Eskom Holdings SOC Limited

PROPOSED ESTABLISHMENT OF THE

ANDERSON-DINALEDI 400 kV TRANSMISSION LINE BETWEEN THE PROPOSED NEW ANDERSON SUBSTATION (FLORA PARK) AND THE DINALEDI SUBSTATION (BRITS), NORTH WEST AND GAUTENG PROVINCES

FINAL ENVIRONMENTAL IMPACT ASSESSMENT REPORT

DEA Ref No: 12/12/20/1567

March 2013

ENVIRONMENTAL AND SOCIAL CONSULTANTS

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PUBLIC REVIEW

This document presents the Draft EIA Report for the proposed Anderson-Dinaledi 400kV Transmission Line. The main purpose of the report is the following:

- To describe the need for the project;
- To explain the environmental legal framework governing the project;
- To explain the Environmental Impact Assessment (EIA) process;
- To present the assumptions and limitations associated with the EIA;
- To describe how the proposed project will be executed during the project life-cycle;
- To provide a description of the receiving environment that could be affected by the proposed project;
- To provide a summary of the specialist studies conducted as part of the EIA;
- To assess the significant impacts associated with the project;
- To conduct a comparative analysis of the proposed alternative alignments to the transmission line;
- To describe the public participation process that was undertaken to date, as part of the EIA phase; and
- To draw conclusions regarding the EIA and to make recommendations for decision-making.

To date, the following activities have been undertaken as part of the overall EIA process:

- An application form for Scoping and EIA, in terms of Regulation 27 of Government Notice No. R385 of 21 April 2006, was submitted to the Department of Environmental Affairs (DEA) on 29 July 2009 and the following reference number was assigned to the project: **12/12/20/1567**;
- Public participation was conducted for the Scoping phase, which included the identification of Interested and Affected Parties (I&APs), project announcement (via onsite notices, Background Information Documents, newspaper advertisements and public meetings) and public review of the Draft Scoping Report;
- DEA issued approval for the Scoping Report on 03 March 2011, which allowed the commencement of the EIA phase;
- Specialist studies were undertaken to address certain key environmental issues that were identified during the Scoping phase; and
- The Draft EIA Report (version 1) was released to I & APs for comment from the 25 October 2012 – 03 December 2012. Public meetings were held on the 14 and 15 November 2012; and
- The Draft EIA Report (version 2) was released to I & APs for comment from the 12 December 2012 – 14 December 2012 and 03 January 2013 – 31 January 2013.
- The final EIR have been made available for comment from the 25 March 2013 – 08 April 2013 and will be lodged at the following places for review:

Location	Address	Tel. No.
Madibeng Community Library	51 Van Velden Street, Brits Office Hours: Mon-Fri: 09:00-17:00 Saturdays: 09:00-12:00	012 318 9318
Schoemansville Library	Marais Street, Schoemansville	012 253 1177

The final report can also be viewed electronically on http://www.eskom.co.za/c/44/environmental-impact-assessment/

EXECUTIVE SUMMARY

ELECTRICITY GENERATION, TRANSMISSION AND DISTRIBUTION - OVERVIEW

Electricity is generated, supplied and distributed by Eskom via a network called a “Grid”. The amount of electricity being fed into the grid must always match what the customers are taking out. The amount of electricity required by the customers varies not just from day to day, but from minute to minute. As electricity demand increases, and loads are connected, more power stations and associated substations and lines need to be built to meet the electricity demands. An overview of electrify generation, transmission and distribution is provided in Section 2.1 of this Report.

PROJECT BACKGROUND AND MOTIVATION

The Medupi integration identified the need for the new 2 x 400kV Spitskop-Dinaledi lines to transmit power further into the grid beyond Spitskop. The Dinaledi Main Transmission Substation (MTS) is the main node to link the Waterberg generation and the Mpumalanga pools. Dinaledi MTS is connected by 400kV lines to Bighorn (Rustenburg), Apollo (Pretoria) and will be connected by 2x400kV lines to Spitskop (Northam). This meshed network will be linked to the Central Grid by establishing a new 400kV line from Dinaledi MTS to a new substation called Anderson.

Over the past 15 years, load in the Tshwane area has increased by 80%. This load is anticipated to double in the next 20-30 years, to meet the future electricity requirements in this area and as part of the Tshwane Strengthening Project a new substation named Anderson is proposed to feed the Hartebeespoort and neighbouring areas. This new substation will be linked to the existing Dinaledi Main Transmission Substation by a 40km 400kV line.

The proposed Anderson Substation will be located in Flora Park. The Dinaledi – Anderson 400kV line will transmit power from Dinaledi to the Central Grid and strengthen it. This will ensure that the transmission system north of Johannesburg, Brits and Rustenburg are heavily meshed. This will improve the reliability of the Transmission system and sustain economic growth in the three areas.

PROJECT DETAILS

Description

Eskom Holdings SOC Limited (Eskom) is proposing the construction of a new Anderson-Dinaledi 400kV Transmission Line, and a proposed new Anderson 400kV Substation as part of their Tshwane Strengthening Scheme Project. The proposed powerline will be approximately 40km in length and will run between the proposed new Anderson Substation, which will be located in Flora Park, to the existing Dinaledi Substation which is located approximately 8km North East of Brits. The proposed powerline will be constructed in the following two Municipal Areas: Madibeng Local Municipality (North West Province) and the City of Tshwane Local Municipality (Gauteng Province). The proposed substation is earmarked for construction within the City of Tshwane Metropolitan Municipality. Please note that a separate Environmental Impact Assessment process is being undertaken for the proposed Anderson 400kV Substation.

Location

The Dinaledi Substation is located on Portion 843 of the Farm Roodekopjes of Zwartkopjes 427 JQ, which is located approximately 8km North East of Brits. Three site alternatives are being investigated for the proposed construction of the Anderson Substation. Two of the site alternatives are located directly to the north of NECSA, in Broederstroom, within the Madibeng Local Municipality, North West Province. The third site alternative is located in Flora Park, Gauteng Province. Three alternative powerline routes have been identified (refer to the locality map attached to Appendix A, and to Figure 4). A 1km buffer area has been placed around each alternative route, which will form the study area/corridor to be investigated during the Scoping and EIA Phase. During the EIA Phase a preferred study area/corridor will be selected. The Department of Environmental Affairs (DEA) may authorise the identified preferred corridor, the Department may authorise one of the other corridors, or the Department may request that additional information be submitted in order to make a decision regarding the proposed project. Once DEA authorises a corridor, a walk down survey will be undertaken by suitably qualified specialists in order to determine the exact location of the powerline.

Several properties are located within these 1km study areas/corridors. Details of the affected properties are provided in Section 8.1 of this Report.

Construction Footprint/Construction Details

The proposed powerline requires a servitude width of 55m (27.5m on either side of the centre of the powerline). Generally, the pylons to be used for the powerline can be spaced at 350m to about 550m apart, depending on the type of pylon used, location of the bend points, topography and sensitive areas. The type of Pylons used is dependent on bend points, conductor configuration, voltage level and topography. A minimum vertical clearance of 8.1m between the line and the ground will be required after construction. Details of the construction footprint and construction details are discussed in Section 8 of this Report.

Surrounding Land Uses

Land uses in the study area for the proposed powerline alternatives is mainly comprised of agriculture, mining, vacant land, conservation and tourism, industrial, commercial, recreational and residential.

Access

Existing main roads and farm access roads, should the landowner agrees will be utilised during the construction phase of the proposed powerline. Where existing roads does not exist access roads and roads for construction purposes will be developed. A maintenance road will be required in order for Eskom to undertake maintenance on the powerline. The maintenance road will be located within the 55m servitude. Roads developed for construction purposes which will not be used during maintenance procedures will be closed and rehabilitated at the end of the construction phase. Where roads needs to be developed on side slopes where the slope is steeper than 4%, cut and fill operations may be required to level the roads. Road construction and levelling will be undertaken in terms of the "Transmission Line Towers and Line Construction" (TRMSCAAC1 – Rev 3) document compiled by Eskom. This document provides certain specification for road construction and levelling to ensure that side slopes are stable. All roads to be constructed as part of the proposed project will most likely be gravel roads.

Where construction and maintenance roads intersect with fences gates need to be installed. Furthermore all existing infrastructure along the access and maintenance roads should be maintained in its existing condition. Access points and access roads needs to be negotiated with the landowners.

Zoning

Various land use zonings occur along the study area as various different types of land uses occur. Once a preferred corridor has been approved by the authorities, the exact location of the tower structures will be determined which will determine the exact location of the centre line. Eskom will then negotiate with all affected landowners to purchase a 55m wide servitude. The zoning of the affected properties will therefore not change, only an Eskom servitude will be registered on the affected properties. An application for rezoning may be required for the temporary construction camps, however, clarity on this matter needs to be obtained from the Local Municipalities.

Ownership

The proposed powerline will be approximately 40km in extent and will traverse many properties. Details of the properties affected are provided in Sections 8 of this report.

DETAILED ROUTE DESCRIPTION (DIRECTLY AFFECTED PROPERTIES)

Eskom Grid Planning is responsible for establishing future electricity demands as a result of growth and development. Once an area has been identified where future growth will result in electricity constraints, methods for strengthening the grid to sustain future growth patterns is considered. The Tshwane Strengthening Scheme is one of these projects which were identified by Eskom to ensure a stable and

efficient electricity supply for the future. After Eskom Grid Planning has identified the selected method to strengthen the grid, the various substations and powerlines which will be required for this project were identified.

The transmission line route selection process involves the consideration of various technical criteria to determine where a line could be located within the selected study area where grid strengthening is required. The technical criteria used by Eskom to determine the route alignments includes *inter alia* the following:

- The cost of construction of Transmission Line Routes is directly proportional to the total length, therefore the longer the route the more expensive construction becomes, the shortest route between two points area therefore preferable;
- Bend towers on a Powerline are extremely expensive due to the large quantities of steel and the large foundations required to construct such towers, therefore the least amount of bends in a line is preferable;
- The maximum angle for a bend tower is 60 degrees, therefore a line cannot just be deviated easily, and proper planning is required. For larger bends, special towers have to be constructed;
- Transmission line routes with existing access routes are preferred, as heavy vehicles and cranes are used for tower construction which needs to travel to the servitude area and specifically to tower positions; and
- When planning a route it is preferable to avoid construction on erosive land, land which is undermined where sinkholes occur or where sinkholes could occur in future, furthermore area with poor geotechnical conditions should be avoided as far as possible.

Three route alternatives each with a 1km wide study area and some deviations are being considered for this proposed project. A detailed route description of all properties currently directly affected by the proposed centre line is discussed in Section 8 of this Report.

PROPERTIES AFFECTED BY 1KM STUDY AREA

A list of all properties located within the 1km study area of the three alternative proposed Powerline Routes is provided in Section 7 of this Report. The table also includes all the directly affected properties. The Cadastral 2006 information was used to determine the affected properties. Therefore all subdivisions undertaken after 2006 will not be reflected on this list.

UPGRADE OF EXISITNG 88KV LINE

The proposed Madibeng Substation project which is undertaken by Eskom Distribution forms part of the Tshwane Strengthening Scheme Project. This project entails the construction of a proposed Madibeng Substation which will be located at about 8km south-west of the Dinaledi Substation. The Madibeng Substation will be fed from Dinaledi MTS through 2x132kV lines and thereby split the existing 88kV network in the Tshwane and Brits area. The existing 88kV network in and around the Brits and Tshwane area will be split in such a way that an existing 88kV Lomond-De Wildt line becomes redundant. The Lomond-De Wildt line route is located within the Anderson-Dinaledi 400kV line study area and thus it can be decommissioned after the construction of the Madibeng Substation in order to accommodate the proposed Anderson-Dinaledi 400kV line.

The Madibeng substation project is scheduled to be commissioned by 2014 depending on the speed acquisition of servitudes. The current 88kV Lomond-De Wildt line route servitude is designed for 88kV lines and therefore becomes inadequate for a 400kV line route. The majority of the existing line towers are wood poles which were designed for 88kV lines in terms of clearances and insulations. It is thus necessary that the servitude be extended and the towers be re-designed or changed for the 400kV line.

The foundation of the towers will most probably change as the centre line servitude may change due to the servitude extension and different towers.

The centre line will change because the existing line runs closer to another existing 88kV line. It is therefore with noting that the decommissioning and dismantling of the existing 88kV Lomond-De Wildt line for the proposed 400kV Anderson-Dinaledi line can only begin when Madibeng substation is successfully commissioned.

LEGISLATION AND GUIDELINES CONSIDERED

A summary of the legislation and guidelines which has been considered during the Scoping and Environmental Impact Assessment Phases for this project is provided in Section 4 of this Report. Please note this project will be undertaken in terms of the Environmental Impact Assessment (EIA) Regulations of 2006, as the Application Form for undertaking the Environmental Authorisation Phase for this project was submitted to the Department of Environmental Affairs (DEA) on the 29th of July 2009. However, the new EIA Regulations which was promulgated on the 18th of June 2010 and which came into effect on the 2nd of August 2010 will be considered as part of the Scoping and EIA Phases in order to ensure that listed activities under the new EIA Regulations are considered, assessed and addressed. The EIA Regulation of 2006 and of 2010 as well as the relevant listed activities which will be triggered as part of this proposed project is addressed in Section 4.1 of this Report.

SCOPING AND EIA PROCESS

The proposed Anderson-Dinaledi 400kV powerline project entails certain activities that require authorisation in terms of the National Environmental Management Act (No. 107 of 1998) (NEMA), as described in Section 4.1 of this Report. The process for seeking authorisation is undertaken in accordance with the Environmental Impact Assessment (EIA) Regulations, 2006, promulgated in terms of Section 24(5) of the NEMA.

Section 24C(2)(d)(iii) of the National Environmental Management Amendment Act (Act 62 0f 2008) states that the Minister must be identified as the competent authority in terms of subsection (1) if an activity is undertaken, or is to be undertaken, by a statutory body, excluding any municipality, performing an exclusive competence of the national sphere of government.

Section 4(1) of Regulation 385 of the Environmental Impact Assessment Regulation, 2006, states that if the Minister is the competent authority in respect of a specific application, the application must be submitted to DEA. Eskom is a parastatal or statutory body, and therefore the decision-making authority for this project is DEA.

The Department will make a decision on whether authorisation will be granted for this project or not based on the content of the Scoping and Environmental Impacts Assessment Reports which will be submitted to the Department for review and decision making. The Scoping and EIA Report will also be submitted to the following authorities for comment:

- Department of Environmental Affairs (DEA);
- Gauteng Department of Agriculture and Rural Development (GDARD);
- North West Department of Agriculture, Conservation and Environment;
- Madibeng Local Municipality;
- City of Tshwane Local Municipality;
- South African National Roads Agency (SANRAL);
- North West Province Roads Department and Public Works;
- North West Department of Housing;
- Department of Mineral Resources (DMR);
- Department of Water Affairs (DWA);
- National Department of Agriculture (NDA);
- Provincial Heritage Resources Authority, Gauteng; and
- South African Heritage Resources Authority.

Comment received from these authorities have been incorporated into the final EIA Report which will be submitted to DEA for review and decision making.

The Scoping Phase is the first phase of an Environmental Impact Assessment and has been completed. The second phase, the EIA phase has commenced and the draft EIR will be submitted to I & APs for comment. A Scoping and EIA process consist of various phases. These phases have been illustrated in a Process Flow Diagram (Figure 2).

An application to undertake Scoping and EIA for this proposed project was submitted to DEA on the 21st of July 2009. DEA acknowledged receipt of this application from and issued the project with the following reference number: 12/12/20/1567.

THE RECEIVING ENVIRONMENT

The EIA Report provides a general description of the status quo of the receiving environment in the project area (1 km wide corridor for each of the alternative routes), and also provides local and site-specific discussions on those environmental features investigated by the respective specialists. This allows for an appreciation of sensitive environmental features and possible receptors of the effects of the proposed project. The following environmental features are discussed:

- Geology;
- Topography;
- Climate;
- Soils and Land Capability;
- Land Use;
- Flora;
- Fauna;
- Surface Water;
- Groundwater;
- Air Quality;
- Noise;
- Visual;
- Traffic;
- Socio-Economic Environment;
- Infrastructure and Services; and
- Archaeological and Cultural Historical.

SPECIALIST STUDIES

The necessary specialist studies triggered by the findings of the Anderson-Dinaledi 400kV Scoping process, aimed at addressing the identified key issues and compliance with legal obligations, include the following:

- Fauna and Flora Impact Assessment;
- Invertebrate Impact Assessment;
- Herpetological Impact Assessment;
- Heritage Impact Assessment;
- Agricultural Potential Assessment;
- Visual Impact Assessment; and
- Socio-Economic Impact Assessment.

