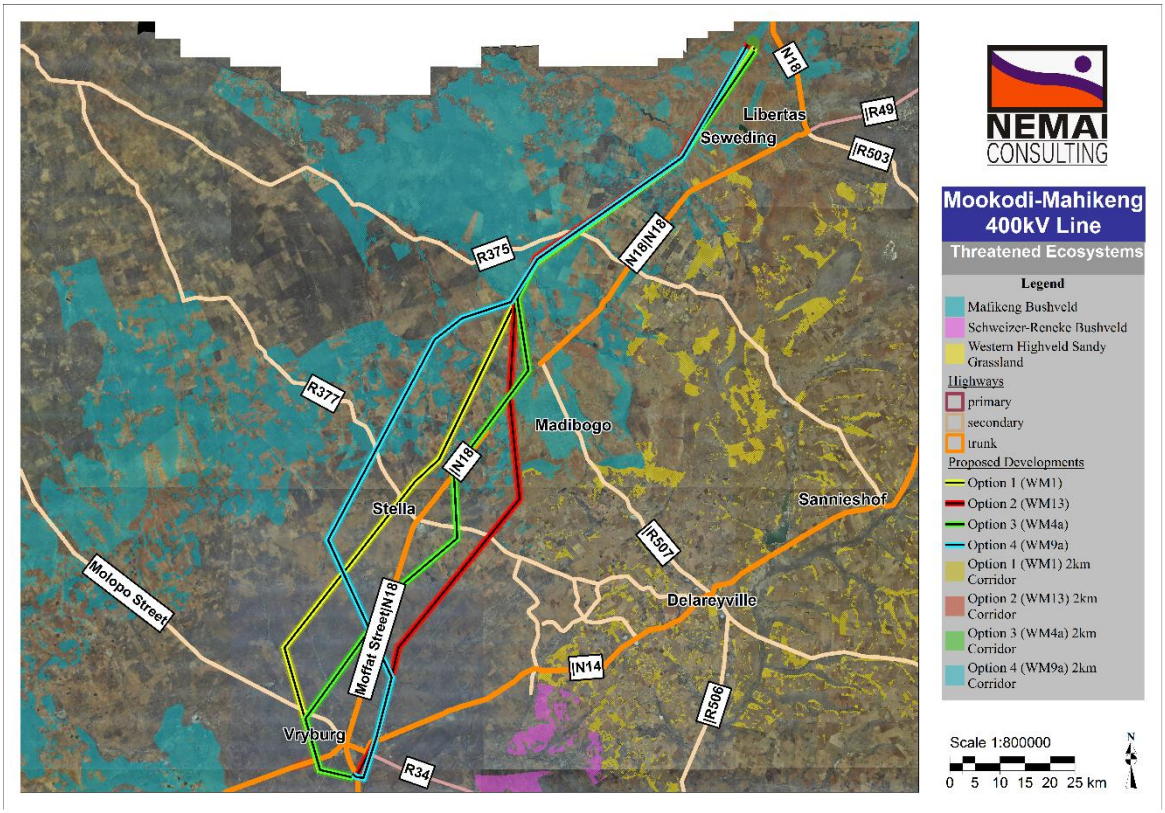


Figure 42: Threatened terrestrial ecosystems

12.6.3 North West Biodiversity Sector Plan (2015)

The North West Province's biodiversity provides an important basis for economic growth and development, in ways such as providing rangelands that support commercial and subsistence farming, horticulture and agriculture industry based on indigenous species, tourism industry, aspects of film industry, commercial and non-commercial medicinal applications of indigenous resources, and provision of clean water.

Critical biodiversity areas (CBAs) are terrestrial and aquatic features the landscape that are critical for retaining biodiversity and supporting continued ecosystem functioning and services (Anon, 2008). The primary purpose of CBA's is to inform land-use planning and the land-use guidelines attached to CBA's aim to promote sustainable development by avoiding loss or degradation of important natural habitat and landscapes in these areas and the landscape as a whole. CBA's can also be used to inform protected area expansion and development plans. The use of CBA's here follows the definition laid out in the guideline for publishing bioregional plans (Anon, 2008):

- CBAs are areas of the landscape that need to be maintained in a natural or near-natural state in order to ensure the continued existence and functioning of species and ecosystems and the delivery of ecosystem services. In other words, if these areas are not maintained in a natural or near-natural state then biodiversity conservation targets cannot be met. Maintaining an area in a natural state can include a variety of biodiversity-compatible land uses and resource uses.

- Ecological support areas (ESAs) are areas that are not essential for meeting biodiversity representation targets/thresholds but which nevertheless play an important role in supporting the ecological functioning of critical biodiversity areas and/or in delivering ecosystem services that support socio-economic development, such as water provision, flood mitigation or carbon sequestration. The degree of restriction on land use and resource use in these areas may be lower than that recommended for critical biodiversity areas.

The map of CBAs includes five categories: Protected Areas, Critical Biodiversity areas, Ecological Support Areas, Other Natural Areas and Areas with no natural habitat remaining. The biodiversity criteria used to define Critical Biodiversity Areas (CBAs) in the North West Province are listed in **Table 11** below.

The proposed Mookodi-Mahikeng 400kV Powerline route alternatives fall within CBA2, ESA1 and ESA2 (**Figure 43**).

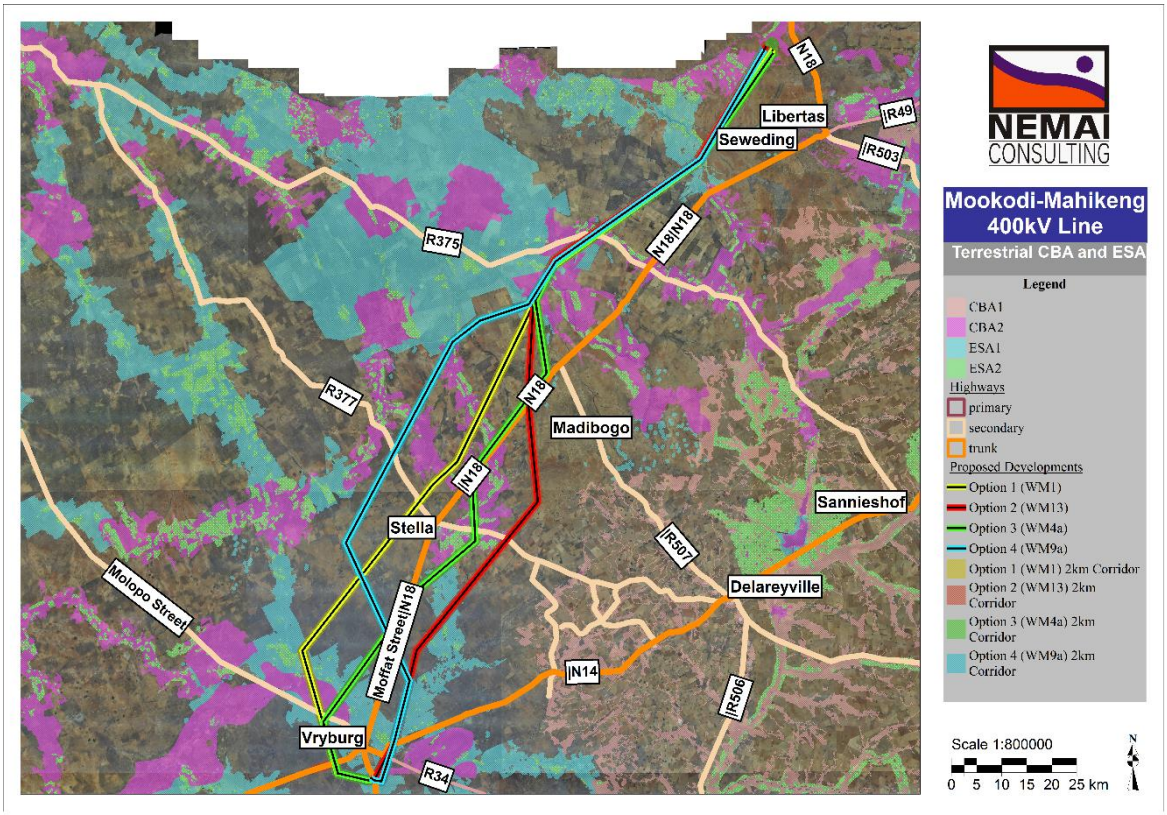


Figure 43: CBA and ESA

Table 11: Criteria used to define CBA map categories (Desmet and Schaller, 2015)

CBA MAP CATEGORY AND CRITERION NAME	DESCRIPTION OF BIODIVERSITY FEATURES USED TO DEFINE CBA MAP CATEGORY	MAP CODES
Protected Areas		
Protected Areas	Protected areas recognised in the Protected Areas Act including South African National Parks and North West Provincial Parks.	PA
Conservation Areas	Conservation areas not recognised in the Protected Areas Act (e.g. conservancies and private nature reserves or game farms where there is no legal agreement)	CA
Terrestrial Critical Biodiversity Area Level 1		
Critical Patches: Ecosystem Status –Critically Endangered Ecosystems	Remaining patches larger than 3 ha of provincially Critically Endangered ecosystems (vegetation types), i.e. the amount of vegetation remaining intact (of these ecosystems) is less than the representation/biodiversity target, therefore all remaining patches of these vegetation units are of the highest conservation priority and further impacts on natural habitat should be avoided.	CBA1
Irreplaceable Sites	Planning units with high irreplaceability values based on the provincial MARXAN analysis, i.e. areas or sites that are mandatory if biodiversity targets are to be achieved.	
Critical Biodiversity Corridors Linkages	Critical linkages in the provincial biodiversity corridor network where existing conversion of natural landscapes to other land uses has severely restricted options for maintaining connectivity in the natural landscape. Critical linkages that are not in a natural state are categorised as ESA 2	
Important Terrestrial Habitats: Expert Areas	Areas in the terrestrial environments less than 10 000 ha in extent identified by experts as being important for biodiversity conservation.	
Important Terrestrial Habitats: Kloofs	All medium to large kloofs identified as an important habitat for climate change adaptation.	
Aquatic Critical Biodiversity Areas Level 1		
FEPA Rivers	All FEPA river lines (FEPA rivers, fish sanctuary and free-flowing rivers) buffered by 100 m as identified in NFEPA and modified by DWS National River Ecostatus Monitoring Program (REMP) and experts.	CBA1
Important Habitats: Peat Wetlands	Peat wetlands as mapped by experts.	
Important Habitats: Dolomitic Eyes	Dolomitic eyes as mapped by experts.	
Terrestrial Critical Biodiversity Areas Level 2		
Critical Patches: Ecosystem Status –Endangered and Vulnerable Ecosystems	Remaining patches larger than 5 ha of provincially Endangered and Vulnerable ecosystems (vegetation types), i.e. the amount vegetation remaining intact (of these ecosystems) is less than 60%. Any further modification of these vegetation types should be limited to existing irreversibly modified or heavily degraded areas.	CBA2
Critical Patches: Endemic Vegetation Types	Remaining patches larger than10 ha of endemic vegetation types to the province. These are vegetation types whose biodiversity target can only be achieved in the NW Province.	
Important Habitats: Features	Important natural features (habitats, springs, scenic landscapes) used in the 2008 biodiversity conservation assessment (DACERD, 2009).	

CBA MAP CATEGORY AND CRITERION NAME	DESCRIPTION OF BIODIVERSITY FEATURES USED TO DEFINE CBA MAP CATEGORY	MAP CODES
Important Habitats: Focus Wildlife Areas	Areas identified as being important for maintaining species of conservation concern (free-ranging red hartebeest (*Alcelaphus buselaphus*), black-footed cat (*Felis nigripes*), vulture nesting areas, Important Bird Areas).	
Aquatic Critical Biodiversity Areas Level 2		
Modelled Wetlands	Pans, instream wetlands and riparian areas modelled from a digital terrain model.	CBA2
Terrestrial Ecological Support Areas Level 1 and Level 2		
Important Habitats: Hills and Ridges	Hills and ridges identified as sensitive habitats in the existing provincial SDF dataset. The hill and ridges layer was developed to address the special biodiversity significance of these topographic features in the province. The layer was re-developed from scratch using the GIS modelling approach used in Gauteng Province and modified for the North West.	ESA1 if natural ESA2 if not natural

12.6.4 Protected Areas

The aim of the National Environmental Management: Protected Areas Act (Act No. 57 of 2003) is to provide for the protection and conservation of ecologically viable areas representative of South Africa's biological diversity and natural seascapes. The purpose of a Protected Environment is amongst others to protect a specific ecosystem outside a special nature reserve world heritage site or nature reserve and also to ensure the use of the natural resources in the area is sustainable.

The proposed Mookodi-Mahikeng 400kV Powerline route alternatives fall near the Botsalano Game Reserve, Mafikeng Game Reserve and Barberspan Bird Sanctuary (**Figure 44**).

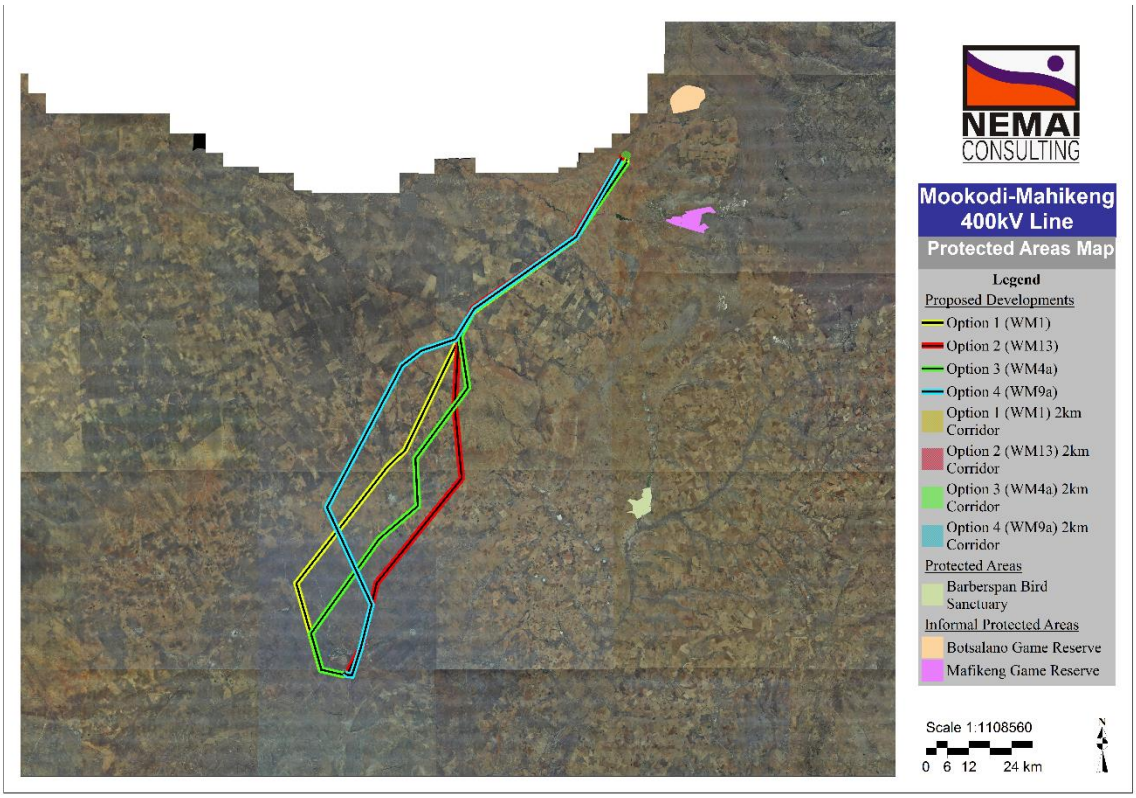


Figure 44: Protected areas

A Municipal Reserve, namely the Leon Taljaard Nature Reserve, occurs near the starting point of the powerline alternative routes (**Figures 45** to **47**).

Figure 45: Leon Taljaard Nature Reserve

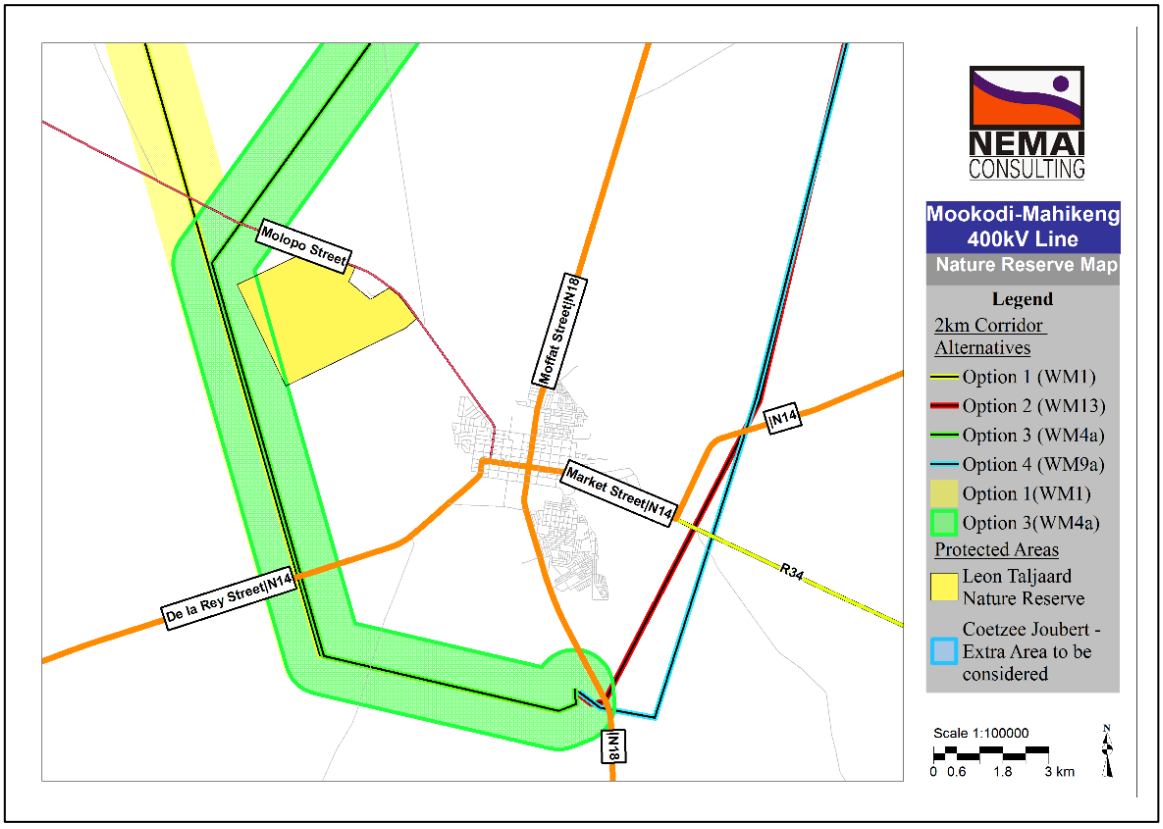


Figure 46: The Leon Taljaard Nature Reserve in relation to the proposed development

Figure 47: Game within the Leon Taljaard Nature Reserve

12.6.5 Plant Species of Conservation Concern

The proposed development is located within the following quarter degree squares in terms of the 1:20 000 grid of South Africa:

1. 2724BB
2. 2724BA
3. 2624DD
4. 2624DC
5. 2625CA
6. 2624DB
7. 2624DA
8. 2625AC
9. 2624BD
10. 2624BC
11. 2625AA
12. 2624BB
13. 2625AB
14. 2525CD
15. 2525DC
16. 2525DA
17. 2525CB

The Pretoria Computerised Information System (PRECIS) list of Red Data plants was obtained from SANBI (http://posa.sanbi.org/searchspp.php). The list was consulted to verify the record of occurrence of the plant species seen in the vicinity of the proposed development. The site sampled is also only a very small portion of all the grids and so habitats suitable for certain species in the PRECIS list may not be present at the areas sampled. A list of the threatened plant species is provided in **Table 12** below. Conservation status and definitions of each status is listed next to each species in **Table 13**.

Table 12: Red Data Plant species recorded which could potentially occur in the study area (SANBI data)

Family	Genus	Species	Common Name	Red List category
Mesembryanthemaceae	*Lithops*	*lesliei*		NT
Asteraceae	*Rennera*	*stellate*		VU
Apocynaceae	*Brachystelma*	*canum*		CR

Family	Genus	Species	Common Name	Red List category
Anacardiaceae	*Searsia*	*maricoana*		VU
Hyacinthaceae	*Drimia*	*sanguinea*	Rooislangkop	NT
Fabaceae	*Acacia*	*erioloba*		Declining

Table 13: Definitions of Red Data plant status (Raimondo et al. 1999)

Symbol	Status	Description
EN	Endangered	A taxon is Endangered when the best available evidence indicates that it meets any of the International Union for Conservation of Nature (IUCN) criteria for Endangered, and is therefore facing a very high risk of extinction in the wild.
VU	Vulnerable	A taxon is Vulnerable when the best available evidence indicates that it meets any of the five) an IUCN criterion for Vulnerable and it is therefore considered to be facing a high risk of extinction in the wild.
NT	Near Threatened	A taxon is Near Threatened when available evidence indicates that it is close to meeting any of the five IUCN criteria for Vulnerable, and is therefore likely to qualify for a threatened category in the near future.
CR	Critically Endangered	A taxon is Critically Endangered when the best available evidence indicates that it meets any of the five International Union for Conservation of Nature (IUCN) criteria for Critically Endangered and it is therefore facing an extremely high risk of extinction in the wild.
Declining		A taxon is Declining when it does not meet any of the five IUCN criteria and does not qualify for the categories Critically Endangered, Endangered, Vulnerable or Near Threatened, but there are threatening processes causing a continuing decline in the population.

12.7 Fauna

12.7.1 Mammals

According to the Animal Demography Unit (http://vmus.adu.org.za/vm_sp_list.php) there are a few sensitive species that occur in the grids mentioned in Section 12.6.1.5. A list of the sensitive mammal species found in these grid cells can be seen in **Table 14.**

Table 14: Mammal species recorded which could occur in the study area

Family	Genus	Species	Common name	Red List Category
Bovidae	*Hippotragus*	*niger*	Sable Antelope	VU
Bovidae	*Hippotragus*	*equinus*	Roan Antelope	VU
Canidae	*Lycaon*	*pictus*	African wild dog	EN
Felidae	*Acinonyx*	*jubatus*	Cheetah	VU
Hyaenidae	*Hyaena*	*brunnea*	Brown Hyena	NT
Manidae	*Smutsia*	*temminckii*	Ground Pangolin	VU

Family	Genus	Species	Common name	Red List Category
Mustelidae	*Mellivora*	*capensis*	Honey Badger	NT
Rhinolophidae	*Rhinolophus*	*denti*	Dent's Horseshoe Bat	NT
Vespertilionidae	*Miniopterus*	*schreibersii*	Schreibers's Long-fingered Bat	NT

Note: VU=Vulnerable; EN=Endangered; NT=Near Threatened; CR=Critically Endangered

12.7.2 Reptiles

According to the Reptile Atlas of Southern African (http://vmus.adu.org.za/vm_sp_list.php), no red data reptile species occur in the grids mentioned in Section 12.6.1.5.

12.7.3 Amphibians

According to the Frog Atlas of Southern African (http://vmus.adu.org.za/vm_sp_list.php), the frog species that was recorded in the grids mentioned in Section 12.6.1.5 is shown in **Table 15** below. According to Frog Atlas of Southern Africa, Giant Bull Frog is expected to be found within the site.

Table 15: Amphibian species recorded which could occur in the study area

Family	Genus	Species	Common name	Red List Category
Pyxicephalidae	*Pyxicephalus*	*adspersus*	Giant Bull Frog	NT

Note: NT=Near Threatened

12.7.4 Avifauna

Important Bird and Biodiversity Areas (IBAs) form a network of sites, at a bio-geographic scale, which are crucial for the long-term viability of naturally occurring bird populations (Barnes, 2000). Conservation and planning tools were consulted for relevancy for this project, and found that the proposed Mookodi-Mahikeng 400kV Powerline route alternatives fall near the (**Figure 48**).

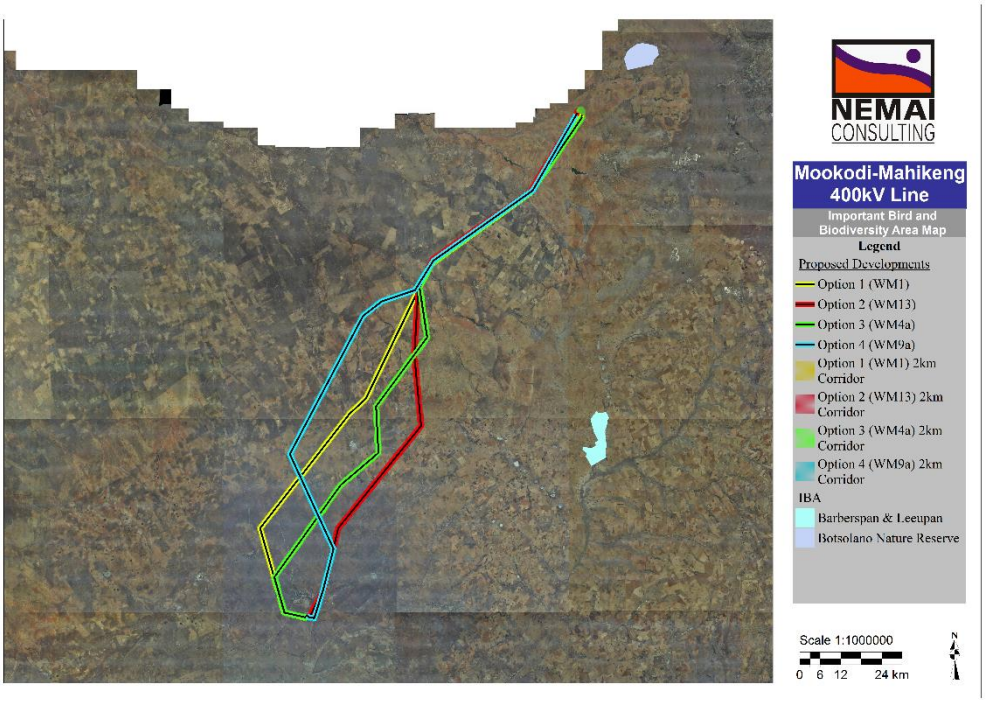


Figure 48: Important bird and biodiversity area

According to the Southern African Bird Atlas Project 2 (SANBAP 2), a list of threatened bird species occur in the grids mentioned in Section 12.6.1.5 (**Table 16**).

Table 16: List of threatened bird species which could occur in the study area

Family	Genus	Species	Common name	Red List Category
Phoenicopteridae	*Phoenicopterus*	*roseus*	Greater Flamingo	NT
Phoenicopteridae	*Phoeniconaias*	*minor*	Lesser Flamingo	NT
Sagittariidae	*Sagittarius*	*serpentarius*	Secretarybird	NT
Accipitridae	*Polemaetus*	*bellicosus*	Martial Eagle	VU
Falconidae	*Falco*	*naumanni*	Lesser Kestrel	VU
Gruidae	*Anthropoides*	*paradiseus*	Blue Crane	VU
Ciconiidae	*Ciconia*	*nigra*	Black Stork	NT
Otididae	*Ardeotis*	*kori*	Kori Bustard	VU
Ciconiidae	*Mycteria*	*ibis*	Yellow-billed Stork	NT
Accipitridae	*Gyps*	*coprotheres*	Cape Vulture (Griffon)	VU
Accipitridae	*Gyps*	*africanus*	White-backed Vulture	VU
Accipitridae	*Torgos*	*tracheliotos*	Lappet-faced Vulture	VU
Accipitridae	*Circus*	*ranivorus*	African Marsh-Harrier	VU
Falconidae	*Falco*	*biarmicus*	Lanner Falcon	NT
Alaudidae	*Mirafra*	*cheniana*	Melodious (Latakoo) Lark	NT
Alaudidae	*Certhilauda*	*chuana*	Short-clawed Lark	NT
Pelecanidae	*Pelecanus*	*rufescens*	Pink-backed Pelican	VU
Rostratulidae	*Rostratula*	*benghalensis*	Greater Painted-snipe	NT
Buphagidae	*Buphagus*	*erythrorynchus*	Red-billed Oxpecker	NT
Pelecanidae	*Pelecanus*	*onocrotalus*	Great White Pelican	NT
Accipitridae	*Aquila*	*rapax*	Tawny Eagle	VU

Note: VU=Vulnerable; NT=Near Threatened

12.8 Land Capability

Agricultural activities in the project area include game and cattle farming. As shown in **Figure 49**, the land capability is classified as marginal potential arable land and non-arable grazing, woodland or wildlife.

12.9 Land Use

The 2013-14 South African National Land-cover dataset produced by GEOTERRAIMAGE shows that the proposed Mookodi-Mahikeng 400kV Powerline route alternatives fall within various land uses such as low shrubland, grassland, low cultivated fields, woodland/open bush, cultivated pivots, low cultivated subsistence and urban residential (dense trees/bush) (**Figure 50**).

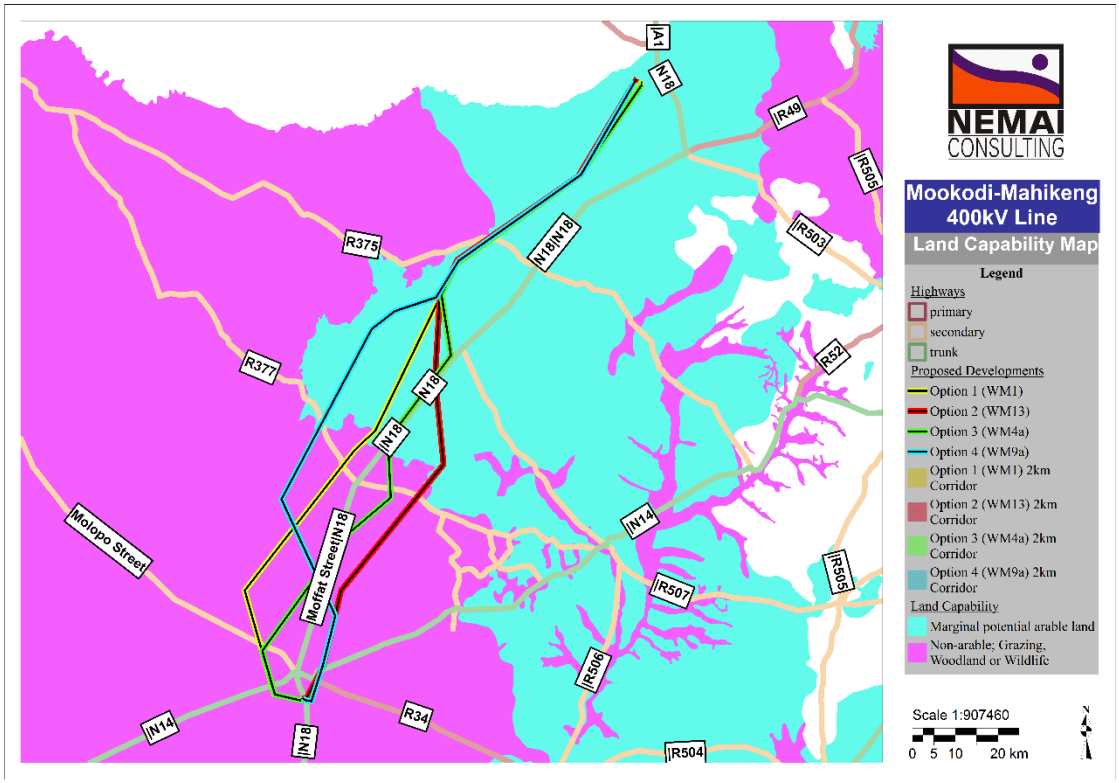


Figure 49: Land capability (Schoeman et al. 2000)

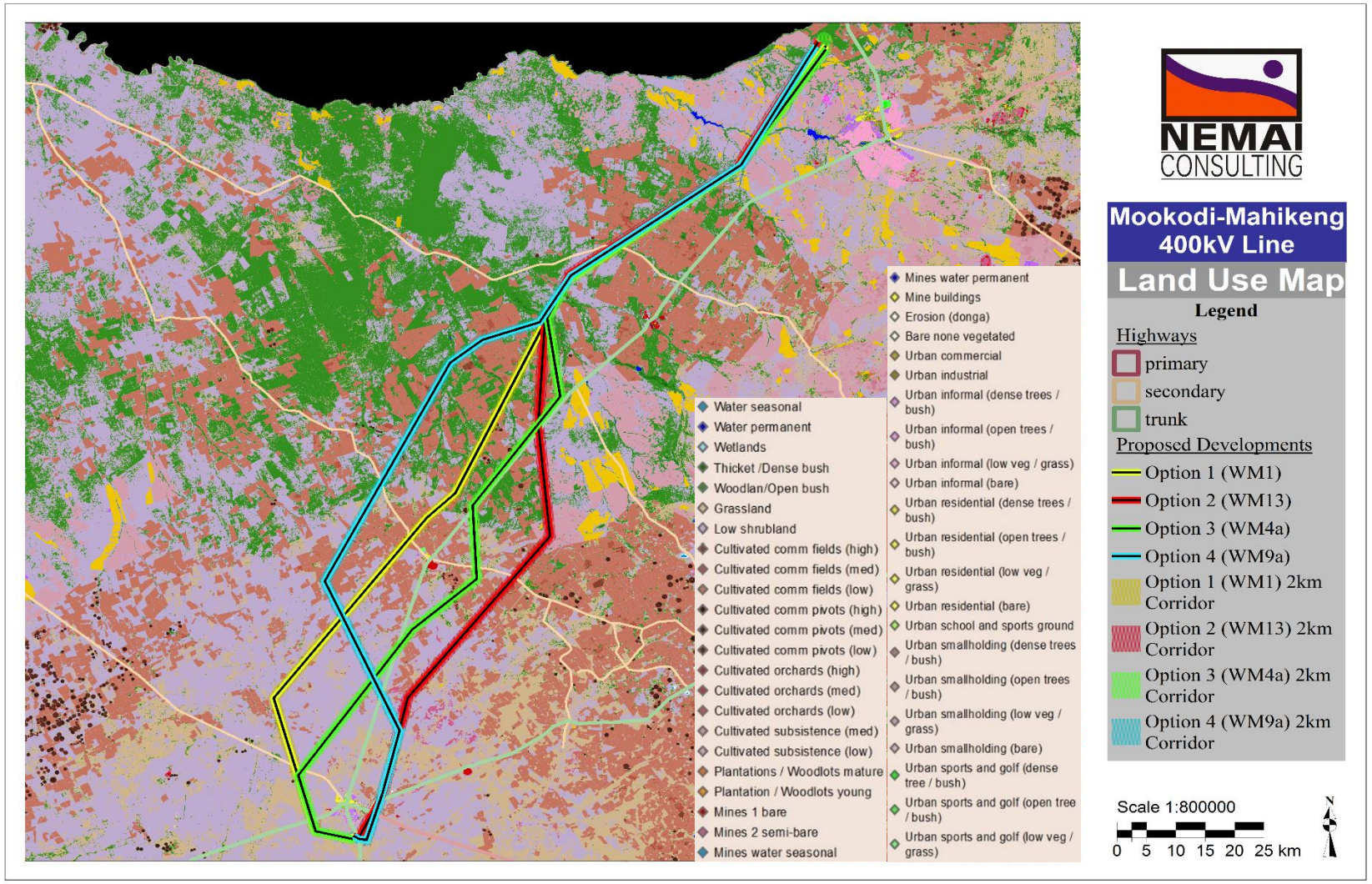


Figure 50: Land use

12.10 Heritage

Very little habitation of the central highveld area took place during Stone Age times. Tools dating to the Early Stone Age period are mostly found in the vicinity of larger watercourses, e.g. the Vaal River or the Harts River and especially in sheltered areas such as at the Taung fossil site (some 70 km south of Vryburg). During Middle Stone Age times (c. 150 000 – 30 000 BP), people became more mobile, occupying areas formerly avoided. The Middle Stone Age is a technological stage characterized by flakes and flake-blades with faceted platforms, produced from prepared cores, as distinct from the core tool-based Early Stone Age technology. Late Stone Age people had more advanced technology and therefore succeeded in occupying even more diverse habitats. Some sites are known to occur in the region. These are mostly open sites located near river and pans. The Late Stone Age people also left a rich legacy of rock art. Some of the farms known to have rock engravings are Bernauw Content (which is crossed by Options 2 and 4), Gemsbok Laagte, Klipfontein, Kinderdam, Melalarig, Schatkist, Verdwaal Vlakte (Option 1) and Wonderfontein (Van Schalkwyk, 2016).

Iron Age people started to settle in southern Africa c. AD 300, with one of the oldest known sites at Broederstroom south of Hartebeespoort Dam dating to AD 470. Having only had cereals (sorghum, millet) that need summer rainfall, Early Iron Age people did not move outside this rainfall zone, and neither did they occupy the central interior Highveld area. Due to their specific technology and economy, Iron Age people preferred to settle on the alluvial soils near rivers for agricultural purposes, but also for firewood and water (Van Schalkwyk, 2016). The occupation of the larger geographical area (including the study area) did not start much before the 1500s. By the 16th century things changed, with the climate becoming warmer and wetter, creating condition that allowed Late Iron Age farmers to occupy areas previously unsuitable, for example the treeless plains of the Free State and North West Province.

The earliest Iron Age settlers who moved into the North West Province region were Tswana-speakers such as the Tlhaping, Hurutshe, Fokeng, Kgatla and Rolong. Stone walled sites dating to the Late Iron Age and which can be linked to the Tswana occupation of the area, are found on a number of farms in the region, e.g. Waai Hoek and Brul Pan. However, the most important one, named Dithakong which is located some distance to the west of the project area. White settlers moved into the larger area during the first half of the 19th century basing their survival on cattle/sheep farming and hunting (Van Schalkwyk, 2016).

Vryburg was established as the capital of the independent Boer Republic of Stellaland in 1882, hence the name of the town. Stellaland was incorporated as a British protectorate into British Bechuanaland in 1884, which in turn became part of the Cape Colony in 1895 (Rossouw, Undated). Vryburg became an important base, during the Anglo-Boer War (1899-1902), for the resupply and refitting of British troops operating in the north-west of the then Cape Colony and western areas of the Boer Republic. Six armoured trains were assembled at Vryburg as part of the defence of railway line northwards to Mahikeng (then Mafeking) (Jones and Jones

1999). The town of Mahikeng was given the name Mahikeng by the Barolong boo Ratshidi who settled in the area during the early nineteenth century. The Barolong spelling of using an H was later changed to an F in order to comply with a more standard Setswana spelling. The name in English means “place of rocks”. In Setswana, Lefika means rock and Mafika is the plural. The ‘eng’ at the end of Mafikeng denotes place of (Vhufa Hashu Heritage Consultants, 2012). Pistorius (Pistorius, 2011) has conjectured that the town of Mahikeng may have been established on Late Iron Age stone walled sites considering the fact that the name refer to ‘the place of stone / rocks’.