The information obtained from the respective specialist studies were incorporated into the EIA report in the following manner:

- The information was used to complete the description of the receiving environment in a more detailed and site-specific manner;
- A summary of each specialist study is contained in the report, focusing on the approach to the study, key findings and conclusions drawn;
- The evaluations performed by the specialists on the alternative routes were included in the comparative analysis to identify the most favourable option;
- The specialists' impacts assessment, and the identified mitigation measures, were included in the overall project impact assessment;
- Specialist input was obtained to address comments made by I&APs that related to specific environmental features pertaining to each specialist discipline; and
- Salient recommendations made by the specialists were taken forward to the final EIA Conclusions and Recommendations.

IMPACT ASSESSMENT

This section of the EIA Report focuses on the pertinent environmental impacts that could potentially be caused by the proposed Anderson-Dinaledi 400kV transmission line during the pre-construction, construction and operation phases of the project.

The impacts to the environmental features are linked to the project activities, which in broad terms relate to the physical infrastructure (emphasis on construction and operation stages). Impacts were identified as follows:

- An appraisal of the project description and the receiving environment;
- Impacts associated with listed activities contained in GN No. R386; R387; R544; R545 and R546;
- Issues highlighted by environmental authorities;
- Findings from specialist studies; and
- Comments received during public participation.

The impacts associated with the listed activities and raised by environmental authorities are discussed on a qualitative level. In order to understand the impacts related to the project's components, the activities and environmental aspects associated with the project life-cycle were identified. The following significant environmental impacts associated with the proposed Anderson Dinaledi 400kV transmission line are assessed quantitatively and concomitant mitigation measures are provided.

CONSTRUCTION PHASE	
Feature	**Impact**
Topography	• Visual impact on ridges • Erosion of affected areas on steep slopes
Surface Water	• Impacts where access roads and the transmission lines cross watercourses
Geology and Soil	• Erosion on steep slopes

CONSTRUCTION PHASE	
Feature	**Impact**
Flora	• Removal of vegetation for stringing, building of new access roads, tower construction and construction camp(s) establishment
Fauna	• Impacts to animals • Impacts to livestock
Socio-economic	• Loss of income • Reduction in property value • Damage to property • Relocation of structures situated within servitude
Agricultural Potential	• Loss of agricultural land • Impacts to livestock
Archaeological and Cultural Features	• Damage to heritage resources
Transportation	• Damage to roads by heavy construction vehicles
Aesthetics	• Clearing of vegetation. • Construction-related operations.
Tourism	• Visual and noise impacts from construction operations. • Influence to ecotourism. • Reduction in tourism to areas affected by construction
OPERATIONAL PHASE	
Feature	**Impact**
Topography	• Visual impact on ridges from disturbed area and infrastructure. • Erosion along access roads on steep slopes.
Surface Water	• Inadequate stormwater management on access roads • Damage to towers from major flood events
Geology and Soil	• Erosion on steep slopes
Flora	• Encroachment by exotic species through inadequate eradication programme. • Clearing of vegetation along maintenance road.
Fauna	• Risk to birds from collision with infrastructure and from electrocution
Socio-economic	• Loss of land with extension of existing servitude • Reduction in property value • Threats to human and animal health from EMF
Agricultural Potential	• Loss of agricultural land
Transportation	• Use of maintenance roads
Aesthetics	• High visibility of transmission lines. • Inadequate reinstatement and rehabilitation of construction footprint.
Tourism	• High visibility of transmission lines • Loss of “sense of place”

Cumulative impacts, such as use of local road network, alien and invasive vegetation along the corridor, following existing high-voltage power lines, high erodible nature of local soils and benefits to macro-economy, are also considered.

ANALYSIS OF ALTERNATIVES

Based on the recommendations of the specialists and the comparison of the impacts associated with the various alignments, the following options are considered to be the preferred alternatives:

Western Alternative: The invertebrate and herpetological specialist recommends that the western route be recommended as the preferred route, the southern, eastern and western deviations will not ameliorate any potential impact.

Western Alternative – Western Deviation: The flora and fauna specialist recommends that this route be recommended in terms of flora and fauna sensitivity as most parts of the route are along the main road and existing powerline and are considered less sensitive than the alternative routes in terms of biodiversity.

Eastern Alternative: The heritage, agricultural, visual and socio-economic specialists recommend that the eastern alternative route be recommended.

Based on the recommendations by the specialists and the impact assessment, **the Best Practicable Environmental Option (BPEO) is the Eastern Route**.

PUBLIC PARTICIPATION PROCESS

A Public Participation Process was conducted as described in Regulation 58 of the EIA Regulations, 2006. The Public Participation Process included the following:

- Consultation and involvement of relevant Authorities at various levels;
- Consultation and involvement of the owners and occupiers of land adjacent to the properties earmarked for development, and within a 100m radius of the boundary of the site where the activity is to be undertaken, by hand delivering Background Information Documents (BID's) to all owners and occupiers within a 100m radius of the properties earmarked for development;
- Consultation and involvement of the municipal ward councillors of the wards in which the properties earmarked for development are located;
- Consultation and involvement of the municipality which has jurisdiction in the area;
- Consultation and involvement of any organ of state having jurisdiction in respect of any aspect of the activity;
- Compilation and placing of advertisements in local and regional newspapers;
- Compilation and placing of site notices on the properties earmarked for development;
- Compilation and distribution of Background Information Documents (BID's) to all relevant Stakeholders within a 100m radius;
- Hosting of a Public Meeting; and
- The Draft Scoping Report was made available to I & APs for review.

The Public Participation Process is described in detail in Section 13 of this Report.

EIA CONCLUSIONS AND RECOMMENDATIONS

With the selection of the BPEO for the transmission line route, the adoption of the mitigation measures included in the EIA Report and the dedicated implementation of the Environmental Management Programme (EMPr), it is believed that the significant environmental aspects and impact 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 recommends various conditions that are regarded as critical mitigation measures emanating from the environmental assessment process.

TITLE AND APPROVAL PAGE

TITLE: Proposed Establishment of the Anderson-Dinaledi 400 kV Transmission Line between the proposed new Anderson Substation (Flora Park) and the Dinaledi Substation (Brits), North West and Gauteng Provinces – Draft EIA Report

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Signature **Date**

APPROVAL _____ _____

Signature **Date**

AMENDMENTS PAGE

Date	Nature of Amendment	Amendment No.	Signature
25 October 2012	Draft Copy for Public Review	1	
12 December 2012	Final Copy of Draft EIR for Public Review	2	
25 March 2013	Final EIR for Public Review	3	

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APPENDICES

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1 DOCUMENT ROADMAP

This draft EIA Report for the proposed **Anderson-Dinaledi 400 kV Transmission Line** aims to satisfy the requirements stipulated in Government Notice (GN) No. R385 (21 April 2006), regulation 32(2). **Table 1** presents the document's composition, in terms of the aforementioned requirements.

Table 1: Anderson-Dinaledi 400 kV Transmission Line EIA Report Roadmap

Chapter	Title	Correlation with G.N. No. R385	Description
2	Project Background and Motivation	R32(2)(f)	A description of the need and desirability of the proposed activity.
3	Legislation and Guidelines Considered	–	–
4	Scoping and EIA Process	–	–
5	Assumptions and Limitations	R32(2)(l)	A description of any assumptions, uncertainties and gaps in knowledge.
6	Environmental Assessment Practitioner	R32(2)(a)	Details of – (i) the EAP who compiled the report; and (ii) the expertise of the EAP to carry out an environmental impact assessment.
7	Project Location	R32(2)(c)	A description of the location of the activity.
8	Project Description	R32(2)(b)	A detailed description of the proposed activity.
		R32(2)(c)	A description of the property on which the activity is to be undertaken and the route of the linear activity.
9	Profile of the Receiving Environment	R32(2)(d)	A description of the environment that may be affected by the activity.
10	Summary of Specialist Studies	R32(2)(i)	A summary of the findings and recommendations of any specialist reports.
11	Impact Assessment	R32(2)(d)	A description of the manner in which the physical, biological, social, economic and cultural features of the environment may be affected by the proposed activity.
		R32(2)(g)	An indication of the methodology used in determining the significance of potential environmental impacts.
		R32(2)(j)	(j) a description of all environmental issues that were identified during the environmental impact assessment process, an assessment of the significance of each issue and an indication of the extent to which the issue could be addressed by the adoption of mitigation measures;
		R32(2)(k)	An assessment of each identified potentially significant impact, including – (i) cumulative impacts; (ii) the nature of the impact; (iii) the extent and duration of the impact; (iv) the probability of the impact occurring; (v) the degree to which the impact can be reversed; (vi) the degree to which the impact may cause irreplaceable loss of resources; and

Chapter	Title	Correlation with G.N. No. R385	Description
			(vii) the degree to which the impact can be mitigated.
12	Analysis of Alternatives	R32(2)(f)	A description identified potential alternatives to the proposed activity, including advantages and disadvantages that the proposed activity or alternatives may have on the environment and the community that may be affected by the activity.
		R32(2)(h)	A description and comparative assessment of all alternatives identified during the environmental impact assessment process.
13	Public Participation	R32(2)(e)	Details of the public participation process.
14	EIA Conclusions and Recommendations	R32(2)(m)	An opinion as to whether the 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.
		R32(2)(n)	An environmental impact statement
Appendix E		R32(2)(o)	A draft Environmental Management Plan.
Appendix D		R32(2)(p)	Copies of any specialist reports and reports on specialised processes.
N/A	N/A	R32(2)(q)	Any specific information that may be required by the competent authority.

2 PROJECT BACKGROUND AND MOTIVATION

2.1 Setting the Scene

The Medupi integration identified the need for the new 2 x 400kV Spitskop-Dinaledi lines to transmit power further into the grid beyond Spitskop. The Dinaledi Main Transmission Substation (MTS) is the main node to link the Waterberg generation and the Mpumalanga pools. Dinaledi MTS is connected by 400 kV lines to Bighorn (Rustenburg), Apollo (Tshwane) and will be connected by 2 x 400 kV lines to Spitskop (Northam). This meshed network will be linked to the Central Grid by establishing a new 400 kV line from Dinaledi MTS to a new substation called Anderson.

Over the past 15 years, load in the Tshwane area has increased by 80%. This load is anticipated to double in the next 20-30 years, and to meet the future electricity requirements in this area and as part of the Tshwane Strengthening project a new substation named Anderson is proposed to feed the Hartebeespoort and neighbouring areas. This new substation will be linked to the existing Dinaledi MTS by an approximate 40 km 400 kV line.

The Anderson- Dinaledi 400kV line will transmit power from Dinaledi to the Central Grid and strengthen it. This will ensure that the transmission system north of Johannesburg, Brits and Rustenburg are heavily meshed, which will improve the reliability of the Transmission system and sustain economic growth in the three areas.

Note: This report only focuses on the Anderson- Dinaledi 400kV transmission line. A separate EIA process is being conducted for the proposed Anderson Substation.

2.2 Transmission and Distribution of Electricity

Electricity is generated, supplied and distributed by Eskom via a network called a “Grid”. The electricity being fed into the grid must always match what the customers are taking out. The electricity required by the customers varies not just from day to day, but from minute to minute. As electricity demand increases, and loads are connected, more power stations and associated substations and lines need to be built to meet the electricity demands.

Eskom produces electricity at power stations. Most of the power stations in South Africa are located near coal mines in Mpumalanga and the Waterberg area in the Limpopo Province. The largest load centres are located in Gauteng, the Western Cape and Kwa-Zulu Natal. After electricity is generated at a power station, it is conveyed from the power stations to the load centres via high voltage power lines. As electricity leaves the power station, the electricity is boosted by a ‘step-up’ transformer to voltages such as 400kV, 275kV

and 132kV. Electricity is 'stepped-down' at sub-stations to voltages used for distribution to customers. A diagram of the Eskom Supply Chain is provided in **Figure 1**.

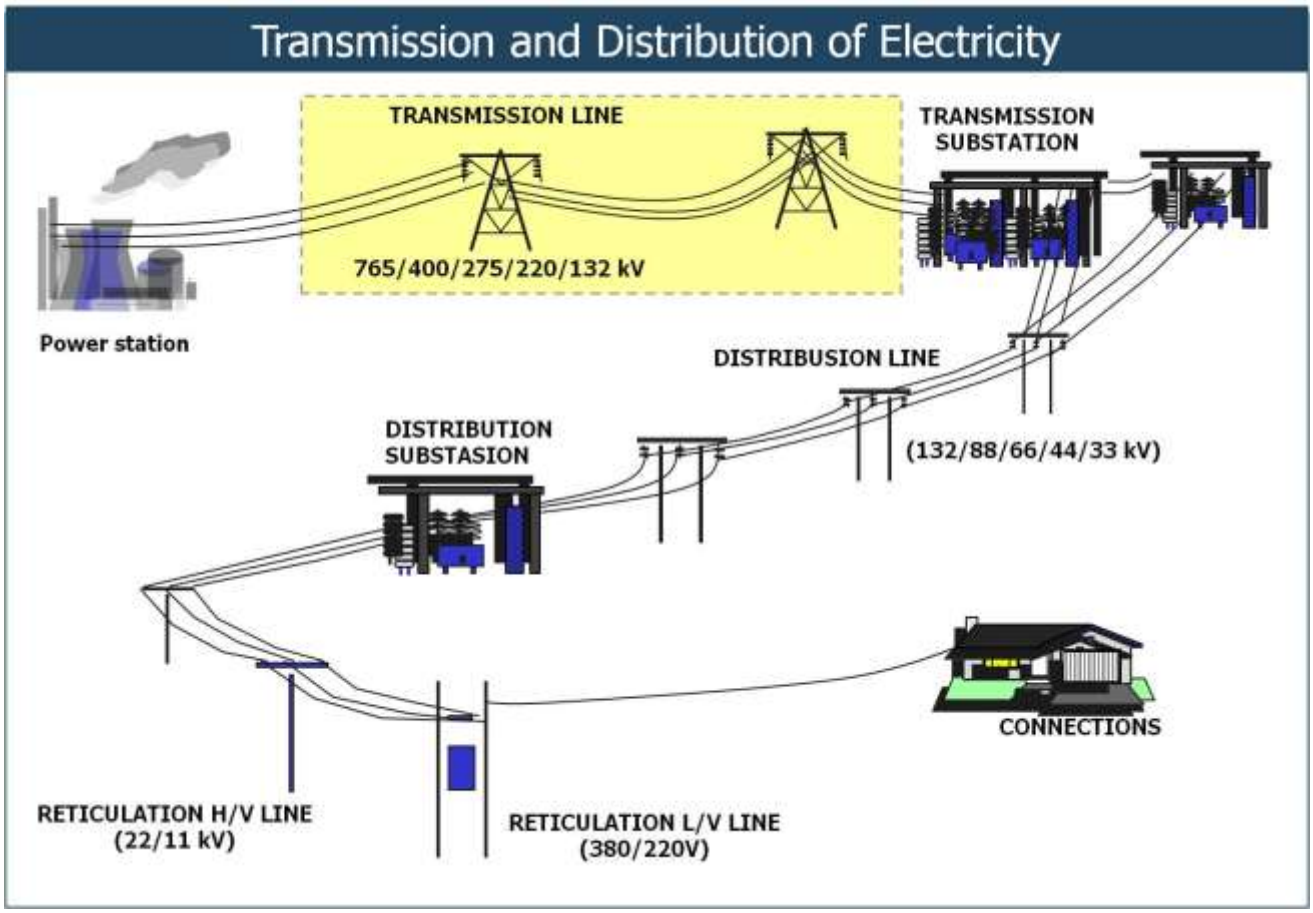

Figure 1: Illustration of the transmission and distribution of electricity

3 LEGISLATION AND GUIDELINES CONSIDERED

3.1 Legislation

The legislation that has possible bearing on the proposed Anderson-Dinaledi 400 kV transmission line project is captured in Table 2 below. A more detailed overview of relevant legislation was provided in the Scoping Report.

Note: This list does not attempt to provide an exhaustive explanation, but rather an identification of the most appropriate sections from pertinent pieces of legislation.

Table 2: Environmental Statutory Framework

Legislation	Relevance
Constitution of the Republic of South Africa, (No. 108 of 1996)	• Chapter 2 – Bill of Rights. • Section 24 – environmental rights.
National Environmental Management Act (No. 107 of 1998)	• Section 24 – Environmental Authorisation (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. • Authorities – National: Department of Environmental Affairs (DEA); Provincial: North West Department of Agriculture, Conservation, Environment and Rural Development (NWDACERD) and Gauteng Department of Agriculture and Rural Development (GDARD)
National Water 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. • Watercourse crossings. • Authority – Department of Water Affairs (DWA).
Environment Conservation Act (No. 73 of 1989):	• Environmental protection and conservation. • Section 25 – Noise regulation. • Section 20 – Waste management. • Authority – DEA
National Environmental Management Air Quality Act (No. 39 of 2004)	• Air quality management • Section 32 – dust control. • Section 34 – noise control.