During the nineteenth century the expansion of the Voortrekkers and the establishment of the Zuid Afrikanse Republic in the then Western Transvaal became a threat to Barolong boo Ratshidi autonomy. As a result, Chief Montshiwa requested British protection. On the 22 May 1884 in Mafikeng, Chief Montshiwa signed a treaty ceding his Sovereignty to the British. Soon afterwards the British government established a garrison in town and the following year, a proclamation was approved that divided Mafikeng into two sections, one for the Barolong and the other for European settlement (Vhufa Hashu Heritage Consultants, 2012). The settlers with their 140 farms established the independent Republic of Goosen with Rooigrond as capital 15km to the south-east of Mahikeng. The Republic of Goosen was disabled by a British expeditionary force in 1885 and incorporated in British Bechuanaland and a new town was laid out on a place which the Tswana’s called ‘Mahikeng’ – ‘the place of stones’ (Pistorius, 2011). During the Anglo-Boer War, 1899-1902, the town was besieged by Boer forces for 217 days from October 1899 until 17 May 1900 (Jones and Jones, 1999). One of the people trapped in Mafikeng was Solomon T Plaatjie who was one of the founders of the African National Congress (ANC) in January 1912. In 1977, the northern section of the project area was incorporated into the so-called independent homeland of Bopthutshwana. The homeland policy was put in place by the Nationalist government to give black South African’s self-government in restricted areas. The homeland policy was disbanded in 1994 and the homelands incorporated into South Africa.

12.11 Air Quality

Current air pollution sources in the region include the following:

- Agricultural activities;
- Biomass burning (veld fires);
- Domestic fuel burning;
- Vehicle tailpipe emissions;
- Vehicle entrainment of dust from paved and unpaved roads; and
- Other fugitive dust sources such as wind erosion of exposed areas.

12.12 Noise

Noise in the region emanates primarily from farming operations (e.g. use of farming equipment) and vehicles on the surrounding road network.

12.13 Visual Quality

The sense of place for proposed Mookodi-Mahikeng 400kV Powerline route alternatives can be associated with a natural and rural state consisting of game farms and cattle farms (**Figure 51**). There are some existing powerlines within the area (**Figure 52**).

Figure 51: Game farm along the N18

Figure 52: Existing powerlines along the N18

12.14 Existing Infrastructure

Several structures and infrastructure may occur within the 2km corridors for the four route alternatives such as roads, households, existing powerlines, boreholes, cattle kraals, railway lines. The Lidar Survey that will be undertaken by Eskom once a route is authorised, which will mark the exact footprint of any existing infrastructure that affect the centreline and 55m servitude.

12.15 Traffic

Noteworthy roads in the immediate study area include N18, N14, R34, R378 (also known as Molopo Street), R377, R376 and R375.

12.16 Socio-Economic

The directly affected Ward boundaries and the affected sub places within the wards for proposed Mookodi-Mahikeng 400kV Powerline route alternatives are described below (**Table 17** and **Figure 53**):

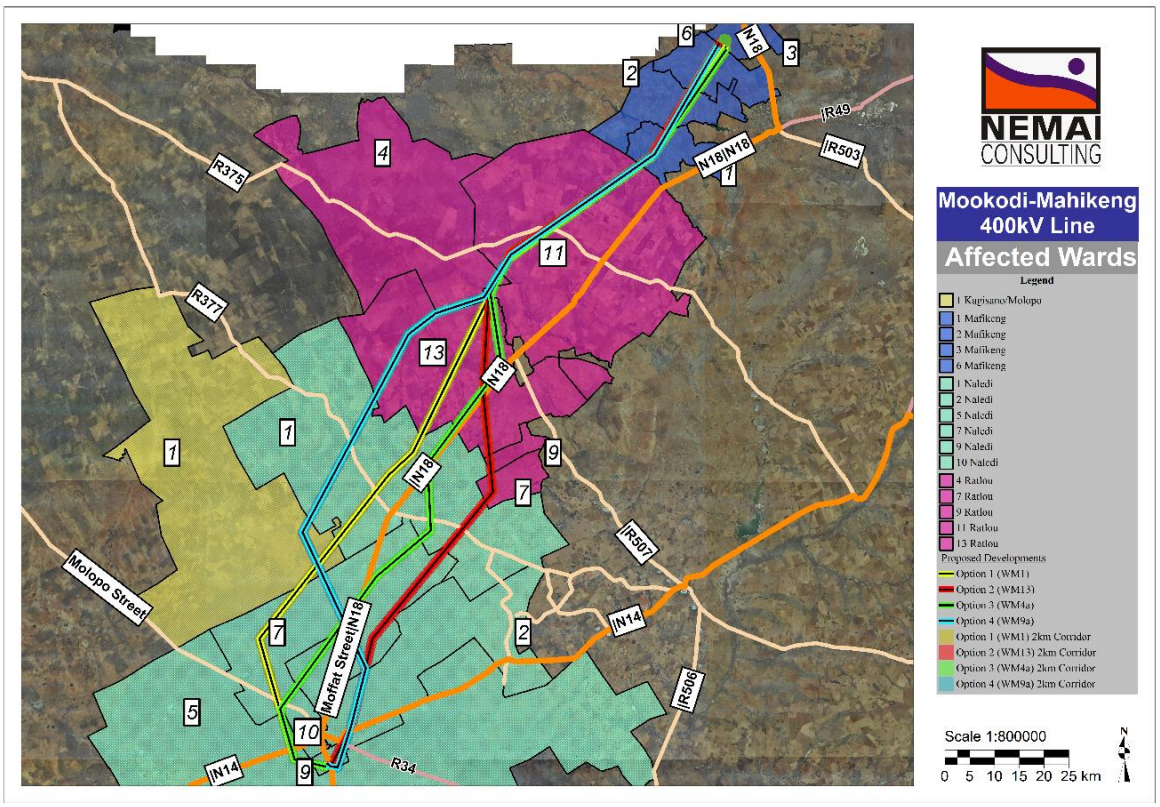


Figure 53: Wards

Table 17: Local Municipalities, Wards and Sub Places

Local Municipality	Wards	Sub Places
Naledi	1, 2, 5, 7, 9 and 10	Naledi NU
Kagisano-Molopo	1	Kagisano NU
Ratlou	4, 7, 9, 11 and 13	Ratlou NU
Mahikeng	1, 2, 3 and 6	Makgabana (Madibe) SP, Masutlhe SP, Modimola SP, Motsumorwane SP (no data available), Lekung SP, Tlapeng SP, Mogosane SP, Lokgalong SP, and Mafikeng NU

Data pertaining to the socio-economic profile of the above mentioned sub places (based on Statistics South Africa's Census 2011) is presented in the tables to follow.

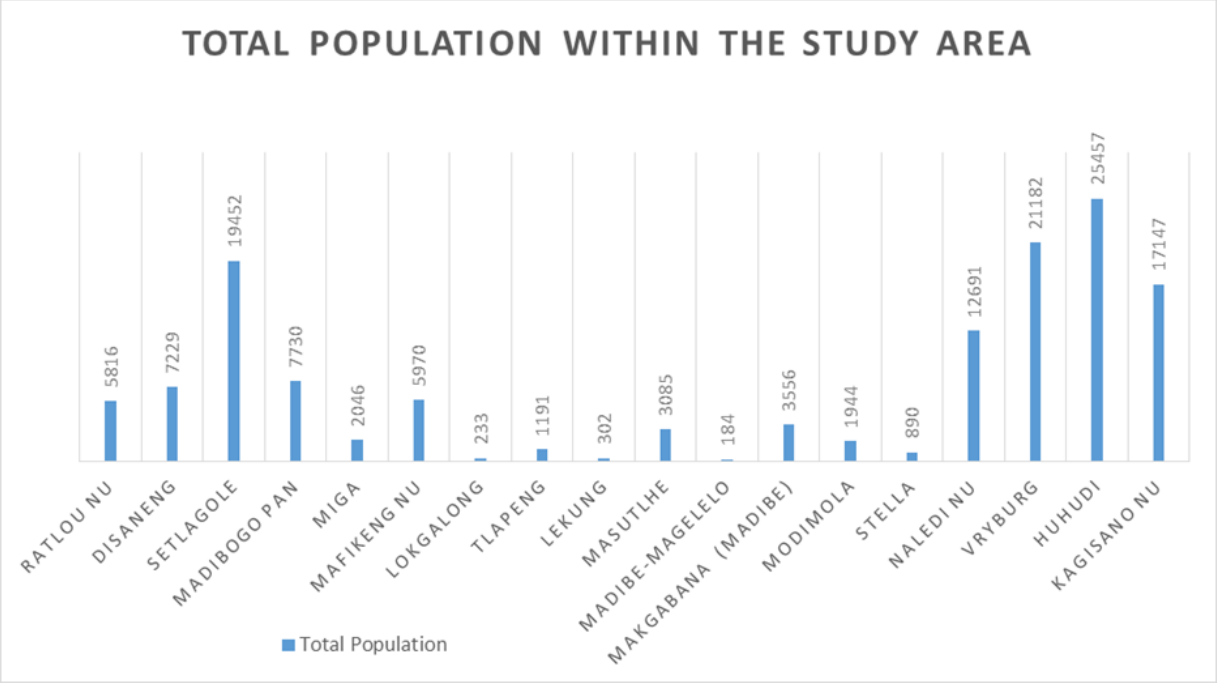


Figure 54: Population

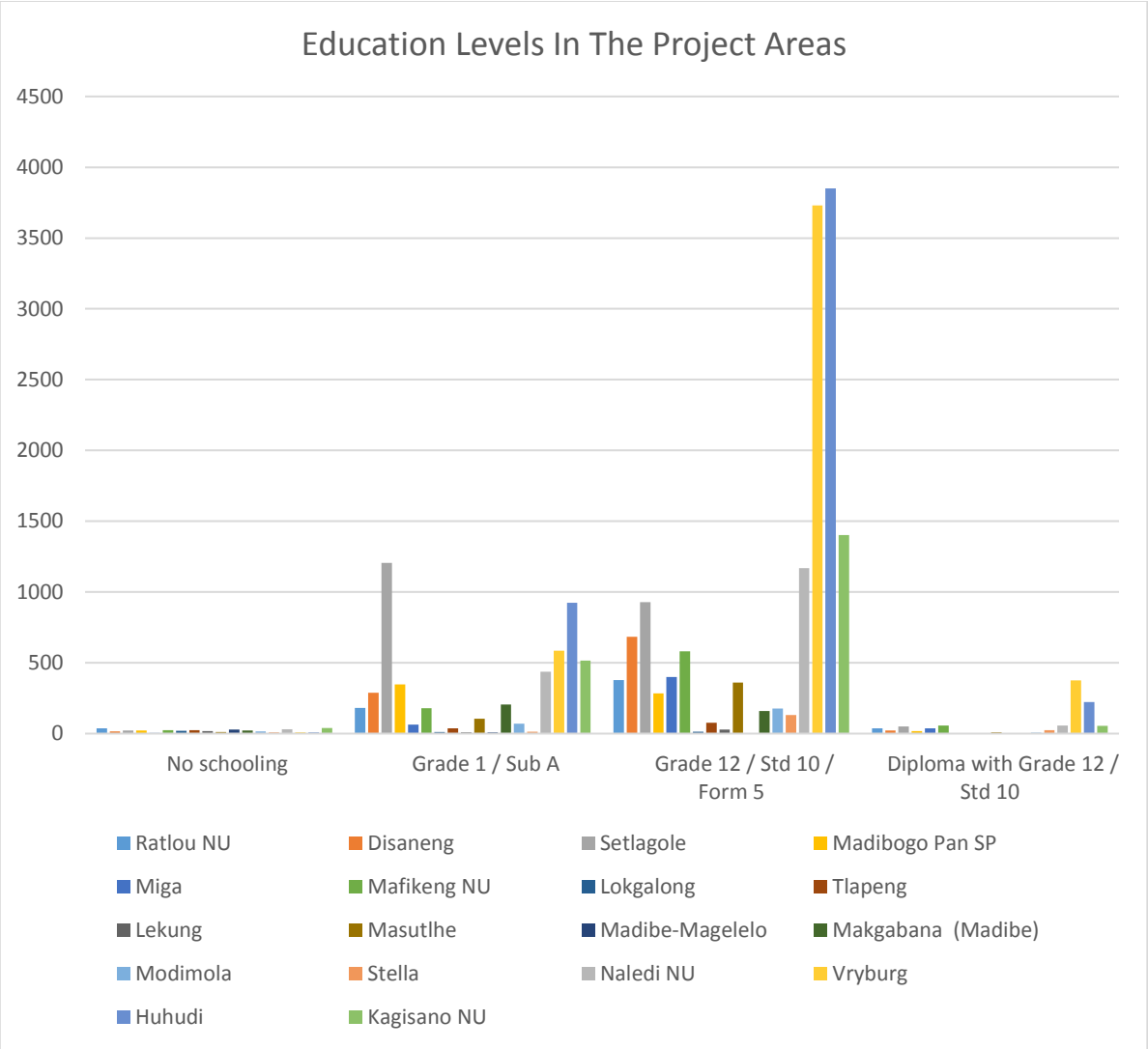


Figure 55: Education

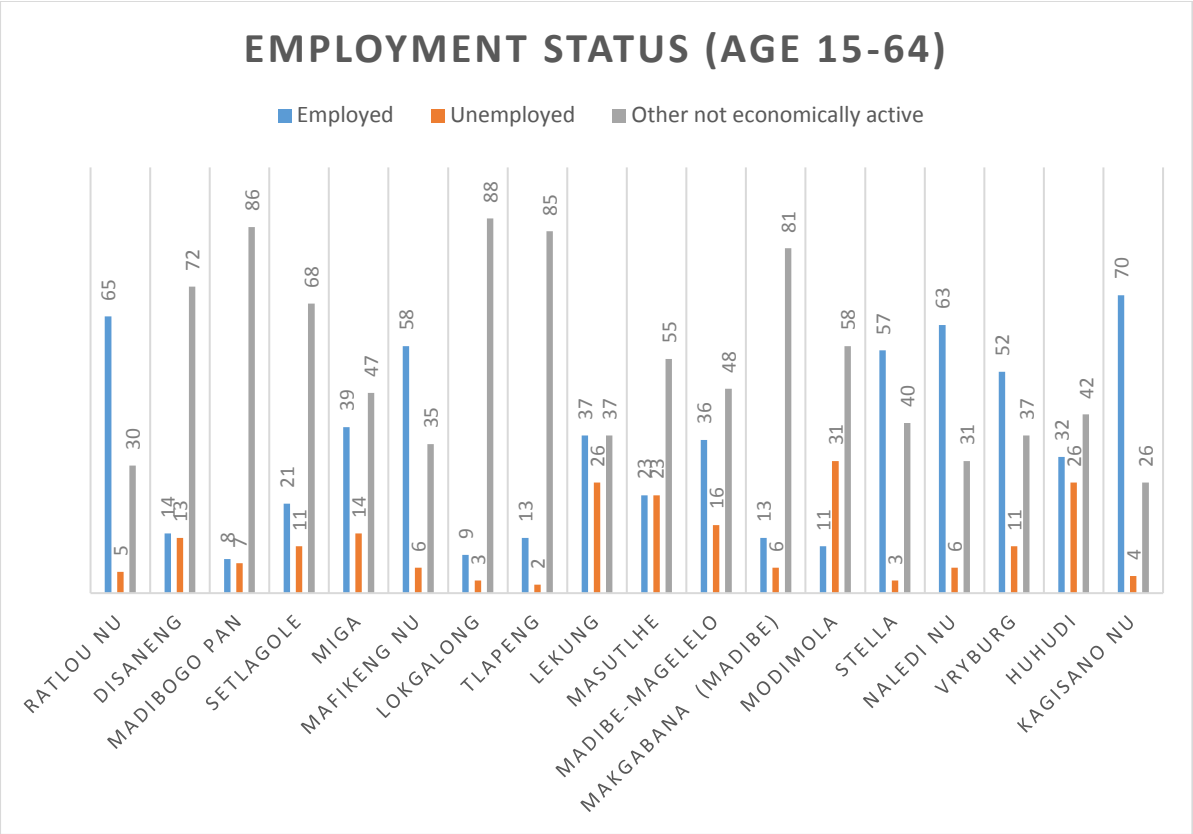


Figure 56: Employment

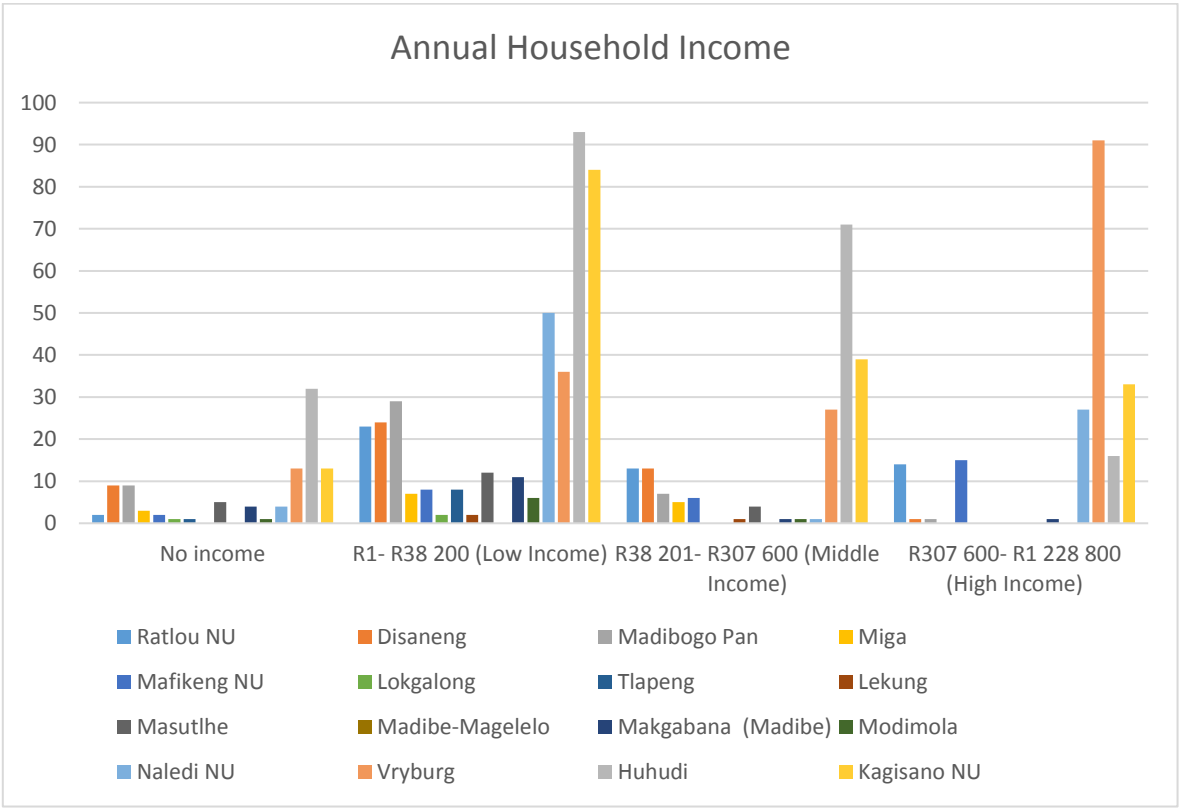


Figure 57: Annual household income

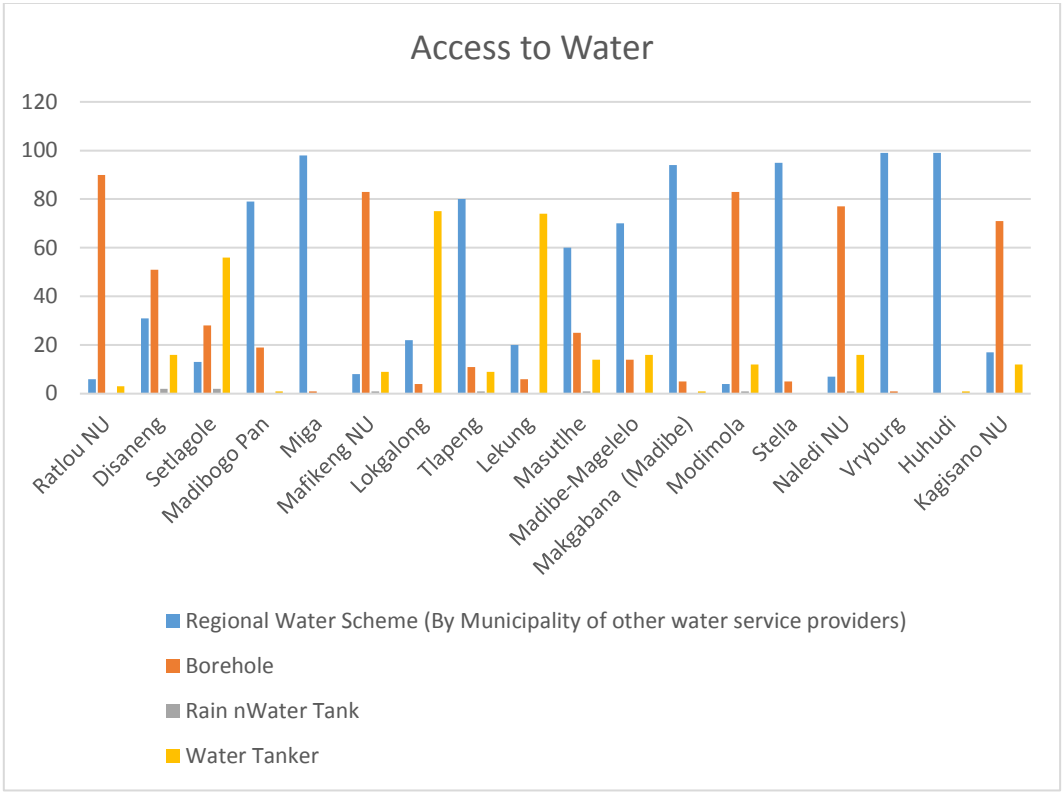


Figure 58: Access to water

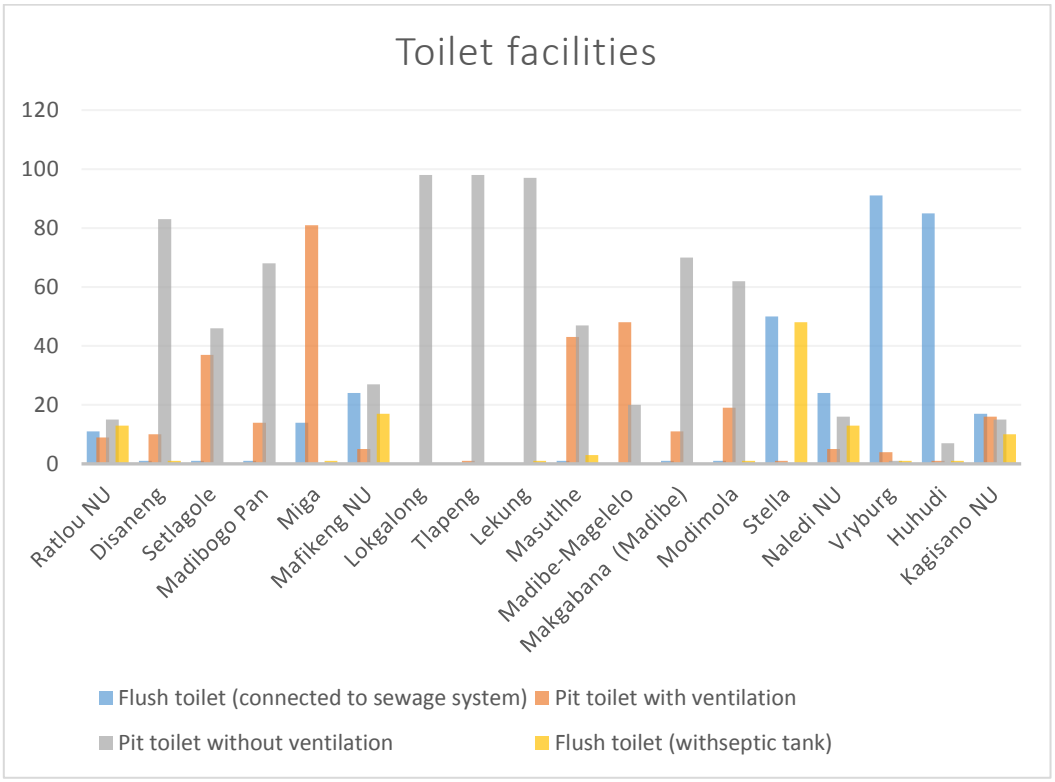


Figure 59: Access to sanitation

13 SUMMARY OF SPECIALIST STUDIES

The Plan of Study for the EIA that was approved in the Scoping Report, was to provide the Terms of Reference (ToR) for the requisite Specialist Studies. According to Münster (2005), a 'trigger' is "a particular characteristic of either the receiving environment or the proposed project which indicates that there is likely to be an issue and/or potentially significant impact associated with that proposed development that may require specialist input". The requisite specialist studies 'triggered' by the findings of the Scoping process, and the Specialist Studies, aimed at addressing the key issues and compliance with legal obligations, include:

1. Terrestrial Ecological Impact Assessment;
2. Avifaunal Impact Assessment;
3. Agricultural Impact Assessment;
4. Phase 1 Heritage Impact Assessment;
5. Desktop Palaeontological Impact Assessment;
6. Social Impact Assessment;
7. Economic Impact Assessment; and
8. Visual Impact Assessment.

All Specialist Studies conform to Appendix 6 of GN R. 982 of the 2014 EIA Regulations (as amended). The information obtained from the Specialist Studies (refer to **Appendix 6**) was incorporated into the EIA Report in the following manner:

1. A summary of each Specialist Study is contained in the sub-sections to follow, each focusing on the following:
    a. Trigger for the study;
    b. Details of the Specialist;
    c. Objectives of the study;
    d. Key findings;
    e. Preferred Route;
    f. Conclusions drawn
2. The assumptions and limitations identified in each study are included in Section 10;
3. The Impact Assessment for each Specialist Study and the identified mitigation measures were included in the overall impact assessment contained in Section 14;
4. The evaluations performed by the Specialist Studies on the route alternatives were included in the comparative analysis in Section 15 to identify the BPEO;
5. Input from the Specialists was obtained to address comments from IAPs pertaining to each Specialist discipline, refer to the CRR in **Appendix 5D**; and
6. Pertinent recommendations made by the Specialist Studies were included in the EAP Conclusions and Recommendations in Section 17.

13.1 Terrestrial Ecological Impact Assessment

This section provides a summary of the Terrestrial Ecological Impact Assessment (Nemai Consulting, 2018a), contained in **Appendix 6A**.

13.1.1 Trigger for Study

- Potential loss of significant flora and fauna species;
- Impacts to sensitive terrestrial ecological features; and
- Management actions for controlling exotic vegetation.

13.1.2 Specialist Details

Organisation	Name	Qualification	Years Experience	Affiliation
Nemai Consulting	Mr. Avhafarei Phamphe	MSc – Botany	10	Pri.Sci.Nat (400349/12); Professional Member of South African Institute of Ecologists and Environmental Scientists; and Professional Member: South African Association of Botanists.

13.1.3 Objectives of the Study

- To apply relevant literature to determine the diversity and eco-status of the plants, mammals, reptiles and amphibians along the proposed route alternatives;
- To carry out field surveys to gain an understanding of the diversity and eco-status of taxa which inhabit the study area, as well as the presence of unique habitats that might require further investigation or protection;
- To assess the current habitat and conservation status of plant and animal species along the study area;
- To comment on ecological sensitive species/areas;
- To assess the possible impact of the proposed project on these taxa and/or habitats;
- To list the species on site and to recommend necessary actions in case of occurrence of endangered, vulnerable or rare species or any species of conservation importance; and
- To provide management recommendations to mitigate negative and enhance positive impacts along the proposed route alternatives.

13.1.4 Findings of the Study

The proposed Mookodi-Mahikeng 400kV Powerline route alternatives fall within the Savanna biome. However, a very small section of Alternative Route Option 2 (WM13) also falls within the Grassland biome. In terms of threatened terrestrial ecosystems, the proposed powerline route alternatives fall within the Mafikeng Bushveld (Vulnerable), with a very small section of Alternative Route Option 2 (WM13) falling within the Western Highveld Sandy Grassland (Critically Endangered). The proposed Mookodi-Mahikeng 400kV Powerline route alternatives

fall within CBA2, ESA1 and ESA2. No CBA1 regions occur along the proposed route alternatives. Small sections of the corridor (± 3km in length) of Option 1 (WM1) and Option 3 (WM4a) fall within a Municipal Reserve, namely the Leon Taljaard Nature Reserve. The proposed Option 4 traverses the Makgoro Game Ranch.

Results – Flora:

During the field survey, no threatened plant species were observed along the proposed route alternatives; however, two (2) species of conservation concern (Orange Listed Plants) (listed as Declining) were found, namely *Vachellia erioloba* (= *Acacia erioloba*) (known as Camel Thorn) and *Boophane disticha* (known as Century Plant). These plant species were recorded along the four alternative routes. *Vachellia* (Acacia) *erioloba* (Camel Thorn), which is listed as a protected tree in terms of the National Forests Act (Act No. 84 of 1998), were recorded in abundance along the four route alternatives.

Results – Fauna:

Historically, the study area could have provided habitat for a diverse population of larger mammal species, but the agricultural activities and human settlements, associated with hunting activities, have transformed the majority of the habitats and due to these anthropogenic disturbances, it is likely that only the more common and smaller mammal species will be observed, which show more adaptation. However, remnants of natural vegetation still exist and these remnants areas are suitable for survival of the mammals species recorded along the routes. The agricultural fields were largely devoid of mammal species; however Meerkat dens were present on the edges of agricultural fields. Domestic animals such as cattle, sheep, donkeys and horses were noted in abundance along the routes. The riparian vegetation and natural grasslands between agricultural fields are utilised significantly as a movement and linkage corridor within the study area. These areas also provide ideal foraging and breeding habitat for a number of mammal species. Grassland habitats are utilised by a range of faunal species, particularly if there is some form of topographical change within the grassland. Although the grassland along the routes is disturbed as a result of overgrazing and human settlements, it may still supply habitat for small mammals and reptile species. Mammal species such as Gemsbok, Springbok, Blesbok, Sable, Greater Kudu, Blue Wildebeest, Nyala, Common Warthog, Common Eland, Red Hartebeest, Waterbuck, Impala, Common Tsessebe, Burchell's Zebra, African Buffalo, White Rhinoceros and a Camel were either recorded in the Leon Taljaard Nature Reserve, Makgoro Game Ranch or Boereplaas Holiday Resort Resort.

A separate Avifauna Study has been undertaken to assess the impact of the proposed powerline development on avifauna.

The reptile assessment indicated that the rocky habitats, grasslands and riparian vegetation along the proposed route alternatives are of high importance to reptiles. Reptiles are exceptionally hard to detect during field surveys. Riverine habitats are traditionally rich in reptile diversity and concentrations due to the habitat supporting a high number of prey species, such as frogs, birds and small mammals. The majority of reptile species are sensitive

to severe habitat alteration and fragmentation. Species are also very often “expelled” into riparian zones due to transformation of lands for anthropogenic disturbances such as human settlements and agricultural purposes. Termite mounds were present in abundance along the proposed development site. Old termite mounds offer important refuges especially during veld fires as well as cold winter months for numerous frog, lizard, snake and smaller mammal species. A large number of species of mammals, birds, reptiles and amphibians feed on the emerging alates (winged termites). No termite mounds were destroyed during the brief field survey. All overturned rock material was carefully replaced in its original position.

During the field surveys, no Red Data reptile species were noted. The main potential impact of the proposed powerline development on reptile species is probable to be habitat loss or degradation. Nevertheless, in the long-term, effects on reptile species are probable to be comparatively low as the extent of habitat loss would be low and the majority of the powerline servitude would still be available for use by most reptile species. Habitat destruction should be limited to the absolute minimum throughout the survey area. According to the information obtained from one of the farm owners, species such as Black Mamba (*Dendroaspis polylepis*) are known to occur along the proposed route alternatives, however, according to the distribution range of this species, no such species has been recorded in or around the region.

According to the Frog Atlas of Southern African, the only species of conservation concern which could potentially be found in the study area was the Giant Bullfrog (*Pyxicephalus adspersus*), listed as Near Threatened. The Giant Bullfrog has been chosen as a flagship species for the grassland eco-region. Some sections of the proposed route alternatives offer suitable habitat for Giant Bullfrog to occur in the study area. The conservation of this species and of amphibians in general will be met by the protected area network as well as the designation of priority habitats i.e., pans or quaternary catchments, with associated restrictions on land use.

Refer to **Figure 60** below for the Terrestrial Ecological sensitivity map.

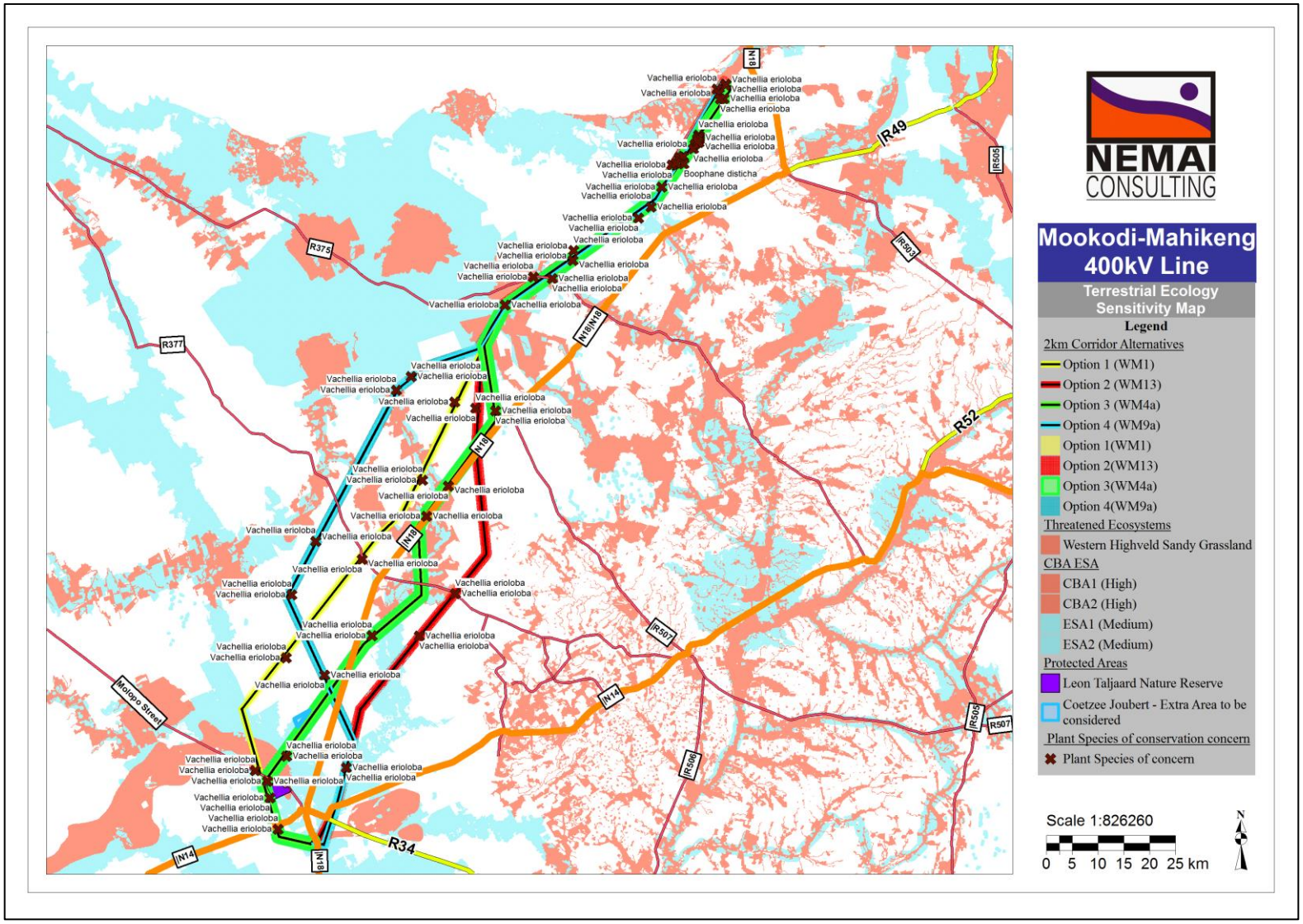


Figure 60: Terrestrial ecological sensitivity map

13.1.5 Preferred Route

Based on the terrestrial ecological sensitivity map and analysis, the four proposed route alternatives were compared to identify the route with the least impacts from a terrestrial ecological point of view. All four proposed route alternatives traverse similar habitat units, however almost 2km of the Option 2 (WM13) corridor traverses the Critically Endangered terrestrial threatened ecosystem, the Western Highveld Sandy Grassland. Option 2 (WM13), however, traverses degraded portions of threatened ecosystem habitats and is the alternative with the shortest length (175km) which would lead to less clearing of CBA regions (about 4884Ha).

Even though Option 3 is the alternative that runs along the N18 for a longer distance (approximately 28km), large sections of the CBA 2 areas will be affected (about 7823 Ha). Almost 3km of this corridor traverses sections of the Leon Taljaard Nature Reserve near Vryburg. However, the position of the final servitude can be amended to avoid the Nature Reserve. Like Option 3, the corridor of Option 1 also traverses sections of the Nature Reserve for about 3km, but more natural areas depicted as CBA 2 will be affected. Option 4 traverses the Makgoro Game Ranch, which is home to mammal species such as Buffalos and also traverses more natural areas depicted as CBA 2.

Options	CBA 2 (ha)
Option 1 (WM1)	6343
Option 2 (WM13)	4884
Option 3 (WM4a)	7823
Option 4 (WM9a)	5069

13.1.6 Conclusions and Recommendations

All four route alternatives incorporate habitat units that would support a variety of both faunal and floral species to a greater or lesser extent and the impacts on biodiversity and habitat conservation can be successfully mitigated with the sincere efforts of the contractor and construction team. Areas exhibiting dense natural vegetation can be avoided/ spanned in order to reduce vegetation loss and also river systems must be spanned and no towers should be placed within the buffer zones dictated by the surface water studies. Powerlines do not result in large-scale clearing and suitable mitigation measures can be implemented to reduce the identified impacts.

It is therefore recommended that a walk-down survey of the approved route alternative be undertaken prior to the start of the construction activities in order to survey the area in detail for any Red Data Listed species and also to develop a comprehensive and site-specific EMPr so as to limit the impacts imposed by the proposed development activities at each tower site and tower locations can then be adjusted accordingly. The walk-down survey should

preferably be undertaken during the summer season in order to have a higher probability of detecting species of special concern. This is relevant in the areas that have been labelled as ecologically sensitive. In order to conserve the faunal species community structures within the region, habitat destruction should be limited to an absolute minimum as intact habitat would result in higher faunal and floral species diversity. It is therefore critical that operations are limited to the required footprint only. It is recommended that the larger exotic species that are not included in the Category 1b list of invasive species could also be allowed to remain for aesthetic purposes.

After the conclusion of this Terrestrial Ecological Assessment, it is the opinion of the ecologist that the proposed development be considered favourably provided that the sensitivity map be considered during the planning and construction phases of the proposed development activities to aid in the conservation of ecology within the study area. Once the proposed development has been constructed, the rehabilitation process needs to take place and should ensure that alien plant emergence and erosion do not occur.

13.2 Avifaunal Impact Assessment

This section provides a summary of the Avifaunal Impact Assessment (Enviross, 2018), contained in **Appendix 6B**.

13.2.1 Trigger for Study

- Impacts to avifauna associated with the powerline; and
- Possible occurrence of sensitive avifauna species in project area.

13.2.2 Specialist Details

Organisation	Name	Qualification	Years Experience	Affiliation
Enviross CC	Mr. Mathew Ross	PhD – Aquatic Health	15	Pri.Sci.Nat (400061/09)

13.2.3 Objectives of the Study

The aim of the survey was to ascertain the ecological state of the avifaunal communities within the region associated with the survey area, to evaluate the state of the habitat features and potential dependent avifaunal species that could be impacted by the proposed development activities. Once the habitat features and potential avifaunal species community structures have been ascertained, the significance of the potential impacts emanating from a development of this nature within the areas proposed could be determined.

13.2.4 Findings of the Study

The survey area was found to suffer varying degrees of ecological transformation and degradation through current and historical land use practices, with agriculture being the main regional land use. Cultivated land is common for irrigated and dryland crops, but cattle farming

also forms a major component of the agricultural sector. Much of the woodlands have been cleared and transformed to open grasslands (either cultivated or naturalised), which adds a further component to the habitat availability to avifauna. Large indigenous trees are commonplace throughout the survey area as well. Primary vegetation features have been retained within areas utilised for game farming. Avifaunal diversity was therefore expected to be relatively high.

Red Data Listed (RDL) avifaunal species were noted during the field survey (numerous sightings of Whitebacked vultures (*Gyps africanus*), which is listed as a critically endangered species. Habitat throughout much of the survey area is suitable for supporting this species, and further RDL avifaunal species as well. Migratory corridors have been identified and it is recommended that mitigation measures to make the lines more visible to birds be implemented within these areas. The migrations that are applicable to the proposed development are those cyclic movements that are undertaken cyclically on a daily (or longer) period of time for foraging/hunting and roosting. Various features are utilised for navigation purposes, which include rivers, prominent linear ridges, and linear infrastructure such as roads. Birds will fly between foraging grounds and roosting areas and between habitat units such as wetlands on a daily basis. **Figures 61** to **63** show the main migratory routes and how they associate with the various line alternatives within the northern, central and southern region of the survey area.

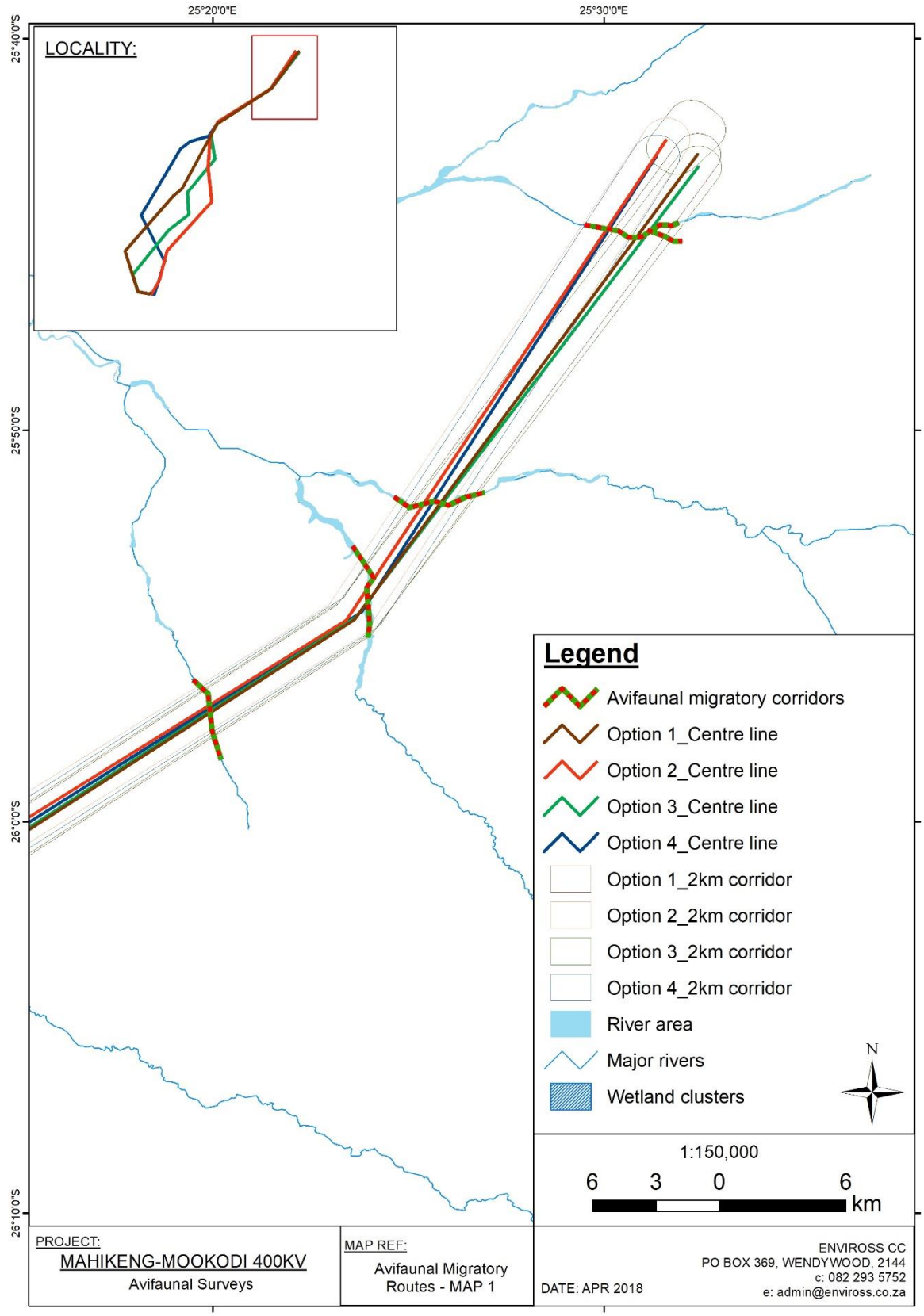


Figure 61: The main migratory routes and how they associate with the various line alternatives within the northern region of the survey area

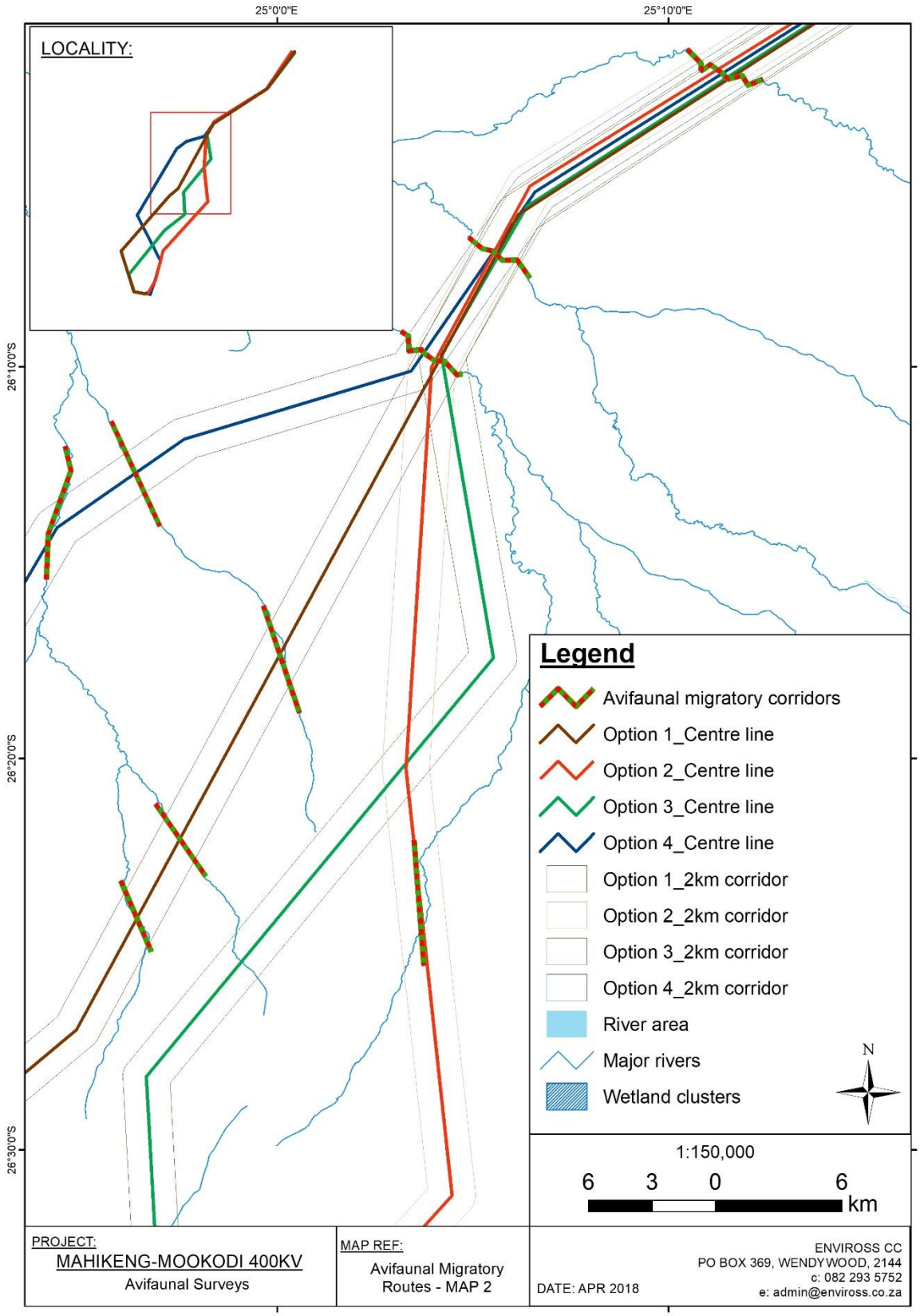


Figure 62: The main migratory routes and how they associate with the various line alternatives within the central region of the survey area

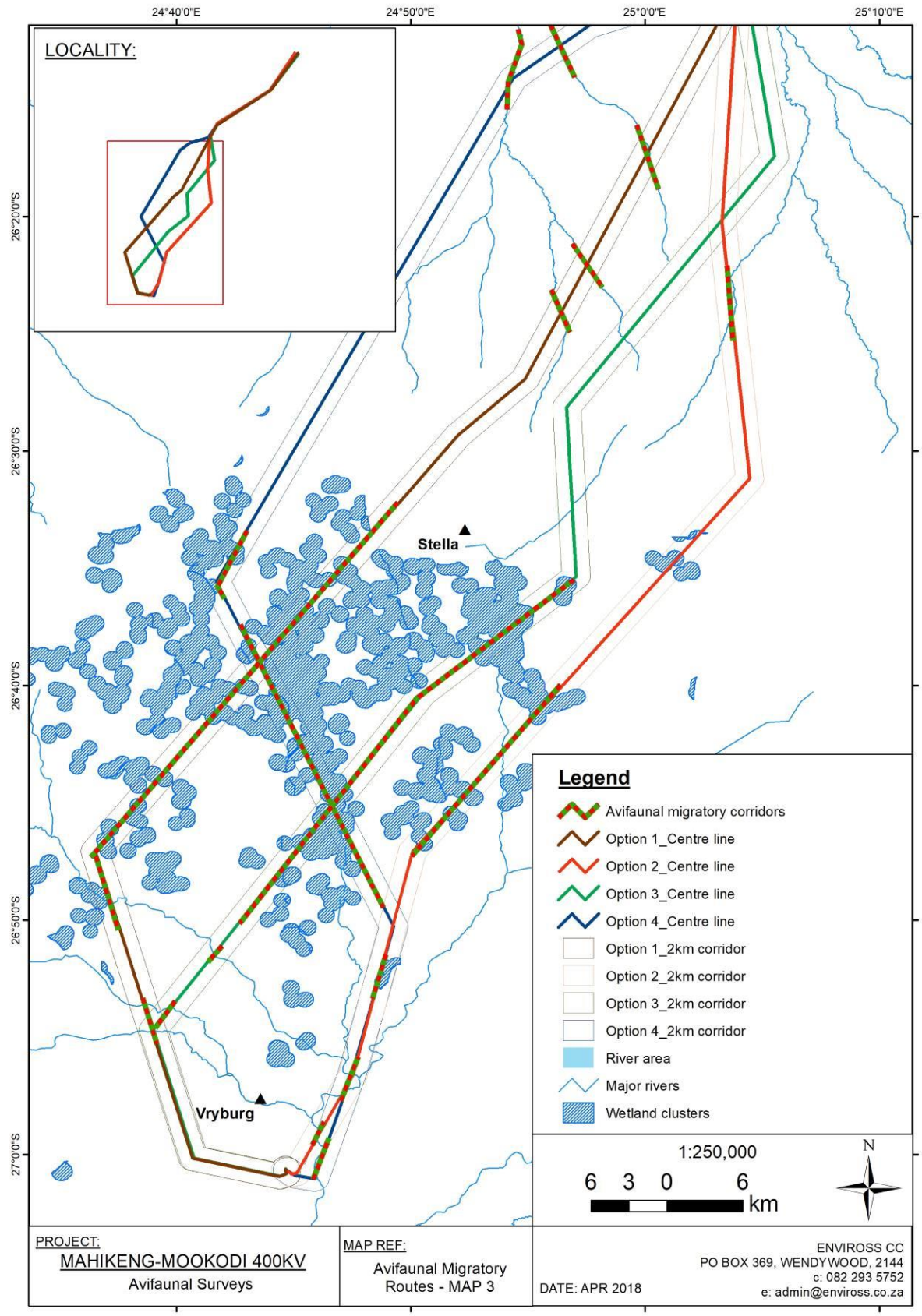


Figure 63: The main migratory routes and how they associate with the various line alternatives within the southern region of the survey area

13.2.5 Preferred Route

The preferred alignment alternative from an avifaunal ecological perspective was noted to be Option 2. The next preferred alternative is Option 3. The impact significance ratings showed that no fatally flawed aspects were noted and that all impacts can be mitigated to lower their significance.

The various ecological processes associated with the proposed alignment routes were all considered in calculating an overall impact score for each line. These included habitat units, condition of habitat, association with ecologically sensitive habitat features that are considered important to avifaunal conservation within the region, association with existing linear infrastructure and the overall areas that would require specific mitigation to abate negative impacts to avifaunal species were all aspects considered when alignment alternatives were assessed.

Each aspect has been provided an impact score out of 10. A further factor has been added by multiplying the impact rating by the perceived success rate of the mitigation measures that have been outlined within Section 10. A high perceived success of mitigation is designated a factor of 0.3; a medium perceived success a factor of 0.6 and a low perceived success rate of mitigation, a factor of 1.0. The designated value is provided within brackets after the impact score for each element. This scoring is outlined below.

Alignment	Habitat impacts				Loss of large trees	Existing infrastructure association*	Overall rating
	Wetlands	Watercourses	Woodlands	Grasslands			
Option 1	6 (0.6)	6 (0.3)	4 (0.3)	3 (0.3)	4 (0.6)	5 (0.6)	12.9
Option 2	4 (0.3)	4 (0.3)	4 (0.3)	3 (0.3)	4 (0.6)	4 (0.3)	8.1
Option 3	6 (0.6)	4 (0.3)	4 (0.3)	3 (0.3)	4 (0.6)	5 (0.6)	12.3
Option 4	6 (0.6)	6 (0.3)	4 (0.3)	3 (0.3)	4 (0.6)	5 (0.6)	12.9

The overall rating is provided for each alignment option, with the lowest scoring being the highest ranking (i.e. the preferred option). From the ratings provided, it can be seen that the overall impacts pertaining to the proposed development activities are considered to be of a medium rating. From these scores and ratings, it can be seen that alignment option 2 is regarded as the preferred option. This option has the least association with wetland cluster areas, the lowest rate of crossings of major watercourses and also has an association with an existing overhead powerline for short distance (the remaining options do not have any association with existing overhead aerial infrastructure. The remaining factors that were considered were all rated similarly for the various options and therefore were not considered to be deciding factors.

It can be seen that alignment Option 2 was rated as the overall lowest impact, with an overall impact rating of 8.1, followed by Option 3 with a calculated rating of 12.3. Options 1 and 4 showed the greatest impact ratings and therefore are the least preferred alternatives.

13.2.6 Conclusions and Recommendations

The following final conclusions were drawn following an avifaunal survey of the areas that would be impacted by the proposed Mahikeng-Mookodi 400 kV overhead powerline:

- Impact ratings are generally regarded as being within a medium category. This is largely due to the construction of a powerline within an area where limited powerline infrastructure exists. No fatally flawed or high impact features were identified during the survey following the implementation of mitigation measures;
- Development at the substation sites will have limited significance to the avifaunal communities within the area as these sites are generally suffering habitat transformation from existing land uses;
- It is felt that the impacts associated with the proposed development activities can be successfully mitigated to within acceptable limits;
- The preferred alignment alternative is Option 2;
- Migratory corridors have been identified and it is recommended that mitigation measures to make the lines more visible to birds be implemented within these areas;
- Ongoing monitoring should be undertaken during the operations phase of the development to identify further problem areas and mitigation measures implemented if found to be necessary;
- Habitat units that are considered to be particularly important to avifaunal conservation such as watercourses, riparian zones and wetlands should be impacted as little as possible;
- As much of the natural vegetation, including larger trees within servitude areas should be allowed to remain as practically possible. Only larger trees that pose a direct risk to the overhead lines should be removed;
- A walk down survey of the chosen alignment option must be undertaken to identify nests and/or important roosting areas to manage these aspects appropriately;
- Indiscriminate habitat destruction must not be allowed to take place within areas outside of the construction footprint areas. Any destruction of habitat that has occurred that is not part of the ultimate footprint of the infrastructure must be rehabilitated.

It should be noted that, in order to conserve the ecological features within the region, a holistic conservation approach should be adopted. This includes keeping general habitat destruction to an absolute minimum. Conserving the habitat units will ultimately conserve the species communities that depend on it for survival. This can only be achieved by the efforts of the contractor during the various processes of the construction phase.

13.3 Phase 1 Heritage Impact Assessment

This section provides a summary of the Heritage Impact Assessment (JLB Consulting, 2018), contained in **Appendix 6C**.

13.3.1 Trigger for Study

- Due to the size of the development for the powerline, a Phase 1 Heritage Impact Assessment is required; and
- Potential occurrence of heritage resources, graves and structures older than 60 years within project footprint.

13.3.2 Specialist Details

Organisation	Name	Qualification	Years Experience	Affiliation
JLB Consulting	Ms. Jean Beater	MA (Heritage Studies) MSc (Environmental Management)	15	Member of Association of South African Professional Archaeologists (No. 349) Member of IAIAsa (No. 1538)

13.3.3 Objectives of the Study

- Undertake a HIA in accordance with the NHRA (Act No. 25 of 1999);
- Identify and map all heritage resources in the project area as defined in Section 2 of the NHRA, including archaeological and palaeontological sites on or close (within 100m) of the proposed developments;
- Undertake a desktop palaeontological assessment (evaluate site in terms of SAHRIS);
- The assessment of the significance of such resources in terms of the heritage assessment criteria as set out in the regulations;
- Assessment of the impact of development on such heritage resources;
- An evaluation of the impact of the development on heritage resources relative to the sustainable social and economic benefits to be derived from the development;
- Prepare a heritage sensitivity map (GIS-based), based on the findings of the study;
- Prepare a desktop palaeontological sensitivity map and recommend if a palaeontological study is required;
- Identify heritage resources to be monitored;
- Comply with specific requirements and guidelines of North-West Provincial Heritage Resources Agency (NWPHRA); and
- Submit the HIA to NWPHRA and the SA Heritage Resources Agency (SAHRA) (as requested by the NWPHRA).

13.3.4 Findings of the Study

The termination point for the proposed powerline (including the future site for the Mahikeng substation) was inspected on foot. The landscape was largely undisturbed and the area was covered with a thick layer of grass interspersed with pockets of shrubs. Several fence posts

were observed indicating that the area is being used for the grazing of animals. A rudimentary gravel road provides access to the future substation site. The inspection revealed no visible heritage resources.

A foot survey was undertaken for the area south of the termination point of the proposed powerline routes, through several villages including Moletsamongwe and Phadima. There were a number of settlements in the area as well as undeveloped tracts of land where goat and cattle farming takes place with some subsistence farming occurring near dwellings. Residential structures encountered were fairly recently built. The remains of a several structures were also observed in this area.

Throughout the communal land area, many informal cemeteries were found. Some were small in size but several were very large with one cemetery containing around 100 graves. Many of the graves have legible headstones; however, there were many graves made from mounds of calcite and/or rocks that are unmarked (without headstones). Some of the graves are very recent but many are older than 60 years therefore protected by section 36 of the NHRA.

Several buildings that are older than 60 years were found along the route options. These buildings are protected by section 34 (1) of the NHRA and must therefore not be impacted by the proposed powerline.

The powerline options that pass on the eastern side of Vryburg (Option 2 and 4) will cross an undisturbed rocky outcrop situated just off the R34 road. Rocky outcrops are often archaeological sensitive and should, accordingly, be treated with care and avoided where possible by the powerline. Several pans and borrow pits (quarries) were observed along the powerline route options. These sites can contain archaeological material. However, most of the pans and borrow pits were full of water from recent rains as well as thickly vegetated making archaeological material difficult to detect.

Refer to **Figure 64** below for the Heritage sensitivity map.

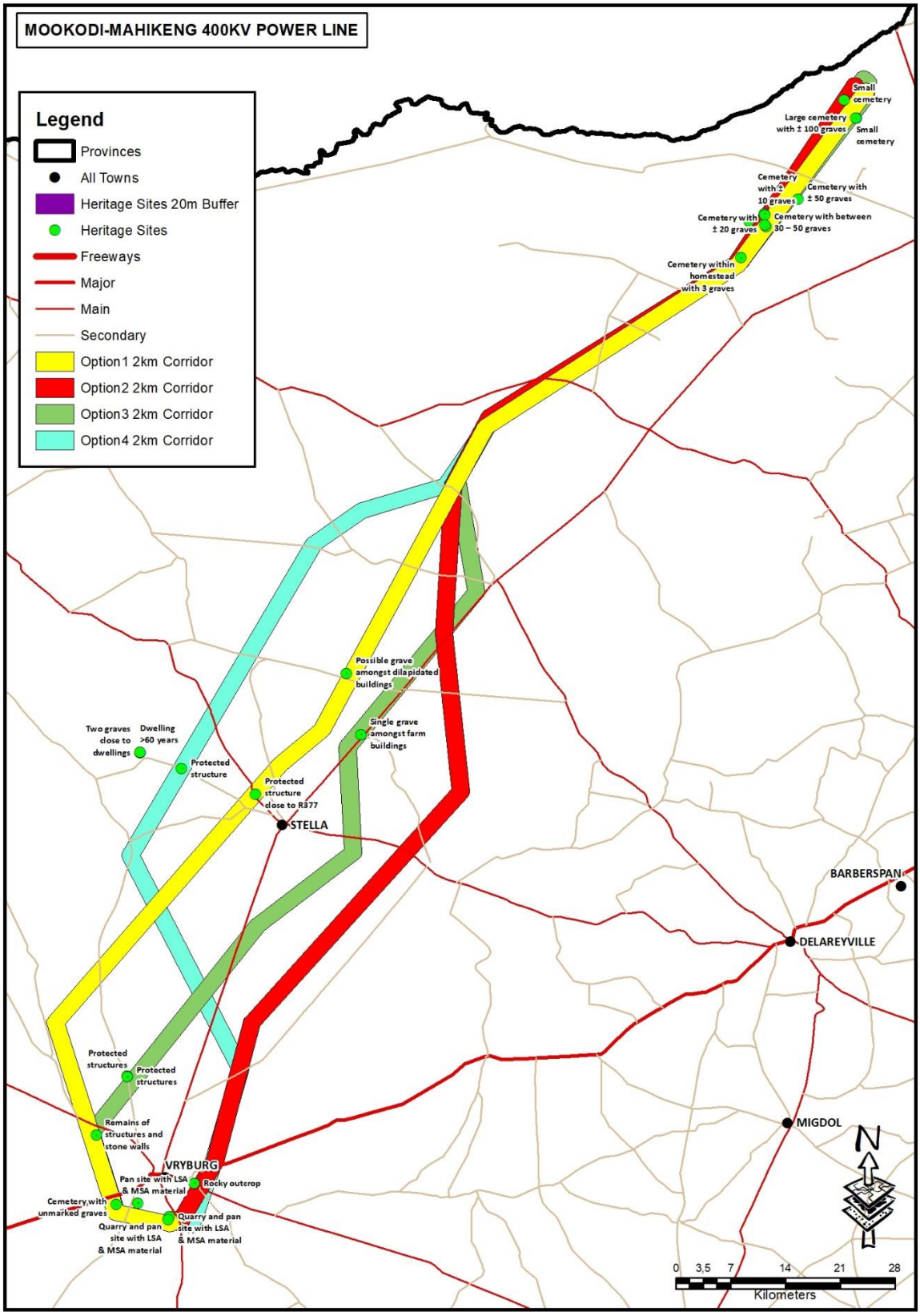


Figure 64: Heritage sensitivity map

13.3.5 Preferred Route

Four powerline route options were provided as alternatives for the proposed 400kV powerline. The environment that the four powerline options cross is largely the same for all the options and during the site inspection, heritage sites were found along or close to all the options. Hence, the length of the route options is important as the longer the length of a powerline is, the higher the risk or possibility that the powerline could impact on heritage resources. Route option 2 is shorter than the other routes and is therefore the preferred route from a heritage perspective. For this reason, Option 2 is the Best Practicable Environmental Option (BPEO) in the opinion of the heritage specialist.

13.3.6 Conclusions and Recommendations

The following recommendations are made to mitigate potential impacts on heritage resources:

- Route Option 2 is the preferred option from a heritage perspective as it is shortest in length;
- A walk-down survey of the selected route option by a heritage specialist, preferably an archaeologist, must be undertaken prior to construction in order that all heritage sites are identified and recorded prior to construction;
- All heritage sites identified along the route option and in close proximity must be protected with a 20 m buffer so that the construction process does not impact these sites; and
- A desktop palaeontological assessment must be undertaken as the project area falls into an area of both medium and low fossil sensitivity. The project may only proceed once the desktop palaeontological assessment has been undertaken.

No fatal flaws were identified during this study hence the construction of the proposed powerline can proceed from a heritage perspective as long as the recommendations and mitigation measures contained in this report and in the desktop palaeontological assessment are implemented where necessary.

13.4 Desktop Palaeontological Impact Assessment

This section provides a summary of the Desktop Palaeontological Impact Assessment (Banzai Environmental (Pty) Ltd, 2018), contained in **Appendix 6D**.

13.4.1 Trigger for Study

- The Heritage Impact Assessment (JLB Consulting, 2018) recommended that a desktop palaeontological assessment must be undertaken as the project area falls into an area of both medium and low fossil sensitivity and must establish whether significant fossil finds will be impacted by the proposed powerline.

13.4.2 Specialist Details

Organisation	Name	Qualification	Years Experience	Affiliation
Banzai Environmental (Pty) Ltd	Ms. Elize Butler	MSc in Palaeontology	24	Palaeontological Society

13.4.3 Objectives of the Study

The objective of a Palaeontological Desktop Assessment is to determine the impact of the development on potential palaeontological material at the site.

According to the "SAHRA APM Guidelines: Minimum Standards for the Archaeological and Palaeontological Components of Impact Assessment Reports" the aims of the palaeontological impact assessment are: 1) to identify the palaeontological importance of the exposed and subsurface rock formations in the development footprint 2) to evaluate the palaeontological importance of the formations 3) to determine the impact of the development on fossil heritage; and 4) to recommend how the developer ought to protect or mitigate damage to fossil heritage.

When a palaeontological desktop study is compiled, the potentially fossiliferous rocks (i.e. groups, formations, etc.) present within the study area are established from 1:250 000 geological maps. The topography of the development area is identified using 1:50 000 topography maps as well as Google Earth Images of the development area. Fossil heritage within each rock section is obtained from previous palaeontological impact studies in the same region, the PalaeoMap from SAHRIS; and databases of various institutions (identifying fossils found in locations specifically in areas close to the development area). The palaeontological importance of each rock unit of the development area is then calculated. The possible impact of the proposed development footprint on local fossil heritage is established on the following criteria: 1) the palaeontological importance of the rocks and 2) the type and scale of the development footprint and 3) quantity of bedrock excavated.

In the event that rocks of moderate to high palaeontological sensitivity are present within the study area, a field-based assessment by a professional palaeontologist is required. Based on both the desktop data and field examination of the rock exposures, the impact significance of the planned development is measured with recommendations for any further studies or mitigation. In general, destructive impacts on palaeontological heritage only occur during construction. The excavations will transform the current topography and may destruct or permanently seal-in fossils at or below the ground surface. Fossil Heritage will then no longer be accessible for scientific research.

Mitigation comprises the sampling, collection and recording of fossils and may precede construction or, more ideally, occur during construction when potentially fossiliferous bedrock is exposed. Preceding the excavation of any fossil heritage a permit from SAHRA must be obtained and the material will have to be housed in a permitted institution. When mitigation is

applied correctly, a positive impact is possible because our knowledge of local palaeontological heritage may be increased.

13.4.4 Findings of the Study and Preferred Route

The proposed development footprint is underlain by sediments of the Kalahari Group (*low Palaeontological sensitivity*); the Allanridge Formation of the Ventersdorp Supergroup (*moderate Palaeontological sensitivity*); the Schmidsdrift Subgroup (Ghaap Group) and the Vryburg Formation (*both with a moderate Palaeontological sensitivity*) of the Transvaal Supergroup as well as the ancient metamorphic rocks of the Swazian Era. The possible impact on palaeontological resources is rated as *low.* All four route alternatives were found to be in the above mentioned geological sediments and therefore none of the routes were preferred above the other and none were a no-go option.

IMPACT	SIGNIFICANCE	SPATIAL SCALE	TEMPORAL SCALE	PROBABILITY	RATING
	Low	Study Area	Permanent	Unlikely	Low
Impact on palaeontology	2	2	5	2	1.2

13.4.5 Conclusions and Recommendations

As the Palaeontological sensitivity of the development footprint varies between low to moderate the proposed development is thus unlikely to pose a substantial threat to local fossil heritage. However, should fossil remains be discovered during any phase of construction, either on the surface or exposed by fresh excavations, the ECO responsible for these developments should be alerted immediately. Such discoveries ought to be protected (preferably in situ) and the ECO should alert SAHRA (South African Heritage Research Agency) so that appropriate mitigation (e.g. recording, sampling or collection) can be taken by a professional palaeontologist.

13.5 Agricultural Impact Assessment

This section provides a summary of the Agricultural Impact Assessment (Index, 2018), contained in **Appendix 6E**.

13.5.1 Trigger for Study

- Loss of fertile soil, cultivated areas and grazing land in project footprint;
- Disruptions to farming practices during construction; and
- Loss of farming-related infrastructure.

13.5.2 Specialist Details

Organisation	Name	Qualification	Years Experience	Affiliation
Index (Pty) Ltd	Dr Andries Gouws	PhD (Interdisciplinary Studies)	40	Council of Natural Sciences.No:400036/93, Category: Agricultural sciences; and Member of the Soil Science Society of South Africa

13.5.3 Objectives of the Study

- Discuss the natural resources that influence agricultural potential;
- Identify the sensitivity to agriculture and the impact on agricultural resources; and
- Indicate the impact of the development on the farmers and ways to mitigate the effect of the project during and after construction.

13.5.4 Findings of the Study

- The predominant land use is animal production. Approximately 80% of the land is grazing;
- The area under cultivation is approximately 3 000 hectares under commercial production that lies around Stella and Setlagole. This is also where the deeper soils are found;
- Route 1 has a number of small irrigation farms close to Vryburg that may not remain viable after construction. It further has two centre pivot systems that will be lost;
- Route 2 passes through land with communal ownership (or for which a Permit to Occupy had been issued), where the cultivation is opportunistic, in other words, land is not cultivated every year and usually follows incidences of high significant rain showers. Route 2 has only 63 hectares of irrigated lands. Only one farming unit's viability may be influenced. However, the irrigation is done by conventional system that will not lose its underground infrastructure. The land under the transmission line could still be irrigated after mitigation;
- Two poultry production units were identified, both in route alignment 3. Route 3 has much more irrigated lands. These lands usually have a high investment in pumps and underground water supply lines and should be avoided if at all possible. Route 3 has the most units that may not be viable after construction; and
- Route 4 has three units may not be viable after construction.

Refer to **Figures 65** to **67** for the land uses of the northern, central and southern region of the survey area.