Legislation	Relevance
	• Authority – DEA.
National Environmental Management: Biodiversity Act, 2004 (No. 10 of 2004)	• Management and conservation of the country's biodiversity. • Protection of species and ecosystems. • Authority – DEA.
National Environmental Management: Protected Areas Act (No. 57 of 2003)	• Protection and conservation of ecologically viable areas representative of South Africa's biological diversity and natural landscapes. • Section 16 to 18 - a section of the proposed Anderson-Dinaledi power line traverses the Magaliesberg Protected Natural Environment (MPNE).
National Environmental Management: Waste Act (No. 59 of 2008)	• Chapter 5 – licensing requirements for listed waste activities (Schedule 1). • Authority – provincial (general waste) or national (hazardous).
National Forests Act (No. 84 of 1998)	• Section 15 – authorisation required for impacts to protected trees. • Authority – Department of Agriculture, Forestry and Fisheries
Minerals and Petroleum Resources Development Act (No. 28 of 2002)	• Permit required for borrow pits. • Authority – Department of Mineral Resources (DMR).
Occupational Health & Safety Act (No. 85 of 1993)	• Provisions for Occupational Health & Safety. • Authority – Department of Labour.
National Heritage Resources 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 000m^2 in extent. • Authority – South African Heritage Resources Agency (SAHRA), Provincial Heritage Resources Agency.
Conservation of Agricultural Resources Act (No. 43 of 1983)	• Control measures for erosion. • Control measures for alien and invasive plant species. • Authority – Department of Agriculture.
National Road Traffic Act (No. 93 of 1996)	• Authority – Department of Transport
Tourism Act of 1993	• Authority – South African Tourism Board

Environmental Impact Assessment Regulations

The Anderson-Dinaledi 400 kV power line project entails certain activities that require authorisation in terms of the National Environmental Management Act (Act No. 107 of 1998) (NEMA). The environmental assessment for this project is being conducted in terms of the Environmental Impact Assessment (EIA) Regulations of 2006 (GN No. R385 of 21 April 2006), which was promulgated in terms of Chapter 5 of

NEMA. **Table 3** lists the associated relevant activities that apply to the proposed project in terms of GN No. R386 and R387 of 21 April 2006.

Table 3: EIA Regulations of 2006 - list of Activities Triggered

GN No.	Activity	Description	Relevance to Project
R387	**1(l)**	The construction of facilities or infrastructure, including associated structures or infrastructure, for the transmission and distribution of above ground electricity with a capacity of 120 kilovolts or more.	The project involves the construction of a 400kV Transmission Line
R387	**2**	Any development activity, including associated structures and infrastructure, where the total area of the developed area is, or is intended to be, 20 hectares or more.	This activity was considered as construction of a power line will occur within a 55m wide servitude over a distance of approximately 40km. Therefore the total project area will be approximately 220ha in extent. However, this activity is not applicable for linear developments and is therefore excluded as a listed activity.
R387	**5**	The route determination of roads and design of associated physical infrastructure, including roads that have not yet been built for which routes have been determined before the publication of this notice and which has not been authorised by a competent authority in terms of the Environmental Impact Assessment Regulations, 2006 made under section 24(5) of the Act and published in Government Notice No. R.385 of 2006, where – (a) It is a national road as defined in section 40 of the South African National Roads Agency Limited and National Roads Act, 1998 (Act No.7 of 1998); (b) it is a road administered by a provincial authority; (c) the road reserve is wider than 30 meters; or (d) the road will cater for more than one lane of traffic in both directions.	This activity will not be applicable as only single lane access and maintenance roads will be required for this proposed project. The proposed maintenance roads will be gravel roads which will be located within the 55m servitude. Access roads will most likely also be single lane gravel roads.

GN No.	Activity	Description	Relevance to Project
R386	**1(m)**	The construction of facilities or infrastructure, including associated structures or infrastructure, for any purpose in the one in ten year flood line of a river or stream, or within 32 metres from the bank of a river or stream where the flood line is unknown, excluding purposes associated with existing residential use, but including - (i) canals; (ii) channels; (iii) bridges; (iv) dams; and (v) weirs.	A 1km study corridor for the construction of the 400kV power line will be considered as part of this project. Once a corridor has been approved by DEA, a walk down survey will be undertaken by all the relevant specialists to determine where the actual centre line (power line) will be located within the corridor. It is therefore not yet known whether it would be necessary to construct pylons within the 32m of the bank of rivers or streams, or whether it will be possible to span across. New road bridges may be require or existing bridges may need to be upgraded.
R386	**1(p)**	The construction of facilities or infrastructure, including associated structures or infrastructure for the temporary storage of hazardous waste.	This activity is not applicable as any hazardous waste produced on site will be temporarily stored and then disposed of at an approved landfill site.
R386	**4**	The dredging, excavation, infilling, removal or moving of soil, sand or rock exceeding 5 cubic metres from a river, tidal lagoon, tidal river, lake, in-stream dam, floodplain or wetland.	This activity relates to where construction work may need to take place in watercourses to build new road bridges or to upgrade existing bridges for access roads.
R386	**7**	The above ground storage of a dangerous good, including petrol, diesel, liquid petroleum gas or paraffin, in containers with a combined capacity of more than 30 cubic metres but less than 1 000 cubic metres at any one location or site.	Diesel storage tanks may be erected at the construction camps during the construction phase. The size of these tanks is not known.
R386	**12**	The transformation or removal of indigenous vegetation of 3 hectares or more or of any size where the transformation or removal would occur within a critically endangered or an endangered ecosystem listed in terms of section 52 of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004).	It is not yet clear exactly where the proposed power line will be located within the 1km corridor. This activity has therefore been included. Authorities have indicated in the past that this activity is not applicable for linear projects, however, should transformation of vegetation occur within the proposed 55m servitude over a

GN No.	Activity	Description	Relevance to Project
			long distance within a sensitive area, then this activity may be triggered.
R386	**14**	The construction of masts of any material or type and of any height, including those used for telecommunication broadcasting and radio transmission, but excluding - (a) masts of 15 metres and lower exclusively used, (i) by radio amateurs; or (ii) for lighting purposes; (b) flag poles; and (c) lightning conductor poles.	The project will include the construction of towers for electricity transmission.
R386	**15**	The construction of a road that is wider than 4 metres or that has a reserve wider than 6 metres, excluding roads that fall within the ambit of another listed activity or which are access roads of less than 30 metres long.	Maintenance roads will be required in order for Eskom to access the power lines for maintenance purposes. Details on the maintenance roads are not yet known as the exact power line location within the corridor is yet to be determined. It is not anticipated that any of these maintenance roads will be wider than 4m.
R386	**20**	The transformation of an area zoned for use as public open space or for a conservation purpose to another use.	It is not yet clear exactly where the proposed power line will be located within the 1 km corridor. This activity have therefore been included as it is not yet known exactly what types of land uses will be affected by the power line servitude.

On 18 June 2010 the amended EIA Regulations were promulgated in terms of Chapter 5 of NEMA. From the date of effect of these amended EIA Regulations on 02 August 2010, they replaced the previous EIA Regulations that had been promulgated on 21 April 2006. In terms of transitional arrangements, an application submitted in terms of the previous EIA regulations (2006) and which were pending when the amended EIA regulations (2010) took effect, must be dispensed with in terms of the former regulations (despite the repeal of these regulations). This is the case with the proposed Anderson-Dinaledi 400 kV power line project, where the Application Form for Scoping and EIA, in terms of Regulation 27 of GN No. R. 385 of 21 April 2006, was submitted to DEA on 29 July 2009.

For the sake of completeness, the activities contained in the listing notices of the amended EIA Regulations (2010) (i.e. GN No. R544, R545 and R546 of 18 June 2010) are presented in **Table 4** and are also assessed in this report. Schedule R544 defines activities which will trigger the need for a Basic Assessment and R545 defines activities which trigger a Scoping and EIA process. If activities from both schedules are

triggered, then an EIA process will be required. R546 defines certain additional listed activities for geographical areas, based on environmental attributes, for which a Basic Assessment would be required.

Table 4: EIA Regulations of 2010 - list of Activities Triggered

GN No.	Activity	Description	Relevance to Project
R544	**11**	The construction of: (i) canals; (ii) channels; (iii) bridges; (iv) dams; (v) weirs; (vi) bulk storm water outlet structures; (vii) marinas; (viii) jetties exceeding 50 square metres in size; (ix) slipways exceeding 50 square metres in size; (x) buildings exceeding 50 square metres in size; or (xi) infrastructure or structures covering 50 square metres or more where such construction occurs within a watercourse or within 32 metres of a watercourse, measured from the edge of a watercourse, excluding where such construction will occur behind the development setback line.	A 1km study corridor for the construction of the 400kV power line will be considered as part of this project. Once a corridor has been approved by DEA, a walk down survey will be undertaken by all the relevant specialists to determine where the actual centre line (power line) will be located within the corridor. It is therefore not yet known whether it would be necessary to construct pylons within the 32m of the bank of rivers or streams, or whether it will be possible to span across. New road bridges may be required or existing bridges may need to be upgraded.
R544	**13**	The construction of facilities or infrastructure for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 but not exceeding 500 cubic metres;	Diesel storage tanks may be erected at the construction camps during the construction phase. The size of these tanks is not known.
R544	**18**	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 from (i) a watercourse; (ii) the sea; (iii) the seashore; (iv) the littoral active zone, an estuary or a distance of 100 metres inland of the high-water mark of the sea or an estuary, whichever distance is the greater- but excluding where such infilling, depositing, dredging, excavation, removal or moving (i) is for maintenance purposes undertaken in	This activity relates to where construction work may need to take place in watercourses to build new road bridges or to upgrade existing bridges for access roads.

GN No.	Activity	Description	Relevance to Project
		accordance with a management plan agreed to by the relevant environmental authority; or (ii) occurs behind the development setback line.	
R544	**22**	The construction of a road, outside urban areas, (i) with a reserve wider than 13,5 meters or, (ii) where no reserve exists where the road is wider than 8 metres, or for which an environmental authorisation was obtained for the route determination in terms of activity 5 in Government Notice 387 of 2006 or activity 18 in Notice 545 of 2010.	Maintenance roads will be required in order for Eskom to access the power lines for maintenance purposes. Details on the maintenance roads are not yet known as the exact power line location within the 1km corridor is not yet known. It is not anticipated that any of these maintenance roads will be wider than 4m and as such this activity will no longer be applicable.
R544	**39**	The expansion of (i) canals; (ii) channels; (iii) bridges; (iv) weirs; (v) bulk storm water outlet structures; (vi) marinas; within a watercourse or within 32 metres of a watercourse, measured from the edge of a watercourse, where such expansion will result in an increased development footprint but excluding where such expansion will occur behind the development setback line.	This activity relates to where construction work may need to take place in watercourses to build new road bridges or to upgrade existing bridges for access roads.
R545	**8**	The construction 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.	The project involves the construction of a 400kV Transmission Line.
R546	**4**	The construction of a road wider than 4 metres with a reserve less than 13,5 metres **(b) In Gauteng:** i. A protected area identified in terms of NEMPAA, excluding conservancies; ii. National Protected Area Expansion Strategy Focus	Access and construction / maintenance roads will be required in order for Eskom to access the servitude and power line for construction and maintenance purposes. A section of the

GN No.	Activity	Description	Relevance to Project
		areas; iii. Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority; iv. Sites identified in terms of the Ramsar Convention; v. Sites identified as irreplaceable or important in the Gauteng Conservation plan; vi. Areas larger than 2 hectares zoned for use as public open space; vii. Areas zoned for a conservation purpose. viii. Any declared protected area including Municipal or Provincial Nature Reserves as contemplated by the Environment Conservation Act, 1989 (Act No. 73 of 1989) and the Nature Conservation Ordinance (Ordinance 12 of 1983); Any site identified as land with high agricultural potential located within the Agricultural Hubs or Important Agricultural Sites identified in terms of the Gauteng Agricultural Potential Atlas, 2006. **(c) In North West :** i. Outside urban areas, in: (aa) A protected area identified in terms of NEMPAA, excluding conservancies; (bb) National Protected Area Expansion Strategy Focus areas; (cc) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority; (dd) Sites or areas identified in terms of an International Convention; (ee) Critical biodiversity areas (Terrestrial Type 1 and 2 and Aquatic Type 1) as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;	proposed power line will traverse the Magaliesberg Natural Protected Environment (MPNE).

GN No.	Activity	Description	Relevance to Project
		(ff) Core areas in biosphere reserves; (gg) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from a biosphere reserve. ii. In urban areas: (aa) Areas zoned for use as public open space; (bb) Areas designated for conservation use in Spatial Development Frameworks adopted by the competent authority or zoned for a conservation purpose; (cc) Natural heritage sites.	
R546	**12**	The clearance of an area of 300 square metres or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation. (a) Within any critically endangered or endangered ecosystem listed in terms of section 52 of the NEMBA or prior to the publication of such a list, within an area that has been identified as critically endangered in the National Spatial Biodiversity Assessment 2004; (b) Within critical biodiversity areas identified in bioregional plans; (c) Within the littoral active zone or 100 metres inland from high water mark of the sea or an estuary, whichever distance is the greater, excluding where such removal will occur behind the development setback line on erven in urban areas.	Vegetation clearing within the servitude may be required. The extent of vegetation clearance is not yet known. A section of the proposed power line will traverse the MPNE.
R546	**13**	The clearance of an area of 1 hectare or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation, except where such removal of vegetation is required for: 1) The undertaking of a process or activity included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008), in which case the activity is regarded to be excluded from this list.	Vegetation clearing within the servitude may be required. The extent of vegetation clearance is not yet known. A section of the proposed power line will traverse the MPNE.

GN No.	Activity	Description	Relevance to Project
		2) The undertaking of a linear activity falling below the thresholds mentioned in Listing Notice 1 in terms of GN No522 of 2010 (a) Critical biodiversity areas and ecological support areas as identified in systematic biodiversity plans adopted by the competent authority. (b) National Protected Area Expansion Strategy Focus areas. (d) **In Gauteng:** i. A protected area identified in terms of NEMPAA, excluding conservancies; ii. National Protected Area Expansion Strategy Focus areas; iii. Any declared protected area including Municipal or Provincial Nature Reserves as contemplated by the Environment Conservation Act, 1989 (Act No. 73 of 1989), the Nature Conservation Ordinance (Ordinance 12 of 1983); (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; iv. Sites or areas identified in terms of an International Convention; v. Sites identified as irreplaceable or important in the Gauteng Conservation Plan. **(e) In North West:** i. Outside urban areas, in: (aa) A protected area identified in terms of NEMPAA, excluding conservancies; (bb) National Protected Area Expansion Strategy Focus areas; (cc) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority; (dd) Sites or areas identified in terms of an	

GN No.	Activity	Description	Relevance to Project
		International Convention; (ee) Critical biodiversity areas (Type 1 only) and ecological support areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans; (ff) Core areas in biosphere reserves; (gg) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core areas of a biosphere reserve. ii. In urban areas: (aa) Areas zoned for use as public open space; (bb) Areas designated for conservation use in Spatial Development Frameworks adopted by the competent authority or zoned for a conservation purpose; (cc) Natural heritage sites.	

3.2 Guidelines

The following guidelines were considered during the preparation of the EIA Report:

- Guideline in Alternatives: NEMA Environmental Impact Assessment Regulations (prepared by the Western Cape Department of Environmental Affairs and Development Planning, 2006);
- Guideline 3: General Guide to the Environmental Impact Assessment Regulations, 2005. Integrated Environmental Management Guideline Series (DEAT, 2005a); and
- Guideline 4: Public Participation, in support of the EIA Regulations. Integrated Environmental Management Guideline Series (DEAT, 2005).

3.3 Environmental Authorisations Required

From the relevant legislation listed in **Section 3.1**, the following environmental authorisations will be required for the proposed Anderson-Dinaledi 400 kV transmission line:

1. Approval required from DEA for listed activities associated with the project. Scoping and EIA conducted under NEMA, in accordance with the EIA Regulations (Government Notice No. R385, R386 and R387 of 21 April 2006).

2. If applicable, permit to be obtained under National Forests Act (No. 84 of 1998) if protected trees are to be cut, disturbed, damaged, destroyed or removed.
3. If applicable, permit to be obtained from SAHRA under the National Heritage Resources Act (No. 25 of 1999) if heritage resources are to be impacted on.
4. If applicable, authorisation from DWA, in terms of section 21(i) [and potentially 21(c)] of the National Water Act (No. 36 of 1998), for any activities (including the positioning of the towers) within the extent of a watercourse (i.e. 1:100 year floodline or the delineated riparian habitat, whichever is greatest).
5. If applicable, Environmental Management Programme to be submitted for approval to DMR for burrow pits, under the Minerals and Petroleum Resources Development Act (No. 28 of 2002).

3.4 Regional Plans, Policies and Programmes

The following regional plans were considered during the execution of the EIA:

- Spatial Development Frameworks(where available);
- Integrated Development Plans;
- Relevant provincial, district and local policies and strategies.
- The Gauteng Ridges Guideline Policy – relates to the protection of ridges within the Gauteng Province. Sections of the transmission line routes traverse the Magaliesberg and Witwatersberg.

3.5 Energy Sector Strategic Documents

The EIA further considered Energy Sector Strategic Documents, including the following:

- White Paper on the Energy Policy of the Republic of South Africa (December 1998);
- Eskom's Transmission Development Plan;
- Integrated Energy Plan;
- Integrated Strategic Electricity Planning (ISEP);
- Electricity Regulation Act (Act 4 of 2006) as amended;
- National Electricity Response Plan (NERP) (2008);
- National Guidelines on Environmental Impact Assessment for facilities to be included in the Electricity Response Plan (2008); and
- Environmental Impact Assessment Guidelines for transmission lines within the Southern African Power Pool Region (1999).

3.6 Magaliesberg Protected Environment EMF

The main objectives of the Magaliesberg Protected Environment (MPE) Environmental Management Framework (EMF) include the following:

- To maintain and enhance the contribution of the MPE to water quality and quantity to the Crocodile West Water Management Area and specifically to the Elands and Upper Crocodile Sub-management Areas;
- To maintain and promote the contribution of the MPE to the conservation of biodiversity in South Africa, both in terms of ecosystem integrity and species diversity;
- To protect and manage all types of heritage resources within the MPE as an important physical and eco-tourism asset;
- To maintain and enhance the visual and aesthetical character of the MPE with a view to protect the eco-tourism potential of the mountain;
- To manage and build environment and development activities in a sustainable manner, without reducing the aesthetic appeal or ecosystem function of the MPE; and
- To optimize potential economic and social development opportunities compatible with the MPE, and to conserve the MPE's ability to provide and support these opportunities.

The EMF and Plan for the MPE is aimed at addressing the requirements of Section 71 of the EIA Regulations of Government Notice R385 (21 April 2006), as well as the basic components of a Management Plan for a protected area as described in Section 41 of the National Environmental Management: Protected Areas Act (Act 57 of 2003).

The following sub-objectives stipulated in the EMF are of particular importance in terms of the proposed Anderson-Dinaledi 400 kV line:

- **Objective 1.1:** To maintain and enhance water quality emanating from the MPE;
- **Objective 1.3:** To protect and conserve special water features within the MPE (such as mountain streams, wetlands, and natural springs);
- **Objective 1.4:** To maintain the functionality of wetlands in the MPE;
- **Objective 2.1:** To conserve the ecological integrity of ecosystems of the mountain;
- **Objective 2.2:** To conserve indigenous threatened species and other species of high conservation priority in the mountain;
- **Objective 2.3:** To conserve the rich indigenous biodiversity of the mountain;
- **Objective 3.2:** To prohibit the alteration or destruction of heritage resources and cultural landscapes resulting from uncontrolled and unplanned development within and immediately adjacent to the MPE;
- **Objective 4.3** To prohibit the development of bulk infrastructure such as power lines, reservoirs and bulk water supply pipelines, within or traversing the MPE;
- **Objective 5.1:** To manage the intensity of development around the MPE in order to limit the “edge effect” on the MPE boundaries; and
- **Objective 5.5:** To prohibit the development of bulk infrastructure such as power lines, reservoirs and bulk water supply pipelines, within or traversing the MPE.

The construction of bulk infrastructure (including power lines) is regarded as an incompatible activity in the MPE. The MPE EMF recommends that all applications for development activities within the MPE not classified as “compatible activities” be subject to a full EIA process. The EMF further recommends that the EIA reports for all applications in the EMF area should include at least specialist studies which will address the key aspects as outlined in the objectives for the MPE. This is the case with this EIA Report for the Anderson-Dinaledi 400 kV line, where the specialists have considered the recommendations included in the EMF.

4 SCOPING AND EIA PROCESS

4.1 Environmental Assessment Triggers

As noted in **Section 3.1**, the Anderson-Dinaledi 400 kV power line project triggers activities under GN No. R386 and R387 of 21 April 2006, and thus a Scoping and EIA process that conforms to the requirements stipulated in GN No. R385 of 21 April 2006 is required.

4.2 Environmental Assessment Authorities

Section 24C(2)(d)(iii) of the National Environmental Management Amendment Act (Act 62 of 2008) states that the Minister must be identified as the competent authority in terms of subsection (1) if an activity is undertaken, or is to be undertaken, by a statutory body, excluding any municipality, performing an exclusive competence of the national sphere of government.

Section 4(1) of GN No. R385 of the EIA Regulations (2006) states that if the Minister is the competent authority in respect of a specific application, the application must be submitted to the Department of Environmental Affairs (DEA). Eskom is a parastatal or statutory body, and therefore the decision-making authority for this project is DEA. The Scoping and EIA Report will also be submitted to the following authorities for comment:

- Gauteng Department of Agriculture and Rural Development (GDARD);
- North West Department of Agriculture, Conservation, Environment and Rural Development (DACERD);
- Department of Water Affairs (DWA);
- National Department of Agriculture (NDA);
- Provincial Heritage Resources Authority, Gauteng (PHRA-G);
- South African Heritage Resources Agency (SAHRA);
- Madibeng Local Municipality (Environmental and Town Planning Departments); and
- City of Tshwane Metropolitan Municipality (Environmental and Town Planning Departments).

Comments received from these authorities will be incorporated into the EIA Report which will be submitted to DEA for review and decision making.

4.3 Amendment of the Application Form

Note that the initial Application Form did not include the following activity listed in term of GN No. R386 of 21 April 2006:

- 4 - The dredging, excavation, infilling, removal or moving of soil, sand or rock exceeding 5 cubic

metres from a river, tidal lagoon, tidal river, lake, in-stream dam, floodplain or wetland.

The above activity relates to where construction work may need to take place in watercourses to build new road bridges or to upgrade existing bridges for access roads.

An amended Application Form was submitted to DEA.

4.4 Scoping Process

The following milestones were reached during the completion of the preceding Scoping process (as contemplated in regulation 28(e) of GN No. R. 385 of 21 April 2006):

1. An application form for Scoping and EIA, in terms of Regulation 27 of GN No. R. 385 of 21 April 2006, was submitted to DEA on 29 July 2009 and the following reference number was assigned to the project: 12/12/20/1567;
2. Meeting held with DEA on 08 July 2011 to confirm EIA study area and public participation approach.
3. A database of Interested and Affected Parties (I&APs) was compiled, which included (amongst others):
    a. Owners and occupiers of land directly affected by the centreline of each alternative route; and
    b. Key affected stakeholders (e.g. mines, Nuclear Energy Corporation South Africa);
    c. Parastatals (e.g. SANRAL, Transnet);
    d. Local authorities (City of Tshwane Metropolitan Municipality and Madibeng Local Municipality);
    e. Commentary authorities; and
    f. Environmental groups (e.g. Magaliesberg Protection Association, Bird Life Africa, Hartbeespoort Environment).
4. I&APs were notified via onsite notices, Background Information Documents (BIDs), newspaper advertisements and meetings of the proposed project in October 2010;
5. A Scoping-level impact assessment was completed to identify potentially significant environmental issues for detailed assessment during the EIA phase;
6. Feasible alignment alternatives were screened and identified for further appraisal during the EIA phase;
7. A Comments and Response Report was compiled (which was updated during the execution of the Scoping process), which summarised the salient issues raised by I&APs and the project team's response to these matters;
8. A Plan of Study, which explains the approach to be adopted to conduct the EIA, was prepared in accordance with Regulation 29(1)(i) of GN No. R. 385 of 21 April 2006; which included *inter alia* the Terms of Reference for the identified specialist studies;
9. A Draft Scoping Report, which conformed to Regulation 29 of GN No. R. 385 of 21 April 2006, was compiled;
10. The Draft Scoping Report was lodged for public review from 08 November 2010 until 15 December 2010;
11. The final Scoping Report was submitted to DEA in December 2010; and

12. DEA issued approval for the Scoping Report on 03 March 2011 (refer to ***Appendix B***), which allowed the commencement of the EIA phase.

A meeting was held with DEA on the 8th of July 2010 to discuss the Public Participation process to be followed, whether DEA finds the 1km study corridor acceptable for the proposed powerline alternatives, and whether a 1x1km study area will be allowed for the proposed substation. The minutes of the meeting with DEA is attached to Appendix C.

4.5 EIA Methodology

4.5.1 Need and Desirability

In terms of Regulation 32(2)(f) of GN No. R385 (21 April 2006), this section discusses the need and desirability of the project.

Note that the questions raised in the Guideline on Need and Desirability (DEA&DP, 2009) was used to complete this section.

Table 5: Need and Desirability of the Project

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).	**Section 2.1** explains the strategic need for the proposed Anderson-Dinaledi 400kV project in an endeavour to ensure the reliability of the transmission system north of Johannesburg, Brits and Rustenburg.
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?	Any future development would need to take cognisance of the servitude restrictions.
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 a specific local context it could be inappropriate)	The Anderson-Dinaledi 400kV power line will strengthen the Central Grid and sustain economic growth in the Johannesburg, Brits and Rustenburg areas.
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?	Current services are sufficient.

No.	Question	Response
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)?	Planning consideration to be given to upgrading of electricity distribution and reticulation infrastructure.
6.	Is this project part of a national programme to address an issue of national concern or importance?	Strengthening of Central Grid will benefit the reliability of the transmission system north of Johannesburg, Brits and Rustenburg
DESIRABILITY ('placing')		
7.	Is the development the best practicable environmental option (BPEO) for this land/site?	Through the comparative analysis (**Section 12**), the BPEO was selected.
8.	Would the approval of this application compromise the integrity of the existing approved municipal IDP and SDF as agreed to by the relevant authorities?	The alternatives will cross the Magaliesberg Protected Natural Environment, however provided that the relevant mitigation measures are implemented, the potential impacts will be minimal.
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 proposed power line is regarded as an incompatible activity in the MPE. The MPE EMF recommends that all applications for development activities within the MPE not classified as "compatible activities" be subject to a full EIA process. The EMF further recommends that the EIA reports for all applications in the EMF area should include at least specialist studies which will address the key aspects as outlined in the objectives for the MPE. This is the case with this EIA Report for the Anderson-Dinaledi 400 kV line, where the specialists have considered the recommendations included in the EMF.
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).	• The western alternative follows existing transmission line and existing roads in an attempt to minimise impact in western portion of project area. • Controlled activities (e.g. agriculture) will be permissible within the servitude. • Power line will detract from the visual quality of the area.
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)?	• Through walk-down survey, sensitive environmental features can be avoided, as far as possible. • Special construction methods employed for crossing inaccessible and sensitive areas. • Power line will detract from the visual quality of the area. • The western route will follow existing transmission lines over the Magaliesberg and Witwatersberg.

No.	Question	Response
12.	How will the development impact on people's health and wellbeing (e.g. in terms of noise, odours, visual character and sense of place, etc.)?	• Refer to impact assessment contained in **Section 11**. • Potential risks associated with electromagnetic fields – see ***Appendix D8*** (Electric and Magnetic Fields from Overhead Powerlines – A Summary of Technical and Biological Aspects). • Potential impacts during construction phase to be managed through EMPr. • See response provided for question no. 11 above.
13	Will the proposed activity or the land use associated with the activity applied for, result in unacceptable opportunity costs? *[Opportunity costs = the net benefit that would have been yielded by the next best alternative, e.g. if farming is the next best alternative for a piece of land, then the foregone benefit of losing the farming option will be the opportunity cost of any other land use]*	• The Eastern Route follows existing transmission lines. • The western route follows existing transmission line and roads in an attempt to minimise impact in western portion of project area. • Controlled activities (e.g. agriculture) will be permissible within the servitude.
14	Will the proposed land use result in unacceptable cumulative impacts?	• See **Section 11.** • It is believed that the cumulative impacts can be mitigated to a satisfactory level.

4.5.2 Formal Process

Key objectives for the EIA phase include the following:

- Carry out relevant specialist studies;
- Conduct public participation;
- Assess receiving environment;
- Undertake quantitative assessment of significant environmental impacts and identify concomitant mitigation measures;
- Evaluate alternative alignments through a comparative analysis; and
- Compile EIA Report in accordance with the requirements stipulated in GN No. R385 of 21 April 2006, regulation 32(2); for review by I&APs. Refer to **Section 1** for the document's composition, in terms of the regulatory requirements.

An outline of the Scoping and EIA process for the proposed Anderson-Dinaledi 400kV Transmission Line is provided in **Figure 2**.

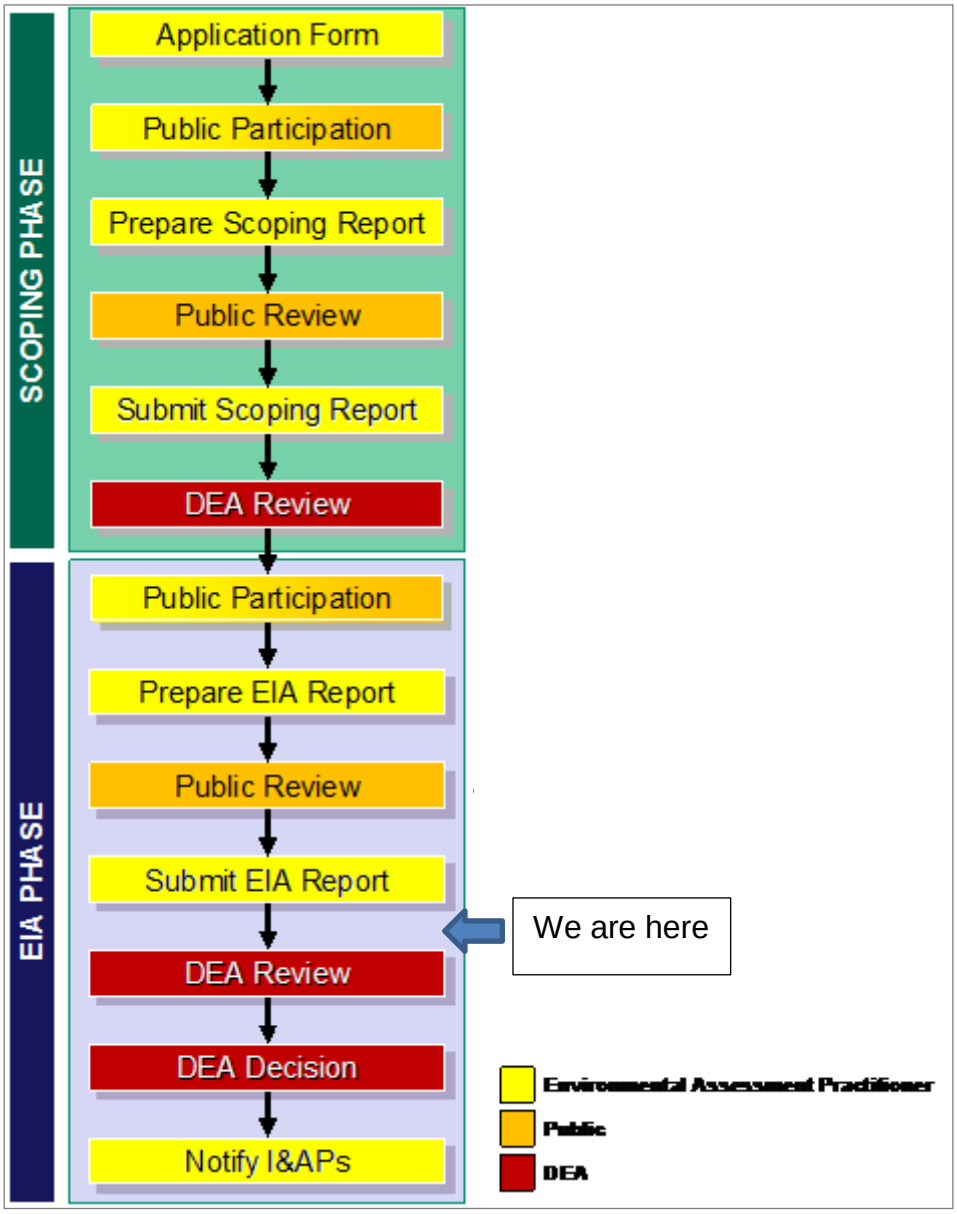

Figure 2: Outline of Scoping and EIA process

4.5.3 Alignment with the Plan of Study

The Plan of Study, which was contained in the Scoping Report and was approved by DEA, explained the approach to be adopted to conduct the EIA for the proposed Anderson-Dinaledi 400 kV Transmission Line. The manner in which the EIA Report addresses the requirements of the Plan of Study is tabulated below.

Table 6: Alignment of EIA Report with Plan of Study

Plan of Study Requirement	EIA Report Reference
Stakeholder engagement during the EIA - Public participation to include the following (amongst others):	**Section 13**

<table>
<tr><th>Plan of Study Requirement</th><th>EIA Report Reference</th></tr>
<tr><td>

- Registration of any additional stakeholders;
- Notification of the review of the Draft EIA Report;
- Convening public meetings;
- On-going communication with authorities and stakeholders throughout EIA process; and
- Convening steering committee meetings, if required, throughout the EIA phase.