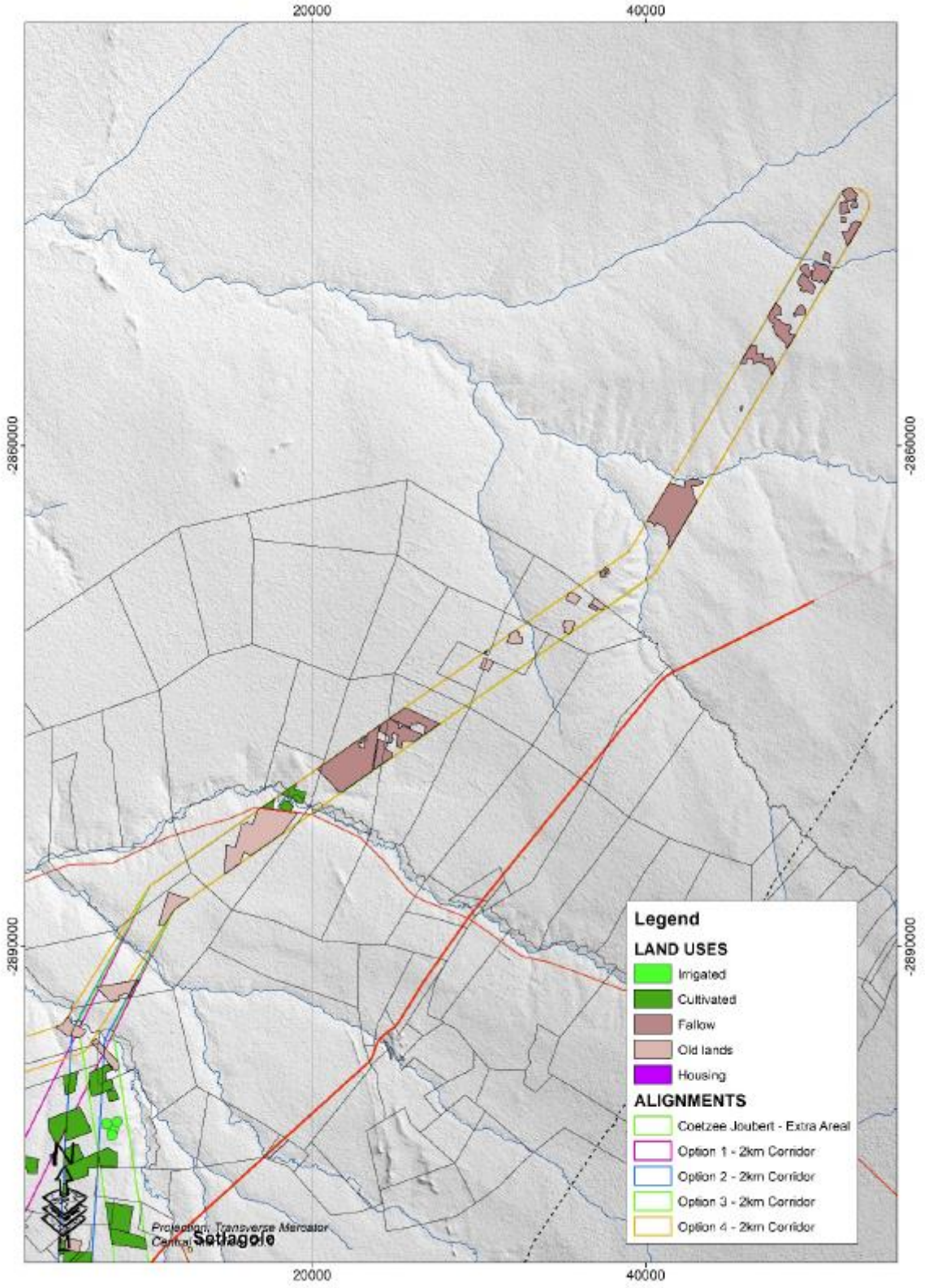


Figure 65: Land uses of the northern section

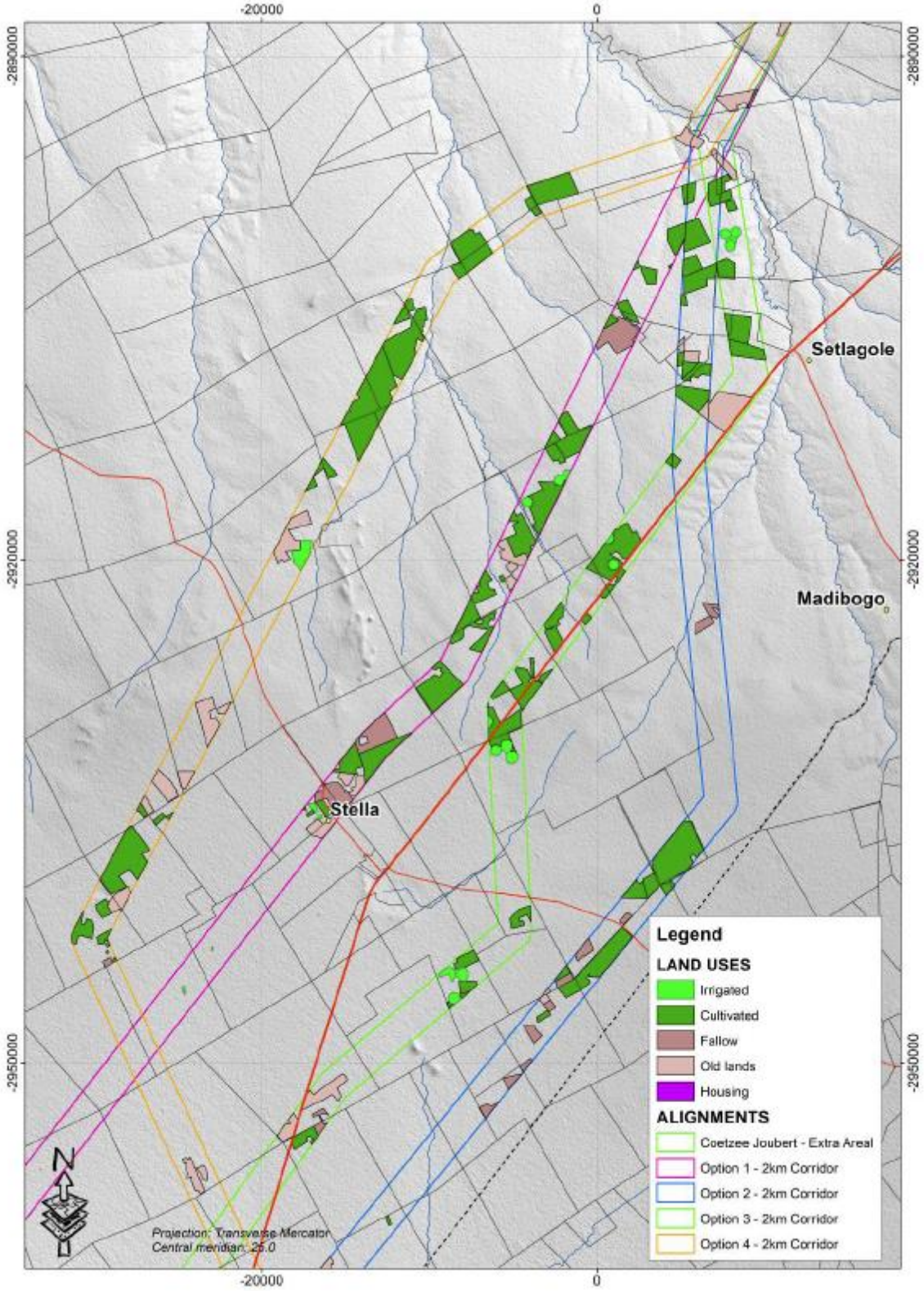


Figure 66: Land uses of the central section

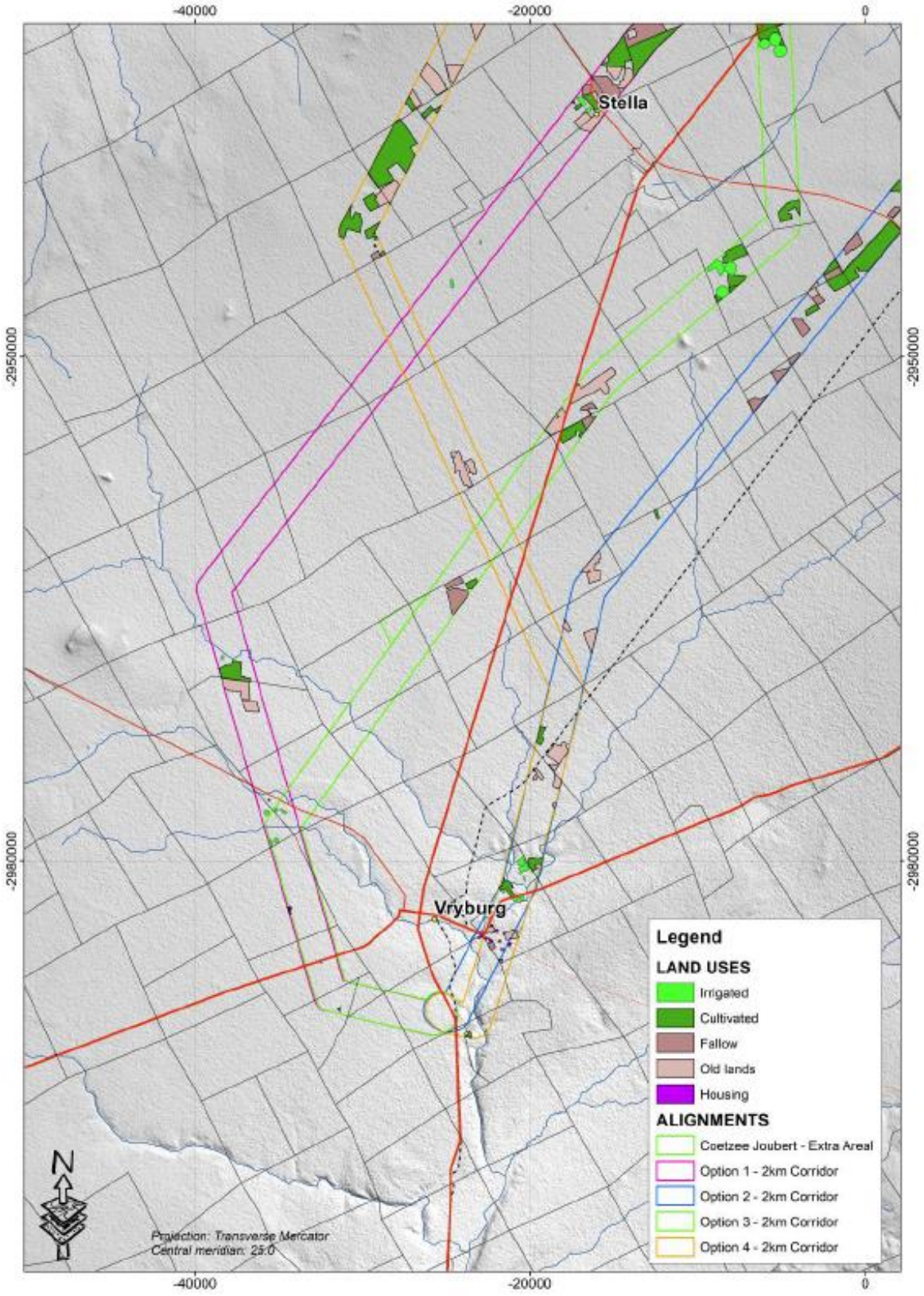


Figure 67: Land uses of the southern section

13.5.5 Preferred Route

The preferred option was selected based on the following:

- Loss of irrigated land has the only permanent impact that the construction of the line poses from an agricultural perspective;
- Loss of grazing and land under cultivation is largely temporary and is for a maximum of only one production season; and
- Loss of agriculture related infrastructure can be permanent but can be mitigated by placement of the line in order to have the least impact. This is also a social issue due to aesthetics and visual impact but is outside the scope of the agricultural assessment.

The table below indicates the order of preference, with Option 2 being the preferred option.

	Preference 1	**Preference 2**	**Preference 3**	**Preference 4**
Preference	Route 2	Route 1	Route 4	Route 3
Description	Will lead to the least loss of high potential irrigated land. Only 63ha of irrigated land will be lost. The loss of cultivated land and grazing is temporary and can be mitigated by keeping the construction period short.	Will lead to the loss of 156ha high potential irrigated land.	Will lead to the loss of 190ha high potential irrigated land.	This is the least preferred route. It will lead to the loss of 464 high potential irrigated land. Also, this is where most of the agricultural related infrastructure is located that will be permanently lost.

13.5.6 Conclusions and Recommendations

- Irrigated land is the only land that is considered as high potential. If it is under pivot irrigation (because of the permanent nature of the supply line and pumps), then the entire portion applicable will be lost. Route 2 has only 63 hectares of irrigated lands. Only one farming unit's viability may be influenced. However, the irrigation is done by conventional system that will not lose its underground infrastructure. The land under the transmission line could still be irrigated after mitigation. This is the preferred suit if compared to the other alignments;
- The loss of land under dryland cultivation is temporary and will at most be for one production season. The land can be returned to cultivation after construction;
- The loss of grazing land is also temporary and also for one production season. The land will remain as grazing after construction; and
- The loss of farming infrastructure in this assessment is limited to structures that are directly linked to production, i.e., irrigation supply lines, packing sheds and chicken houses.

13.6 Visual Impact Assessment

This section provides a summary of the Visual Impact Assessment (Ecoelementum, 2018), contained in **Appendix 6F**.

13.6.1 Trigger for Study

- The proposed powerline may have impacts on the aesthetics and sense of place.

13.6.2 Specialist Details

Organisation	Name	Qualification	Years Experience	Affiliation
Ecoelementum	Mr. Vernon Siemelink	MSc (Environmental Management)	10	SAATCA Registered

13.6.3 Objectives of the Study

1. Viewshed and viewing distance using GIS analysis up to 3 km from the proposed structures.
2. Visual Exposure Analysis comprising the following aspects:
   a. Terrain Slope;
      Slope angle is determined from the Digital Terrain Model (DTM) and the location of the proposed structures given a ranking depending on the steepness of the slope;
   b. Aspect of structure location;
      Aspect of the slope where the structures are to be built, are calculated from the DTM and given a ranking determined by the Sun angle.
   c. Landforms;
      Landform of the location of the proposed structures are determined from the DTM and ranked according to the type of landform. Structures built on certain landforms, e.g. ridges, will be more visible than structures built in valleys.
   d. Slope Position of structure;
      Using GIS analysis, the position of the proposed structure is determined and ranked according to the position on the slope the structure is to be built.
   e. Relative elevation of structure;
      Using the DEM the elevation of the proposed structure relative to the surrounding elevation is determined and ranked according to the difference in height of the surrounding areas.
   f. Terrain Ruggedness;
      The terrain ruggedness is determined from the DEM and given a ranking based on the homogeneousness of the terrain.
3. Viewer Sensitivity;
   a. The Viewer sensitivity ranking of the surrounding areas is determined using various land cover and land use datasets and ranked according to the sensitivity of the related structures to the environment.

4. Overall Visual Impact;
   a. Combing all the above dataset a final visual impact of the proposed structures is calculated.
5. Determine Visual Impact Significance ranking of project.

13.6.4 Findings of the Study

A visibility analysis was run to determine the locations from which the proposed infrastructure would be visible within the 3 km buffer of the centre line of the Powerlines.

Potential construction camps visual impact will have a LOW significance impact before mitigation and LOW significance after mitigation, as indicated in the table below. Although the construction camps will be LOW visible, the time of exposure is minimal and thus the impact on the users will remain LOW.

Potential Powerlines visual impact will have a HIGH significance impact before mitigation and MEDIUM significance after mitigation, as indicated in Table 14 below. Although the Powerlines will be HIGH visible, the extent and magnitude of the exposure can be mitigated and thus the impact on the users will remain MEDIUM.

Potential Access Roads visual impact will have a MEDIUM significance impact before mitigation and MEDIUM significance after mitigation, as indicated in the table below. Although the Access Roads visual impacts will be MEDIUM visible, the probability of the exposure is can be mitigated and thus the impact on the users will reduce although remain MEDIUM.

Refer to **Figure 68** below for the Visual sensitivity map.

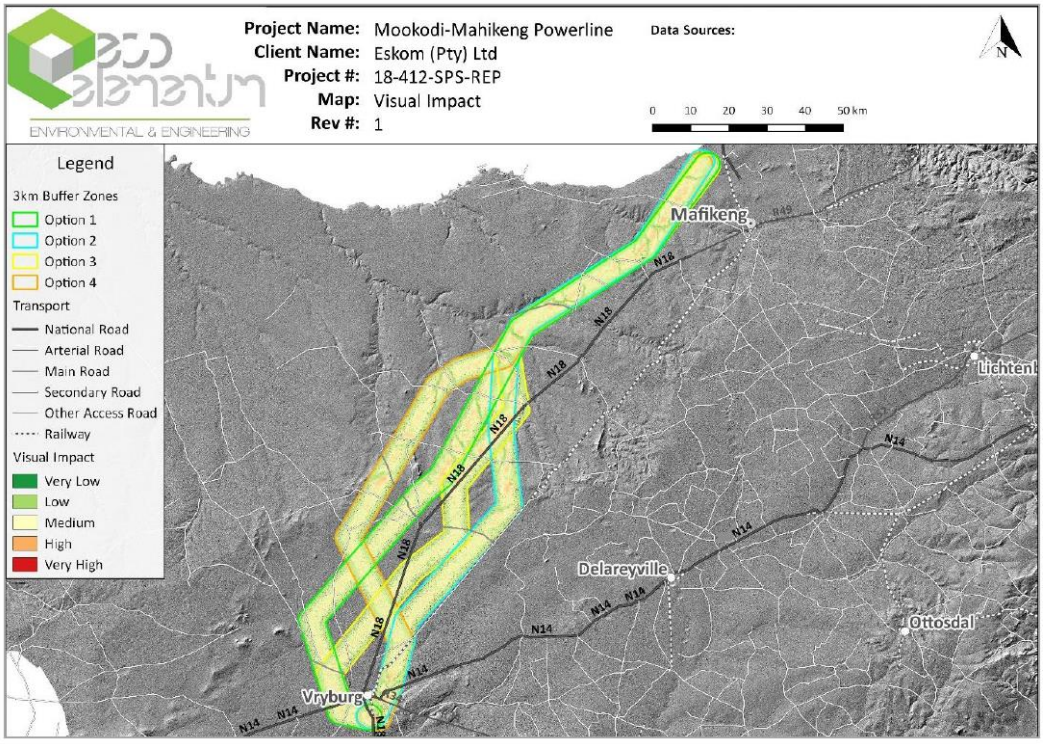


Figure 68: Visual Impact

13.6.5 Preferred Route

The final Visual impact of the proposed infrastructure was calculated using all the datasets above then summarising all the pixel values of each corridor option to get to a final rating as shown in the table below. Option 2 is the preferred option.

Alternative	Rank	Sum of GIS Pixel Values	Mean of GIS Pixel Values	% Difference from Lowest
Option 1	2	2832702	2.709	+4.6%
Option 2	**1**	2702506	2.753	0%
Option 3	4	3034484	2.902	+11%
Option 4	3	2837609	2.732	+5%

13.6.6 Conclusions and Recommendations

The Visual Impact due to the construction activities and associated project infrastructure can be seen as having a MEDIUM impact on the surrounding environment and inhabitants before mitigation measures are implemented. After mitigation, the visual impact can be seen as lowered although still classified as MEDIUM. Thus, mitigation measures are very important and two of the most significant mitigation measures are the rehabilitation of the area after construction has been concluded and reducing the visibility of the Powerlines as much as possible. If the mitigation of the impact is not done correctly then the visual impact will become

a concern. However, with correct mitigation, the impact will be of minimal visual intrusion for the type of proposed structures.

13.7 Economic Impact Assessment

This section provides a summary of the Economic Impact Assessment (Baur, 2018), contained in **Appendix 6G**.

13.7.1 Trigger for Study

- Loss of land in project footprint; and
- Construction-related impacts.

13.7.2 Specialist Details

Organisation	Name	Qualification	Years Experience	Affiliation
University of Johannesburg	Mr. Peter Baur	PH.D. (Economics)	10	Economic Society of South Africa

13.7.3 Objectives of the Study

This macroeconomic assessment will include a literature analysis, a review of documents and information provided by Eskom relating to the project, an analysis of the comments made by people affected by the proposed project, including landowners and other interested parties. An assessment of both the larger economy of South Africa will be undertaken and an assessment of the North West Province will also be explored.

13.7.4 Findings of the Study and Preferred Route

Six possible scenarios have been developed putting emphasis on different elements of this model for each of the possible scenarios. Scenario one examines the economic outcome on each of the possible routes by focusing on the importance of game farming, Scenario two and three emphasise agriculture and livestock farming respectively. Scenario 4 excludes the potential considerations used by Eskom in the BOSA study when developing possible route alternatives. Scenario five examines the economic impact with equal emphasis on each of the different farming sectors. Scenario 6 simulates an overall negative impact on all the routes proposed.

From this estimate based on 5 possible scenarios, it is clear that Option 2 (Route WM13) is, based on this analysis, the recommended route given the analysis presented above. However, it must be stressed that the scenarios presented above reflect the principal of caeteris paribus ("other things held constant"). There are many factors which could result in a negative impact of this project. This is simulated in scenario 6, where the impact of Option 2 (Route WM13) shows the greatest negative economic impact. Route 3 would be the second best option based on the criteria presented in this study. Refer to Appendix 1 of the Economic Study for the calculations for each scenario given the different options.

Scenario	WM1 (Option 1)	WM13 (Option 2)	WM4 (Option 3)	WM9 (Option 4)
1. Emphasis on Game Farming and Tourism	0.615542522	0.927859238	0.831524927	0.625073314
2. Emphasis on Agriculture	0.61346443	0.933765182	0.823689994	0.629080393
3. Emphasis on Livestock Farming	0.626828998	0.923342557	0.808057554	0.641770891
4. Excluding BOSA	0.628442797	0.898569915	0.841366525	0.631620763
5. Emphasis on Equal Agricultural	0.615980944	0.935599827	0.811650065	0.636769164
6. Simulating a Negative Impact	-0.410361681	-0.618572825	-0.554349951	-0.416715543

13.7.5 Conclusions and Recommendations

Given the economic environment of South Africa, and the socioeconomic structure of the North West Province, the need to extend the electricity network is paramount and is in line with the agenda of the IDP (IDP, 2012). In order to ensure sustainability of the economy, promote a sustainable future, it is advisable that the Government, through Eskom, continue on a path of expansion and development.

From the findings of this research, the implementation of the proposed Mookodi-Mahikeng 400kV Line is necessary. However, here are some points of consideration that needs to be mentioned regarding the externalities associated with this project.

- The impact on tourism will be most likely felt through the visual influence of the powerlines. This impact will most likely be negatively felt by the game farms, where people who visit such farms wish to enjoy the experience of untouched nature. This negative impact will spill over to jobs through a multiplier process, possibly influencing hotels, resorts and accommodation. Alternatives such as underground tunnelling or even making use of main roads should be re-considered. The long term impact of this should not be underestimated as the impact will influence local, and possibly regional and national levels.
- In some cases, land near or under powerlines could be used productively, especially in the case of livestock and agriculture. The ‘sterilisation’ of land is a very important point which should be dealt with in such a way as not to harm farming activities, block the movement of wildlife and people, and not interfere with existing efficiency. The concept of Pareto efficiency suggests that if you can improve the life of just one person, without harming anybody else, then this should be dealt with accordingly. It would be

important that when the lines are constructed, that they are constructed in a way that minimises any form of disruption to local activity.

- The 'compensation' must be dealt with in a transparent fashion and must take into consideration the long term effect as per the real implications to land owners.
- The gap between the environment and the economy is extremely narrow. The environment is a large part of the local economy, and any decision relating to the environment will have long term effects on the economy.
- The benefits of skill transfers, remittances of incomes, local economic development are all benefits which will occur due to the project. With great likely hood, the investment into the project will have both short term befits and long term effects.
- Any development strategy of this project should bear in mind that while there is the greatest positive economic impact shown in this study using possible positive outcomes, the possible negative outcomes are also quite stark and should be considered as a whole in this analysis. From this perspective, the negative concerns identified in the study should be carefully mitigated so as to minimise the risk and possible long term consequences.

The national economy can only benefit from such an investment, and this will most likely be felt on an international level as there is scope of international investment into the North West Province. However, the negative influence as raised by the local residents should and must be taken into consideration, and such concerns need to be mitigated in such a way as not to harm the economy on even the most microeconomic of levels. This study has been developed by developing its assumptions on the current economic environment. If these current environment should change, then the findings of this report should be reassessed.

13.8 Social Impact Assessment

This section provides a summary of the Social Impact Assessment (Nemai Consulting, 2018b), contained in **Appendix 6H**.

13.8.1 Trigger for Study

- Loss of land in project footprint; and
- Construction-related impacts.

13.8.2 Specialist Details

Organisation	Name	Qualification	Years Experience	Affiliation
Nemai Consulting	Mr. Ciaran Chidley	BSc Eng (Civil) and MBA	20	-

13.8.3 Objectives of the Study

- Determine the specific social, land utilisation and acquisition implications of the project.
- Collect baseline data on the current social environment.
- Gather an understanding of the social landscape of the project area through the following actions:
    - Attend and review minutes of public and individual stakeholder meetings; and
    - Review of the formally submitted commented for the project.
- Assess the social impacts of the project, both positive and negative;
- Suggest suitable mitigation measures to address the identified impacts; and
- Provide recommendations on the preferred route alternative from a social perspective.

13.8.4 Findings of the Study

The land use in the area is predominantly agricultural. Crops are planted along some of the route of the proposed alternative options, with large areas being given over to grazing. Commercial agriculture dominates in the southern and central sections of the powerline route, traditional agriculture and rural dwelling patterns dominate the final third of the route, to the north.

All of the route options impact upon farm building and dwellings, smallholdings, irrigation pivots, commercial and industrial entities to differing extents. The site for the proposed Mahikeng Substation is located near the village of Lokgalong where scattered dwellings occupy the area proposed for the substation.

The study area is made up a population of 66 781, living within 18 572 households. In general, the rural households in the study area are impoverished and have low access to services such as water and sanitation. The urban households are relatively more wealthy and have been access to water, housing and employment opportunities.

The social impacts of the proposed development were divided into categories and were identified as follows:

- Impacts owing to and extended and more secure electricity supply;
- Impacts due to land acquisition and the establishment of servitude rights;
    - Partial loss of livelihood on the part of landowners
    - Reduced access to productive land
    - Development constraints within the sub places
- Impacts Due to Scheme Operations;
    - Economic growth and induced impacts
    - Opportunity for local business.
    - Employment of local people

  - Skills development
  - Safety concerns

- Impacts occurring at the construction phase;
  - Security Concerns
  - Damage to property or equipment
  - Damage or wear to access roads
  - Improvement of access in the project area
  - Proximity to construction work and associated inconvenience and dangers.
  - Employment of local people
  - Sourcing of equipment, machinery and services locally
  - Noise
  - Pollution of remaining waste material
  - Safety concerns (road safety)
  - Dust
  - Influx of workers
  - Employment of local people
  - Temporary road closures
  - Increased traffic
  - Loss of vegetation
  - Improved access to amenities

13.8.5 Preferred Route

The alternative route selection was based on selecting a route which would create the least number of impacts, which would have the lowest long term effect on the development of rural towns and with a consideration of the length of the route.

Route option 2 was considered to be the preferred option. This option has the advantage of being the shortest of the four routes under consideration. It impacts upon relatively few farm buildings and the lowest number of irrigation pivots. However, it impinges upon the most smallholdings and commercial enterprises, passing as it does to the east of Vryburg. This route crosses the N18 twice as well as railway line and avoids the centre of Setlagole.

Component	Alternatives	Order of Preference (1: most preferred, 3: least preferred)	Comments
Go / No Go	To not carry out the proposed project	Not Supported	Subsequent electricity supply to the area will be less secure that if the project did go ahead. A secure power supply is a fundamental input to the social and economic activities of the area.
400Kv Powerline	Route alternative 1 WM1	3	The social impact assessment aims to reduce the impact upon as many people as possible through the selection of a preferred alternative, it also aims to select the shortest feasible route following the principal that reducing the cost for the same outcome is a social benefit. It should be noted that there are no alternative routes available for selection through the traditional areas, hence the only selection criteria that can be applied are relevant only to the southern and central section of the powerline, sections that are dominated by commercial farming and formal enterprise. As a result, Option 1 is not the preferred route, it impacts upon 32 farm buildings or dwellings, 5 irrigation pivots and 22 smallholdings. It is also 186 kilometres long, so the additional distance traveller does not have an offsetting advantage of creating a lesser social impact than the alternatives.
	Route alternative 2 WM13	1	Option 2 has the advantage of being the shortest of the four routes under consideration. It impacts upon relatively few farm buildings and the lowest number of irrigation pivots. However, it impinges upon the most smallholdings and commercial enterprises, passing as it does to the east of Vryburg. This route crosses the N18 twice as well as railway line and avoids the centre of Setlagole. It is therefore the preferred route from a social perspective.
	Route alternative 3 WM4a	2	Route option 3 is the longest route at 187 kilometres. It does however impact the least number of farm buildings. The corridor does travel over the most number of irrigation pivots and two hatcheries. It impacts upon the least number of

Component	Alternatives	Order of Preference (1: most preferred, 3: least preferred)	Comments
			smallholdings. This route also impacts upon the centre of Setlagole and might impede its natural growth. The route crosses the N18 twice and passes to the west of Vryburg, creating a ring around the town that may impact upon future development. Having regard to the above this route is not preferred by the social impact assessment.
	Route Alternative 4 WM9a	3	Route option 4 is another long route, at 185 kilometres. This route is similar to Option 2 in the sense that it impacts the most smallholdings and commercial enterprises to the east of Vryburg, as well as impacted upon the most number of farm buildings or dwellings. Given that it has a higher impact that Option 2, and its impacts are inferior to Option 3 which also passes to the east of Vryburg, this route is not preferred by the social impact assessment.

13.8.6 Conclusions and Recommendations

This study assesses the social impacts which would be created as a result of the proposed project. As expected, development and construction creates both positive and negative impacts and whilst the positive impacts are accepted, the negative impacts can be successfully mitigated through route selection and careful tower placement within the selected route corridor.

Relevant and appropriate mitigation measures are proposed in the report and the implementation of these mitigation measures is expected to reduce the social impacts of the project to lower levels.

The manifest benefits to the region of a more secure and extended electricity supply were covered by the study.

The final routing of the 400kV powerline and the selection of the proposed Mahikeng substation site are considered to be the primary mitigation measures of the project. The routing and the selection of the site should be carried out so as to avoid impacting upon existing development as far as possible. Where not possible, the suggested mitigation measures provide for the compensation of any losses that may be encountered during the pre-construction, construction, operation and decommissioning phase of the project.

Local labour and business stand to benefit from the economic stimulus of construction of the proposed project. As a result, mitigation measure encourages active participation of the local community.

Disturbances that may occur during construction phase can be successfully mitigated through contractor agreements and discussions with the directly affected parties which are in close proximity to the project and through regular monitoring throughout the construction phase.

14 IMPACT ASSESSMENT

14.1 Overview

This section focuses on the pertinent environmental impacts that could potentially be caused by the proposed Mookodi-Mahikeng 400kV Powerline during the pre-construction, construction and operational phases of the project.

An 'impact' refers to the change to the environment resulting from an environmental aspect (or activity), whether desirable or undesirable. An impact may be the direct or indirect consequence of an activity. Impacts were identified as follows:

- Impacts associated with listed activities contained in GN No. R. 983, R. 984 and R. 985 of the 2014 EIA Regulations (as amended), for which authorisation has been applied for;
- An appraisal of the project activities and components;
- Issues highlighted by environmental authorities;
- Comments received during public participation;
- An assessment of the receiving biophysical, social, economic and technical environment; and
- Findings from Specialist Studies.

14.1.1 Impacts Associated with Listed Activities

As mentioned, the project requires authorisation for certain activities listed in the EIA Regulations (2014), which serve as triggers for the environmental assessment process. The potential impacts associated with the key listed activities are broadly stated in **Table 18**.

Table 18: Impacts associated with the Listed Activities

GN No. R.	Activity	Description as per GN	Potential Impact Overview
GN R. 983 of 04 December 2014	12 (ii) (a)	The development of— (ii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs— (a) within a watercourse. excluding— (aa) the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour; (bb) where such development activities are related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies; (cc) activities listed in activity 14 in Listing Notice 2 of 2014 or activity 14 in Listing Notice 3 of 2014, in which case that activity applies; (dd) where such development occurs within an urban area; (ee) where such development occurs within existing roads, road reserves or railway line reserves; or (ff) the development of temporary infrastructure or structures where such infrastructure or structures will be removed within 6 weeks of the commencement of development and where indigenous vegetation will not be cleared.	• Impacts associated with the footprint of the towers within a watercourse. • Adverse effects to resource quality (i.e. flow, in-stream and riparian habitat, aquatic biota and water quality) associated with working instream and alongside watercourses. • Disturbance of affected watercourses. • Potential loss of sensitive environmental features (e.g. sensitive fauna and flora species). • Visual impacts.

GN No. R.	Activity	Description as per GN	Potential Impact Overview
	19 (i)	The infilling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 5 cubic metres from: (i) a watercourse but excluding where such infilling, depositing, dredging, excavation, removal or moving- a) will occur behind a development setback; b) is for maintenance purposes undertaken in accordance with a maintenance management plan; or c) falls within the ambit of activity 21 in this Notice, in which case that activity applies.	• Impacts associated with the footprint of the towers within a watercourse. • Adverse effects to resource quality (i.e. flow, in-stream and riparian habitat, aquatic biota and water quality) associated with working instream and alongside watercourses. • Disturbance of affected watercourses.
	30	Any process or activity identified in terms of Section 53(1) of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004).	• Potential loss of sensitive fauna and flora species within the Mafikeng Bushveld (Vulnerable) and the Western Highveld Sandy Grassland (Critically Endangered).
GN R. 984 of 04 December 2014	9	The development of facilities or infrastructure for the transmission and distribution of electricity with a capacity of 275 kilovolts or more, outside an urban area or industrial complex excluding the development of bypass infrastructure for the transmission and distribution of electricity where such bypass infrastructure is — (a) temporarily required to allow for maintenance of existing infrastructure; (b) 2 kilometres or shorter in length; (c) within an existing transmission line servitude; and (d) will be removed within 18 months of the commencement of development.	• Clearance of large areas of indigenous vegetation associated with the construction footprint of the tower structures. • Potential loss of sensitive environmental features (e.g. sensitive fauna and flora species). • Impacts to avifauna associated with the powerline. • Loss of fertile soil, cultivated areas and grazing land in project footprint. • Disruptions to farming practices during construction. • Loss of farming-related infrastructure.

GN No. R.	Activity	Description as per GN	Potential Impact Overview
			• Potential disturbance of heritage resources, graves and structures older than 60 years within project footprint. • Loss of land in project footprint. • Social and Economic impacts. • Visual impacts.
GN R. 985 of 04 December 2014	12 (h) (iv, v and vi)	The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan. h. North West: iv. Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority; v. Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority; or vi. Areas within a watercourse or wetland, or within 100 metres from the edge of a watercourse or wetland.	• Clearance of large areas of indigenous vegetation associated with the construction footprint of the tower structures. • Potential loss of sensitive environmental features (e.g. sensitive fauna and flora species).

GN No. R.	Activity	Description as per GN	Potential Impact Overview
	14 (ii)(a)(h)(iv, v and vi)	The development of— (ii) infrastructure or structures with a physical footprint of 10 square metres or more; where such development occurs— (a) within a watercourse h. North West iv. Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority; v. Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority; or vi. Areas within 5 kilometres from protected areas identified in terms of NEMPAA or from the core areas of a Biosphere reserve.	• Impacts associated with the footprint of the towers within a watercourse. • Adverse effects to resource quality (i.e. flow, in-stream and riparian habitat, aquatic biota and water quality) associated with working instream and alongside watercourses. • Disturbance of affected watercourses. • Potential loss of sensitive environmental features (e.g. sensitive fauna and flora species). • Visual impacts.

14.1.2 Environmental Activities

In order to understand the impacts related to the project it is necessary to unpack the activities associated with the project life-cycle (refer to Section 7.2), as done in the sub-sections to follow.

14.1.2.1 Project Phase: Pre-construction

The main project activities as well as high-level environmental activities undertaken in the pre-construction phase are listed in **Table 19**.

Table 19: Activities associated with Pre-construction Phase

Pre-construction Phase
Project Activities
1. Obtain EA, Water Use License (WUL) if required and other relevant permits
2. Applicant to appoint an ECO
3. Negotiations and agreements with the affected landowners, stakeholders and authorities
4. Initiate legal process required for powerline servitude
5. Detailed engineering design
6. Detailed geotechnical investigations, if applicable
7. Survey and mark construction servitude
8. Survey and map topography for determination of post-construction landscape, rehabilitation and shaping (where necessary)
9. Pre-construction photographic records
10. Development and approval of method statements
11. Development of employment strategy
12. Development and approval of construction plans
Environmental Activities
13. Diligent compliance monitoring of the EMPr, EA and other relevant environmental legislation
14. Undertake a walk-down survey of the project footprint by the relevant environmental specialists to identify sensitive environmental features
15. Develop Search, Rescue and Relocation Management Plan, based on findings of walk-down survey
16. Barricading and installing barriers around buffer areas as identified in the Specialist Studies
17. Ongoing consultation with IAPs
18. Establish baseline water quality data for river crossings based on aquatic and wetland studies

14.1.2.2 Project Phase: Construction

The main project activities as well as high-level environmental activities undertaken in the construction phase are listed in **Table 20**.

Table 20: Activities associated with Construction Phase

Construction Phase
Project Activities
1. Site establishment
2. Pegging of central line and overall footprint
3. Grading of site (where necessary)
4. Construct new access road (where necessary)
5. Delivery of construction material
6. Transportation of equipment, materials and personnel
7. Storage and handling of material
8. Construction employment
9. Stormwater control mechanisms
10. Site clearing
11. Excavations for foundations and anchors of towers
12. Position premade foundation structures into excavations
13. Erection of steel structures
14. Construction works for the powerline
15. Stringing of cables
16. Management of topsoil and spoil
17. Concrete works (filling of foundations)
18. Traffic control measures
19. Mechanical and electrical works
20. Electrical Supply
21. Cut and cover activities
22. Stockpiling
23. Waste and wastewater management
24. Site security
25. Construction of powerlines and towers
26. Landscaping
27. Signing off by landowners
28. Handing over the servitude
Environmental Activities
29. Diligent compliance monitoring of the EMPr, EA and other relevant environmental legislation
30. Ongoing search, rescue and relocation of red data, protected and endangered species, medicinal plants, heritage resources (based on area of influence of the construction activities) – permits to be in place
31. Control of invasive plant species

Construction Phase
32. Conduct environmental awareness training
33. Implement EMPr
34. Reinstatement and rehabilitation of construction domain
35. On-going consultation with IAPs

14.1.2.3 Project Phase: Operation

The main project activities as well as high-level environmental activities undertaken in the operation phase are listed in **Table 21**.

Table 21: Activities associated with Operation Phase

Operation Phase
Project Activities
1. Maintenance of powerline infrastructure
2. Routine maintenance inspections
3. Servitude access arrangements and requirements
Environmental Activities
4. Stormwater management
5. Pollution control measures
6. Maintenance of servitude
7. Management of vegetation clearance
8. Management of sensitive areas or buffered areas
9. On-going consultation with IAPs

14.1.3 Potential Significant Environmental Impacts

Note that it is not the intention of the impact assessment to evaluate all potential environmental impacts associated by the project's environmental aspects, but rather to focus on the potentially significant direct and indirect impacts identified during the Scoping phase and any additional issues uncovered during the EIA stage.

The potential significant environmental impacts associated with the project, as listed in **Table 22** (construction phase) and **Table 23** (operational phase), were identified through an appraisal of the following:

- Project-related components and infrastructure (Section 7);
- Activities associated with the project life-cycle (i.e. pre-construction, construction, operation and decommissioning) (Section 7.2);
- Proposed alternatives to project components (Section 6);

- Nature and profile of the receiving environment and potential sensitive environmental features and attributes (Section 12), which included a desktop evaluation (via literature review, specialist input, GIS, topographical maps and aerial photography) and site investigations;
- Findings from Specialist Studies (Section 13);
- Understanding of direct and indirect effects of the project as a whole (Section 14);
- Input received during public participation from authorities and IAPs (Section 16); and
- Legal and policy context (Section 8).

Table 22: Potential significant environmental impacts during Construction Phase

Environmental Feature	Potential Impacts/Implications
Geology	• Unsuitable geological conditions • Blasting (if required)
Soil	• Soil erosion • Soil contamination
Topography	• Visual impact • Crossing topographic features (watercourses) • Erosion of affected areas on steep slopes

Surface Water	• Surface water pollution due to spillages and poor construction practices
	• Encroachment of construction activities into riparian zones / wetlands
	• Impacts where the powerline crosses watercourses, such as:
	  ○ Loss of riparian and instream vegetation within construction domain
	  ○ Destabilisation of banks of watercourses
	  ○ Sedimentation

Terrestrial Ecology	• Impacts to sensitive terrestrial ecological features • Potential loss of significant flora and fauna species • Damage / clearance of habitat of conservation importance in construction domain • Proliferation of exotic vegetation
Land Capability	• Loss of cultivated land within construction domain • Loss of grazing land within construction domain • Risk to livestock and game from construction activities • Disruptions to farming operations • Loss of fertile soil through land clearance
Land Use	• Loss of land used for agriculture • Servitude restrictions
Heritage	• Possible disturbance and destruction of heritage resources
Air Quality	• Excessive dust levels • Greenhouse gas emissions
Noise	• Localised increase in the noise levels during construction
Existing Infrastructure	• Crossing of existing infrastructure by powerline (including roads and railway line) • Relocation of structures

Environmental Feature	Potential Impacts/Implications
Traffic	• Increase in traffic on the local road network • Risks to road users
Visual Quality	• Visual quality and sense of place to be adversely affected by construction activities
Socio-Economic Environment	• Loss of land within construction domain (affects landowners future plans to develop their property) • Risk to livestock and game from construction activities • Nuisance from dust and noise • Influx of people seeking employment and associated impacts (e.g. foreign workforce, cultural conflicts, squatting, demographic changes, anti-social behaviour, and incidence of HIV/AIDS) • Safety and security • Use of local road network

Table 23: Potential Significant Environmental Impacts during Operation Phase

Environmental Feature	Potential Impacts/Implications
Geology	• Unsuitable geological conditions – risks to structural integrity of towers
Soil	• Soil erosion at areas that were not suitably reinstated and rehabilitated
Topography	• Visual impact • Crossing topographic features (watercourses) • Erosion of affected areas on steep slopes
Surface Water	• Damage to towers from major flood events • Impacts to characteristics of riparian zones and wetlands at areas where they are encroached upon by the project footprint
Terrestrial Ecology	• Encroachment by exotic species through inadequate eradication programme • Clearing of vegetation along servitude and maintenance road • Risk to birds from collision with infrastructure and from electrocution
Land Capability	• Permanent loss of cultivated and grazing land within servitude • Loss of livestock and game though improper access control
Land Use	• Loss of land used for agriculture • Servitude restrictions
Heritage	• Possible disturbance and destruction of heritage resources
Traffic	• Use of permanent access and • maintenance roads
Visual Quality	• High visibility of transmission lines / towers • Inadequate reinstatement and rehabilitation of construction footprint
Socio-Economic Environment	• Use of local road network for operation and maintenance purposes • Safety and security issues through improper access control during inspections and maintenance activities • Threats to human and animal health from EMF

The cumulative impacts are discussed in Section 14.16.

The findings of the Specialist Studies are of particular importance in terms of understanding the impacts of the project and managing these during the project life-cycle, as these studies focused on the significant environmental issues identified during the execution of the EIA.

14.1.4 Issues raised by Environmental Authorities and IAPs

The issues raised by authorities (both regulatory and commenting) and IAPs during meetings are contained in correspondence received to date during the execution of the EIA are captured and addressed in the CRR (**Appendix 5D**). The main comments are summarised below:

- Affected Property Enquires;
- Ecological Impacts;
- Impact on Farming Practices;
- Impact on Visual Quality of Area;
- Impact on Safety and Security;
- Impact on Property Value;
- Comments from Authorities; and
- Objections.

14.1.5 Impact Assessment Methodology

The impacts and the proposed management thereof are first discussed on a qualitative level and thereafter quantitatively assessed by evaluating the nature, extent, magnitude, duration, probability and ultimately the significance of the impacts (refer to methodology provided in **Table 24**). The assessment considers impacts before and after mitigation, where in the latter instance the residual impact following the application of the mitigation measures is evaluated.

Table 24: Impact methodology table

Nature				
Negative		Neutral		Positive
-1		0		+1
Extent				
Local	Regional		National	International
1	2		3	4
Magnitude				
Low		Medium		High
1		2		3
Duration				
Short Term (0-5yrs)	Medium Term (5-11yrs)		Long Term	Permanent
1	2		3	4
Probability				
Rare/Remote	Unlikely	Moderate	Likely	Almost Certain

1	2	3	4	5
Significance				
No Impact/None	No Impact After Mitigation/Low	Residual Impact After Mitigation/Medium	Impact Cannot be Mitigated/High	
0	1	2	3	

The following definitions apply:

Nature (/Status)
The project could have a positive, negative or neutral impact on the environment.
Extent
• Local – extend to the site and its immediate surroundings. • Regional – impact on the region but within the province. • National – impact on an interprovincial scale. • International – impact outside of South Africa.
Magnitude
Degree to which impact may cause irreplaceable loss of resources. • Low – natural and social functions and processes are not affected or minimally affected. • Medium – affected environment is notably altered; natural and social functions and processes continue albeit in a modified way. • High – natural or social functions or processes could be substantially affected or altered to the extent that they could temporarily or permanently cease.
Duration
• Short term – 0-5 years. • Medium term – 5-11 years. • Long term – impact ceases after the operational life cycle of the activity either because of natural processes or by human intervention. • Permanent – mitigation either by natural process or by human intervention will not occur in such a way or in such a time span that the impact can be considered transient.
Probability
• Almost certain – the event is expected to occur in most circumstances. • Likely – the event will probably occur in most circumstances. • Moderate – the event should occur at some time. • Unlikely – the event could occur at some time. • Rare/Remote – the event may occur only in exceptional circumstances.
Significance
Provides an overall impression of an impact's importance, and the degree to which it can be mitigated. The range for significance ratings is as follows- 0 – Impact will not affect the environment. No mitigation necessary. 1 – No impact after mitigation. 2 – Residual impact after mitigation. 3 – Impact cannot be mitigated.

The following scoring system applies:

Overall Score = (NxMxS)x(E+D+P)

For example, the worst possible impact score of -117 would be achieved based on the following ratings:

N = Nature = -1

M = Magnitude = 3

S = Significance = 3

E = Extent = 4

D = Duration = 4

P= Probability = 5

Worst impact score = (-1 x 3 x 3) x (4+4+5) = -117

On the other hand, if the nature of an impact is 0 (neutral or no change) or the significance is 0 (no impact), then the impact will be 0.

Impact Scores will therefore be ranked in the following way:

Table 25: Ranking of Overall Impact Score

Impact Rating	Low/Acceptable impact	Medium	High	Very High
Score	0 to -30	-31 to -60	-61 to -90	-91 to -117

In the case of the Specialist Studies, some of the impact assessment methodologies deviated from the approach shown in **Table 24** and **Table 25**. However, the quantitative basis for these specialist evaluations of the impacts to specific environmental features still satisfied the intention of the EIA.

14.1.6 Impact Mitigation

14.1.6.1 Mitigation Hierarchy

Impacts are to be managed by assigning suitable mitigation measures. According to DEAT (2006), the objectives of mitigation are to:

- Find more environmentally sound ways of executing an activity;
- Enhance the environmental benefits of a proposed activity;
- Avoid, minimise or remedy negative impacts; and
- Ensure that residual negative impacts are within acceptable levels.

Figure 69: Mitigation hierarchy

Prevention mitigation measures (1) are the first preference for developments and are usually measures that avoid impacts completely. The impacts for the mitigation measures listed below

will mostly fall under the reduction hierarchy (2). This involves mitigation measures that minimise impacts. This EMPr also includes remediation and rehabilitation measures (hierarchy 3) for environmental impacts. Compensation (4) involves compensating the loss of an entire feature. In the case for the environment, this usually means consideration of an off-set associated with rehabilitation and mitigation.

The basis for the management measures which follow below comprise of the following:

- Management objectives – i.e. desired outcome of management measures for mitigating negative impacts and enhancing the positive impacts related to project activities and aspects (i.e. risk sources);
- Targets – i.e. level of performance to accomplish management objectives; and
- Management actions– i.e. practical actions aimed at achieving management objectives and targets;
- Responsibilities; and
- Monitoring requirements.

The proposed mitigation of the impacts associated with the project includes specific measures identified by the technical team (including engineering solutions) and environmental specialists, stipulations of environmental authorities and environmental best practices. Note that the mitigation measures in the subsequent sections are not intended to be exhaustive, but rather focus on the potentially significant impacts identified.

The EMPr (**Appendix 7**) provides a comprehensive list of mitigation measures for specific elements of the project, which extends beyond the impacts evaluated in the body of the EIA Report.

14.1.6.2 EMPr

An EMPr represents a detailed plan of action prepared to ensure that recommendations for enhancing positive impacts and/or limiting or preventing negative environmental impacts are implemented during the life-cycle of a project.

The EMPr aims to satisfy the requirements stipulated in Appendix 4 of GN No. R. 982 of the 2014 EIA Regulations (as amended).

The scope of the proposed Mookodi-Mahikeng 400kV Powerline EMPr is as follows:

- Establish management objectives during the project life-cycle in order to enhance benefits and minimise adverse environmental impacts;
- Provide targets for management objectives, in terms of desired performance;
- Describe actions required to achieve management objectives;
- Outline institutional structures and roles required to implement the EMPr;
- Provide legislative framework; and
- Description of requirements for record keeping, reporting, review, auditing and updating of the EMPr.

All liability for the implementation of the EMPr (as well as the EIA findings and EA) lies with the project proponent.

14.2 Geology and Soil

14.2.1 Potential Impacts

The geotechnical characteristics determine the conditions for the tower foundations. Potential impacts during the construction phase include:

- Blasting (depending on geotechnical conditions);
- Disposal of spoil material (i.e. excess soil and rock) from excavations; and
- Collapsible soils.

In areas of steep terrain soil erosion could occur following the clearing of vegetation, grading of the tower sites and use of access roads. Use of heavy equipment during the construction phase could lead to soil compaction. Soil could also be contaminated through inadequate storage and handling of hazardous materials, spillages from equipment and plant and poor management of waste, wastewater and cement mixing. Topsoil may also be lost if not properly stripped and stockpiled for use during rehabilitation. The depth of the water level will be confirmed during geotechnical investigations.

14.2.2 Impact Assessment

Geology and Soil							
Project Life-cycle:	Construction and Operation						
Potential Impact:	Soil erosion						
Proposed Mitigation:	• Stabilisation of cleared areas to prevent and control erosion. The method chosen (e.g. watering, planting, retaining structures, commercial anti-erosion compounds) will be selected according to the site specific conditions. Drainage management should also be implemented to ensure the minimization of potential erosion. • Rehabilitate all areas disturbed during construction. • Monitoring to be conducted to detect erosion.						
	Nature	**Extent**	**Magnitude**	**Duration**	**Probability**	**Significance**	**Score**
Without Mitigation	-	Local	Medium	Medium	Likely	2	-28
With Mitigation	-	Local	Low	Short	Unlikely	1	-4

Geology and Soil	
Project Life-cycle:	Construction and Operation
Potential Impact:	Contamination of Soil
Proposed Mitigation:	• Wind and water erosion-control measures to be implemented to prevent loss of topsoil.

	• After excavation, all soils must be replaced in the same order as they were removed. • Remove, stockpile and preserve topsoil for re-use during rehabilitation. • Topsoil should be temporarily stockpiled, separately from (clay) subsoil and rocky material, when areas are cleared. If mixed with clay sub-soil the usefulness of the topsoil for rehabilitation of the site will be lost. • Stockpiled topsoil should not be compacted and should be replaced as the final soil layer. No vehicles are allowed access onto the stockpiles after they have been placed. • Stockpiled soil shall be protected by erosion-control berms Topsoil stripped from different sites must be stockpiled separately and clearly identified as such. Topsoil obtained from sites with different soil types must not be mixed. • Topsoil stripped from different sites must be stockpiled separately and clearly identified as such. Topsoil obtained from sites with different soil types must not be mixed. • Topsoil stockpiles must not be contaminated with oil, diesel, petrol, waste or any other foreign matter, which may inhibit the later growth of vegetation and microorganisms in the soil. • Soil must not be stockpiled on drainage lines or near watercourses without prior consent from the Project Manager. • Soil should be exposed for the minimum time possible once cleared of invasive vegetation, that is the timing of clearing and grubbing should be coordinated as much as possible to avoid prolonged exposure of soils to wind and water erosion. Stockpiled topsoil must be either vegetated with indigenous grasses or covered with a suitable fabric to prevent erosion and invasion by weeds.						
	Nature	**Extent**	**Magnitude**	**Duration**	**Probability**	**Significance**	**Score**
Without Mitigation	-	Local	Medium	Medium	Likely	2	-28
With Mitigation	-	Local	Low	Short	Unlikely	1	-4

14.3 Topography

14.3.1 Potential Impacts

During construction, only the pylon foundations will result in a hard impact footprint which will require excavations and drilling. There could be a visual impact caused by proposed project infrastructure and erosion of areas cleared for construction purposes.

14.3.2 Impact Assessment

Topography							
Project Life-cycle:	Construction and Operation						
Potential Impact:	• Visual impact • Erosion on sloped areas						
Proposed Mitigation:	• No vehicles, storage of building materials or rubble, construction or landscaping are allowed in the sensitive and buffer areas stipulated in the specialist studies. • Erecting a fence with controlled access around the open spaces and natural areas will prevent access of vagrants and criminals into these areas.						
	Nature	**Extent**	**Magnitude**	**Duration**	**Probability**	**Significance**	**Score**
Without Mitigation	-	Local	Medium	Short	Almost Certain	2	-28
With Mitigation	-	Local	Medium	Short	Likely	1	-12

14.4 Surface Water

14.4.1 Potential Impacts

Impacts to the resource quality of the affected watercourses during the construction phase could include:

- Damage to riparian habitat as part of the clearing of the servitude;
- Destabilisation of morphology (i.e. river structure);
- Reduction of water quality through sedimentation (e.g. access roads over watercourses, silt from the construction site transported via runoff) and poor construction practices (e.g. Improper management of wastewater, incorrect storage of material, spillages);
- Temporary alteration of flow and the structure (i.e. bed and banks) of watercourses at river crossings for access roads; and
- Reduction in biodiversity of aquatic biota as a result of the abovementioned drivers.

Potential impacts during the operational phase include:

- Sedimentation through silt-laden runoff, caused by inadequate stormwater management on access roads and at the substation; and
- Damage to towers from major flood events.

14.4.2 Impact Assessment

Surface Water							
Project Life-cycle:	Construction and Operation						
Potential Impact:	Impacts to watercourses from temporary diversions						
Proposed Mitigation:	• Minimise influence to downstream flow regime when diverting and impeding flow (cofferdams, temporary river crossings etc.). • Prevent erosion caused by temporary in-stream diversion. Install suitable buttressing / stabilisation structures to prevent future erosion, if required. • Select appropriate crossing points (geotechnical conditions, sensitivity of riparian habitat and in-stream habitat), depending on technical feasibility.						
	Nature	**Extent**	**Magnitude**	**Duration**	**Probability**	**Significance**	**Score**
Without Mitigation	-	Local	Medium	Short	Likely	2	-24
With Mitigation	-	Local	Low	Short	Unlikely	1	-4

Surface Water	
Project Life-cycle:	Construction and Operation
Potential Impact:	Contamination of surface water through sedimentation from silt-laden runoff from disturbed areas.
Proposed Mitigation:	• Conduct water quality monitoring (baseline and during construction) at suitable up- and downstream sites.

	• All diffuse pollution sources to be managed to prevent pollution of the watercourses in the project area. • Storage area and ablution facilities to be located 50m from edge of riparian habitat. • Where necessary, install in-stream silt traps during construction within the watercourse channel and along the riparian habitat. The style of silt trap will depend on materials used and the water movement patterns. • Implement suitable stormwater measures during construction to manage ingress of runoff into watercourses. • Ensure proper storage of material (including fuel, paint) that could cause water pollution. Ensure proper storage and careful handling of hazardous substances with spill prevention materials at hand. • Reduce sediment loads in water from dewatering operations. All dewatering should be done through temporary sediment traps (e.g. constructed out of geo-textiles and hay bales).

	Nature	Extent	Magnitude	Duration	Probability	Significance	Score
Without Mitigation	-	Local	Medium	Short	Moderate	2	-20
With Mitigation	-	Local	Low	Short	Unlikely	1	-4

Surface Water							
Project Life-cycle:	Construction and Operation						
Potential Impact:	Contamination through spillage of fuel, hazardous chemicals, leaking vehicles, etc.						
Proposed Mitigation:	• All construction activities to comply with the National Water Act (Act No. 36 of 1998). • Ensure that all hazardous storage containers and storage areas comply with the relevant SABS standards to prevent leakage. • Regularly inspect all vehicles for leaks. • Re-fuelling of vehicles must take place off-site. • Littering must be prohibited by providing adequate number of rubbish bins during the construction and operational phases to ensure proper disposal of rubbish. • Staff must be trained to deal with fuel/chemical spills and spill kits must be easily available at all times.						
	Nature	**Extent**	**Magnitude**	**Duration**	**Probability**	**Significance**	**Score**
Without Mitigation	-	Local	Medium	Short	Moderate	2	-20
With Mitigation	-	Local	Low	Short	Unlikely	1	-4

Surface Water	
Project Life-cycle:	Construction and Operation
Potential Impact:	Inadequate stormwater management due to lack of maintenance
Proposed Mitigation:	• Existing stormwater infrastructure should be maintained during construction activities to prevent the deterioration and subsequent failure of current infrastructure. • Temporary berms should be constructed on the downstream perimeter of the site to channel runoff containing silt to a location where silt is allowed to settle prior to discharging into the existing stormwater infrastructure or natural watercourse. • The main contractor is to control stormwater during construction by installing berms at the top of all cut and fill embankments.

	• Runoff is to be diverted into the site and, either discharged by gravity or, if required, pumped to the Municipal stormwater network.						
	Nature	**Extent**	**Magnitude**	**Duration**	**Probability**	**Significance**	**Score**
Without Mitigation	-	Local	Medium	Short	Moderate	2	-20
With Mitigation	-	Local	Low	Short	Unlikely	1	-4

Should construction activities encroach upon the regulated area of a watercourse (i.e. 1:100 year floodline / delineated riparian or 500 m of a wetland habitat) water use authorisation will be required in terms of Section 21 of the National Water Act (Act No. 36 of 1998). In accordance with Section 27 of this Act, the following factors need to be taken into consideration by DWS before an authorisation may be issued:

1. Existing lawful water uses;
2. The need to redress the results of past racial and gender discrimination;
3. Efficient and beneficial use of water in the public interest;
4. The socio-economic impact of the water use or uses if authorised; or of the failure to authorise the water use or uses;
5. Any catchment management strategy applicable to the relevant water resource;
6. The likely effect of the water use to be authorised on the water resource and on other water users;
7. The class and the resource quality objectives of the water resource;
8. Investments already made and to be made by the water user in respect of the water use in question;
9. The strategic importance of the water use to be authorised;
10. The quality of water in the water resource which may be required for the Reserve and for meeting international obligations; and
11. The probable duration of any undertaking for which a water use is to be authorised.

14.5 Terrestrial Ecology

14.5.1 Potential Impacts

Potential impacts to vegetation resulting from the construction of the proposed powerline includes the clearance of vegetation in accordance with The Eskom Contract Specification for Vegetation Management Services on Eskom Networks (240-52456757). During the operational phase, vegetation that could possibly interfere with the operation and/or reliability of the power line must be trimmed or completely cleared. Invasive alien species in the servitude is cleared and chemically treated for the total width of the servitude.

The proposed Mookodi-Mahikeng 400kV Powerline may negatively impact fauna currently occurring in and around the four route alternatives. Threatened species could occur within the study area and the construction of the proposed powerline will have a negative impact on the habitats of such species. The flora and fauna specialist will be expected to establish whether

these species are found on site and whether a search and rescue operation should be instituted prior to construction.

Potential impacts which could occur during the construction phase include:

- Habitat loss due to vegetation clearing; and
- Disturbance to fauna during the construction phase that will result in fauna leaving the project area.

Potential impacts which could occur during the operational phase include:

- Loss of habitat (e.g. removal of trees);
- Temporary emigration of animals away from area;
- Poaching and wilful harming of animals by construction workers;
- Risk of harm from construction activities (e.g. open excavations);
- Loss of livestock though improper access control; and
- Birds are particularly susceptible to impacts from powerlines, which include electrocution, collision with power lines and loss of habitat.

14.5.2 Impact Assessment

The impact assessment to follow was extracted from the Terrestrial Ecological Impact Assessment (Nemai Consulting, 2018a). Please refer to the methodology used by the Specialist in the report (**Appendix 6A**).

FLORA PRE – CONSTRUCTION PHASE						
Potential Impact	Mitigation					
Loss of plant species of conservation concern	• It is recommended that prior to construction, the *Boophane disticha* plant species recorded must be searched and rescued and then following construction activities, they can be re-established at the site or along the route. • A permit from DAFF is required before construction commences in order to disturb, destroy or remove the several *Acacia erioloba* noted along the routes. • It is therefore recommended that a walk-down survey of the approved route alternative be undertaken prior to the start of the construction activities in order to survey the area in detail for any Red Data Listed species and also to develop a comprehensive and site-specific EMPr so as to limit the impacts imposed by the proposed development activities at each tower site. This is relevant in the areas that have been labelled as ecologically sensitive.					
Without Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Positive	Local	Medium	Medium-term	Almost certain	2
With Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Positive	Local	Low	Short-term	Likely	1

FLORA PRE – CONSTRUCTION PHASE						
Potential Impact		Mitigation				
Destruction of indigenous flora during site establishment		• Indigenous plants naturally growing along the proposed development routes, but that would be otherwise destroyed during clearing for development purposes should be incorporated into landscaped areas. • Vegetation clearing should be kept to a minimum, and this should only occur where it is absolutely necessary and the use of a brush-cutter is highly preferable to the use of earth-moving equipment. • Rehabilitate all disturbed areas as soon as the construction is completed along the proposed development route. • Ensure that all personnel have the appropriate level of environmental awareness and competence to ensure continued environmental due diligence and on-going minimisation of environmental harm and this can be achieved through provision of appropriate awareness to all personnel. • Vehicles and construction workers should under no circumstances be allowed outside the site boundaries to prevent impact on the surrounding vegetation. • Where possible, natural vegetation must not be cleared and encouraged to grow. • Disturbance of vegetation must be limited only to areas of construction. • Prevent contamination of natural grasslands by any pollution. • Areas cleared of vegetation must be re-vegetated prior to contractor leaving the site. • Any fauna (mammal and reptile) that becomes trapped in the trenches or in any construction or operational related activity may not be harmed and must be placed rescued and relocated by an experienced person. • Proliferation of alien and invasive species is expected within the disturbed areas and they should be eradicated and controlled to prevent further spread. • No trapping or any other method of catching of any animal or bird may be performed on site • No storage of building materials or rubbles are allowed in the sensitive areas. • Avoid translocating stockpiles of topsoil from one place to sensitive areas in order to avoid translocating soil seed banks of alien species. • Areas showing dense natural vegetation can be avoided/ spanned in order to reduce vegetation loss.				
Without Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Medium	Medium-term	Almost certain	2
With Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Low	Short-term	Likely	1

FAUNA PRE – CONSTRUCTION PHASE	
Potential Impact	Mitigation
Loss and displacement of animals on site.	• Training of construction workers to recognise threatened animal species will reduce the probability of fauna being harmed unnecessarily.

FAUNA PRE – CONSTRUCTION PHASE						
Potential Impact		Mitigation				
		• The contractor must ensure that no faunal species are disturbed, trapped, hunted or killed during the construction phase. • Vehicles must adhere to a speed limit, 30-40 km/h is recommended for light vehicles and a lower speed for heavy vehicles. • All construction and maintenance vehicles must stick to properly demarcated and prepared roads. Off-road driving should be strictly prohibited. • No fires should be allowed at the site • No dogs or other domestic pets should be allowed at the site.				
Without Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Positive	Local	Medium	Medium-term	Almost certain	2
With Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Positive	Local	Low	Short-term	Likely	1

FLORA AND FAUNA PRE – CONSTRUCTION PHASE						
Potential Impact		Mitigation				
Loss of habitat and habitat fragmentation		• The most significant way to mitigate the loss of habitat is to limit the footprint within the natural habitat areas remaining. • No structures should be built outside the area demarcated for the development. • Although it is unavoidable that sections of the powerline will need to traverse areas of potential sensitivity, the powerline construction should be constructed in such cases so as to avoid further impact to these areas. • Where possible, the proposed linear infrastructure (powerline) should be aligned with existing linear infrastructure or routed through already transformed/degraded areas. • All stockpiles, construction vehicles, equipment and machinery should be situated away from the natural vegetation.				
Without Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Medium	Medium-term	Almost certain	2
With Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Low	Short-term	Likely	1

FLORA CONSTRUCTION PHASE	
Potential Impact	Mitigation
Loss of vegetation due to fuel and chemical spills.	• Appropriate measures should be implemented in order to prevent potential soil pollution through fuel and oil leaks and spills and then compliance monitored by an appropriate person. • Make sure construction vehicles are maintained and serviced to prevent oil and fuel leaks. • Emergency on-site maintenance should be done over appropriate drip trays and all oil or fuel must be disposed of according to waste regulations. Drip-trays must be placed under vehicles and equipment when not in use. • Implement suitable erosion control measures

FLORA CONSTRUCTION PHASE						
Potential Impact		Mitigation				
Without Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Medium	Medium-term	Almost certain	2
With Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Low	Short-term	Likely	1

FLORA CONSTRUCTION PHASE						
Potential Impact		Mitigation				
Introduction of alien species.		• During construction, the construction area and immediate surroundings should be monitored regularly for emergent invasive vegetation • Promote awareness of all personnel. • The establishment of pioneer species should be considered with the natural cycle of rehabilitation of disturbed areas, which assists with erosion control, dust and establishment of more permanent species. This can be controlled during construction phase and thereafter more stringent measures should be implemented during the rehabilitation and post rehabilitation. • Larger exotic species that are not included in the Category 1b list of invasive species could also be allowed to remain for aesthetic purposes				
Without Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Medium	Medium-term	Almost certain	2
With Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Low	Short-term	Likely	1

FLORA CONSTRUCTION PHASE						
Potential Impact		Mitigation				
Destruction of alien vegetation.		• All alien seedlings and saplings must be removed as they become evident for the duration of construction phase • Manual / mechanical removal is preferred to chemical control.				
Without Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Medium	Medium-term	Almost certain	2
With Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Low	Short-term	Likely	1

FLORA CONSTRUCTION PHASE	
Potential Impact	Mitigation
Increased soil erosion	• Topsoil should be stored in such a way that does not compromise its plant-support capacity. • Topsoil from the construction activities should be stored for post-construction rehabilitation work and should not be disturbed more than is absolutely necessary.

FLORA CONSTRUCTION PHASE						
Potential Impact		Mitigation				
		• Protect topsoil in order to avoid erosion loss on steep slopes. • Protect topsoil from contamination by aggregate, cement, concrete, fuels, litter, oils, domestic and wastes. • An ecologically-sound storm water management plan must be implemented during construction and appropriate water diversion systems put in place.				
Without Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Medium	Medium-term	Almost certain	2
With Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Low	Short-term	Likely	1

FLORA CONSTRUCTION PHASE						
Potential Impact		Mitigation				
Loss of habitat of the CBA and ESA		• Where possible, natural vegetation must not be cleared and encouraged to grow. • Disturbance of vegetation must be limited only to areas of construction. • Areas cleared of vegetation must be re-vegetated prior to contractor leaving the site Vehicles and construction workers should under no circumstances be allowed outside the site boundaries to prevent impact on the surrounding vegetation. • All stockpiles, construction vehicles, equipment and machinery should be situated away from the natural vegetation. • Prevent contamination of natural areas by any pollution.				
Without Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Medium	Medium-term	Almost certain	2
With Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Low	Short-term	Likely	1

FLORA AND FAUNA CONSTRUCTION PHASE	
Potential Impact	Mitigation
Damage to plant and animal life outside of the proposed route alternatives	• Any fauna (mammal, reptile and amphibian) that becomes trapped in the trenches or in any construction or operational related activity may not be harmed and must be placed rescued and relocated by an experienced person. • Proliferation of alien and invasive species is expected within the disturbed areas and they should be eradicated and controlled to prevent their spread. • No unauthorised vehicles should be allowed to drive through the site during the construction activities. • No trapping or any other method of catching of any animal may be performed on site. • Illegal hunting is prohibited. • No dumping of any form is permitted. • No damage and/or removal/trapping/snaring of indigenous plant or animal material for cooking and other purposes will be allowed.

FLORA AND FAUNA CONSTRUCTION PHASE						
Potential Impact		Mitigation				
		• All areas to be affected by the proposed project will be rehabilitated by indigenous vegetation. • Construction activities should be restricted to the development footprint area and then the compliance in terms of footprint can be monitored by Environmental Control Officer (ECO). • Natural areas which could be deemed as no go should be clearly marked. • River systems must be spanned and no towers should be placed within the buffer zones dictated by the surface water studies.				
Without Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Medium	Medium-term	Almost certain	2
With Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Low	Short-term	Likely	1

FAUNA CONSTRUCTION PHASE						
Potential Impact		Mitigation				
Disturbance to animals		• Animals residing within the designated area shall not be unnecessarily disturbed. • During construction, refresher training can be conducted to construction workers with regards to littering and poaching. • The Contractor and his/her employees shall not bring any domestic animals onto site. • Toolbox talks should be provided to contractors regarding disturbance to animals. Particular emphasis should be placed on talks regarding snakes.				
Without Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Medium	Medium-term	Almost certain	2
With Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Low	Short-term	Likely	1

FLORA OPERATIONAL PHASE						
Potential Impact				Mitigation		
The proposed construction activities may affect biodiversity through the encroachment of exotic vegetation following soil disturbance, in addition the maintenance of the area would disturb naturalised species within the area.				Newly cleared soils will have to be re-vegetated and stabilised as soon as construction has been completed and there should be an on-going monitoring program to control and/or eradicate newly emerging invasives.		
Without Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Medium	Medium-term	Almost certain	2
With Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Low	Short-term	Likely	1

FLORA CONSTRUCTION/POST CONSTRUCTION PHASE						
Potential Impact	Mitigation					
Loss of habitat due to construction activities	• All areas to be affected by the proposed project will be rehabilitated after construction and all waste generated by the construction activities will be stored in a temporary demarcated storage area, prior to disposal thereof at a licensed registered landfill site. • As much vegetation growth as possible should be promoted within the proposed route alternatives in order to protect soils and to reduce the percentage of the surface area which is left as bare ground. In this regard special mention is made of the need to use indigenous vegetation species as the first choice during landscaping. In terms of the percentage of coverage required during rehab and also the grass mix to be used for rehab, the EMPr will be consulted for guidance. However, the plant material to be used for rehabilitation should be similar to what is found in the surrounding area.					
Without Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Positive	Local	Medium	Medium-term	Almost certain	2
With Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Positive	Local	Low	Short-term	Likely	1

FAUNA OPERATIONAL PHASE						
Potential Impact		Mitigation				
Disturbance of faunal species		• The disturbance of fauna should be minimized. • Animals residing within the designated area shall not be unnecessarily disturbed.				
Without Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Positive	Local	Medium	Medium-term	Almost certain	2
With Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Positive	Local	Low	Short-term	Likely	1

The impact assessment to follow was extracted from the Avifaunal Impact Assessment (Enviross, 2018). Please refer to the methodology used by the Specialist in the report (**Appendix 6B**).

PRE-CONSTRUCTION & CONSTRUCTION PHASE									
Activity	**Nature of Impact**	**Impact type**	**Extent**	**Duration**	**Potential Intensity**	**Likeli-hood**	**Rating**	**Mitigation***	**Interpretation**
Clearing of vegetation to accommodate infrastructure and services (roads, etc), which will remove habitat utilised by avifauna.	<u>Direct Impact:</u>	Expected	2	3	4	1.0	9.0 - MOD	Limit the footprint to only areas necessary for the construction process; Utilise single access roads only if service roads are not to be part of operations access roads; Avoid indiscriminate destruction of habitat outside of footprint area.	The survey area suffers varying degrees of vegetation transformation and therefore the significance of this impact also varies. Areas already suffering transformation will have lower impact significance than areas that have retained primary/natural vegetation. This rating is taken as an average of the overall impact.
	Vegetation stripping will be necessary to allow for the establishment of services and infrastructure; Vegetation will have to be removed to allow access for heavy earthmoving equipment, vehicles, etc. This will have varying levels of significance depending on whether it is undertaken in natural areas or areas that have already suffered disturbances.	Cumulative	3	3	4	1.0	10-HIGH		Cumulative loss of the vegetation units to accommodate agriculture is relatively high within the region.
		Residual	1	2	2	1.0	5.0 - MOD		Limited residual impact remains due to the ultimately small footprint area of each tower. Residual impacts will remain where new servitude roads have been established, but this is thought to have limited long-term impacts.
Loss and/or displacement of sensitive avifaunal species.	<u>Direct Impact:</u>	Expected	2	3	4	0.2	1.8 - LOW	Indiscriminate habitat destruction to be avoided and the proposed development should remain as localised as possible (including support areas and services); Observation of the ecological sensitivity map and inclusion of the sensitive areas into planning of access routes, etc will reduce this impact;	The significance of this impact is regarded as being minimal due to the availability of alternate habitat within the area. The wetland and riparian habitats, which have the most potential of supporting RDL or sensitive species, will presumably only suffer marginal/fringing impacts. Sensitive and habitat specialist species will also be dependent on the wetland and riparian habitats.

PRE-CONSTRUCTION & CONSTRUCTION PHASE									
Activity	**Nature of Impact**	**Impact type**	**Extent**	**Duration**	**Potential Intensity**	**Likeli-hood**	**Rating**	**Mitigation***	**Interpretation**
	Site disturbances and vegetation (habitat) loss may lead to the loss of avifaunal species that are sensitive to disturbances.	Cumulative	2	3	4	0.75	6.75 - MOD	Site reinstatement and clean up following the completion of the construction phase of each tower site will be important.	Displacement of sensitive avifaunal species due to habitat destruction and habitat fragmentation eventually leads to isolation and loss of those species. This is, however, considered to be low within the region.
		Residual	1	2	2	0.2	1.0 - LOW		Limited residual impact will remain following site reinstatement of each tower footprint following the completion of the construction phase.
Destruction of nesting and/or roosting habitat for avifaunal species.	<u>Direct Impact:</u>	Expected	2	3	4	0.2	1.8 - LOW	A walk-through of the site should be undertaken once tower footprint sites have been established in order to clear the area of any active nests; Limit the footprint to only areas necessary for the construction process; Utilise single access roads only; Avoid indiscriminate destruction of habitat; Rehabilitate areas affected by the construction process as far as possible.	Many large trees occur within the alignment corridors that have a high potential to support nesting of various larger species. Nests of ground-dwelling species will also have to be considered.
	Site clearing will remove all vegetation to accommodate the substation infrastructure development. This may include established nests and/or roosting areas; Servitude clearing for the powerline will also impact nesting/roosting habitat.	Cumulative	2	3	4	0.75	6.75 - MOD		Destruction of nesting habitat displaces the affected species eventually leading to loss of those species.
		Residual	1	2	2	0.2	1.0 - LOW		Following completion of the construction and rehabilitation phases, the site should not be subject to routine disturbances and therefore species will return to the area.
Destruction of ecologically important or sensitive habitat that is utilised by specialist	<u>Direct Impact:</u>	Expected	2	4	4	1.0	10 - HIGH	Indiscriminate habitat destruction to be avoided and the proposed development should remain as localised as possible (including support areas and services); Site reinstatement and clean up following the completion of the	The survey area suffers varying degrees of habitat transformation and therefore the significance of this impact also varies. Areas already suffering transformation will have lower impact significance than areas that have retained primary/natural vegetation. This rating is taken as an average of the overall impact.

PRE-CONSTRUCTION & CONSTRUCTION PHASE									
Activity	**Nature of Impact**	**Impact type**	**Extent**	**Duration**	**Potential Intensity**	**Likeli-hood**	**Rating**	**Mitigation***	**Interpretation**
avifaunal species.		Cumulative	2	3	4	1.0	9 - MOD	construction phase of each tower site will be important.	Cumulative loss of sensitive habitat units is relatively rare as these areas are generally unsuitable for agricultural purposes (the main land use within the area).
	Wetlands are considered sensitive and ecologically important habitat features regardless of ecological state. Destruction of ecologically sensitive habitat units will lead to loss of ecological functionality and destruction/loss of natural biodiversity.	Residual	2	1	2	0.75	3.75 - MOD		The footprint of the proposed development should be limited to the areas that already suffer transformation, taking an ecological sensitivity map into consideration; Limited residual impact remains due to the ultimately small footprint area of each tower. Residual impacts will remain where new servitude roads have been established, but this is thought to have limited long-term impacts.
Disturbance features that alter the vegetation structures that will impact avifaunal community structures	<u>Indirect Impact:</u>	Expected	2	4	4	1.0	10 - HIGH	Disturbance of soils will enhance the Ongoing management of exotic vegetation recruitment as well as future recruitment of exotic vegetation must be managed. A monitoring protocol must be developed and utilised during both the construction and operations/management phases of the development.	Exotic vegetation is limited to isolated areas within wetland and riparian habitat (especially) and some isolated occurrences within the terrestrial habitats.
	Disturbances of soils will lead to altered state of vegetation structures. This will often lead to bush encroachment or establishment of exotic invasive species, which will impact on avifaunal community structures.	Cumulative	2	4	4	1.0	10 - HIGH		Cumulative loss of primary vegetation features due to exotic vegetation and vegetation transformation is high at the national level and therefore should be avoided.
		Residual	2	1	2	0.5	2.5 - LOW		Transformation of vegetation structure within areas that have suffered disturbances required active management. If mitigation measures are put into place to manage vegetation degradation then little to no residual impacts should remain.

OPERATIONAL PHASE									
Activity	**Nature of Impact**	**Impact type**	**Extent**	**Duration**	**Potential Intensity**	**Likeli-hood**	**Rating**	**Mitigation**	**Interpretation**
Servitude maintenance will displace species that have become established.	<u>Direct Impact:</u>	Expected	2	2	2	0.2	1.2 - LOW	This impact is regarded as being of limited relevance and of a low significance; Maintenance of the servitude must remain within the designated servitude only and no indiscriminate habitat destruction outside of the designated area should be allowed.	There will be limited need for routine maintenance of the servitude, which is regarded as a short-lived impact feature. This reduces the significance of this impact.
	The servitude for the powerline will require periodic maintenance to abate fire risks and to control tall trees. This maintenance will displace individuals that utilise these areas.	Cumulative	2	3	2	0.2	1.4 - LOW		Limited powerline infrastructure occurs within the area and therefore the cumulative impact of servitude maintenance is limited.
		Residual	1	1	2	0.1	0.4 - LOW		Servitude maintenance should be undertaken in sections, which will allow for continuity of habitat availability. Again, however, this is regarded as having limited significance.
Impacts to avifauna due to collisions with overhead lines.	<u>Direct Impact:</u>	Expected	2	3	4	1.0	9.0 - MOD	Avifaunal utilise watercourses as navigation aids during cyclic migrational movements. The identification of these main migratory routes associated with the proposed alignment routes has been undertaken. The powerlines that run through these areas must be fitted with bird flapper devices on the earth wire to increase the visibility of the line. This should be done at least at 10 m intervals; Monitoring for bird collisions must be routinely undertaken and bird flappers should be retro-fitted to sections of the line where collisions are occurring (identified collision hotspots).	Avifaunal species within the region have been shown to learn where powerlines occur and tend to avoid them. This line, however, is proposed within an area where no other lines occur. Therefore some bird fatalities will occur if the lines are not made more visible. Regardless, some fatalities due to collision with the wires will occur, with greater frequency initially, tapering off with time.
	Collisions with overhead powerlines is a leading cause of fatalities of larger-bodied avifaunal species, many of which are Red Data listed. This is largely limited to collision with the	Cumulative	3	3	4	1.0	10-HIGH		Powerlines represent the largest proportion of established aerial infrastructure throughout the country and collision impacts are of national concern. Fitment of devices on the earth wires to make the lines more visible is reducing this impact at the national level.