</td><td></td></tr>
<tr><td>

Conduct specialist studies -

Identified specialist studies to be conducted to satisfy pre-determined objectives.

<table>
<tr><th>Study Type</th><th>Status</th></tr>
<tr><td>Vegetation Assessment</td><td rowspan="3">Study completed. Combined assessment entitled Flora And Fauna Assessment (Appendix D1)</td></tr>
<tr><td>Fauna Assessment</td></tr>
<tr><td>Avifaunal Assessment</td></tr>
<tr><td>Herpetological Assessment</td><td>Study completed. Appendix D2</td></tr>
<tr><td>Invertebrate Assessment</td><td>Study completed. Appendix D3</td></tr>
<tr><td>Soil and Land Capability Assessment</td><td>Study completed. Assessment conducted on a desktop level.</td></tr>
<tr><td>Geological and Geotechnical Investigation</td><td rowspan="2">Study forms part of the engineering discipline, and will be conducted during the detailed design stage.</td></tr>
<tr><td>Stormwater Management Plan</td></tr>
<tr><td>Heritage Impact Assessment</td><td>Study completed (Appendix D5).</td></tr>
<tr><td>Electromagnetic Survey</td><td>Previous studies have been reviewed and discussed (Appendix F8).</td></tr>
</table>

</td><td>Sections 10</td></tr>
<tr><td>Environmental Impact Assessment -

Assess pertinent environmental issues identified during Scoping through quantitative approach and identify suitable mitigation measures.</td><td>Sections 11</td></tr>
<tr><td>EIA Report -

EIA Report to satisfy the minimum requirements stipulated in Regulation 32 of GN No. R. 385 of 21 April 2006</td><td>Section 1</td></tr>
<tr><td>Environmental Management Plan -

Environmental Management Programme (EMPr) to satisfy the minimum requirements stipulated in Regulation 34 of GN No. R. 385 of 21 April 2006.</td><td>Appendix E</td></tr>
</table>

The EIA included the following deviations from the Plan of Study:

- The EIA phase does not conform to the timeframes mentioned in the Plan of Study, due to the dynamic nature of the planning and EIA process for the proposed power line and substation. An additional alternative site for the proposed Anderson Substation (12/12/20/1568) was identified through public participation, which needed to be assessed from a technical and environmental perspective. This caused a delay in the execution of the EIA phase.
- The following additional specialist studies were undertaken, over and above what was indicated in the Plan of Study:
  - Visual Impact Assessment (Appendix D7);
  - Socio-Economic Impact Assessment (Appendix D6);

4.5.4 Key Amendments / Clarification of Information from the Scoping Report

Based on comments received from I & AP during the scoping phase, a third site alternative for the substation was included in the EIR for assessment as the preferred alternattive. As a result, the proposed transmission line routes that were initially proposed in the scoping phase were amended as indicated in figure 3 below.

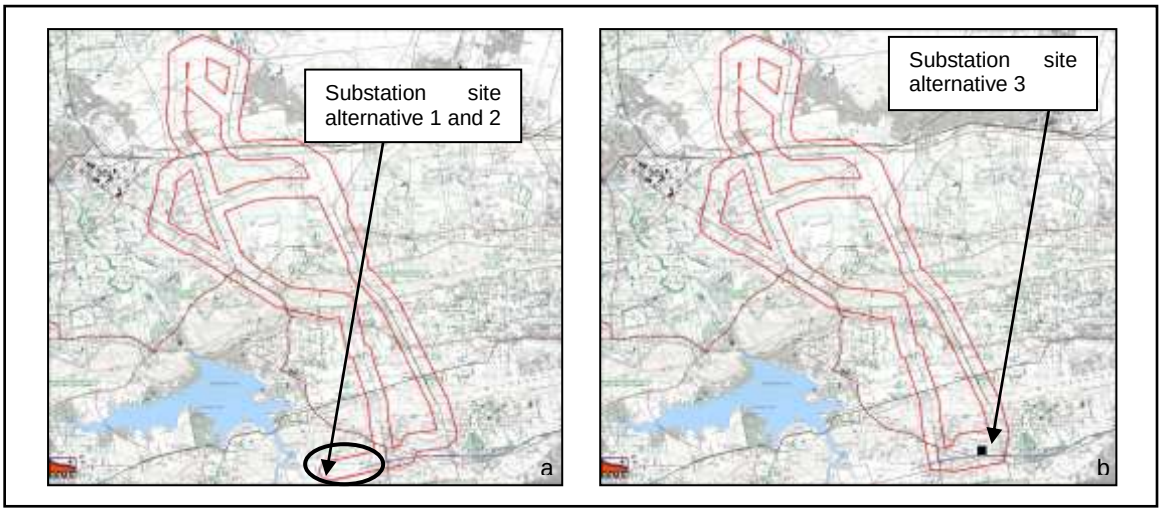

Figure 3: Maps showing the old transmission line (a) and the amended transmission line route (b)

The consideration of a new site alternative was triggered by findings of the specialist studies and comments received from Nuclear Energy Corporation South Africa (NECSA) and The North West Department of Transport.

Following several discussions with NECSA, on Monday the 16th of November 2009, Mr Cairns Bain from NECSA informed Nemai on the outcome of the CEO meeting. This response included:

- The Executive Management Committee (EMC) considered the information and decided that Eskom needs to directly communicate with the NECSA CEO and submit a formal letter outlining their needs before any in principle decision can be made; and
- The technical team considered the new information submitted in the updated substation description, which indicated that the footprint of the proposed substation will be 600 X 600 meters. NECSA indicated that old substation site was only 350 m by about 100 m. Indicated that because of topography considerations this site would not easily allow for such expansion.

Eskom and NECSA then considered options of establishing the Substation outside of the NECSA high security area, but still within the NECSA property. However, no feasible substation site location existed when eliminating the NECSA high security area and dolomitic areas.

Furthermore, site alternative 1 and 2 are proposed to be located within the M4 road reserve which may hamper any future activities on the widening of that road.

4.5.5 Route Selection

Eskom Grid Planning is responsible for establishing future electricity demands as a result of growth and development. Once an area has been identified where future growth will result in electricity constraints, methods for strengthening the grid to sustain future growth patterns are considered. The Tshwane Strengthening Scheme is one of these projects which were identified by Eskom to ensure a stable and efficient electricity supply for the future. After Eskom Grid Planning has identified the selected method to strengthen the grid, the infrastructure (i.e. substations and power lines) required was identified.

The transmission line route selection process involves the consideration of the following technical criteria (amongst others):

- Tie-points (i.e. a point through which the route must pass to achieve the overall goals and requirements of the project / an area towards which the transmission line is attracted between its terminals), which are the substations or significant demand centres along the alignment.
- There are certain areas where the route is attracted in a certain way due to extreme topography at some river crossings, or for considerations of access for maintenance. Existing infrastructure such as rail lines, road or other power lines sometimes attract new routes in an effort to create a utility corridor on an already-disturbed area. The westerns and eastern alternatives predominantly follow existing servitudes / services.
- No-Go areas where it is impractical / impossible to build transmission lines, which could include wetlands, steep or unstable terrain, land subject to mineral rights, buffer zones around landing strips or airfields, dense human settlements, erosive land, undermines area, or highly corrosive zones along the coastline.
- The cost of construction of Transmission Lines is directly proportional to the total length, therefore the longer the route the more expensive construction becomes. The shortest route between two points is therefore preferable.
- Bend towers on a power line are expensive due to the large quantities of steel and the foundations required to build such towers. Hence, the least number of bends in a line is preferable.
- The maximum angle for a bend tower is 60 degrees. Deviating the route of a power line is thus not a simple exercise, and it requires proper planning. For larger bends, special towers have to be constructed.
- Transmission line routes with existing access routes are preferred, as heavy vehicles and cranes are used during the construction phase that need to travel to the servitude area and specifically to tower positions.

During the environmental assessment a 1 km corridor (i.e. 500 m on either side of the route centre line) was adopted as the study area. This is to allow for any possible deviations from the current servitude alignment within this corridor, deemed necessary by the following factors:

- Findings of the impact assessment and specialist studies;
- Outcome of Eskom negotiations with landowners; and
- Technical requirements.

The termination points of the Eastern and Western Route alternatives are dependent on the location of the proposed Anderson Substation site. The EIA for the Anderson substation is running parallel with the EIA for the Anderson-Dinaledi 400kV Transmission Line, and the final end point of the power line in the southern part of the study area will thus be determined through the authorisation of the preferred siting of the proposed Anderson Substation.

4.5.6 Screening and Assessment of Alternatives

Various alternatives to meeting the project's objectives were considered during Scoping, which included options for the alignment route, tower structures, upgrading existing transmission lines and the "no go" option.

The alignment and tower structure alternatives are taken forward in the impact prediction, where the potential adverse effects to the environmental features and attributes are examined further in **Section 11**.

A comparative analysis of the route options (**Section 12**) was also conducted from environmental (including specialist input) and technical perspectives, which included a systematic comparison of the implications of the alternative routes to enable the selection of a Best Practicable Environmental Option (BPEO).

4.5.7 Impact Prediction

Refer to **Section 11** for the impact assessment of the proposed transmission line.

The potential environmental impacts associated with the project were identified through an appraisal of the following:

- Proposed routes of the power line corridors, which included site investigations and a desktop evaluation with a Geographical Information System (GIS) and aerial photography;
- Project infrastructure and design considerations;
- Activities and associated environmental aspects (i.e. causes of potential impacts) related to the project life-cycle (i.e. pre-construction, construction, operation and decommissioning);
- Nature and profile of the receiving environment and potential sensitive environmental features and attributes (e.g. MPNE);
- Input received during public participation from I&APs;

- Findings of specialist studies;
- Legal and policy context; and
- Cumulative impacts.

The Scoping exercise aimed to identify significant environmental impacts for further consideration and prioritisation during the EIA stage. Note that “significant impacts” relate to whether the effect (i.e. change to the environmental feature / attribute) is of sufficient importance that it ought to be considered and have an influence on decision-making. During Scoping, the impact prediction was executed on a qualitative level, where the main impacts where distilled by considering factors such as the nature, extent, magnitude, duration, probability and significance of the impacts.

During the EIA stage a detailed assessment is conducted to identify significant impacts, which are evaluated via contributions from I&APs, the project team and requisite specialist studies, and through the application of the impact assessment methodology contained in **Section 11.1.5**. Suitable mitigation measures are proposed to manage (i.e. prevent, reduce, rehabilitate and/or compensate) the environmental impacts, and are included in the Environmental Management Programme (EMPr) (see ***Appendix E***).

4.6 Servitude Negotiation and the EIA Process

Transmission lines are constructed and operated within a servitude (55 m wide for 400 kV lines) that is established along the entire length of the line. Within this servitude, Eskom Transmission has certain rights and controls that support the safe and effective operation of the line. The process of achieving the servitude agreement is referred to as the Servitude Negotiation Process (refer to ***Appendix F***).

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

5 ASSUMPTIONS AND LIMITATIONS

The following assumptions and limitations accompany the EIA for the proposed Anderson-Dinaledi 400 kV power line:

- The exact locations of the towers and the route can only be determined following detailed design, and the environmental assessment is thus conducted for a 1 km corridor for each alternative alignment. Nonetheless, a centre line within each corridor presents the key focus area for the environmental assessment.
- Although specialist studies were conducted, the identification of sensitive environmental features and attributes (e.g. protected flora, sensitive habitat, heritage resources) will be facilitated by a detailed walk-down survey of the final approved route. This will allow for a more detailed site appraisal of the entire route through on-ground inspections by a surveyor and a team of appropriate environmental specialists.
- The EIA process does not make provision for borrow pits. The necessary approval of borrow pits will be required from the Department of Mineral Resources (DMR) in terms of the Minerals and Petroleum Resources Development Act (Act No. 28 of 2002).
- It is assumed that the baseline information scrutinised and used to explain the environmental profile is accurate.
- The locations of camp sites are not known at this stage, and the associated impacts will need to be addressed through suitable mitigation measures in the EMPr.
- Although existing access roads will be utilised as far as possible, it is not known which access roads will be used and where river crossings (if applicable) will take place. Following the walk-down survey and final alignment of the transmission line, the access roads will be confirmed. The EMPr will also need to make provision for managing the related aspects and impacts.
- The type of tower structure is unknown at this stage, and is dependent on several factors, including terrain, expense and recommendations that emanated from the Visual Impact Study, as well as the final route of the power line. The final engineering design will include the selection of the most appropriate tower type.
- The alignment of a transmission line alongside existing linear infrastructure (e.g. roads, pipelines, railway lines, existing power lines, etc.) to create a utility corridor is often a preferred approach, due to the impacts associated with traversing greenfield land with no substantial prior disturbance. In the case of this project, the western and eastern alternatives predominantly follow existing transmission lines. The cumulative impact on the electromagnetic field (EMF) associated with the corridor sharing of these two high-voltage power lines is not quantified within the EIA.
- The following assumpations and limitations relate to the fauna and flora assessment:
    - GDARD Conservation Plan (C-Plan) version 3.3 was used with caution as it is only covers the Gauteng province;
    - The majority of threatened plant species are extremely seasonal and only flower during specific periods of the year,

  - The majority of threatened faunal species are extremely secretive and difficult to survey even during thorough field surveys conducted over several seasons;
  - The Magaliesberg EMF was used with caution as the ground-truthing surveys do not cover the proposed study area.
  - 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 information gathered or databases consulted at the time of the investigation.

- The following assumptions and limitations relate to the visual impact assessment:
  - This assessment was undertaken during the conceptual stage of the project and is based on information available at the time.
  - An exact commencement date for the construction phase is unknown. Construction is expected to commence as soon as public participation is complete and approval is received from the relevant authorities;
  - The exact location, size and number of construction camps and material lay-down yards are not yet specified at this stage of the project. It is anticipated that construction camps will be set up on farms at central locations along the preferred alignment. The construction camps will consist of temporary structures such as tents or temporary buildings. Ablution facilities will also be associated with the construction camps and are expected to be portable toilets and temporary shower facilities;
  - The exact positions of the pylons are not yet determined. The visibility results have been generated from the anticipated alignment and may deviate from the route for the final approved alignment. The differences are considered omissible.
- The following assumptions and limitations relate to the socio-economic impact assessment:
  - It is assumed that information related to the social environment obtained from the strategic documents of the affected areas such as North West Growth and Development Strategy (NWGDS) 2004/14; Gauteng Provincial Growth and Development Strategy (GPGDS) 2005; Growth and Development Strategy for the City of Tshwane Metropolitan (GDSCT) 2004/14; Madibeng Local Municipality Integrated Development Plan – Analysis, 2004 etc were accurate.
  - Unless otherwise stated, the statistical data reflected in this report are from the 2001 Census data obtained from the Municipal Demarcation Board: www.demarcation.co.za and South Africa Community Survey 2007; bearing in mind that the social- demographic profiles may have changed in the recent number of years.
  - The width of the corridor when compared to the required servitude width, and the possibility that the servitude can be anywhere within the corridor, introduces significant variance and uncertainty into the socio-economic study, and impacts cannot be determined with a high degree of precision. Hence this report takes the approach of highlighting potential impacts and provides mitigations measures on how to reduce these impacts. Final route planning should take these recommendations into account.
- The following assumptions and limitation relate to the herpetological study:

- Limitation to a base-line ecological survey for only 1 day (8 hours) during the late winter months (August).
- Access was restricted to certain privately owned properties as well as mining and agricultural areas.
- The majority of amphibian species in Gauteng and North-West Provinces are classified as explosive breeders completing their short duration reproductive cycle in the early summer months between (November-January). These frog species only emerge after the first heavy summer rainfalls and are dormant during the cold winter months. Explosive breeding frogs utilise ephemeral pans or inundated grasslands for their short duration reproductive cycles.
- The majority of threatened reptile species are secretive and difficult to observe even during intensive field surveys (pit-fall trapping) conducted over several years (especially the rare Striped Harlequin Snake).
- Limitation of historic data and available databases. Insufficient knowledge on detailed habitat requirements (migratory, foraging and breeding habitats) of the majority of threatened herpetofaunal species; especially the Striped Harlequin Snake.
- The presence of threatened species on site is assessed mainly on habitat availability and suitability as well as desk research (literature, personal records and previous surveys conducted in the Skurweberg, Magaliesburg and Brits areas between the period of 1999-2012).

6 ENVIRONMENTAL ASSESSMENT PRACTITIONER

Nemai Consulting was appointed by Eskom as the independent Environmental Consultancy to undertake the environmental assessment for the proposed Anderson-Dinaledi 400 kV power line.

In accordance with Regulation 29(2) of GN No. R. 385 of 21 April 2006, 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 company has offices in Randburg (Gauteng), Rustenburg (North West Province), and Durban (KwaZulu Natal).