OPERATIONAL PHASE									
Activity	**Nature of Impact**	**Impact type**	**Extent**	**Duration**	**Potential Intensity**	**Likeli-hood**	**Rating**	**Mitigation**	**Interpretation**
	single earth wire, which has a low visibility.	Residual	1	2	2	1.0	5.0 - MOD		Limited residual impacts will remain if bird flappers are fitted within migratory zones. Isolated occurrences of collision fatalities will always remain, however.

14.6 Land Capability

14.6.1 Potential Impacts

Eskom will need to register a servitude for the powerline, following compensation of the landowner. The proposed powerline will not result in the sterilisation of all the land within the servitude, and certain agricultural practices (e.g. some grazing and the use of farm roads) are still permissible.

Potential impacts to agriculture during the construction phase include:

- Loss of arable land;
- Risk of harm to livestock from construction activities (e.g. open excavations);
- Loss of livestock though improper access control; and
- Theft of farming produce during construction.

Potential impacts to agriculture during the operational phase include:

- Loss of livestock though improper access control;
- The potential of magnetic radiation affecting pregnant cattle;
- Power cables influencing the GPS signals used for precision farming;
- Farms with power lines are charged extra for crop spraying;
- Introduction of exotic weed species; and
- Limitation of the height of trees.

14.6.2 Impact Assessment

The impact assessment to follow was extracted from the Agricultural Impact Assessment (Index, 2018). Please refer to the methodology used by the Specialist in the report (**Appendix 6E**).

	Potential impact	Proposed Management Objectives / Mitigation Measures	Extent	Magnitude	Duration	Probability	Significance	Area lost Route 1	Area lost Route 2	Area lost Route 3	Area lost Route 4
1	**Loss of high potential arable land**										
	Before mitigation	Permanent loss of high potential farming land	Local	High	Permanent	Certain	Moderate	156	63	464	190
	Mitigation	No mitigation possible for the loss of land Place the line to avoid irrigated land	Local	High	Permanent	Certain	Moderate	156	63	464	190
2	**Loss of cultivated land**										
	Before mitigation	Temporary loss cropping land and disruption of farming process	Local	Low	Temporary	Certain	Low	155	204	130	182
	Mitigation	Place the line to avoid cultivated land The impact is temporary. The construction period is at most for one production season for the line position, and permanently for the tower footprint. Loss of income from the affected land can only be minimised by keeping the construction period as short as possible. Construction can be scheduled to take place after the crops are harvested. The impact will then only be on the stover value as grazing. Employ dust reducing practices to protect adjoining grazing land.	Local	Low	Temporary	Certain	Low	0	0	0	0
3	**Loss of grazing land**										
	Before mitigation	Temporary loss of grazing land	Local	Low	Temporary	Certain	Low	1 435	1 308	1 486	1 418
	Mitigation	Keep the construction period as short as possible. Employ dust reducing practices to protect adjoining grazing land.	Local	Low	Temporary	Certain	Low	0	0	0	0

	Potential impact	Proposed Management Objectives / Mitigation Measures	Extent	Magnitude	Duration	Probability	Significance	Area lost Route 1	Area lost Route 2	Area lost Route 3	Area lost Route 4
4	**Loss of agricultural production**										
	Before mitigation	Permanent loss of irrigated crops. Maize yield under irrigation is 15t/ha that will be lost and replaced with 1,5 that is the yield for dryland production.	Local	Moderate	Permanent	Certain	Low	4 635 tonne maize	6 116 tonne maize	3 912 tonne maize	5 459 tonne maize
		Loss of dryland crops. The loss will be for one production season.	Local	Low	Temporary	Certain	Low	58 tonne maize	76 tonne maize	49 tonne maize	68 tonne maize
		Loss of grazing land. The loss will be for one production season.	Local	Low	Temporary	Certain	Low	143 LSU	131 LSU	149 LSU	142 LSU
		Loss of poultry production. For the period of construction	Local	Low	Temporary	Certain	Low	0	0	2 units	0
	After mitigation	Loss of irrigated land Can be partially mitigated by changing the land use to dryland crops or by moving the infrastructure but only if the farmer has suitable land.	Local	Moderate	Permanent	Certain	Low	4 635 tonne maize	6 116 tonne maize	3 912 tonne maize	5 459 tonne maize
		Dryland crops Keep the construction period as short as possible. Employ dust reducing practices to protect adjoining grazing land.	Local	Low	Temporary	Certain	Low	0	0	0	0
		Grazing land Keep the construction period as short as possible. Employ dust reducing practices to protect adjoining grazing land.	Local	Low	Temporary	Certain	Low	0	0	0	0
5	**Loss of agricultural infrastructure**										
	Before mitigation	The irrigation infrastructure will be permanently lost.	Local	Moderate	Permanent	Certain	High	156	63	464	190
	Mitigation	Move infrastructure to alternative site, provided the farmer has suitable land and water is available	Local	Low	Permanent	Uncertain	Low	?	?	?	?

14.7 Land Use

14.7.1 Potential Impacts

- Temporary interruptions to agricultural activities during the construction period along the powerline;
- Permanents loss of agricultural land at transmission line towers; and
- During the operational phase, the landowner will have permitted access and certain use of the servitude area (depending on the limitations specified in the servitude agreement).

14.7.2 Impact Assessment

Land Use							
Project Life-cycle:	Construction and Operation						
Potential Impact:	Land acquisition and servitude restrictions						
Proposed Mitigation:	• Engage and negotiate with affected landowners. • Eskom will need to conform to all its legal obligations as part of the acquisition of land for the construction and operation of the project.						
	Nature	**Extent**	**Magnitude**	**Duration**	**Probability**	**Significance**	**Score**
Without Mitigation	-	Local	High	Permanent	Almost Certain	2	-60
With Mitigation	-	Local	Low	Permanent	Almost Certain	1	-10

14.8 Heritage

14.8.1 Potential Impacts

There could be heritage resources (such as stone age / iron age tools or objects) of significance, archaeological and palaeontological sites, graves or any other heritage and cultural artefacts on the proposed Mookodi-Mahikeng 400kV Powerline route alternatives.

14.8.2 Impact Assessment

The impact assessment to follow was extracted from the Heritage Impact Assessment (JLB Consulting, 2018). Please refer to the methodology used by the Specialist in the report (**Appendix 6C**).

Graves and cemeteries

All powerline route options – pre-construction, construction and operation		
	Without Mitigation	**With Mitigation**
Scale	Local (2)	Local (2)
Duration	Permanent (5)	Permanent (5)
Magnitude	High (8)	Low (4)
Probability	Medium (3)	Low (2)

Status	Negative	Negative
Reversibility	No	No
Level of Significance	45 (medium negative)	22 (low negative)
Can impacts be mitigated	Yes	n/a

Mitigation

- Prior to construction, a walk-down of the chosen powerline route option must be undertaken by a heritage specialist to identify any grave sites and cemeteries
- If any pylons are positioned on graves or cemeteries, then the position of the pylon must be adjusted to avoid impacting on the graves or cemeteries
- A buffer of 20 m must be placed around all graves and cemeteries to ensure that during the construction of the powerline, these sites are not damaged.
- The material demarcating the 20 m buffer must be highly visible and made of durable material to ensure that they are still in place during the operation of the powerlines so that maintenance crews are aware of the sites.
- If, for any reason, graves or cemeteries have to be moved, then a Phase 2 HIA will need to be undertaken during which process, the family and relevant communities will have to be engaged with to obtain their permission and to discuss where the remains are to be moved to. In addition, application will have to be made to the NWHRA or SAHRA for the necessary permits. Sub-sections (4) and (5) of section 36 of the NHRA regarding the removal of graves must be adhered to.
- **The exhumation and removal of graves is strongly discouraged as graves are highly significant to many people and there are many traditional, cultural and personal sensitivities concerning the removal of graves**.

Structures older than 60 years

All powerline route options – pre-construction and construction		
	Without Mitigation	**With Mitigation**
Scale	Local (2)	Local (2)
Duration	Permanent (5)	Permanent (5)
Magnitude	Moderate (6)	Low (4)
Probability	Medium (3)	Low (2)
Status	Negative	Negative
Reversibility	No	No
Level of Significance	39 (medium negative)	22 (low negative)
Can impacts be mitigated	Yes	n/a

Mitigation

- Prior to construction, a walk-down of the selected powerline route option must be undertaken by a heritage specialist to identify any additional protected structures as well as those protected structures that may be directly impacted by the location of pylons.
- If any pylons are positioned on protected structures, then the position of the pylon must be adjusted to avoid impacting on the structure/s
- A buffer of 20 m must be placed around all structures (whether protected or not) to ensure that during the construction of the powerline, all buildings (including farm houses and associated buildings) are not damaged by the construction process.
- The material demarcating the 20 m buffer must be highly visible and made of durable material to ensure that they are still in place during the operation of the powerlines.

- If any building is to be altered, damaged or destroyed then permission from the owner must be obtained. If the building is protected (older than 60 years), then application must be made to the NWHRA or SAHRA for the necessary permits.

Archaeological sites

All powerline route options – pre-construction, construction and operation		
	Without Mitigation	**With Mitigation**
Scale	Regional (3)	Regional (3)
Duration	Permanent (5)	Permanent (5)
Magnitude	High (8)	Low (4)
Probability	High (4)	Low (2)
Status	Negative	Negative
Reversibility	No	No
Level of Significance	64 (medium negative)	24 (low negative)
Can impacts be mitigated	Yes	n/a

Mitigation

- Prior to construction, a walk-down of the selected powerline route option must be undertaken by an archaeologist to identify archaeological areas (such as pans and quarries) and archaeological sites that may be impacted by the location of pylons.
- If any pylons are positioned on or very close (within 10 m) of archaeological sites, then the position of the pylon must be adjusted to avoid impacting on such sites
- A buffer of 20 m must be placed around significant archaeological sites to ensure that during the construction of the powerline, such sites are not damaged by the construction process.
- The material demarcating the 20 m buffer must be highly visible and made of durable material to ensure that they are still in place during the operation of the powerline so that these sites are not destroyed during the maintenance of the powerline.
- If archaeological sites are impacted by a pylon or by the construction process, then the necessary permits must be obtained from the NWPHRA or SAHRA either for the rescue or destruction of archaeological material dependent on the significance of the material/site.

The possible impact on palaeontological resources is rated as *low.*

IMPACT	SIGNIFICANCE	SPATIAL SCALE	TEMPORAL SCALE	PROBABILITY	RATING
	Low	Study Area	Permanent	Unlikely	Low
Impact on palaeontology	2	2	5	2	1.2

14.9 Air Quality

14.9.1 Potential Impacts

Potential impacts to air quality during the construction phase include:

- Dust from the use of dirt roads;
- Dust from bare areas that have been cleared for construction purposes;

- Emissions from construction equipment and machinery; and
- Tailpipe emissions from construction vehicles.

Potential impacts to air quality during the operational phase include:

- Dust from the use of dirt roads; and
- Tailpipe emissions from maintenance vehicles.

14.9.2 Impact Assessment

Air Quality							
Project Life-cycle:	Construction						
Potential Impact:	Excessive dust levels as a result of construction activities						
Proposed Mitigation:	• Appropriate dust suppression measures or temporary stabilising mechanisms to be used when dust generation is unavoidable (e.g. dampening with water, chemical soil binders, straw, brush packs, chipping), particularly during prolonged periods of dry weather. Dust suppression to be undertaken for all bare areas, including construction area and access roads. Note that all dust suppression requirements should be based on the results from the dust monitoring and the proximity of sensitive receptors. • Speed limits to be strictly adhered to. • The Contractor will take preventative measures to minimise complaints regarding dust nuisances (e.g. screening, dust control, timing, pre-notification of affected parties). • Air quality to be monitored (baseline and during construction) for dust fallout and particulate matter. Sampling locations to consider major sources of dust and sensitive receptors.						
	Nature	**Extent**	**Magnitude**	**Duration**	**Probability**	**Significance**	**Score**
Without Mitigation	-	Local	Low	Short	Likely	1	-6
With Mitigation	-	Local	Low	Short	Unlikely	1	-4

14.10 Noise

14.10.1 Potential Impacts

During construction, localised increases in noise may be caused by:

- Blasting (if required);
- Construction equipment, machinery and vehicles;
- Construction material delivery vehicles; and
- General activities at the construction camp.

Potential sources of noise during the operational phase include:

- Maintenance vehicles and activities; and
- “Crackling” noise (called “corona”) from transmission lines.

14.10.2 Impact Assessment

Noise							
Project Life-cycle:	Construction						
Potential Impact:	Excessive noise levels as a result of construction and operation activities						
Proposed Mitigation:	• The provisions of SANS 10103:2008 will apply to all areas at the perimeter of the site, within audible distance of residents. • Working hours to be agreed upon with Applicant, so as to minimise disturbance to adjacent landowners and community members. • No amplified music will be allowed on the site. The use of radios, tape recorders, compact disc players, television sets etc. will not be permitted unless at a level that does not serve as an intrusion to adjacent landowners. • Construction activities generating output levels of 85 dB or more will be confined to the hours during normal working hours. • The Contractor shall inform local communities and residents of any activity that could cause a nuisance to them. • Noise rules must be established for construction areas. These rules must continue into the operation phase. • The Contractor shall take preventative measures (e.g. screening, muffling, timing, pre-notification of affected parties) to minimise complaints regarding noise and vibration nuisances from sources such as power tools. • No noise generating activity outside of normal hours, regardless of its proximity to residences, can take place without application to the Engineer for approval. The application shall be accompanied by the noise containment measures proposed. • Restrict construction activities and vehicle movement to normal working hours. • Where necessary engage with the land owner to ensure livestock are not in close proximity to the construction activity during times where noise levels are of significance. • Disturbances during the construction phase can be successfully mitigated through contractor specifications issued at tender stage and through monitoring of contractor performance during the construction phase.						
	Nature	**Extent**	**Magnitude**	**Duration**	**Probability**	**Significance**	**Score**
Without Mitigation	-	Local	Medium	Short	Likely	2	-24
With Mitigation	-	Local	Low	Short	Unlikely	1	-4

14.11 Existing Infrastructure

14.11.1 Potential Impacts

The centreline of the BPEO will attempt to avoid direct impact to structures. However, certain linear infrastructure (e.g. road and railway line) is not avoidable. Eskom will need to comply with the requirements of the custodians of existing linear infrastructure and the appropriate wayleave procedures will need to be followed.

Once access to a property is granted, mitigation measures should be taken to ensure that any damage that is caused as a result of this access is made good. This includes damage to infrastructure such as fences, gates, electrical connections or roads. Certain restrictions associated with the power line servitude will need to be adhered to during the operational

phase of the project. Property damage includes the destruction of crops that may be required at the time of site clearance.

Where there is a risk of damage occurring, the contractor is to document to the condition prior to the start of work. If the condition has deteriorated after the completion of the work, any such damage should be made good. Landowner signed off that the damage has indeed been rectified should be obtained.

14.11.2 Impact Assessment

The impact assessment to follow was extracted from the Social Impact Assessment (Nemai Consulting, 2018b). Please refer to the methodology used by the Specialist in the reports (**Appendix 6H**).

Environmental Feature	Disturbance arising from the construction phase
Project life-cycle	Construction phase
Potential Impact	Proposed Management Objectives / Mitigation Measures
Damage to property	• If a risk existing of damage taking place on a property as a result of construction, a condition survey should be undertaken prior to construction; • The contractor is to make good and acknowledge any damage that occurs on any property as a result of construction work; • Where crops and agricultural machinery are damaged, compensation is to be paid to the farmer for the loss of these crops; • The farmer should be compensated for any loss of income experienced at the account of the contractor.

	Nature	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	Negative	Local	Medium	Short Term	Likely	2
After Mitigation	Negative	Local	Low	Short Term	Moderate	1
Significance of Impact and Preferred Alternatives	Disturbances and irritation during construction is to be expected. These can then be successfully mitigated through contractor specifications that are issued at a tender stage and through the continuous monitoring of contractor proceedings and performance during construction phase. Negative impacts owing to the construction will unfortunately be experienced irrespective of the site and routing alternative that is most preferred and chosen.					

14.12 Traffic

14.12.1 Potential Impacts

Local road access will be used during the project, and as a result these roads may be subject to damage. The project is to maintain the local roads for the duration of the contract and should leave them in a state the same or better than they were prior to the start of the construction phase.

Heavy duty trucks and construction vehicles will cause damage to the current road conditions as well as contribute to congestion on the roads.

The greater the number of trucks on the road, the greater the risk of road accidents occurring. It is important that the contractors are sensitive to the road conditions and ensure that throughout the construction process that these roads are maintained and suitable for small vehicles

14.12.2 Impact Assessment

The impact assessment to follow was extracted from the Social Impact Assessment (Nemai Consulting, 2018b). Please refer to the methodology used by the Specialist in the reports (**Appendix 6H**).

Environmental Feature	Disturbance arising from the construction phase
Project life-cycle	Construction phase
Potential Impact	Proposed Management Objectives / Mitigation Measures
Traffic	• Ensure that the necessary signage and traffic measures are implemented for safe and convenient access to the site; • Additional creation of routes and access roads must be implemented to reduce heavy traffic flow; • The EMPr must include restrictions on the Contractor and its sub-contractors related to minimising impacts on the safety of road users; Restrictions should include appropriate speed limitations, restricting travel times to daylight hours, communication measures and the establishment of haul routes.; • Measures must be put in place to prevent construction vehicles from entraining dirt onto public roads; • Traffic control personnel must be assigned where deemed necessary, this will be to control the movement of construction vehicles in relation to local vehicles to ensure maximum safety and coherence.
Local Road Condition	• A continuous condition survey of the local roads to be used during the construction phase should be made prior to construction; • Delivery routes should be defined and adhered to during the construction phase; • Maintenance of local roads should take place during the construction phase, ensuring that the local roads used by the contractor are left in the same or better condition than they were prior to the start of construction.

	Nature	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	Negative	Local	Medium	Short Term	Likely	2
After Mitigation	Negative	Local	Low	Short Term	Moderate	1
Significance of Impact and Preferred Alternatives	Disturbances and irritation during construction is to be expected. These can then be successfully mitigated through contractor specifications that are issued at a tender stage and through the continuous monitoring of contractor proceedings and performance during construction phase. Negative impacts owing to the construction will unfortunately be experienced irrespective of the site and routing alternative that is most preferred and chosen.					

14.13 Visual Quality

14.13.1 Potential Impacts

Potential visual impacts during the construction phase include:

- Clearing of vegetation;
- Construction-related activities;
- Inadequate waste management and housekeeping; and
- Inadequate reinstatement and rehabilitation of construction footprint.

Potential visual impacts during the operational phase include:

- High visibility of transmission lines and substation;
- Loss of “sense of place”; and
- Inadequate reinstatement and rehabilitation of construction footprint.

14.13.2 Impact Assessment

The impact assessment to follow was extracted from the Visual Impact Assessment (Ecoelementum, 2018). Please refer to the methodology used by the Specialist in the report (**Appendix 6F**).

Construction Camps

Nature of impact: Potential visual impact significance of the Construction Camps		
	No Mitigation	**With Mitigation**
	Proposed	**Proposed**
Extent	2	1
Duration	1	1
Magnitude	6	4
Probability	3	3
Significance Rating (SR)	Low (27)	Low (18)
Status (positive, neutral or negative)	Negative	
Reversibility	Yes	
Irreplaceable loss of resources	Yes	
Can impact be mitigated	Yes	
Mitigation:	The visual impact can be minimized by the creation of a visual barrier. The construction area will be cleared as soon as construction of the infrastructure is finished.	
Cumulative Impact:	The construction camps of the proposed Mookodi-Mahikeng Powerlines project with its associated infrastructure will increase the cumulative visual impact of power line type infrastructure within the region. The construction camps of the Mookodi-Mahikeng Power line structures will contribute to a regional increase in heavy vehicles on the roads in the region, with construction activity noticeable.	

Powerlines

Nature of impact: Potential visual impact significance of the Powerlines		
	No Mitigation	With Mitigation
	Proposed	Proposed
Extent	4	3
Duration	5	5
Magnitude	8	6
Probability	5	4
Significance Rating (SR)	High (85)	Medium (56)
Status (positive, neutral or negative)	Negative	
Reversibility	Yes	
Irreplaceable loss of resources	Yes	
Can impact be mitigated	Yes	
Mitigation:	The visual impact can be minimized by the creation of a visual barrier during construction. The steel of the pylons can be painted a darker colour than galvanized steel to reduce the visual impact. Placing Powerlines next to existing linear features as far as possible. Clearing of vegetation should only be done by cutting and not earth moving equipment to reduce the visual impact of the vegetation scars.	
Cumulative Impact:	The Powerlines of the proposed Mookodi-Mahikeng Power line project with its associated infrastructure will increase the cumulative visual impact of Power line type infrastructure within the region.	

Access Roads

Nature of impact: Potential visual impact significance of the Access Roads		
	No Mitigation	With Mitigation
	Proposed	Proposed
Extent	3	3
Duration	4	4
Magnitude	6	6
Probability	4	3
Significance Rating (SR)	Medium (52)	Medium (39)
Status (positive, neutral or negative)	Negative	
Reversibility	Yes	
Irreplaceable loss of resources	Yes	
Can impact be mitigated	Yes	
Mitigation:	The visual impact can be minimized by using existing roads.	
Cumulative Impact:	The Access Roads of the Mookodi-Mahikeng Powerlines structures will contribute to a regional increase in small maintenance vehicles on the roads in the region.	

14.14 Socio-Economic Environment

14.14.1 Economic Impact Assessment (Appendix G)

14.14.1.1 Potential Impacts

The microeconomic impacts were identified as follows:

Microeconomic Consideration	Possible Impact
Local participation, certain individuals wish to be a part of the construction process.	Local participation on a project is critical as the benefits of investment into the local region should be encouraged, and the benefits will be best realised if locals are allowed to participate as it may add value to the local community.
The loss of valuable grazing land. Especially if a fence is installed on both sides of the powerline.	Negotiations around the use of land after the transmission cables are installed must be structured so as to allow access to the land within the 55m servitude, in order to minimise impact. Previous studies have shown that the placing of power transmission lines on agricultural land does not usually impact farming activities. This is as both dry land agriculture and certain types of irrigated agriculture (crop cultivation and grazing) can continue underneath power lines (MasterQ Research, 2010).
The use the N18 should be reconsidered as many respondents urge for this idea.	Eskom undertook and investigation of An alternative along the N18 was investigated but was far less feasible according to the Multi-criteria Decision-Making Model (MCDM).
Leasing the farm and intention to build a game lodge with an airstrip.	The concept of how the project may affect leasing of a farm is a question of the legalities underling the arrangement between land owner and lease, but the nature of farming activity is important. The issue of future ambitions is very difficult to quantify. However after construction of the transmission lines, future developments can be done around the new development.

Microeconomic Consideration	Possible Impact
The damage to grazing land.	Two effects, namely the short run and the long run effects of the transmission. Short run issues deal with construction and land recovery post transmission line instillation. The long term effects depends on how access to the 55m servitude is decided, and the potential for future developments within the servitude corridor. The critical issue of land sterilisation must be carefully dealt with here. Previous studies have shown that if the transmission power lines impact on the agricultural productivity of land along the various corridor routes it may therefore also affect output of the agricultural and forestry industries and the viability of specific operations along the route, which in turn will impact on employment (MasterQ Research, 2010).
Possible fencing off of the powerline	Two effects, namely the short run and the long run effects of the transmission. Short run issues deal with construction and land recovery post transmission line instillation. The long term effects depends on how access to the 55m servitude is decided, and the potential for future developments within the servitude corridor. The critical issue of land sterilisation must be carefully dealt with here.
Fragmentation of the small property	Two effects, namely the short run and the long run effects of the transmission. Short run issues deal with construction and land recovery post transmission line instillation. The long term effects depends on how access to the 55m servitude is decided, and the potential for future developments within the servitude corridor. The critical issue of land sterilisation must be carefully dealt with here.
The housekeeping of the construction domain after the powerline is installed	The long term effects depends on how access to the 55m servitude is decided, and the potential for future developments within the servitude corridor. The critical issue of land sterilisation must be carefully dealt with here.
The magnificent Camel Thorn trees over 100 years old are an outstanding feature of this farm.	This is a question of heritage, and the impact would extend to beyond the negotiation process, and should be consider in this case.

Microeconomic Consideration	Possible Impact
Concerned that the fertility of my stud cattle will be affected by the proposed project.	The powerline is expected to have minimal effect on animals grazing underneath the powerline. A study was undertaken by Eskom (2006) which assessed the impact of EMF from powerlines and the results were inconclusive which indicated that there is no evidence that EMF has a definite impact on cattle fertility.
The security of the farm owners and workers as unfamiliar workers will obtain access.	Short run issues deal with construction. Here Eskom and its expertise in the matter will need to be addressed.
Concerned about my farms property value decreasing due to the proposed powerlines.	Eskom is offering compensation for devaluation of property. However, in the long run the real effect may be insignificant. Depending on visual aspects such as topography) to residential settlements or lifestyle estates, or where lines cross smallholdings/agricultural properties where value is derived from a natural setting. There are also strong indications from previous research that any property value impacts are cumulative for the construction of multiple lines in servitude, especially where smaller agricultural, smallholdings and residential properties are concerned (MasterQ Research, 2010).
Game farming and specialist game farming with accommodation for hunters and tourists. The concern is that the instillation of power transmission lines will affect the scenery and the experience for the tourist/client may be negatively affected.	This may have long term consequences, and if fences are erected, then entire areas of the farm may become unusable, and this is a large concern for this study. Maintenance of the transmission lines would also become a concern, for the safety of the workers running maintenance from both hunters and wildlife. This would interrupt business activities unlike the way in which regular agricultural or livestock farming activities would be influenced. Although there is no historic evidence that transmission power lines are a residential development inhibitor it is possible that the type of developments may change as a result of the location of the power line, and any residential developments that will derive their value from a rural character, farming environment or natural beauty may be affected (MasterQ Research, 2010).

Microeconomic Consideration	Possible Impact
Future plans for open cast mining or other mining activity is a concern for some of the land owners.	Once the land is zoned for the transmission lines, the prospects of a future established opencast mine should be dealt with at the time in the future when an open cast mine is established, and does not fall within the constraints of the existing report. Another study showed that if the corridor crosses any areas where improvements in fixed capital goods or improvements such as land rezoning, land subdivision, infrastructure, installations or buildings are found these may have to be removed or relocated. This requirement may in turn neutralise other fixed capital improvements (MasterQ Research, 2010).

14.14.1.2 Impact Assessment

The impact assessment to follow was extracted from the Economic Impact Assessment (Baur, 2018). Please refer to the methodology used by the Specialist in the report (**Appendix 6G**).

Impact[1]	Brief Synopsis
Impact on rural Agricultural and residential values	Value of land will decrease in the short run. In the long run, if there are benefits from additional investment, there will be long term benefits.
Forfeit of Development opportunities due to project activity	Once the land is zoned for transmission lines, further development thereof is not possible.
Sterilisation of land	This will impact mostly on mobility of within the land and have different impacts on different types of land use.
Loss and removal of capital goods and improvements	This will be moderate in that the area is largely under-developed. Been mostly rural agricultural, there is potential impact in long term development.
Impact on output and employment	There will be short term gains, but with the added benefit of attracting additional investment into the region, this will have a long term potential benefit.

[1] Some of the core impacts correlate with economic impacts identified by MasterQ Research (2010).

Impact[1]	Brief Synopsis
Economic Injections as a result of the activity	This will be of a short term nature, with employment mostly influencing short term low skilled workers, with possible spill over into the local communities. Specialised high payed workers will be brought into the area, and mush of that income will have a remittance effect. Skill transfer will positively affect the area.
Economic Sustainability	The fundamental effect of the project is to reduce inequality by increasing future growth and possible prospects in the region.
Impact on rural Tourism Accommodation Game Farming	The development of transmission lines will have its greatest negative effect on tourism, spill over to accommodation and related industries. Greatest impact in the short run, with little improvement of those properties improving in the long run.

Scenario	**WM1 (Option 1)**	**WM13 (Option 2)**	**WM4 (Option 3)**	**WM9 (Option 4)**
1. Emphasis on Game Farming and Tourism	0.615542522	0.927859238	0.831524927	0.625073314
2. Emphasis on Agriculture	0.61346443	0.933765182	0.823689994	0.629080393
3. Emphasis on Livestock Farming	0.626828998	0.923342557	0.808057554	0.641770891
4. Excluding BOSA	0.628442797	0.898569915	0.841366525	0.631620763
5. Emphasis on Equal Agricultural	0.615980944	0.935599827	0.811650065	0.636769164
6. Simulating a Negative Impact[2]	-0.410361681	-0.618572825	-0.554349951	-0.416715543

Six possible scenarios have been developed putting emphasis on different elements of this model for each of the possible scenarios. Scenario one examines the economic outcome on each of the possible routes by focusing on the importance of game farming, Scenario two and three emphasise agriculture and livestock farming respectively. Scenario 4 excludes the

[2] The negative simulation is calculated by increasing the impact duration on future developments but for a larger area of the region. This could be useful when simulating a negative economic environment induced through other macroeconomic factors, exogenous to the model. In this case it may be possible to mitigate the outcome, but an interesting finding is that the negative impact for option four is also very large.

potential considerations used by Eskom in the BOSA study when developing possible route alternatives. Scenario five examines the economic impact with equal emphasis on each of the different farming sectors. Scenario 6 simulates an overall negative impact on all the routes proposed.

14.14.2 Social Impact Assessment (Appendix H)

The potential impacts and impact assessment to follow was extracted from the Social Impact Assessment (Nemai Consulting, 2018b). Please refer to the methodology used by the Specialist in the report (**Appendix 6H**).

14.14.2.1 Impact of Providing Electricity through the Network Expansion

The network expansion proposed through the development of the proposed 400kV powerline has social implications. The social benefits of a sufficient and sustainable power supply are fundamental to the project and the community. The United Nations Educational Scientific and Cultural Organisation highlight that socio-economic development depends upon the human's use of electricity since electricity is an essential component of modern living.

Electricity supply shortages, and the associated interruptions; have large economic and social implications. Electricity is used as an input by many businesses – manufacturing, irrigated agriculture and offices, whilst sufficient power supply ensures continuing delivery of social benefits such as health care services. Power interruptions cause negative impacts on daily social activities. These include the efficiency and flow of traffic within the cities or towns which rely on traffic lights, the running of trains, lighting in the home and public spaces and other uses in the home such as preparation of food, heating, cleaning, refrigeration and entertainment.

With a secure electricity supply, safety improves since the use of energy sources to carryout household duties such as cooking and lighting require the use of paraffin, candles and possibly small generators, all of which represent a higher safety risk that using electricity. Agricultural production, even on a subsistence level, thrives with a secure water supply and this is often provided by electricity. Thus, increased electricity supply increases food security. These benefits are all realised through an increase and secures electricity supply.

Environmental Feature	Impacts Created by Providing a Secure, Sufficient Power Supply
Project life-cycle	Operational Phase
Potential Impact	Proposed Management Objectives / Mitigation Measures
Economic	• Increased business productivity; • Economic growth;
Social Benefits	• Convenient and less time consuming daily tasks; • Facilitation of education • Facilitation of mass transport; • Health care.

	Nature	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	Positive	Regional	High	Long Term	Likely	3
After Mitigation	Positive	Regional	High	Long Term	Likely	3

Significance of Impact and Preferred Alternatives	Mitigation is not necessary for this positive impact. This mitigation measure does not influence the choice of alternatives considered in the study.

14.14.2.2 Impact Owing to Routing and Site Selection

The implementation of the proposed project will have an impact on landowners in that land would need to be acquired, and servitudes registered for the various project components. Landowners would have a reduced land area to generate income and servitude conditions are likely to restrict the existing use of land. In this regard, the final route and tower location will be carried out prior to construction. A final walk down survey by the specialists will be carried out and negotiations with landowners will begin after route selection has been completed.

Where impacts on agricultural productivity occur and cannot be mitigated by re-location of towers, compensation will be required for all affected landowners. Those landowners who will be directly affected through the sale of their property and loss of land through the footprints of the towers should be compensated for the land, immovable assets and loss of business. Landowners who will be impacted upon by Eskom requiring a servitude over their land should be compensated for the servitude rights.

Eskom (SOC) Ltd are responsible for land and rights acquisition. They should ensure that this process is conducted accordance with the Expropriation Act, 63 of 1975. The process should be a fair and independent land valuations should be conducted. This process should be undertaken in the project planning phase and should be concluded prior to the start of construction. Similarly, servitudes would have to be negotiated and registered in terms of the Alienation of Land Act, 68 of 1981. There will be discussions and engagement with landowners to come to an agreement with regards to the servitude registration and servitude restriction.

There are a number of sections along the various powerline route alternatives where impacts upon existing land-use will be higher than that along other sections. These high impact sections are captured in the report.

Environmental Feature	Impact owing to Land and Rights Acquisition
Relevant Alternatives & Activities	Acquisition of land
Project life-cycle	Pre-construction
Potential Impact	Proposed Management Objectives / Mitigation Measures
Loss of income from the acquisition of land	• Where-ever possible, the final routing of the project infrastructure should be adjusted to avoid impacts. If the powerline servitude is such that it allows powerline alignment to the extent that an impact on a dwelling can be avoided, this should be done. • Where impacts cannot be avoided, all negotiations and payments relating to compensating affected landowners should be conducted and concluded before construction begins. • Those landowners who will be required to sell their property to Eskom SOC Ltd must be compensated for any business that is operating on the premises.

Environmental Feature	Impact owing to Land and Rights Acquisition					
Relevant Alternatives & Activities	Acquisition of land					
Project life-cycle	Pre-construction					
Potential Impact	Proposed Management Objectives / Mitigation Measures					
	• All landowners whose businesses will be affected by the proposed project should be compensated to the full value of their immovable assets and any loss of income. • Negotiations should take place between the landowner and Eskom for any compensation of potential income denied as a result of the servitude agreements.					
Relocation of Households	• In the event that household relocation will be necessary, the process to be followed is as follows: o A relocation action plan to be drawn up providing detail on the impacted households, the households needs and how these will be catered for during and after the relocation, provides detail on the area to which they are to be relocated and the timeframes associated with the relocation; o The relocation action plan is to be discussed with every impacted household and agreed to in writing; o The relocation action plan is to be discussed with every impacted landowner (if this is not the same as the impacted household) and agreed to in writing; o Relocation is to be effected in strict accordance with the relocation action plan; and o An independent audit, carried out by a suitably qualified relocation expert, is to be conducted after every relocation to: determine the relocation's effectiveness and to identify shortfalls in adhering to the relocation action plan; and o Shortfalls are to be addressed by the proponent within the duration of the construction period of the project.					
Construction Period and time frame	• Careful planning should be adopted to reduce the impact of land acquisition on the overall programme for the works					
	Nature	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	Negative	Regional	High	Medium term	Likely	3
After Mitigation	Negative	Local	Medium	Medium term	Likely	1
Significance of Impact and Preferred Alternatives	The final routing of the powerlines within the chosen route alternative corridor and the selection of the Mahikeng substation site are the primary mitigation measures that should be adopted. The routing and site selection should be carried out so as to avoid impacting upon existing development as far as possible. The route alternative with the least impacts is route option 3, which runs for a distance of 187 kilometres. Route option 2 is the second most preferred route from an impact perspective, this route runs for 176 kilometres.					

14.14.2.3 Impacts on Siting of the Mahikeng Substation

The selection of the Mahikeng substation site will have impacts upon current inhabitants of the area surrounding the site. Lokgalong is slowly expanding in the vicinity of the proposed substation.

Site selection should be carefully considered, using a detailed and up to date survey of the structure in the vicinity, in order to site the substation with as few impact as possible.

Environmental Feature	Impact of the siting Mahikeng substation					
Project life-cycle	Planning Phase					
Potential Impact	Proposed Management Objectives / Mitigation Measures					
Loss of productive land due to site selection	• Siting of the substation to avoid impacts on residents in the vicinity. This should be carried out using an up to date survey of the structures in the area and input from the Town Planning department of the Mahikeng Local Municipality;					
	Nature	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	Negative	Local	High	Long Term	Likely	3
After Mitigation	Negative	Local	Medium	Long Term	Likely	2
Significance of Impact and Preferred Alternatives	The siting of the substation on in Mahikeng will impact upon the location of future residential development within Lokgalong. The site should be located so as to avoid structures erected in the vicinity and also take into account the town planning for the area.					

14.14.2.4 Impacts during the Construction Phase

The construction activity will impact the social environment both positively and negatively. Given the nature of the project area, construction activity is likely to cause a number of social nuisances as well as possible economic implications on the communities and commercial activities.

Cumulative impacts can be both positive and negative. Cumulative impacts refer to the impacts that are incremental on the environment that results from the impacts of the proposed action when added to the existing and foreseeable future actions. These impacts can also be temporary in nature (by being restricted to the construction phase) and permanent (occurring in both the construction and operation phase).

14.14.2.4.1 Economic Opportunity

The high number of impoverished households shows that there are vulnerable communities in the study area. It is recommended that the appointed contractor use local SMME's and local labour as far as possible during the construction phase to enhance any local economic impact. In addition, this would increase the skills in the area after construction is completed.

In this way project revenue will stay in the area, raising economic activity and increasing welfare, resulting in induced economic opportunity. In South Africa, most employment is generated through small and medium business. Given the size of the proposed project, should contracts between local SMMEs be implemented, it is likely that there will be an increase in employment by SMMEs for the duration of the contracts.

In particular, the project has the potential to create a number of opportunities for existing and new local SMMEs. These opportunities range from site clearing, to fencing, parts of the construction scope and supply of materials. There are also opportunities for community members to provide labour, catering, accommodation and other services to the new workers.

Where possible, Eskom should support and encourage the development of SMMEs and local or regional suppliers in line with government policy.

Education levels provide an indication of the level of skill in the community and the degree to which skills can be skilled. Rural and less developed areas are mostly defined by poverty, while poverty is associated with poor education outcomes.

Attempts to break the poverty cycle of the project areas will require more than secondary school education. Higher education or further skills training is required. It is therefore important that the community members under-go skills development. It is also recommended that the Eskom institute a skills development program during construction.

Eskom should monitor the employment process. Employment audits should be conducted. It is important that women are also provided employment opportunities. Audits should pay attention to the employment process of women to ensure that exploitation does not take place.

14.14.2.4.2 Noise and Dust

During the construction phase communities may be exposed to increased dust, noise, visual and other nuisance disturbances.