The members of Nemai Consulting that are involved with the Scoping and EIA process for the Anderson-Dinaledi 400 kV power line are captured in **Table 7** below, and their respective Curricula Vitae are contained in to ***Appendix G***.

Table 7: Scoping and EIA Team Members

Name	Qualifications	Experience	Duties
Ms D. Naidoo	• B.Sc Eng (Chem)	17 years	Project Director
Mr D. Henning	• B.Sc (Hons) Aquatic Health • M.Sc River Ecology	10 years	• Project Manager • Compiling EIA Report
Mr C. Chidley	• B.Sc Eng (Civil); • BA (Economics, Philosophy) • MBA	20 years	Quality Reviewer
Ms M Chetty	• BCs (Hons) Biological Science	4 years	EAP

7 PROJECT LOCATION

The Anderson-Dinaledi routes for the alternative alignments traverse the Madibeng Local Municipality (North West) and the City of Tshwane Metropolitan Municipality (Gauteng Province) (See Figure 4).

The proposed powerline will be approximately 40km in length and will run between the proposed new Anderson Substation (Flora Park) to the existing Dinaledi Substation which is located approximately 8km north east of Brits. **Please note that a separate EIA process is being undertaken for the proposed Anderson substation.**

Land uses in the study area for the proposed powerline alternatives is mainly comprised of agriculture, mining, vacant land, conservation and tourism, industrial, commercial, recreational and residential.

A 1 km corridor (i.e. 500 m on either side of the centre line of each alternative route) was adopted as the study area. The various alternatives alignments for the Anderson-Dinaledi 400kV powerline include the following (see **Figure 4** and **5** and enlarged locality map contained in ***Appendix A***):

- **Eastern Route** – Route (approximately 30km) runs in a predominantly north-west to south-east direction (mostly alongside existing power lines), from the Dinaledi Substation to Elandsfontein before turning and continuing south-westwards until the proposed new Anderson Substation located on Portions 82, 83 and 76 of Farms Schurveberg 488 JQ.
    - **Eastern Route Alternative Deviation** – deviates from the Eastern Route in the Schietfontein area to form an arch of approximately 3.5km.

- **Central Route** – Route (approximately 4.3km) runs from the Dinaledi Substation to Portion 55 of the Farm Elandsfontein 440 JQ (Portion 55 of the Farm Boekenhoutfontein 44-JQ) where the route joins the eastern route alternative.

- **Western Route** – Route (approximately 35km) runs in a predominantly north-west to south-east direction (mostly alongside existing power lines), from the Dinaledi Substation to Elandsfontein before turning and continuing south-westwards until the proposed new Anderson Substation located on Portions 82, 83 and 76 of Farms Schurveberg 488 JQ.
    - **Western Route Alternative (Western Deviation)** – This deviation originates on Portion 104 of the Farm Zilkaatsnek 439 JQ from where it links from the Western Route Alternative Deviation 3 (Southern Deviation). This deviation terminates on Portion 0 of the Farm Elandsfontein 440 JQ where it joins the original Western Route Alternative.
    - **Western Route Alternative (Eastern Deviation)** - This deviation originates on Portion 14 of the Farm Zilkaatsnek 439 JQ where it links from the original Western Route Alternative and joins the Eastern Route Deviation on Portion 13 of the Farm Schietfontein 347 JQ.

- **Western Route Alternative (Southern Deviation)** - This deviation originates on Portion 70 of the Farm Rietfontein 485 JQ where it links from the original Western Route Alternative and ends where it joins the original Western Route Alternative on Portion 108 of the Farm Zilkaatsnekl 439 JQ.

A detailed route description of each alternative alignment is provided in **Section 8.1**.

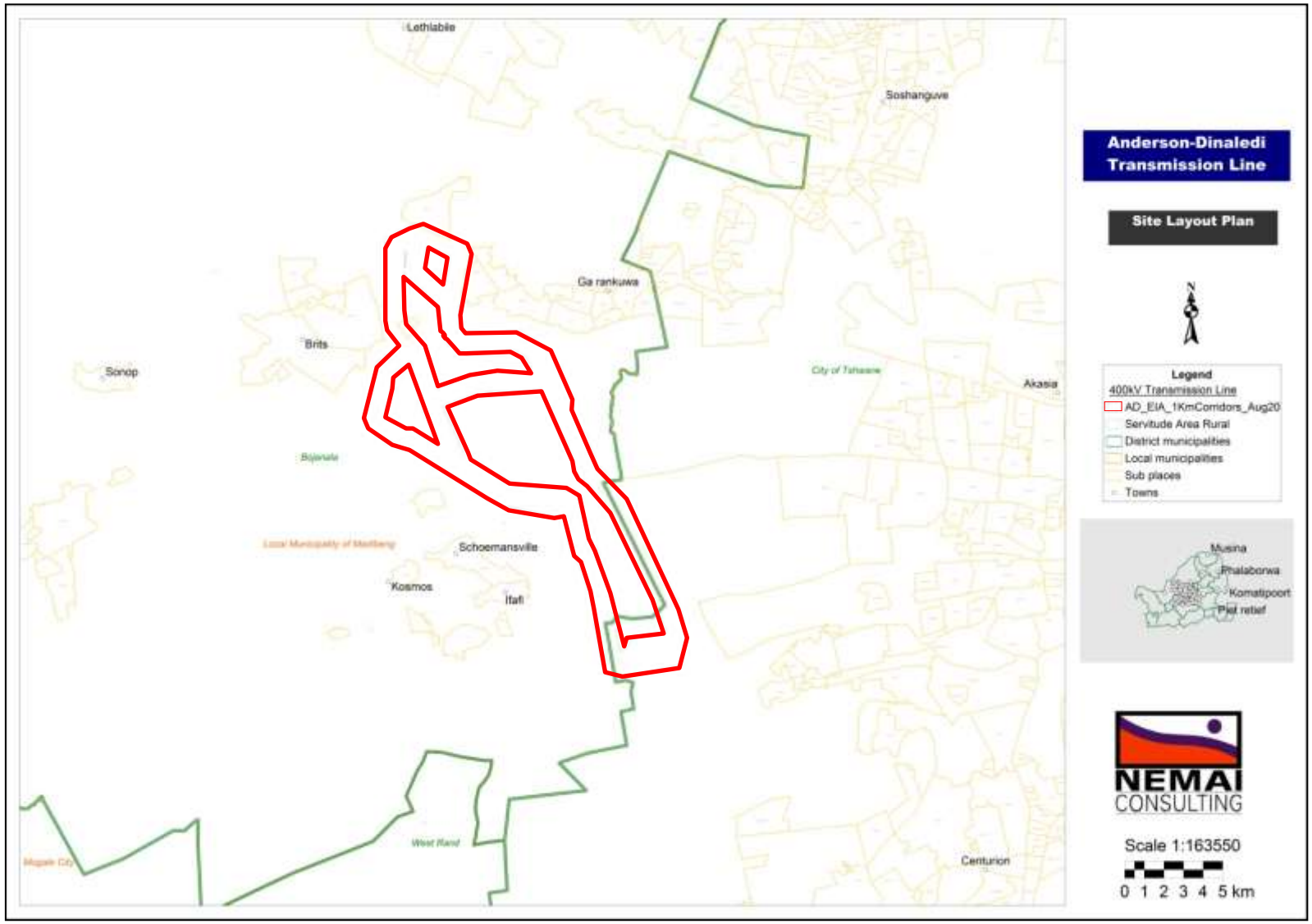

Figure 4: Municipal areas traversed by the corridors

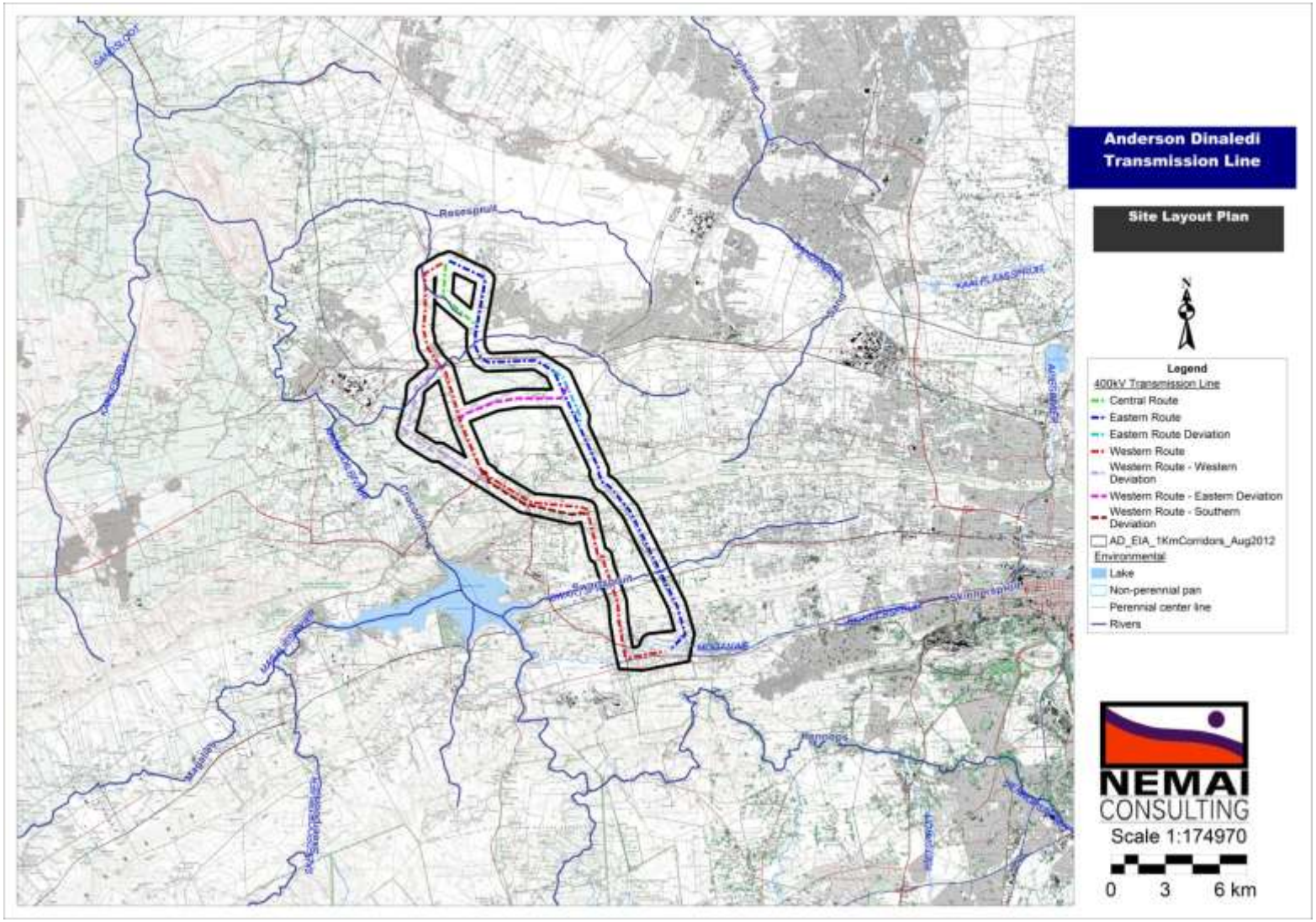

Figure 5: Locality Map

8 PROJECT DESCRIPTION

8.1 Power Line Routes

Refer to ***Appendix A*** for cadastral maps of the route alternatives.

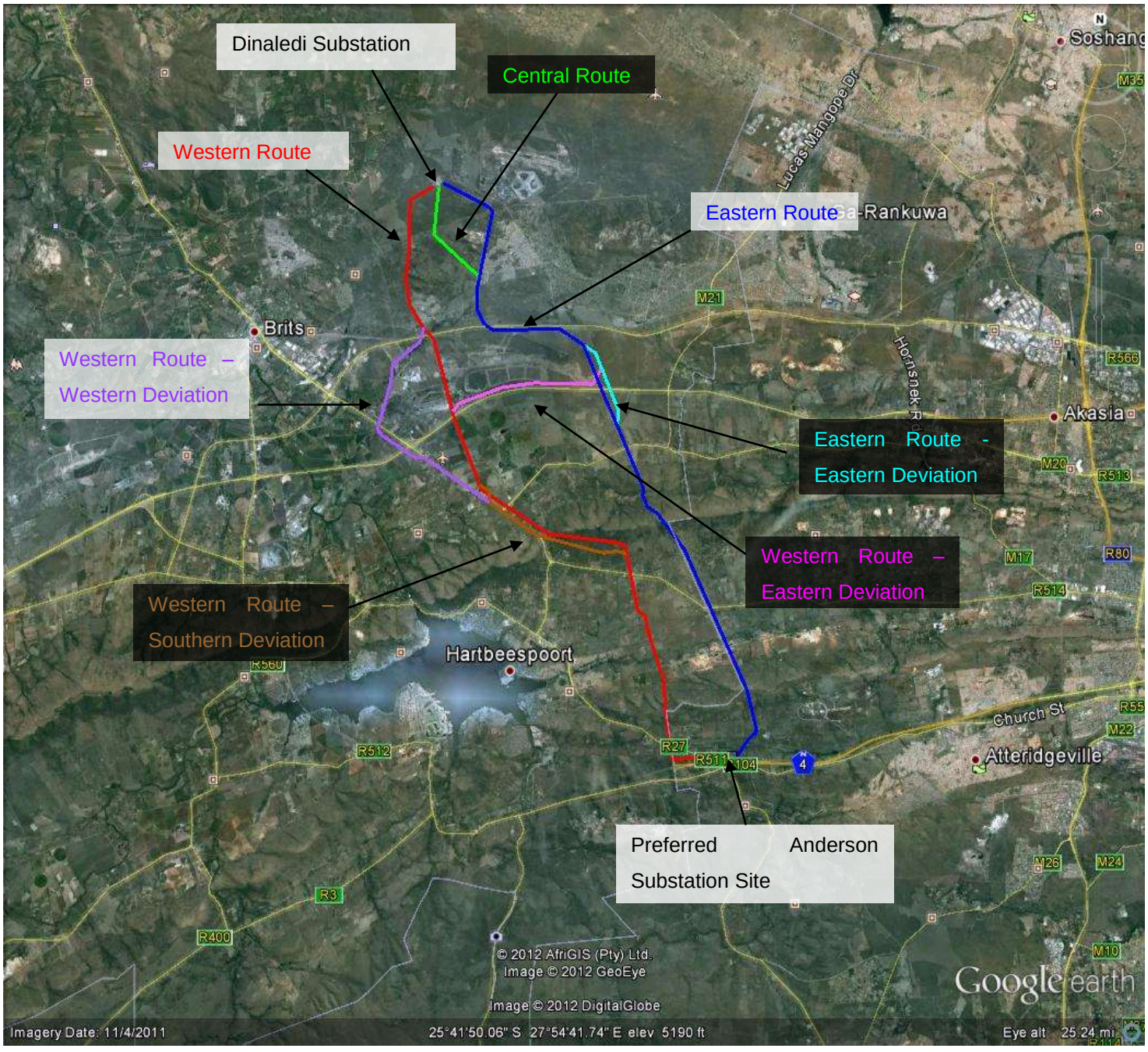

Figure 6: Aerial Map Showing the Centre of Each Route Option

An overview of the alternative transmission line routes as depicted in figure 6 follows below. All distances provided should be regarded as approximates, as they are based on a desktop estimate from a GIS. A 1 km corridor was investigated during the EIA to allow for any possible deviations of the final route within this corridor, and the route description to follow is only for the centreline of each alternative corridor.

Note that the alternative route descriptions are based on the 2006 Cadastral Information as obtained from the Surveyor General in Pretoria. Any subdivision or consolidations which were undertaken after 2006 will therefore not be reflected in the route alternative descriptions.

As mentioned, the termination points of the Eastern and Western Route alternatives are dependent on the location of the proposed Anderson Substation site.

8.1.1 Eastern Route Alternative

The Eastern Route alternative is approximately 30km in length and runs between the existing Dinaledi Substation and the proposed new Anderson Substation (figure 7-9). A route description, from south to north, follows.

The eastern route alternative originates from the proposed Anderson substation located on Portions 82, 83 and 76 of Farms Schurveberg 488 JQ. From here the route runs in an eastern direction and traverse Portion 115 and 114 and 116 of the Farm Schurveberg 488 JQ.

On Portion 116 of the Farm Schurveberg the route turns in a north eastern direction, and runs in close proximity to the boundaries of Portions 75 and 76 of the Farm Elandsfontein 352 JR for approximately 60m before turning in a northern direction on Portion 76. From here the route traverses Portions 77, 145, and 146 of the Farm Elandsfontein 352 JR. On Portion 146 the route turns slightly in a north western direction and traverse Portions 142, 141, 143, 144, 145, and 78 of the Farm Uitzicht Alias Rietvalei 314 JR. From here the route continues in a slight north western direction and traverse Portions 65, 62, 270, and 268 of the Farm Kameeldrift 313 JR. From here the route turns further in a north western direction and traverse Portions 324 and 50 of the Farm Rietfontein 485 JQ. From here the route continues in a north western direction and traverse Portions 44 of the Farm Schietfontein 437 JQ and turns further in a north western direction where it traverses Portions 49 and 23 of the Farm Zilkaatsnek 439 JQ. On Portion 23 the route turns in a north eastern direction and runs back to Portion 44 of the Farm Schietfontein 437 JQ. From here the route runs in a slight north western direction in close proximity to the boundary of Portion 44 and traverse Portions 71, 73, 74, 91, 16, and 13 of the Farm Schietfontein 437 JQ. From here the route turns further in a north eastern direction and traverse Portion 15 of the Farm Elandsfontein 440 JQ.

On Portion 15 the route turns in a western direction and traverse Portions 58, 63, 59 and 61 of the Farm Elandsfontein 440 JQ. On Portion 61 the route turns in a north western direction and traverse Portions 18, and 19 of the Farm Elandsfontein 440 JQ. From here the route turns in a northern direction and traverse Portions 44, 47, and 55 of the Farm Elandsfontein 440 JQ. On Portion 55 of the Farm Elandsfontein 440 JQ (Portion 55 of the Farm Boekenhoutfontein 44-JQ) the route turns slight north east and runs in close proximity to the boundary of Portion 55. On the northern boundary of the Portion 55, the route turns in a north western direction and traverse Portions 855, 854, 853, 852, 851, 850, 849, 848, 847, 846, 845, 844 and 843 of the Farm Roodekopjes of Zwartkopjes 427 JQ. The route terminates on Portion 843 of the Farm Roodekopjes of Zwartkopjes 427 JQ where the Dinaledi Substation is located.

The Eastern Route traverses the Madibeng Local Municipal area for approximately 21.68km and the City of Tshwane Local Municipal area for approximately 5.6km. A total of 59 properties are currently directly affected by this proposed route alternative.

The property of the Xsrata Eland Platinum Mine is located between the Eastern and Western route alternatives. During the Eskom route selection process, one deviation was made to the Eastern Route to accommodate the Eland Platinum Mine. Various deviations were made to the Western Route Alternative which is discussed in detail in Section 1.4.4 below. These deviations were created in order to avoid mining areas and to provide the mine with various options on how the route could traverse their property should the routes not interfere with already approved future mine expansions and to avoid traversing of surfaces earmarked for future open cast mining. The Eastern Route Deviation is discussed in detail in the section to follow.

The coordinates for the approximate bend points along the Eastern Route Alternative corridor are provided in **Table 8**.

Table 8: Eastern Route Alternative bend points (start and end points from south to north)

No.	Latitude	Longitude	
1.	25°46'27.77"S	27°58'40.35"E	Start Point
2.	25°45'57.093"S	27°59'7.308"E	
3.	25°45'6.112"S	27°58'51.179"E	
4.	25°42'16.146"S	27°57'18.19"E	
5.	25°41'31.998"S	27°56'36.954"E	
6.	25°41'25.128"S	27°56'23.931"E	
7.	25°41'10.147"S	27°56'16.382"E	
8.	25°41'3.897"S	27°56'18.317"E	
9.	25°40'11.084"S	27°55'51.646"E	

No.	Latitude	Longitude	
10.	25°39'28.579"S	27°55'29.8"E	
11.	25°39'17.753"S	27°55'23.551"E	
12.	25°38'6.038"S	27°54'47.47"E	
13.	25°37'46.896"S	27°54'13.199"E	
14.	25°37'50.342"S	27°52'37.294"E	
15.	25°37'42.482"S	27°52'24.113"E	
16.	25°37'24.503"S	27°52'13.688"E	
17.	25°37'0.007"S	27°52'13.009"E	
18.	25°36'44.788"S	27°52'16.068"E	
19.	25°36'2.588"S	27°52'24.549"E	
20.	25°35'22.126"S	27°52'32.526"E	
21.	25°35'16.589"S	27°52'26.249"E	
22.	25°34'48.472"S	27°51'20.382"E	End Point

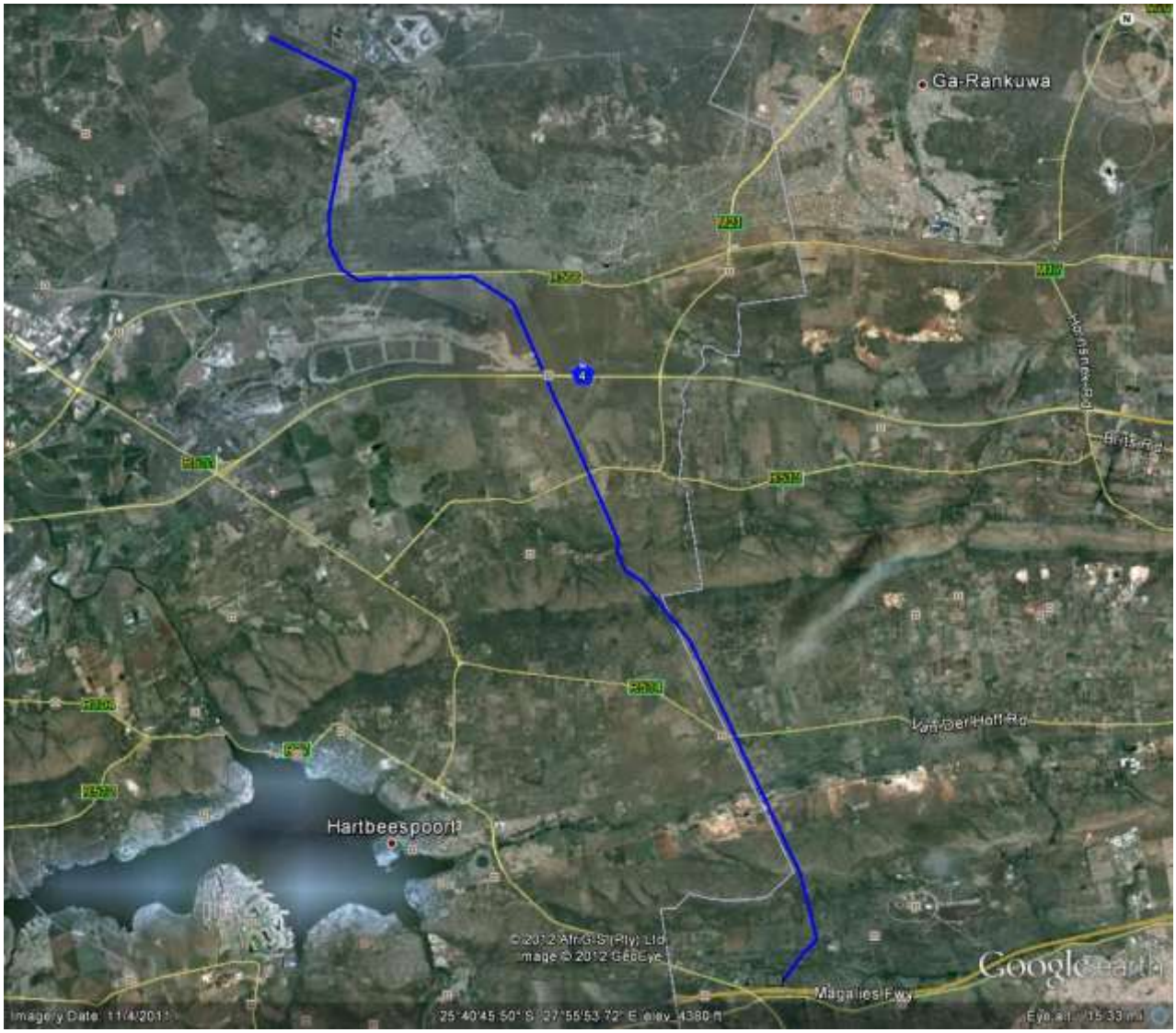

Figure 7: View of the centre line of the Eastern Route corridor in blue

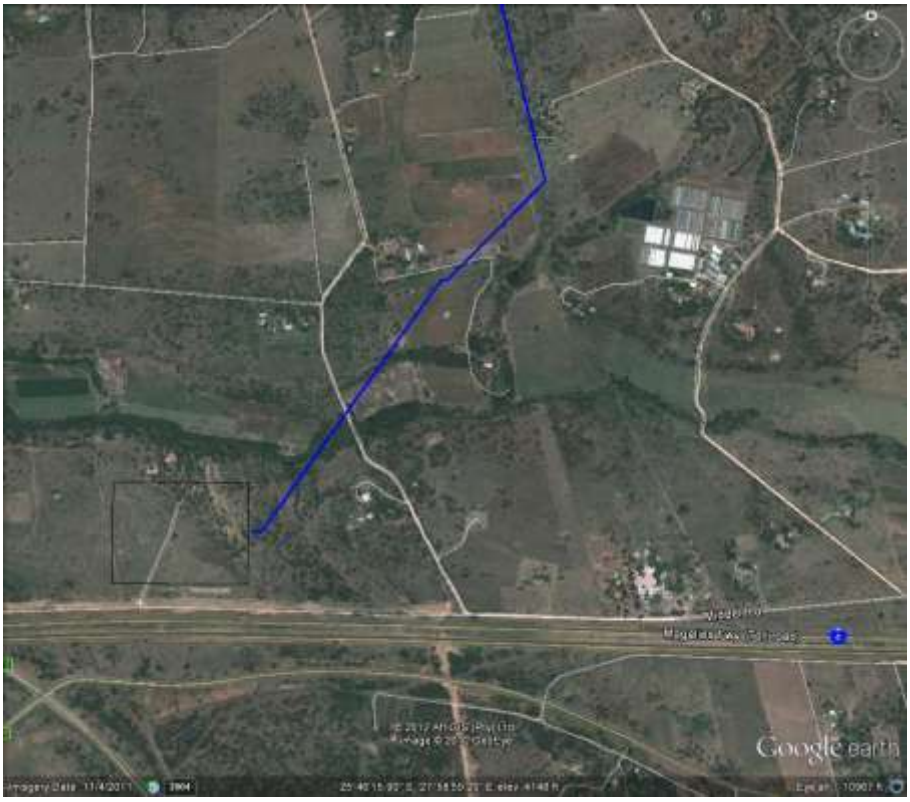

Figure 8: Map showing the start point of the centre line of the eastern route corridor in blue at the Anderson substation site

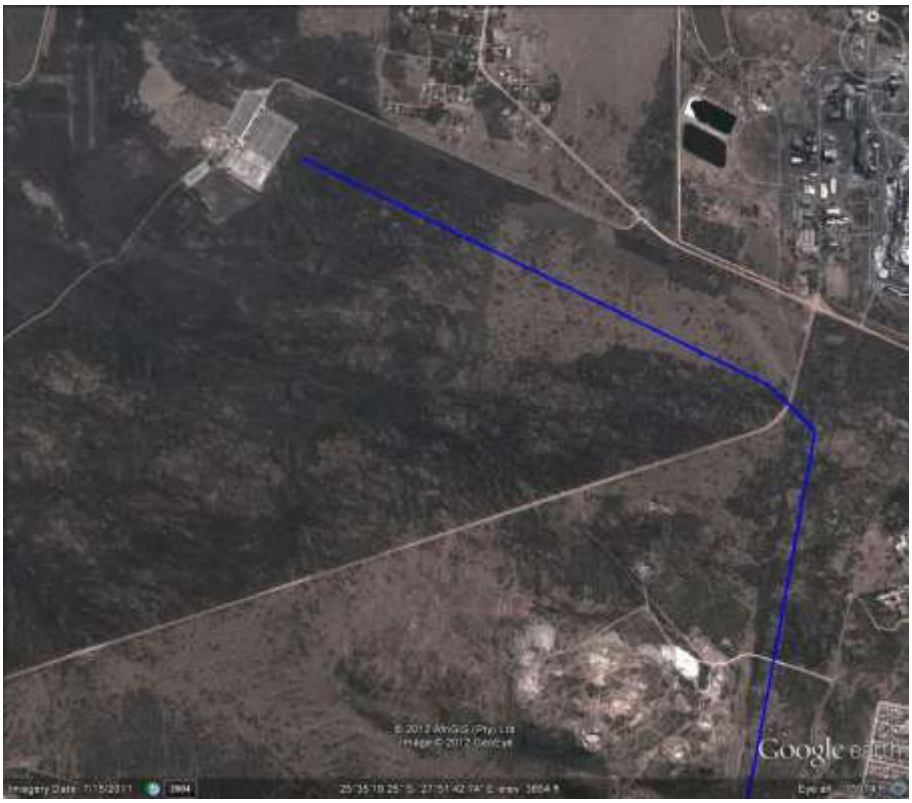

Figure 9: Map showing the end point of the centre line of the eastern route corridor in blue at the Dinaledi substation

Figure 10: North-eastern view along Eastern Route Alternative

Figure 11: South-eastern view along the Eastern Route Alternative (crossing of R566, Magaliesberg in background)

Figure 12: Southern view along the Eastern Route Alternative (crossing of R513, Magaliesberg in background)

Figure 13: South-eastern view along the Eastern Route Alternative (crossing of R514, Witwatersberg in background)

8.1.1.1 Eastern Route Alternative Deviation

The deviation to the eastern route originates on Portion 16 of the Farm Schietfontein 437 JQ where it turns from the original eastern route alternative in a north eastern direction, and then in a northern direction from where it traverses Portion 13 of the Farm Schietfontein 437 JQ. The route runs along the eastern boundary of Portion 13 for approximately 1.4km before it turns in a north western direction where it joins the original eastern route alternative on Portion 13.

The Eastern Route Alternative Deviation is located within the North West Province and the Madibeng Local Municipal area. A total of 2 properties are currently directly affected by this proposed route alternative.

The coordinates for the bend points along the Eastern Route Alternative Deviation are provided in **Table 9**.

Table 9: Eastern Route Alternative Deviation bend points (start and end points from south to north)

No.	Latitude	Longitude	
1.	25°39'44.761"S	27°55'38.325"E	Start point
2.	25°39'27.21"S	27°55'40.105"E	
3.	25°38'15.964"S	27°55'5.244"E	
4.	25°38'6.038"S	27°54'47.47"E	End point

Figure 14: Aerial map showing the start and end point of the centre line of the Eastern route alternative deviation corridor in light blue

8.1.2 Central Route Alternative

The Central Route Alternative originates on Portion 843 of the Farm Roodekopjes of Zwartkopjes 427 JQ where the Dinaledi Substation is located. From here it turns in a south western direction and traverses Portions 843, 844, 845, 846, 847, 848, 849, 850, 851, 853, 853, 854 and 855 of the Farm Roodekopjes of Zwartkopjes 427 JQ and Portion 17 of the Farm Elandsfontein 440 JQ. On Portion 17 the route turns in a south eastern direction and traverse Portions 18, 43, 46, 47 and 55 of the Farm Elandsfontein 440 JQ. On Portion 55 of the Farm Elandsfontein 440 JQ (Portion 55 of the Farm Boekenhoutfontein 44-JQ) the route joins the eastern route alternative.

The Central Route Alternative is located within the North West Province and the Madibeng Local Municipal area. A total of 19 properties are currently directly affected by this proposed route alternative.

The coordinates for the bend points along the Central Route Alternative are provided in **Table 10**.