The generation of dust stems from activities such as earthworks and as well as vehicle movement during the construction phase. This situation will be worst during the dry season and during windy seasons. Air borne particulates may pose a hazard to residents in the vicinity or downwind of the construction site that suffer from upper respiratory tract problems. Mitigation through dust suppression methods will allow for this impact to be effectively managed.

During the construction, heavy equipment may be required for the site clearance, road construction, substation and the erection of the electrical towers and powerlines. Noise generation will be unavoidable. The degree of noise, frequency of noise and individual perception are all important considerations when determining the impact on noise. Drilling; blasting and construction activities will also create noise pollution. Adequate warning of high noise events such as blasting should be communicated to the affected communities prior to carrying out the activities.

14.14.2.4.3 Worker Health and Safety

The impacts of construction can affect the health and safety of those working on the construction site; disturbance, health and income of the host communities; and disturbance to the environment and animals. These impacts can be mitigated in the Environmental Management Programme (EMPr) and through adherence to the Occupational Health and Safety Act 85 of 1993.

An influx of workers is often characterised by higher health risks, particularly if the influx is male dominated. These include a higher disease burden and rise in HIV/AIDS rates. There should also be awareness and education campaigns on health and social risks such as HIV/AIDs and crime prevention.

14.14.2.4.4Security

There a safety concerns related to the construction activity. Landowners have expressed a number of security concerns including increased access to the farms and crime. Trespassing was cited as a concern as well of damage to property once access is granted.

Mitigation measures include Eskom, prior to construction, agreeing with farmers on appropriate access points to ensure the safety of the businesses, livestock and residents. A security policy must be drafted and strictly enforced by the contractors; this would include a requirement to obtain landowner permission prior to any property. As good practice and mitigation against security risks, Eskom should provide some level of security and emergency response services for the duration of the construction measure. All contractors and service providers should obtain permission to enter any property.

Environmental Feature	Economic opportunities arising from the construction phase
Project life-cycle	Construction phase
Potential Impact	Proposed Management Objectives / Mitigation Measures
SMME Creation	• Local SMMEs should be given an opportunity to participate in the construction of the project through the supply of services, material or equipment.
Job Creation and Skills Development	• The main contractor should employ non-core labour from the Main places as far as possible during the construction phase. • The principles of Expanded Public Works Programme can be used for guiding the construction.
Indirect Employment Impacts	• Spaza/informal trader shops may open next to the site as a consequence of construction. These should be controlled by the contractor to limit their footprint and to ensure that the local Municipalities – Informal Trading By-laws are complied with.

	Nature	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	Positive	Local	Medium	Short Term	Likely	1
After Mitigation	Positive	Local	Low	Short Term	Likely	3
Significance of Impact and Preferred Alternatives	Individuals who will benefit during the construction are limited to those who actively participate in the construction activity through employment, sub-contracting or other economic opportunities. Active participation should be encouraged. The benefits on such a construction will take place irrespective of which routing alternative is preferred.					

Environmental Feature	Disturbance arising from the construction phase
Project life-cycle	Construction phase
Potential Impact	Proposed Management Objectives / Mitigation Measures
Increase in Dust	• Dust and disturbance can be mitigated through the use of appropriate dust suppression mechanisms; • Adherence to road signage can be added as an advantage and a measure to manage the increase in dust levels; • Mitigation measures management should be adhered to according to the relevant specialist studies.

Environmental Feature	Disturbance arising from the construction phase
Project life-cycle	Construction phase
Potential Impact	Proposed Management Objectives / Mitigation Measures
Influx of workers	• All employment of locally sourced labour should be controlled on a contractual basis. If possible, and if the relevant Ward Councillors deem it necessary, the employment process should include the affected Ward Councillors. • People in search of work may move into the area, however, the project will create a limited number of job opportunities. Locally based people should be given opportunities and preferences over others; • No staff accommodation should be allowed on site; • Influx of workers could may lead to increased diseases and HIV/AIDSs & STI as well as STD infections, therefore awareness programmes should be implemented through the local educational institutions and for the workers as well.
Worker Health and Safety	• The provisions of the OHS Act 85 of 1993 and the Construction Regulations of 2014 should be implemented on all sites; • Account should be taken of the safety impacts on the local community when carrying out the longitudinal aspects of the project, such as the pipelines; • Contractors should establish HIV/AIDs awareness programmes at their site camps.
Security	• The sites of the substations should be fenced for the duration of construction; • All contractors' staff should be easily identifiable through their respective uniforms; • A security policy should be developed which amongst others requires that permission be obtained prior to entering any property and provisions controlling trespassing by contractor staff; • Security staff should only be allowed to reside at contractor camps and no other employees; • Contractors should establish crime awareness programmes at their site camps.
Noise impacts	• Prior notice should be given to surrounding communities of drilling events; • Construction work should take place during working hours – defined as 07h00 to 17h00 on weekdays and 07h00 to 14h00 on Saturdays. Should overtime work be required, that will generate noise, consultation with the affected community or landowner should take place.

	Nature	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	Negative	Local	Medium	Short Term	Likely	2
After Mitigation	Negative	Local	Low	Short Term	Moderate	1
Significance of Impact and Preferred Alternatives	Disturbances and irritation during construction is to be expected. These can then be successfully mitigated through contractor specifications that are issued at a tender stage and through the continuous monitoring of contractor proceedings and performance during construction phase. Negative impacts owing to the construction will unfortunately be experienced irrespective of the site and routing alternative that is most preferred and chosen.					

14.15 No-go Impacts

The 'no-go' alternative refers to a situation where the proposed Mookodi-Mahikeng 400kV Powerline is not built. This would mean that the area where the proposed powerline is to be located would not change in any way and that the environmental conditions within the site would generally stay the same.

This would also mean that the anticipated load growth in the Mahikeng area and the resulting need for further enhancement of capacity in the area would not be met. There would be no further network expansion if the powerline and other related projects are not built. Therefore the Watershed substation would continue to struggle with constraint problems causing current areas of supply to be affected and restricting future growth in these areas.

14.16 Cumulative Impacts

According to GN No. R. 982 of the 2014 EIA Regulations (as amended), a "cumulative impact", in relation to an activity, means the past, current and reasonably foreseeable future impact of an activity, considered together with the impact of activities associated with that activity, that in itself may not be significant, but may become significant when added to the existing and reasonably foreseeable impacts eventuating from similar or diverse activities.

Cumulative impacts can be identified by combining the potential environmental implications of the proposed project with the impacts of projects and activities that have occurred in the past, are currently occurring, or are proposed in the future within the project area.

- There are existing powerlines located on farms in the project area. This will increase the overall visual impact of the powerlines and may lead to an incremental increase in the EMF. However, the alignment of infrastructure along existing linear disturbances may be preferred, as it limits the fragmentation of the affected land;
- The proposed powerline crosses over properties that are already traversed by existing linear infrastructure. These properties will thus have a network of infrastructure with the associated servitude restrictions;
- The construction period may cause traffic-related impacts in terms of the local road network, which will be associated with heavy vehicle construction traffic for the delivery of material and the transportation of construction workers. This may compound traffic impacts if other large scale projects are planned during the same period;
- Land clearing activities and other construction-related disturbances could lead to the proliferation of exotic vegetation. The associated cumulative impact in relation to other activities in the affected areas, such a livestock grazing and farming, will need to be considered further;
- The project was initiated to strengthen the local power network based on future demands and current constraints of the existing electrical infrastructure. In turn, this will have a positive impact on the macro socio-economic environment;

- Cumulative loss of the vegetation units to accommodate agriculture is relatively high within the region;
- Displacement of sensitive avifaunal species, species of conservation concern and protected trees due to habitat destruction and habitat fragmentation eventually leads to isolation and loss of those species. This is, however, considered to be low within the region;
- Destruction of nesting habitat displaces the affected species eventually leading to loss of those species;
- Cumulative loss of sensitive habitat units is relatively rare as these areas are generally unsuitable for agricultural purposes (the main land use within the area);
- Cumulative loss of primary vegetation features due to exotic vegetation and vegetation transformation is high at the national level and therefore should be avoided;
- Encroachment of alien vegetation;
- Limited powerline infrastructure occurs within the area and therefore the cumulative impact of servitude maintenance is limited;
- Powerlines represent the largest proportion of established aerial infrastructure throughout the country and collision impacts are of national concern. Fitment of devices on the earth wires to make the lines more visible is reducing this impact at the national level;
- Cumulative landscape and visual effects (impacts) resulting from additional changes to the landscape or visual amenity caused by the proposed development in conjunction with other developments (associated with or separate to it), or actions that occurred in the past, present or are likely to occur in the foreseeable future, may also affect the way in which the landscape is experienced. Cumulative effects may be positive or negative. Where they comprise a range of benefits, they may be considered to form part of the mitigation measures;
- Cumulative effects can also arise from the inter-visibility (visibility) of a range of developments and / or the combined effects of individual components of the proposed development occurring in different locations or over a period of time. The separate effects of such individual components or developments may not be significant, but together they may create an unacceptable degree of adverse effects on visual receptors within their combined visual envelopes. Inter-visibility depends upon general topography, aspects, tree cover or other visual obstruction, elevation and distance, as this affects visual acuity, which is also influenced by weather and light conditions. (Institute of Environmental Assessment and The Landscape Institute, 1996);
- The cumulative visual intrusion of the proposed Mookodi-Mahikeng Power line structures will be MEDIUM as it is a power line. The site location expand several hundreds of kilometres through varying terrain and Landover types. The visual impact and impact on sense of place of the proposed project will contribute to the cumulative negative effect on the aesthetics of the study area;

- The construction camps of the proposed Mookodi-Mahikeng Powerlines project with its associated infrastructure will increase the cumulative visual impact of power line type infrastructure within the region;
- The construction camps of the Mookodi-Mahikeng Power line structures will contribute to a regional increase in heavy vehicles on the roads in the region, with construction activity noticeable;
- The Powerlines of the proposed Mookodi-Mahikeng Power line project with its associated infrastructure will increase the cumulative visual impact of Power line type infrastructure within the region;
- The Access Roads of the Mookodi-Mahikeng Powerlines structures will contribute to a regional increase in small maintenance vehicles on the roads in the region;
- Influx of Workers - Due to the nature of unemployment and the low levels of skills available in this area, there will be a significant influx of jobseekers to the construction areas. Cumulative impacts in this regard include conflict between outsiders and locals (characteristic of the insider outsider hypothesis), additional pressure on infrastructure and services and the continued migration of outsiders remaining in the area after the project has been completed;
- Projects of this nature occasionally involve the development of accommodation sites which house the temporary construction workers. This could impact on the daily living and movement patterns of local inhabitants and land owners in the area, with movement patterns having an impact in the area on those living in close proximity to construction activities. Cumulative impacts include misbehaviour of some construction workers at the construction site and possible mismanagement which could impact on safety and security concerns, social conflict and environmental problems;
- There are also strong indications from previous research that any property value impacts are cumulative for the construction of multiple lines in servitude, especially where smaller agricultural, smallholdings and residential properties are concerned;
- Large-scale land clearing activities and other construction-related disturbances could lead to the proliferation of exotic vegetation. The associated cumulative impact in relation to other activities in the affected areas, such a livestock grazing, will need to be considered further;
- The soils in some parts of the project area may be erodible. Any previous disturbance (such as overgrazing) will be aggravated by the construction activities if this impact is not properly managed; and
- Security is already a concern to the local community and this could be worsened during the construction phase, as well as in the operational phase of the powerline (maintenance). An increase in population in a rural area of low-density households could result in an increase in crime for the residents.

15 COMPARATIVE ANALYSIS OF ALTERNATIVES

Alternatives are the different ways in which the project can be executed to ultimately achieve its objectives. Examples could include carrying out a different type of action, choosing an alternative location or adopting a different technology or design for the project. By conducting the comparative analysis, the BPEOs can be selected with technical and environmental justification. Münster (2005) defines BPEO as the alternative that "provides the most benefit or causes the least damage to the environment as a whole, at a cost acceptable to society, in the long term as well as in the short term".

15.1 "No-Go" Option

As standard practice and to satisfy regulatory requirements, the option of not proceeding with the project is included in the evaluation of the alternatives. The implications of the 'no go' option are discussed in Section 14.15. The 'no go' alternative is not supported due to the result that the anticipated load growth in the Mahikeng area and the need for further enhancement of capacity in the area would not be met.

The ultimate economic benefits of the project are in favour of the project being implemented based on the prime objectives of socio-economic upliftment.

15.2 Route Alternatives

15.2.1 Impacts on Environmental Features

Section 13 indicated the preference of the route alternatives by each Specialist Study. This section summarises the alternatives preference for each environmental feature by the relevant Specialist Studies and by the EAP. The BOSA Transmission Line Corridor Route Selection Process Report (2017), as discussed in Section 6.1 of the report, was also used in determining the route alternative preference.

Table 26 represents the environmental features assessed in the impact study by the relevant Specialist Study, where required, as well as the route alternative that is most preferred due to the least impact on the environment. Each route alternative option was ranked in order of preference: 1 being high and 4 being the least preferred. In some cases, certain routes were scored the same ranking as there was no preference between those routes.

It can be seen that Option 2 (WM13) is the most preferred as it had the highest ranking and is the recommended BPEO as a result of having the overall least impact on the environment.

Table 26: Summary of route alternative preference

Feature	Specialist study	Route Alternative Options			
		1 (WM1)	2 (WM13)	3 (WM4a)	4 (WM9a)
Geology and Soil	None	No preference			
Topography	Visual Impact Assessment	2	1	4	3
Surface Water	None	2	1	2	3
Flora and Fauna	Terrestrial Ecological Assessment	3	1	2	4
	Avifaunal Assessment	3	1	2	3
Land Capability	Agricultural Potential Survey	2	1	4	3
Land Use	None	No preference			
Heritage Resources	Heritage Impact Assessment	2	1	2	2
	Desktop Palaeontological Impact Assessment	No preference			
Air Quality	None	No preference			
Noise	None	No preference			
Existing Infrastructure	None	2	1	1	1
Traffic	None	No preference			
Visual Quality	Visual Impact Assessment	2	1	4	3
Socio – Economic	Social Impact assessment	3	1	2	3
	Economic Impact Assessment	4	1	2	3

15.2.2 Impacts on Technical Aspects

Technical criteria consider the cost and ease of both construction and operation, as well as other aspects such as landowner negotiations related to the physical properties of the line, which may increase costs and length of the process involved.

All routes scored equally for slope, indicating that there was no preference based on this criteria. No visible slope issues on any of the possible line routes. They all cross agricultural land which would pose no major issues to construction.

Most routes has access via farm roads. Preference was given to Option 3 (WM4a) due to its proximity to major roads. WM16a (197 km). Option 2 (WM13) is approximately 175 km in length and is preferred over Option 1 (WM1) (185 km), Option 3 (WM4a) (186 km) and Option 4 (WM9a) (184 km). All route alternatives scored equally in first place for the criterion of width, allowing for more landowners to be accommodated within the corridor. All routes show no issues with servitude widths and potential to shift line routes during design. Overall, Route Option 2 (WM13) and Option 3 (WM4a) were considered the best route from an overall technical perspective. Technical considerations ensure the most cost-effective solution for the lifecycle of the project for the planning stages, through construction and operation to decommissioning.

15.3 BPEO Selection

No fatal flaws were identified by any specialist. Based on the recommendations of the Specialist Studies, technical considerations and the comparison of the impacts, Option 2 (WM13) was identified as the BPEO for the Mookodi-Mahikeng 400kV Powerline (**Figure 70**). **Figures 71** to **79** show zoomed-in maps of the BPEO route.

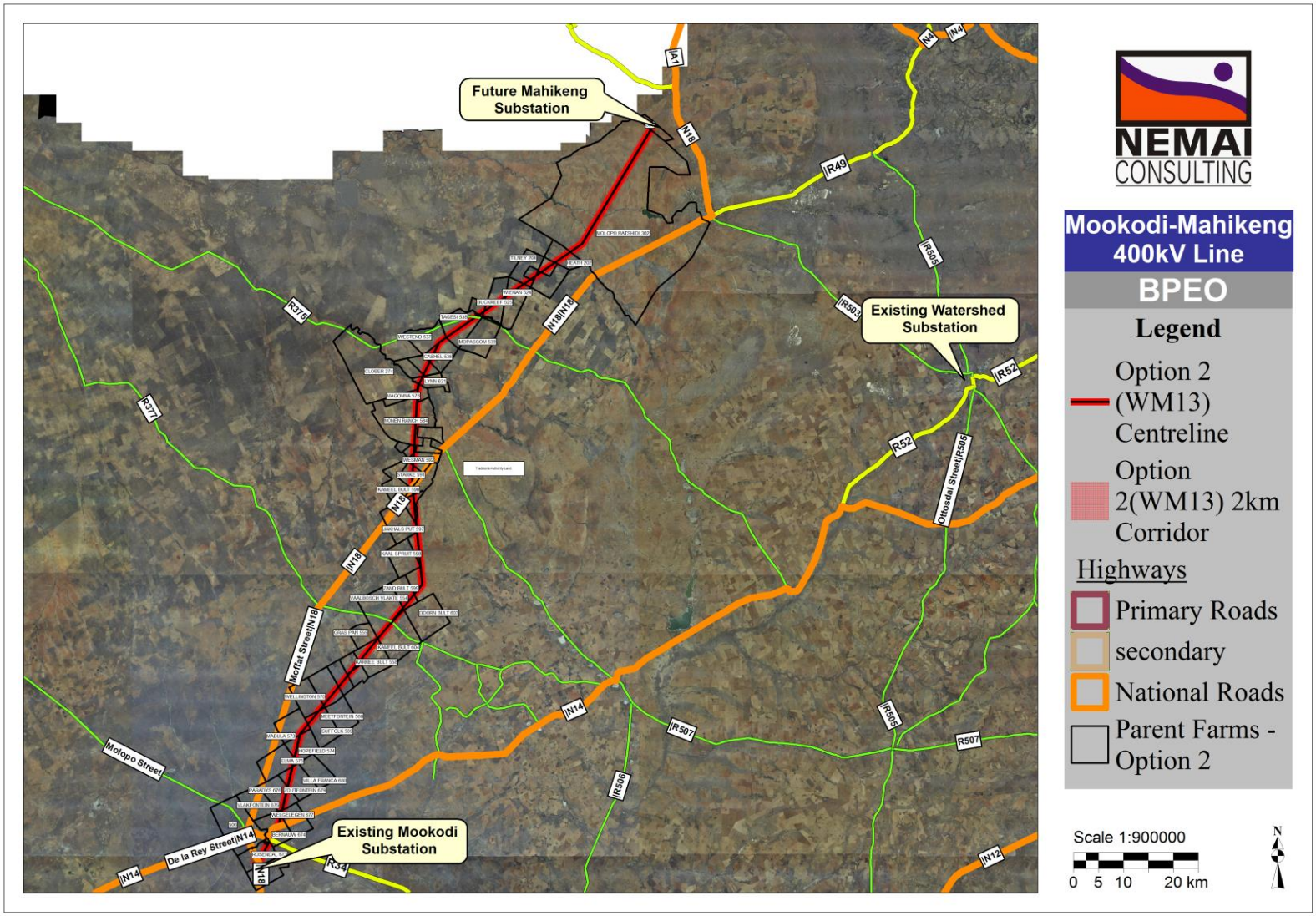


Figure 70: Option 2 BPEO

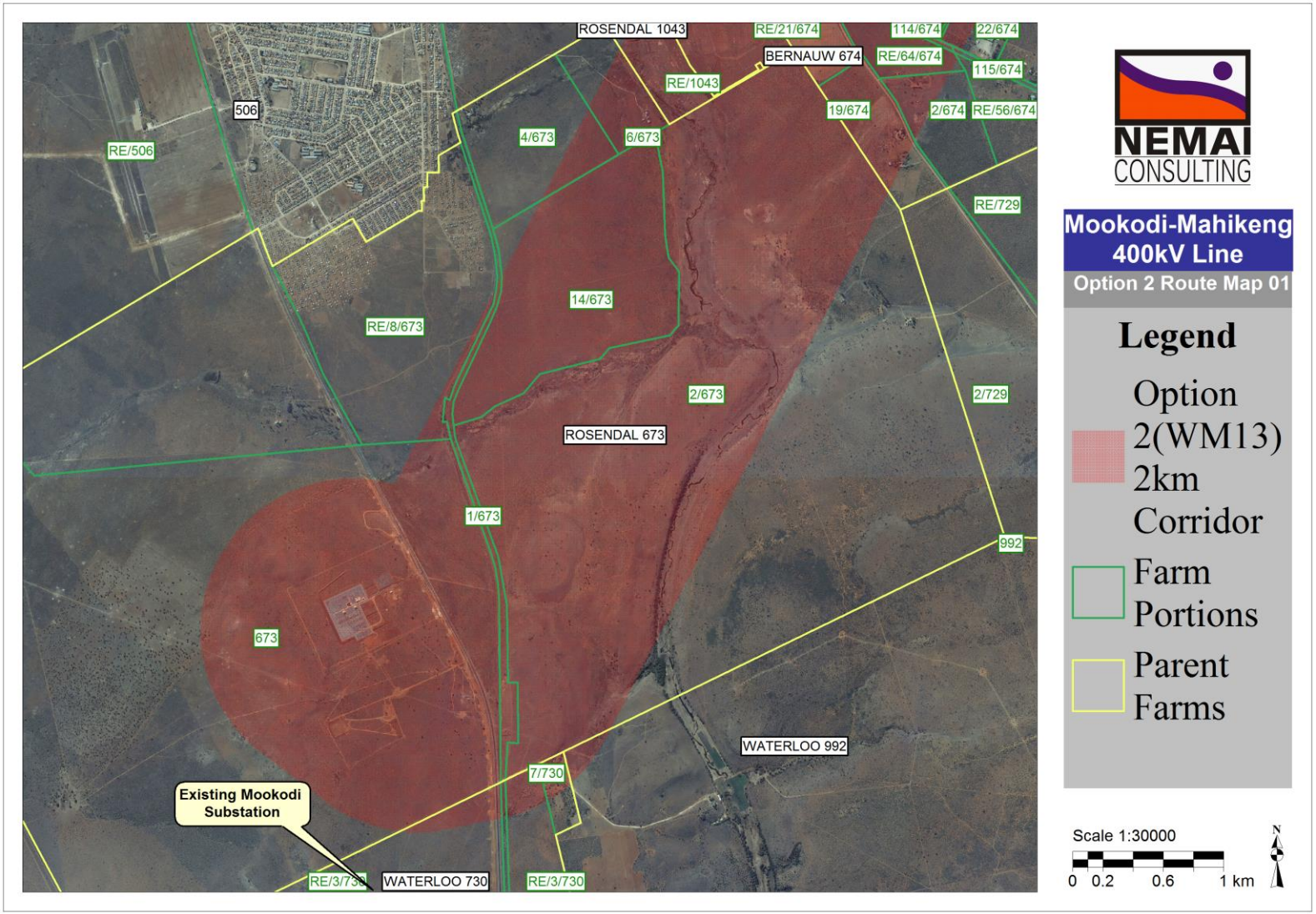


Figure 71: Option 2 (Section 1)

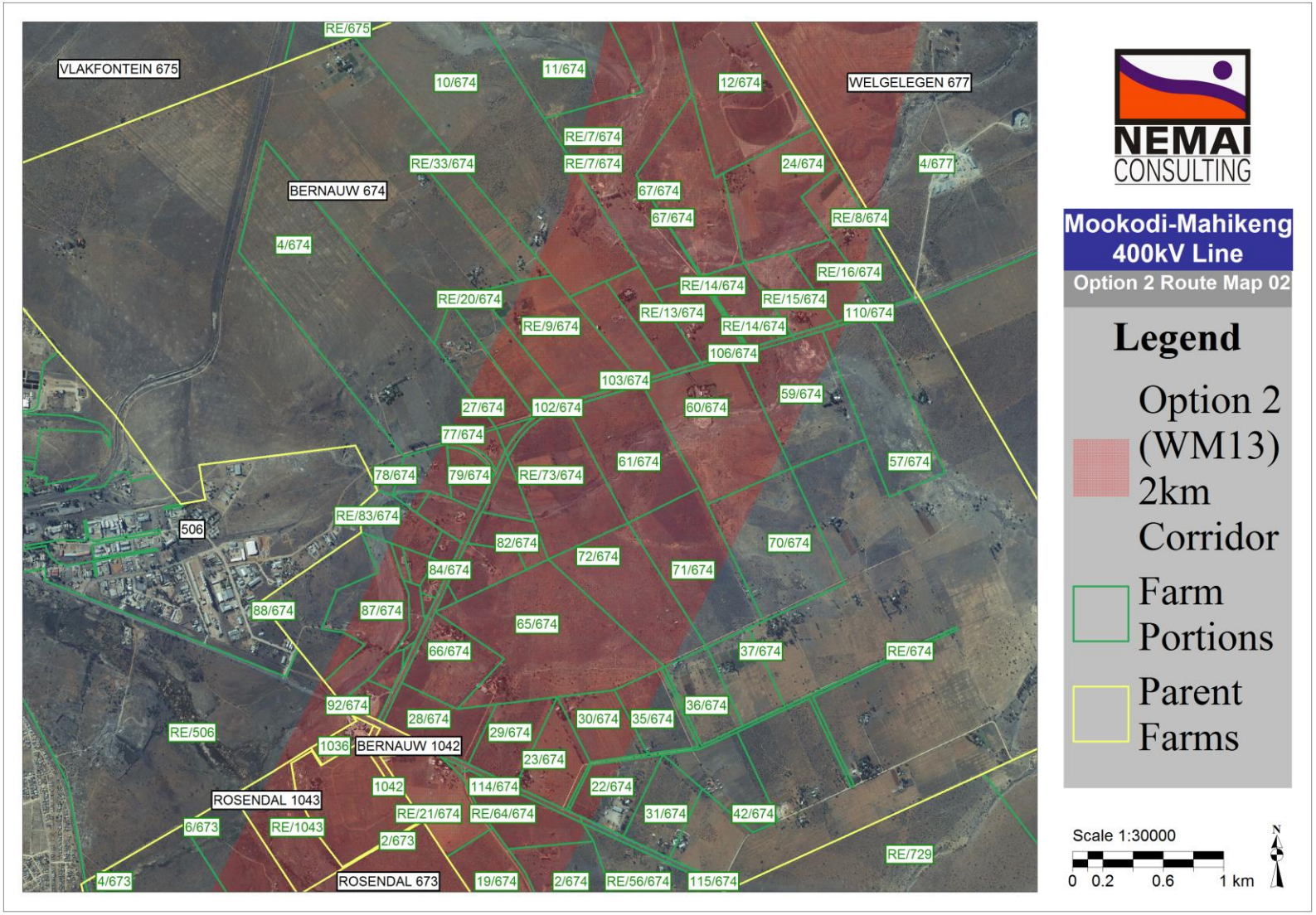


Figure 72: Option 2 (Section 2)

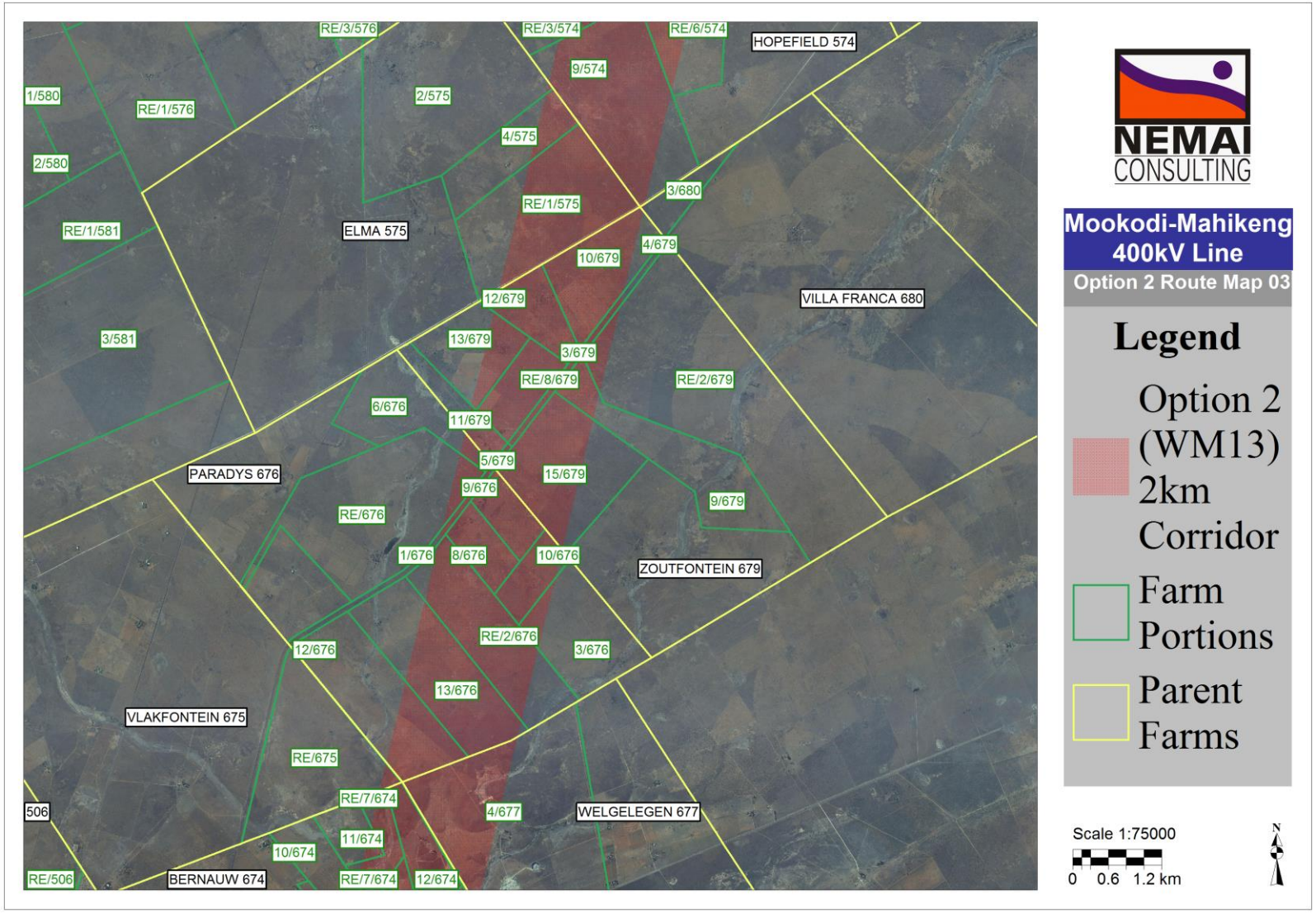


Figure 73: Option 2 (Section 3)

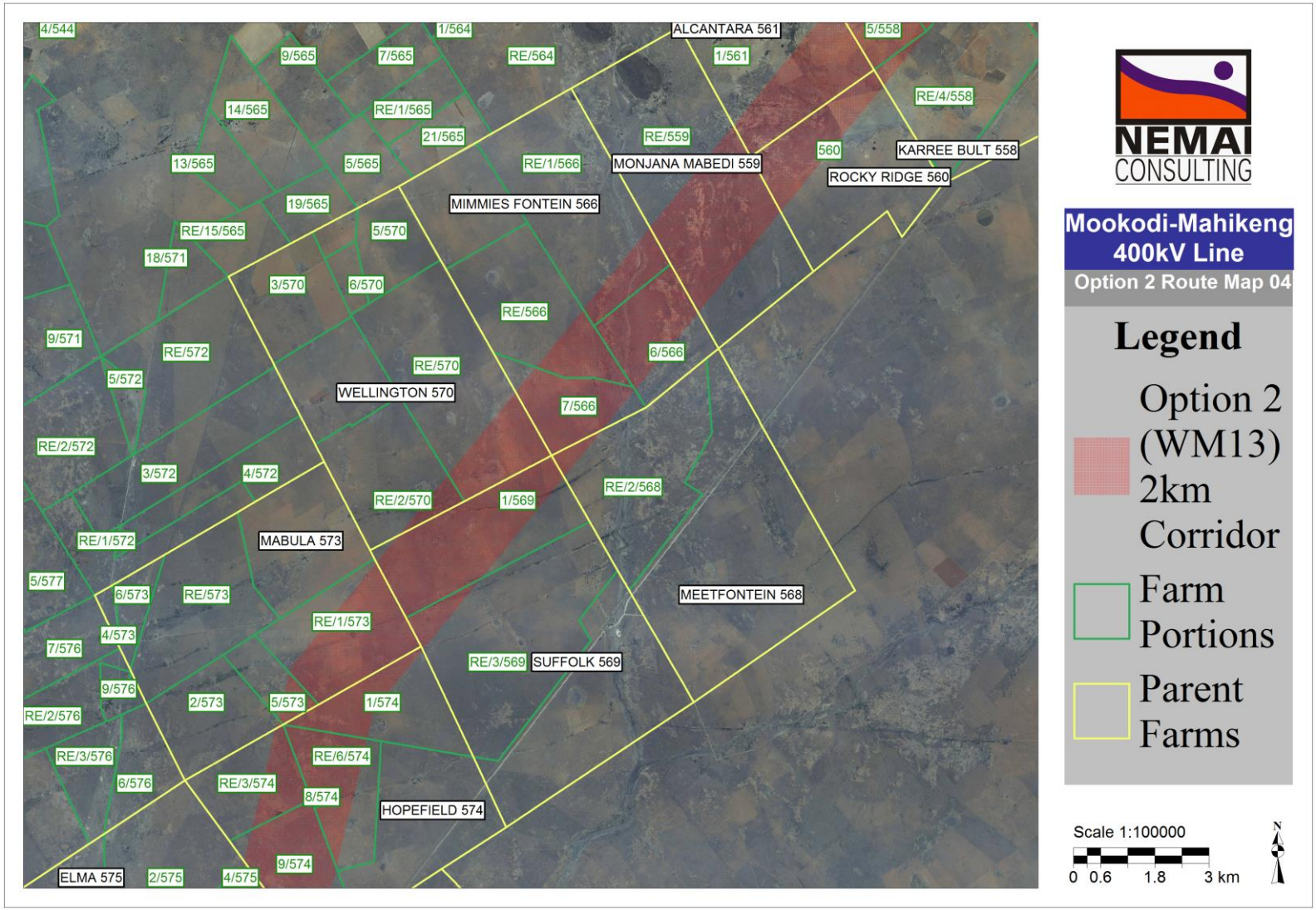


Figure 74: Option 2 (Section 4)

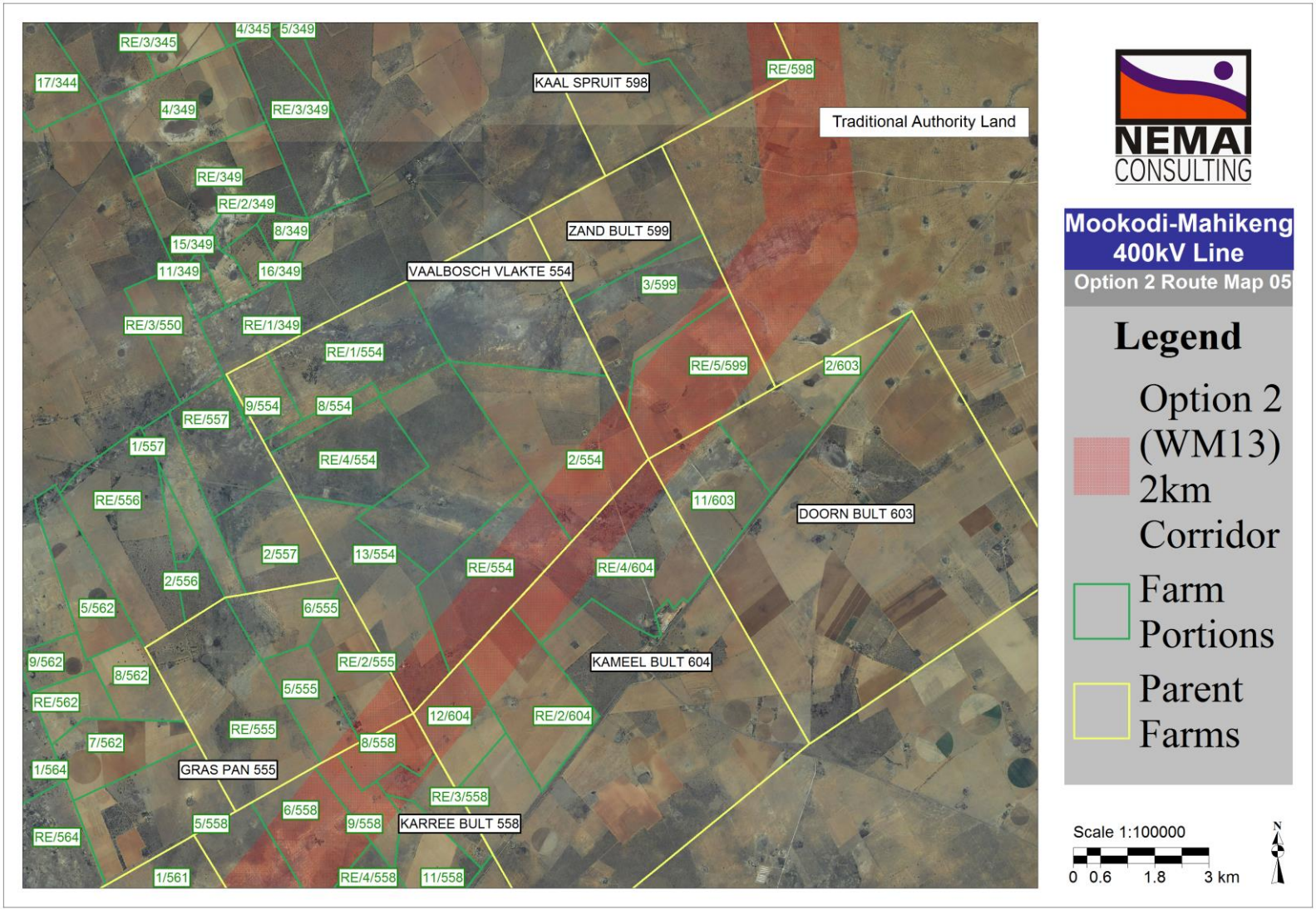


Figure 75: Option 2 (Section 5)

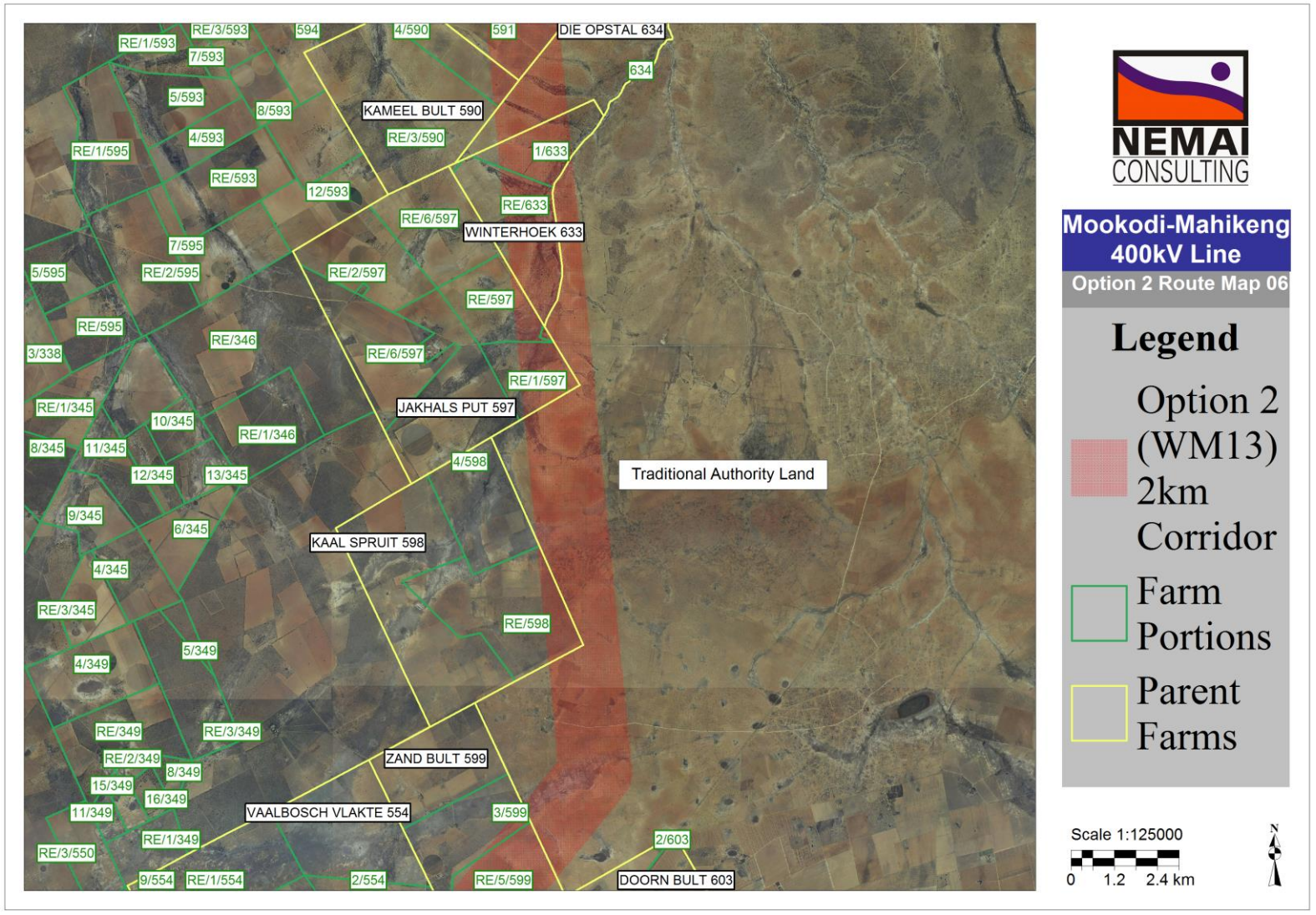


Figure 76: Option 2 (Section 6)

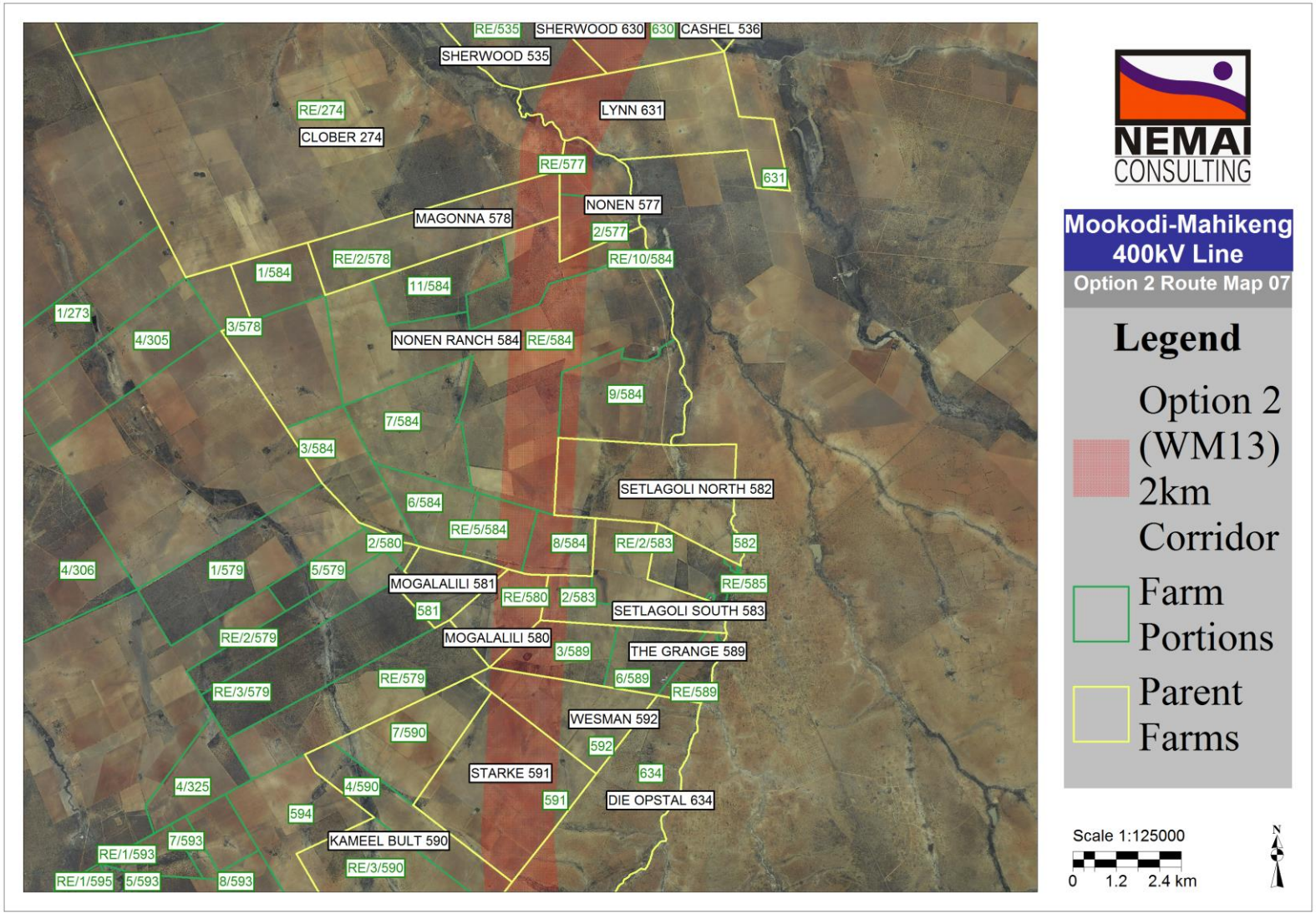


Figure 77: Option 2 (Section 7)

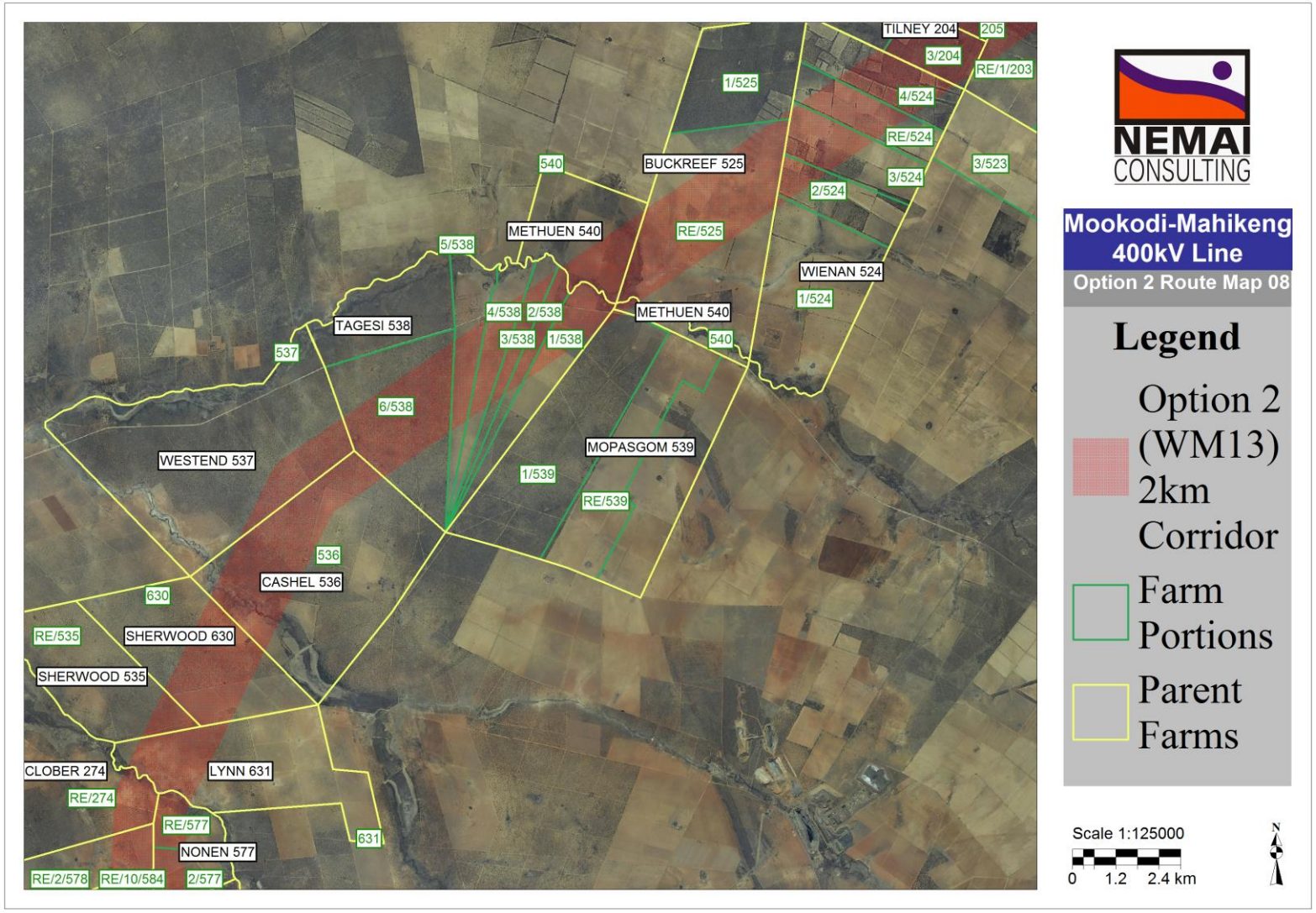


Figure 78: Option 2 (Section 8)

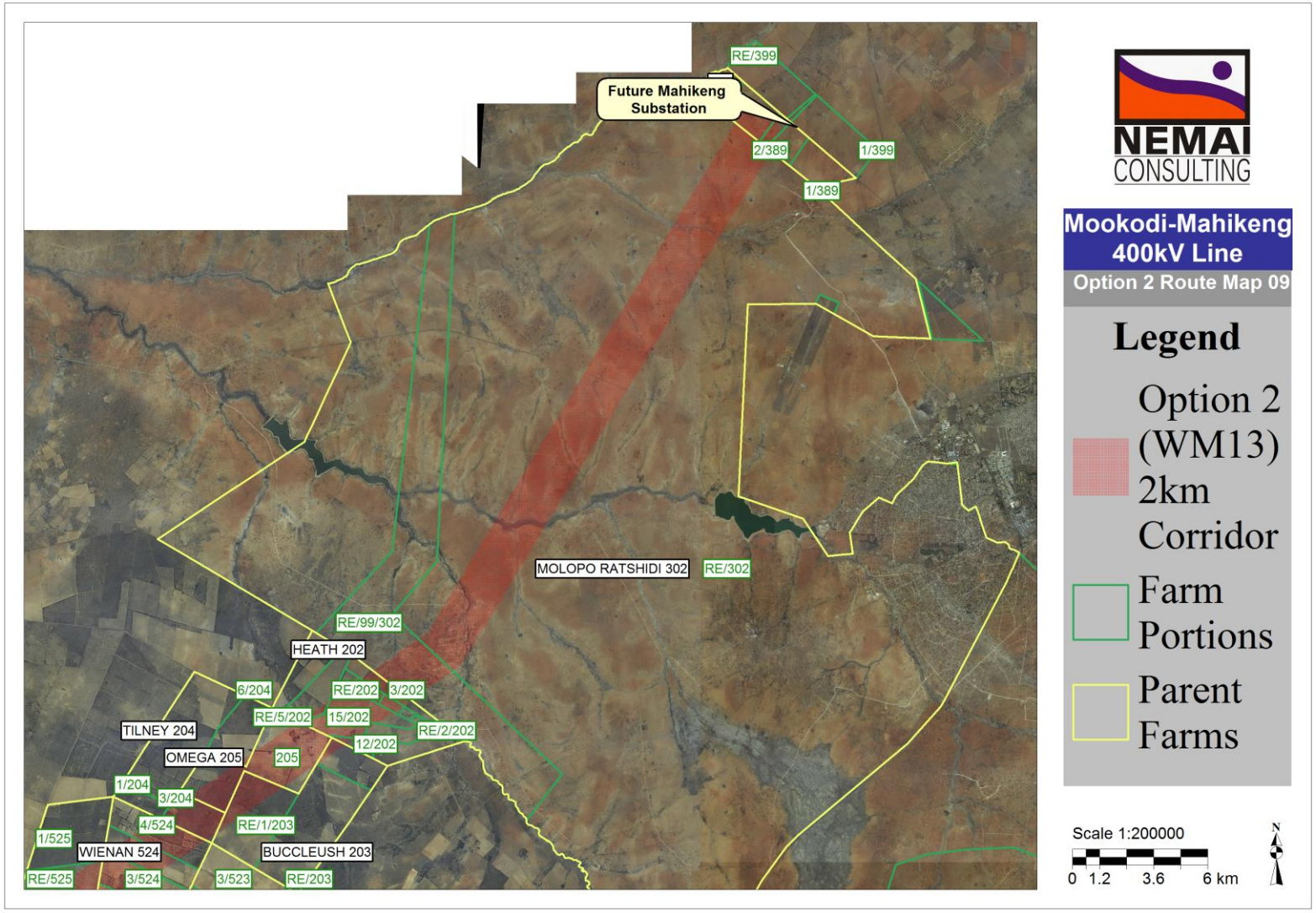


Figure 79: Option 2 (Section 9)

16 PUBLIC PARTICIPATION

The purpose of the public participation process for the proposed development includes:

- Providing IAPs with an opportunity to obtain information about the project;
- Allowing IAPs to express their views, issues and concerns with regard to the project;
- Granting IAPs an opportunity to recommend measures to avoid or reduce adverse impacts and enhance positive impacts associated with the project; and
- Enabling the project team to incorporate the needs, concerns and recommendations of IAPs into the project, where feasible.

The public participation process that was followed for the proposed project is governed by NEMA and GN No. R. 982.

The approved Plan of Study for the EIA stipulates the activities to be undertaken as part of the public participation for the project, in accordance with regulatory requirements, which forms the basis of the discussion to follow. Note that the public participation conducted for the Scoping phase will not receive attention in this section as it was comprehensively discussed in the Scoping Report. Emphases will thus primarily be placed on the EIA public participation process.

16.1 Public Participation - Initial IAP Registration Period

The primary tasks undertaken as part of initial IAP registration period included the following (details provided in Scoping Report):

- Identification of IAPs and Compilation of IAP Database;
- Notifying the affected landowners of the project;
- Announcing the project, which included distributing Background Information Documents (BIDs) and Reply Forms, placing onsite notices, and placing newspaper adverts;
- Convening focus group meetings to announce the project; and
- Compiling and maintaining a CRR.

16.2 Public Participation during the Scoping Phase

The primary tasks undertaken as part of public participation during the Scoping phase included the following (details provided in Scoping Report):

- Maintenance of IAP Database;
- Convening public meetings and focus group meetings to announce the project and to present the Draft Scoping Report;
- Granting IAPs and authorities an opportunity to review the Draft Scoping Report; and
- Compiling and maintaining a CRR.

16.3 Public Participation during the EIA Phase

16.3.1 Maintenance of IAP Database

A database of IAPs (refer to **Appendix 5A**), which includes authorities, different spheres of government (national, provincial and local), parastatals, stakeholders, landowners, interest groups and members of the general public, was maintained during the EIA phase.

16.3.2 Notification – Approval of Scoping Report and Notification of Public Review of Draft EIA Report

Registered IAPs were notified of the approval of the Final Scoping Report at the same time as the public review of the Draft EIA Report, in June 2018. Registered IAPs were notified via emails or SMS. The notice also included information on the public meetings for the EIA Phase.

16.3.3 Public Review Period of Draft EIA Report

In accordance with G.N. No. R. 982 of the 2014 EIA Regulations (as amended), IAPs were granted an opportunity to review and comment on the Draft EIA Report. Hard copies and of the document will be placed at the venues listed below (**Table 27**) and an electronic copy of the report will be made available on the Nemai Consulting website. Emails and SMS's were sent to all registered IAPs which included the details of the review period of the Draft EIA Report. Proof of the notification of the public review period is included in **Appendix 5B**.

Table 27: Locations of Draft EIA Report for Review

Venue	Address	Contact Details

The public review of the Draft EIA Report will take place for a 30-Day review period from **26 June 2018 to 25 July 2018**.

16.3.4 Authority Review Period of Draft EIA Report

Hard copies of the document were also provided to the following key regulatory and commenting authorities:

- DEA
- North West Department of Rural, Environment and Agricultural Development (NWREAD)
- DWS – North West Regional Office
- DAFF – North West Regional Office
- North West Provincial Heritage Resources Authority (NWPHRA)
- South African Heritage Resources Information System (SAHRIS)
- Department of Mineral Resources (DMR) - North West Regional Office
- Department of Energy - North West Regional Office

- North West Parks Board
- Municipalities (Naledi, Kagisano/Molopa, Ratlou and Mahikeng LM)

The authority review of the Draft EIA Report will take place for a 30-Day review period from **26 June 2018 to 25 July 2018**.

16.3.5 EIA Phase Meetings

Meetings have been scheduled in locations around the proposed route alternatives. The aim of the meetings is to present the Draft EIA Report and to provide IAPs with a platform for project related discussions. All registered IAPs were notified of the public meetings via email or SMS. Proof of notification of the public meetings is included in **Appendix 5B**.

The Final EIA Report will contain the minutes of the meetings.

Table 28: Details of meetings during EIA phase

No.	Meeting Type	Date and Time	Venue	Meeting With
1				
2				
3				
4				
5				
6				

16.3.6 Comments and Responses

The EIA CRR (**Appendix 5D**) summarises the correspondence received by IAPs and Organs of State completed via the Reply Forms, Comments Sheets, letters, faxes and emails. This report also includes a summary of the discussions from Focus Group Meetings and Public Meetings held to date, during the Public Participation phase. This report captures all the significant issues and queries raised, any statements that were made, and a record of all IAPs that registered. This report also attempts to address every comment through responses and input provided by the project team.

All comments received following the public review of the Draft EIA Report will be included in the Final EIA Report CRR.

16.3.7 Submission of Final EIA Report

The Final EIA Report will be submitted to DEA for a decision on the EA.

16.3.8 Notification of DEA Decision

All authorities and registered IAPs will be notified via email or SMS after having received written notice from DEA on the final decision for the project. Advertisements will also be placed as notification of the Department's decision. These notifications will include the appeal

procedure to the decision and key reasons for the decision. A copy of the decision will also be provided to IAPs on request.

17 EAP Conclusion and Recommendations

17.1 Sensitive Environmental Features

Figure 80 shows a zoomed in sensitivity map for Option 2 (WM13). The following sensitive environmental features were identified:

- Rivers and wetlands;
- Western Highveld Sandy Grassland Threatened Ecosystem;
- CBA 1 and 2 ;
- ESA 1 and 2;
- Plant species of conservation concern:
    - *Vachellia erioloba* (= *Acacia erioloba*) (known as Camel Thorn); and
    - *Boophane disticha* (known as Century Plant);
- Avifaunal migratory corridors; and
- Heritage sites (with recommended 20m conservation buffer).

The sensitivity map must be made available to the implementation team (including the Applicant, ECO and Contractor's Environmental Officer) to allow for further consideration and adequate interpretation at an appropriate scale.

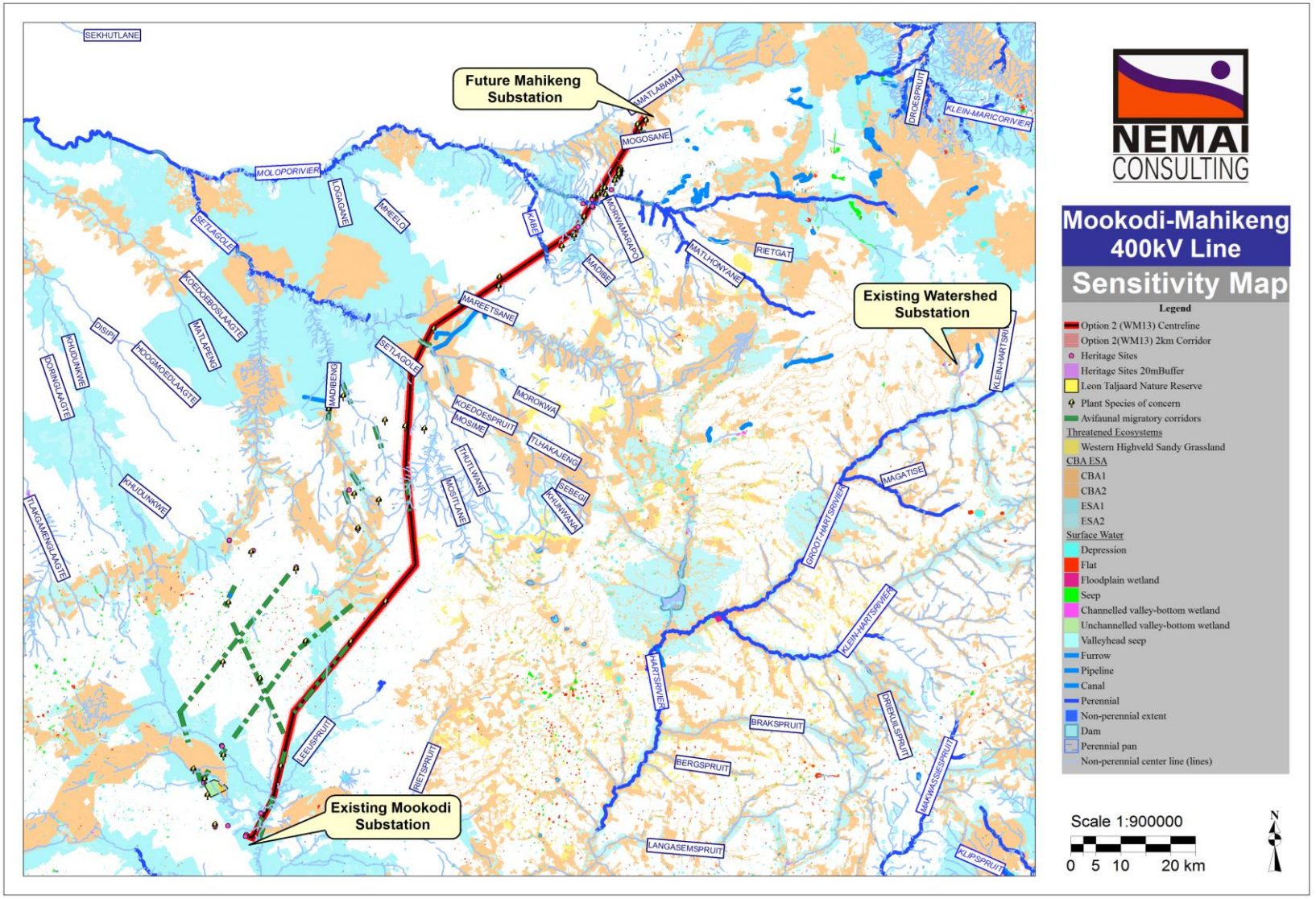


Figure 80: Sensitivity map for Option 2 (BPEO)

17.2 Environmental Impact Statement

Given the economic environment of South Africa, and the socioeconomic structure of the North West Province, the need to extend the electricity network is paramount and is in line with the agenda of the Municipal IDPs. In order to ensure sustainability of the economy and promote a sustainable future, Eskom need to expand infrastructure development. The national economy can only benefit from such an investment, and this will most likely be felt on an international level as there is scope of international investment into the North West Province. Electricity supply shortages, and the associated interruptions; have large economic and social implications. Electricity is used as an input by many businesses – manufacturing, irrigated agriculture and offices, whilst sufficient power supply ensures continuing delivery of social benefits such as health care services. Power interruptions cause negative impacts on daily social activities. These include the efficiency and flow of traffic within the cities or towns which rely on traffic lights, the running of trains, lighting in the home and public spaces and other uses in the home such as preparation of food, heating, cleaning, refrigeration and entertainment. With a secure electricity supply, safety improves since the use of energy sources to carryout household duties such as cooking and lighting require the use of paraffin, candles and possibly small generators, all of which represent a higher safety risk that using electricity. Agricultural production, even on a subsistence level, thrives with a secure water supply and this is often provided by electricity. Thus, increased electricity supply increases food security. These benefits are all realised through an increase and secures electricity supply.

However, the negative influence as raised by the local residents should and must be taken into consideration, and such concerns need to be mitigated in such a way as not to harm the economy on even the most microeconomic of levels. The implementation of the proposed project will have an impact on landowners in that land would need to be acquired, and servitudes registered for the various project components. Landowners would have a reduced land area to generate income and servitude conditions are likely to restrict the existing use of land. In this regard, the final route and tower location will be carried out prior to construction. A final walk down survey by the specialists will be carried out and negotiations with landowners will begin after route selection has been completed. Where impacts on agricultural productivity occur and cannot be mitigated by re-location of towers, compensation will be required for all affected landowners. Those landowners who will be directly affected through the sale of their property and loss of land through the footprints of the towers should be compensated for the land, immovable assets and loss of business. Landowners who will be impacted upon by Eskom requiring a servitude over their land should be compensated for the servitude rights. Eskom are responsible for land and rights acquisition. They should ensure that this process is conducted accordance with the Expropriation Act, 63 of 1975. The process should be a fair and independent land valuations should be conducted. This process should be undertaken in the project planning phase and should be concluded prior to the start of construction. Similarly, servitudes would have to be negotiated and registered in terms of the Alienation of

Land Act, 68 of 1981. There will be discussions and engagement with landowners to come to an agreement with regards to the servitude registration and servitude restrictions.

The recommended Option 2 (WM13) also contains a variety of sensitive environmental features that will be impacted on by the proposed Mookodi-Mahikeng 400kV Powerline and these impacts need to be mitigated as far as possible to minimise the environmental impacts to the area.

Critical environmental activities that need to be executed during the project life-cycle include the following:

- Pre-construction Phase
    - Diligent compliance monitoring of the EMPr, EA and other relevant environmental legislation;
    - Conduct baseline environmental studies for environmental monitoring programme;
    - Undertake a walk through survey of the project footprint by the relevant environmental specialists to identify sensitive environmental features
        - Terrestrial Ecological;
        - Avifaunal; and
        - Heritage;
    - Develop Search, Rescue and Relocation Management Plan for the *Boophane disticha* plant species, based on findings of walk through survey;
    - Barricading and fencing off of sensitive environmental features (e.g. heritage sites);
    - Permits if protected trees are to be cut, disturbed, damaged, destroyed or removed;
    - Permits if heritage resources are to be impacted on;
    - On-going consultation with IAPs; and
    - Other activities as per EMPr;
- Construction Phase
    - Diligent compliance monitoring of the EMPr, EA and other relevant environmental legislation;
    - Implement environmental monitoring programme;
    - Reinstatement and rehabilitation of construction domain;
    - On-going consultation with IAPs; and
    - Other activities as per EMPr;
- Operational Phase
    - Routine maintenance and inspections of the powerline;
    - Develop pollution control measures; and
    - On-going consultation with IAPs.

Based on the recommendations of the Specialist Studies, technical considerations and the comparison of the impacts, Route Option 2 was selected as the BPEO. With the selection of

the BPEO, the adoption of the mitigation measures include in the EIA Report and the dedicated implementation of the EMPr, it is believed that the significant environmental aspects and impacts associated with this project can be suitably mitigated. With the aforementioned in mind, it can be concluded that there are no fatal flaws associated with the project and that authorisation can be issued, based on the findings of the specialists and the impact assessment, through the compliance with the identified environmental management provisions.

17.3 Recommendations

The following key recommendations, which may also influence the conditions of the EA (where relevant), accompany the EIA for the development of the Mookodi-Mahikeng 400kV Powerline:

1. Where relevant, the construction domain needs to be contained within the site footprint as much as possible to avoid disturbance outside of the project footprint.
2. As discussed in the EMPr, various forms of monitoring are required to ensure that the receiving environment is suitably safeguarded against the identified potential impacts, and to ensure that the environmental management requirements are adequately implemented and adhered to during the execution of the project. The types of monitoring to be undertaken include:
    a. Baseline Monitoring needs to be undertaken to determine to the pre-construction state of the receiving environment, and serves as a reference to measure the residual impacts of the project by evaluating the deviation from the baseline conditions and the associated significance of the adverse effects;
    b. Environmental Monitoring entails checking, at pre-determined frequencies, whether thresholds and baseline values for certain environmental parameters are being exceeded; and
    c. Compliance Monitoring for the Independent ECO to monitor compliance against the EMPr and EA.
3. Pertinent recommendations from the Terrestrial Ecological Impact Assessment (Nemai Consulting, 2018a) include:
    a. Prior to construction, the *Boophane disticha* plant species recorded must be searched and rescued and then following construction activities, they can be re-established at the site or along the route;
    b. Obtain a license granted by the Minister of DAFF if the *Vachellia (Acacia) erioloba* (Camel Thorn), which is listed as a protected tree in terms of the National Forests Act (Act No. 84 of 1998), will be cut, disturbed, damaged or destroyed;
    c. Newly cleared soils will have to be re-vegetated and stabilised as soon as construction has been completed and there should be an on-going monitoring programme to control and/or eradicate newly emerging invasives. The rehabilitation of disturbed areas should receive high priority and must be

included in the EMPr and recommendations regarding the specific plant species used during rehabilitation should be site specific and based on the surrounding vegetation composition. Mitigation measures provided will ensure that any available ecological linkages between sensitive areas are not affected negatively;

d. Undertake a walk-down survey of the approved route alternative prior to the start of the construction activities in order to survey the area in detail for any Red Data Listed species and develop a comprehensive and site-specific EMPr so as to limit the impacts imposed by the proposed development activities at each tower site and tower locations can then be adjusted accordingly. The walk-down survey should preferably be undertaken during summer season in order to have a higher probability of detecting species of special concern. This is relevant in the areas that have been labelled as ecologically sensitive;
e. In order to conserve the faunal species community structures within the region, habitat destruction should be limited to an absolute minimum as intact habitat would result in higher faunal and floral species diversity. It is therefore critical that operations are limited to the required footprint only; and
f. The larger exotic species that are not included in the Category 1b list of invasive species could also be allowed to remain for aesthetic purposes.

4. Pertinent recommendations from the Avifaunal Impact Assessment (Enviross, 2018) include:
    a. Migratory corridors have been identified and it is recommended that mitigation measures to make the lines more visible to birds be implemented within these areas;
    b. Ongoing monitoring should be undertaken during the operations phase of the development to identify further problem areas and mitigation measures implemented if found to be necessary;
    c. Habitat units that are considered to be particularly important to avifaunal conservation such as watercourses, riparian zones and wetlands should be impacted as little as possible;
    d. As much of the natural vegetation, including larger trees within servitude areas should be allowed to remain as practically possible. Only larger trees that pose a direct risk to the overhead lines should be removed;
    e. A walk down survey of the chosen alignment option must be undertaken to identify nests and/or important roosting areas to manage these aspect appropriately; and
    f. Indiscriminate habitat destruction must not be allowed to take place within areas outside of the construction footprint areas. Any destruction of habitat that has occurred that is not part of the ultimate footprint of the infrastructure must be rehabilitated.
5. Pertinent recommendations from the Heritage Impact Assessment (JLB Consulting, 2018) include:

a. A walk-down of the selected route option by a heritage specialist, preferably an archaeologist, must be undertaken prior to construction in order that all heritage sites are identified and recorded prior to construction;
b. A desktop palaeontological assessment must be undertaken as the project area falls into an area of both medium and low fossil sensitivity. The desktop assessment would indicate if significant/sensitive fossils will be impacted by the proposed project and provide mitigation measures and the way forward in this regard. The project may only proceed once the desktop palaeontological assessment has been undertaken;
c. For any chance finds of heritage resources, all work must cease in the area affected and the Contractor must immediately inform the Project Manager. A heritage specialist must be called to site to inspect the finds. The NWPHRA / SAHRA must also be informed about any chance finds. The heritage specialist will assess the significance of the heritage resource/s found and provide guidance on the way forward;
d. Permits must be obtained from the NWPHRA or SAHRA if heritage resources are to be removed, destroyed or altered;
e. Any heritage resources found close to the construction site must be protected by a 20m buffer in which no construction can take place. The buffer material (danger tape, fencing, etc.) must be highly visible to construction crews; and
f. Under no circumstances may any heritage material be destroyed or removed from site unless under direction of a heritage specialist.

6. Pertinent recommendations from the Agricultural Impact Assessment (Index, 2018) include:
    a. There is no mitigation for the loss of high potential land that is under irrigation. The route that has the smallest area under irrigation (Option 2) should be preferred. Irrigated land is the only land that is considered as high potential. If it is under pivot irrigation (because of the permanent nature of the supply line and pumps), then the entire portion applicable will be lost. Only one farming unit's viability may be influenced. However, the irrigation is done by conventional system that will not lose its underground infrastructure. The land under the transmission line could still be irrigated after mitigation;
    b. The loss of cultivated land is temporary. The construction period is at most for one production season for the line position, and permanently for the tower footprint. Loss of income from the affected land can only be minimised by keeping the construction period as short as possible. Construction can be scheduled to take place after the crops are harvested. The impact will then only be on the stover value as grazing. Employ dust reducing practices to protect adjoining grazing land;
    c. With regards to loss of grazing land, the construction period should be kept as short as possible. Employ dust reducing practices to protect adjoining grazing land;

d. Theft and vandalism can be reduced by providing security to farmers; and
e. Keep the construction period as short as possible and employ dust reduction methods.

7. Pertinent recommendations from the Visual Impact Assessment (Ecoelementum, 2018) include:
    a. Primary measures to be implemented will mainly be measures that will minimise the visual impact by softening the visibility of the structures by "blending" with the surrounding areas. Such measures will include:
        i. Rehabilitation of the construction areas by re-vegetation of the sites and surrounding area;
        ii. Painting / coating of the pylons to a darker colour than Galvanized steel;
        iii. Building the Powerlines and pylons next to existing linear structures as far as possible;
        iv. Clear vegetation only by cutting and not earth moving equipment; and
        v. Use of existing roads for access roads.
8. Pertinent recommendations from the Economic Impact Assessment (Baur, 2018) include:
    a. In some cases, land near or under powerlines could be used productively, especially in the case of livestock and agriculture. The 'sterilisation' of land is a very important point which should be dealt with in such a way as not to harm farming activities, block the movement of wildlife and people, and not interfere with existing efficiency. It would be important that when the lines are constructed, that they are constructed in a way that minimises any form of disruption to local activity;
    b. The 'compensation' must be dealt with in a transparent fashion and must take into consideration the long term effect as per the real implications to land owners; and
    c. Any development strategy of this project should bear in mind that while there is the greatest positive economic impact shown in this study using possible positive outcomes, the possible negative outcomes are also quite stark and should be considered as a whole in this analysis. From this perspective, the negative concerns identified in the study should be carefully mitigated so as to minimise the risk and possible long term consequences.
9. Pertinent recommendations from the Social Impact Assessment (Nemai Consulting, 2018b) include:
    a. Where-ever possible, the final routing of the project infrastructure should be adjusted to avoid impacts. If the powerline servitude is such that it allows powerline alignment to the extent that an impact on a dwelling can be avoided, this should be done. Where impacts cannot be avoided, all negotiations and payments relating to compensating affected landowners should be conducted and concluded before construction begins. Those landowners who will be required to sell their property to Eskom SOC Ltd must be compensated for any

business that is operating on the premises. All landowners whose businesses will be affected by the proposed project should be compensated to the full value of their immovable assets and any loss of income;

b. Negotiations should take place between the landowner and Eskom for any compensation of potential income denied as a result of the servitude agreements;
c. A Relocation Plan must be developed in the event that household relocation will be necessary;
d. Local SMMEs should be given an opportunity to participate in the construction of the project through the supply of services, material or equipment;
e. The main contractor should employ non-core labour from the Main places as far as possible during the construction phase; and
f. A security policy should be developed which amongst others requires that permission be obtained prior to entering any property and provisions controlling trespassing by contractor staff.

18 OATH OF EAP

I (name and surname) _____

At (address) _____

ID No. _____

Hereby make an oath and state that:

In Accordance with Appendix 3(1)(s) of G.N. R. 982 of the 2014 Environmental Impact Assessment (EIA) Regulations (as amended on 07 April 2017), this serves as an affirmation by the Environmental Assessment Practitioner (EAP) in relation to:

Section 3(1)(s)

i. The correctness of the information provided in this report;
ii. The inclusion of comments and inputs from stakeholders and interested and affected parties (IAPs);
iii. The inclusion of inputs and recommendations from the Specialist Reports where relevant; and
iv. Any information provided by the EAP to IAPs and any responses by the EAP to comments or inputs made by IAPs.

1. I know and understand the contents of this declaration.
2. I do not have any objection in taking the prescribed oath.
3. I consider the prescribed oath to be binding on my conscience.

Signature _____ Date _____

I certify the deponent has acknowledged that he/she knows and understands the contents of the statement and the deponent signature was placed there in my presence.

_____	_____	_____
Commissioner of Oath	Full name	Designation