Table 10: Central Route Alternative bend points (start and end points from south to north)

No.	Latitude	Longitude	
•	25°36'44.788"S	27°52'16.068"E	Start point
•	25°35'53.327"S	27°51'9.219"E	
•	25°34'53.662"S	27°51'14.256"E	End point

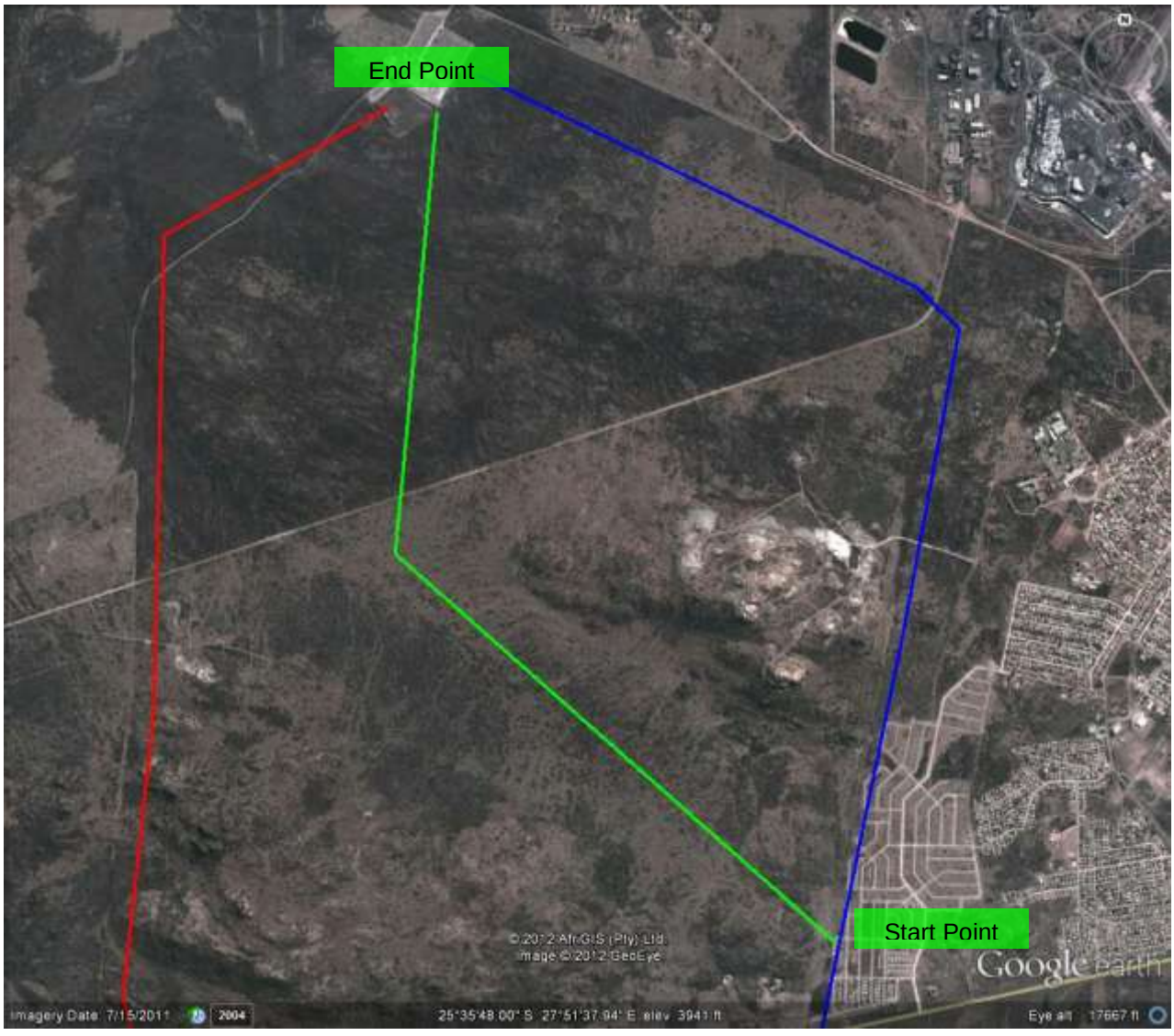

Figure 15: Aerial map showing the start and end point of the centre line of the central route corridor in green

8.1.3 Western Route Alternative

The Western Route Alternative is approximately 30km in length and originates at the same position as the eastern route alternative, on the property earmarked for substation construction. The Western Route Alternative runs between the proposed new Anderson Substation which is earmarked for development north of Pelindaba and the existing Dinaledi Substation which is located approximately 8km north east of Brits. A route description, from south to north, follows.

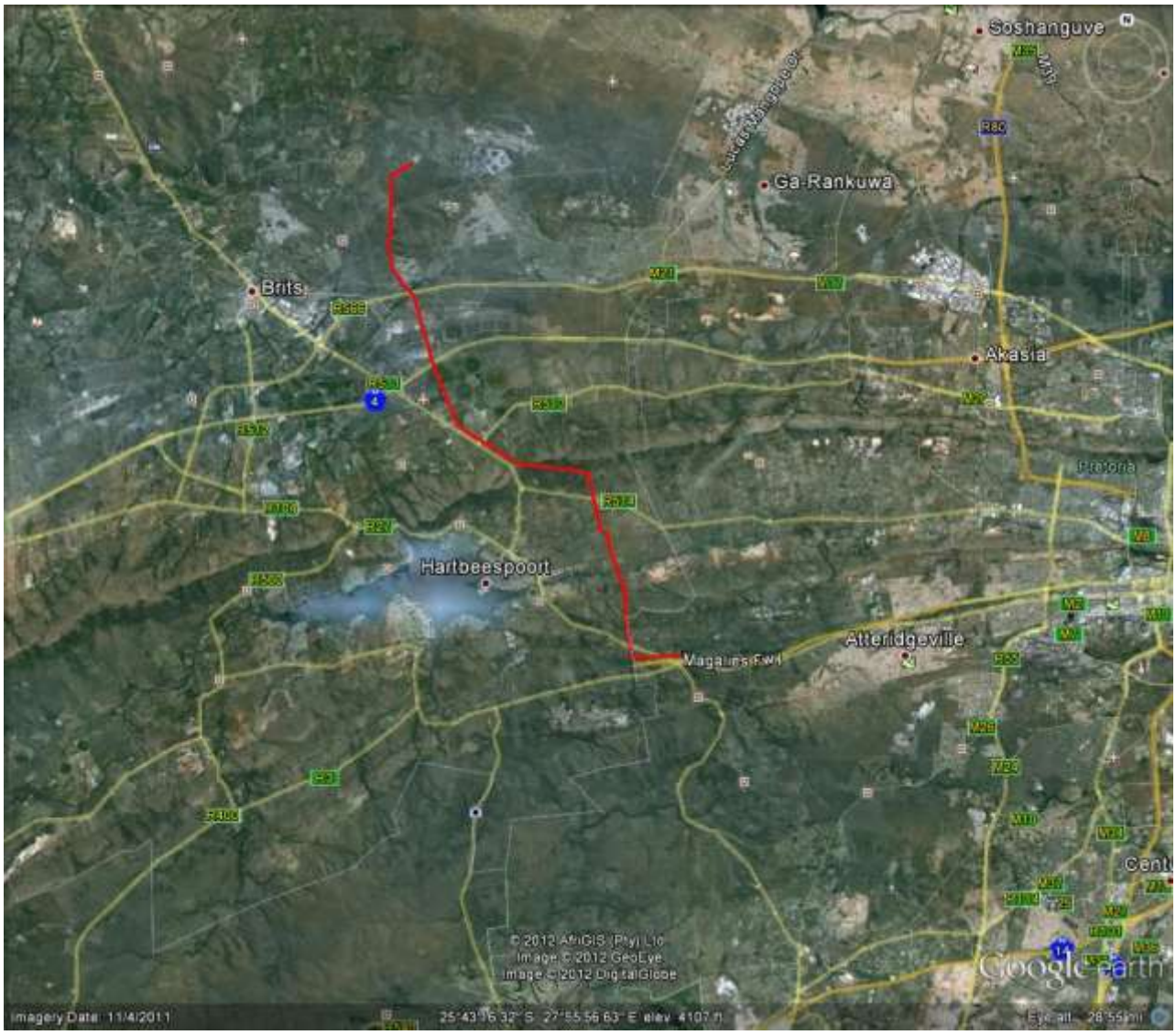

Figure 16: Aerial map showing the start and end point of the centre line of the western route corridor in red

The Western Route Alternative originates from the proposed Anderson substation located on Portions 82, 83 and 76 of Farm Schurveberg 488 JQ. From portion 82 of Farm Schurveberg 488 JQ, the route then traverses 118, 81 and 17 of Farm Schurveberg 488 JQ and then turns north to Portion 2 of the Farm Welgedund 491 JQ. On Portion 2, the route turns in a northern direction and run in close proximity to the boundaries of Portions 2, and 88 of the Farm Welgedund 491 JQ.

From here the route turns in a slight north eastern direction and traverse Portion 59 of the Farm Rietfontein 485 JQ. On Portion 59 the route turns in a northern direction and traverse Portions 236, 237 and 67 of the Farm Rietfontein 485 JQ. On the northern boundary of Portion 67, the route turns in a north western direction and traverse Portions 218 and 108 of the Farm Rietfontein 485 JQ. On Portion 108 the route turns in a northern direction and traverse Portions 111 and 70 of the Farm Rietfontein 485 JQ. On Portion 70 the route turns in a western direction and traverses Portions 71, 57, 28, 47, and 27 of the Farm Rietfontein 485 JQ, Portions 3 and the Remaining Extent of the Farm Uitval 484 JQ, and Portions 38, 37, 35, 34, 51 and 30 of the Farm Zilkaatsnek 439 JQ. On Portion 30 the route turns in a north western direction and traverses Portions 127, 29, 52, 53, 159, 160, 134 and 108 of the Farm Zilkaatsnek 439 JQ. On Portion 108 the route turns on a northern direction and runs in close proximity to the western boundary of Portion 108 from where it traverses Portion 14 of the Farm Zilkaatsnek 439 JQ.

From here the route traverses Portion 0 (or the Remaining Extent) of the Farm Elandsfontein 440 JQ. From here the route turns in a north eastern direction and traverses Portion 52 of the Farm Elandsfontein 440 JQ. From here the route continues in a north eastern direction and traverse Portions 707, 0, 626, 163, 164, 165, 166, 167, 168, 169, 568, 860, and 814 of the Farm Roodekopjes of Zwartkopjes 427 JQ. On Portion 814 the route turns into an eastern direction where it traverse Portion 843 of the Farm Roodekopjes of Zwartkopjes 427 JQ. The route terminates on Portion 843 of the Farm Roodekopjes of Zwartkopjes 427 JQ where the Dinaledi Substation is located.

The Western Route Alternative is located within the North West Province and the Madibeng Local Municipal area (figures 17 – 21). A total of 49 properties are currently directly affected by this proposed route alternative.

As mentioned previously, the property of the Xsrata Eland Platinum Mine is located between the Eastern and Western route alternatives. During the Eskom route selection process, one deviation was made to the Eastern Route to accommodate the Eland Platinum Mine, and two of the three deviations to the Western Route alternative were made to accommodate the Eland Platinum Mine. These deviations were created in order to avoid mining areas and to provide the mine with various options on how the route could traverse their property should the routes not interfere with already approved future mine expansions and to avoid traversing of surfaces earmarked for future open cast mining. The third deviation made to the Western Alternative was created as this deviation follows existing roads and powerline infrastructure. The deviations to the Western Route Alternative are discussed in the sub-sections to follow.

The coordinates for the bend points along the Western Route Alternative are provided in **Table 11**.

Table 11: Western Route Alternative bend points (start and end points from south to north)

No.	Latitude	Longitude	
1.	25°46'29.53"S	27°58'26.19"E	Start Point
2.	25°44'5.656"S	27°56'32.563"E	
3.	25°43'53.83"S	27°56'28.183"E	
4.	25°43'38.766"S	27°56'25.03"E	
5.	25°43'33.601"S	27°56'14.194"E	
6.	25°42'13.24"S	27°55'53.5"E	
7.	25°42'9.468"S	27°55'39.772"E	
8.	25°42'1.193"S	27°54'3.613"E	
9.	25°41'8.728"S	27°52'26.659"E	
10.	25°39'42.021"S	27°51'45.439"E	
11.	25°38'2.406"S	27°51'12.423"E	
12.	25°37'50.194"S	27°50'57.797"E	
13.	25°37'21.048"S	27°50'36.298"E	
14.	25°37'9.193"S	27°50'35"E	
15.	25°36'52.802"S	27°50'30.376"E	
16.	25°36'15.122"S	27°50'34.117"E	
17.	25°35'10.743"S	27°50'33.522"E	
18.	25°34'52.785"S	27°51'7.163"E	End Point

Figure 17: Aerial map showing the start point of the centre line of the western route corridor at porposed Anderson substation site

Figure 18: Aerial map showing the end point of the centre line of the western route corridor at the Dinaledi substation

Figure 19: South-eastern view along the Western Route Alternative (Magaliesberg in background)

Figure 20: North-western view along the Western Route Alternative (western boundary of Damonsville on the right)

Figure 21: South-eastern view along the Western Route Alternative (crossing of the N4)

8.1.3.1 Western Route Alternative – Deviation 1 (Western Deviation)

This deviation originates on Portion 104 of the Farm Zilkaatsnek 439 JQ from where it links from the Western Route Alternative Deviation 3 (Southern Deviation). From the point of origin, the route runs in a north western direction and traverses Portions 93, 92, 91, 90, 105, 106, 107and 85 of the Farm Hartebeesfontein 445 JQ.

From here the route traverses the suburb of Madibeng where it traverses Erf 2. From here the route traverses Portions 207, 60, 97, and 96 of the Farm Hartebeesfontein 445 JQ. On Portion 96 the route turns in an eastern direction and traverses Portion 137 of the Farm Hartebeesfontein 445 JQ. On Portion 137 the route turn in a north eastern direction and traverses Portions 101, 184, 176, 175, 174, 191, 100, and 46 of the Farm De Kroon 444 JQ. On Portion 46 the route turns in a north western direction and traverses Portions 231, 173, 52, 51, 122, and 121 of the Farm De Kroon 444 JQ, and Portion 81 of the Farm Elandsfontein 440 JQ. On the northern boundary of Portion 81 the route turn further in a north eastern direction and traverses Portions 2, 24, 10, 64 and 0 of the Farm Elandsfontein 440 JQ. This deviation terminates on Portion 0 of the Farm Elandsfontein 440 JQ where it joins the original Western Route Alternative.

Figure 22: Aerial map showing the start and end point of the centre line of the western route-western deviation corridor

The Western Route Alternative – Deviation 1 (Western Deviation) (figure 22) is located within the North West Province and the Madibeng Local Municipal area. A total of 35 properties are currently directly affected by this proposed route alternative.

The coordinates for the bend points along the Western Route Alternative Deviation 1 are provided in **Table 12**.

Table 12: Western Route Alternative Deviation 1 bend points (start and end points from south to north)

No.	Latitude	Longitude	
1.	25°41'24.152"S	27°52'38.216"E	Start point

No.	Latitude	Longitude	
2.	25°40'30.61"S	27°51'2.314"E	
3.	25°40'31.8"S	27°50'52.092"E	
4.	25°40'5.477"S	27°50'3.662"E	
5.	25°39'57.527"S	27°49'54.941"E	
6.	25°38'58.052"S	27°50'12.731"E	
7.	25°38'35.46"S	27°50'14.72"E	
8.	25°38'7.482"S	27°50'52.71"E	
9.	25°37'50.194"S	27°50'57.797"E	End point

Figure 23: Southern view along the Western Route Alternative – Deviation 1 (crossing of the R511)

8.1.3.2 Western Route Alternative – Deviation 2 (Eastern Deviation)

This deviation originates on Portion 14 of the Farm Zilkaatsnek 439 JQ where it links from the original Western Route Alternative (figure 24). From here the route runs in an eastern direction and traverses a very small section of Portion 0 (or Remaining Extent) of the Farm Elandsfontein 440 JQ. On Portion 0 the route turns back to traverse Portion 14 of the Farm Zilkaatsnek 439 JQ and continues in an eastern direction to traverse Portions 113, 86, 88, 89, 87, 80 and 98 of the Farm Zilkaatsnek 439 JQ. On Portion 98 the route turns in a north eastern direction where it intersects with the original Eastern Route alignment on Portion 13 of the Farm Schietfontein 437 JQ and where it joins the Eastern Route Deviation on Portion 13 of the Farm Schietfontein 347 JQ.

Figure 24: Aerial map showing the start and end point of the centre line of the western route-eastern deviation corridor

The Western Route Alternative – Deviation 2 (Eastern Deviation) is located within the North West Province and the Madibeng Local Municipal area. A total of 11 properties are currently directly affected by this proposed route alternative.

The coordinates for the bend points along the Western Route Alternative Deviation 2 are provided in **Table 13**.

Table 13: Western Route Alternative Deviation 2 bend points (start and end points from south to north)

No.	Latitude	Longitude	
1.	25°39'32.958"S	27°51'42.643"E	Start point
2.	25°39'22.797"S	27°51'50.998"E	
3.	25°39'1.586"S	27°52'52.356"E	
4.	25°38'54.795"S	27°53'38.084"E	
5.	25°38'54.625"S	27°55'1.606"E	
6.	25°38'34.538"S	27°55'14.331"E	End point

Figure 25: North-eastern view along the Western Route Alternative – Deviation 2 - route situated between the slimes dam (left) and the N4 (right)

8.1.3.3 Western Route Alternative – Deviation 3 (Southern Deviation)

This deviation originates on Portion 70 of the Farm Rietfontein 485 JQ where it links from the original Western Route Alternative (figure 26). From here the route turns in a western direction and traverse Portions 71, 186, 185, 28, 47, and 27 of the Farm Rietfontein 485 JQ and Portions 3 and Portion 0 (Remaining Extent) of the Farm Uitval 484 JQ. From here the route traverses Portions 2, 127 and 105 of the Farm Zilkaatsnek 439 JQ. On Portion 105 the route turns in a north western direction and runs in close proximity to the boundary of Portion 104 of the Farm Zilkaatsnek 439 JQ.

On Portion 104 the route turns in a northern direction where it intersects with the original Western Route Alternative on Portion 108 of the Farm Zilkaatsnek 439 JQ. The route then turns in a north eastern direction where it joins the original Western Route Alternative on Portion 108 of the Farm Zilkaatsnekl 439 JQ.

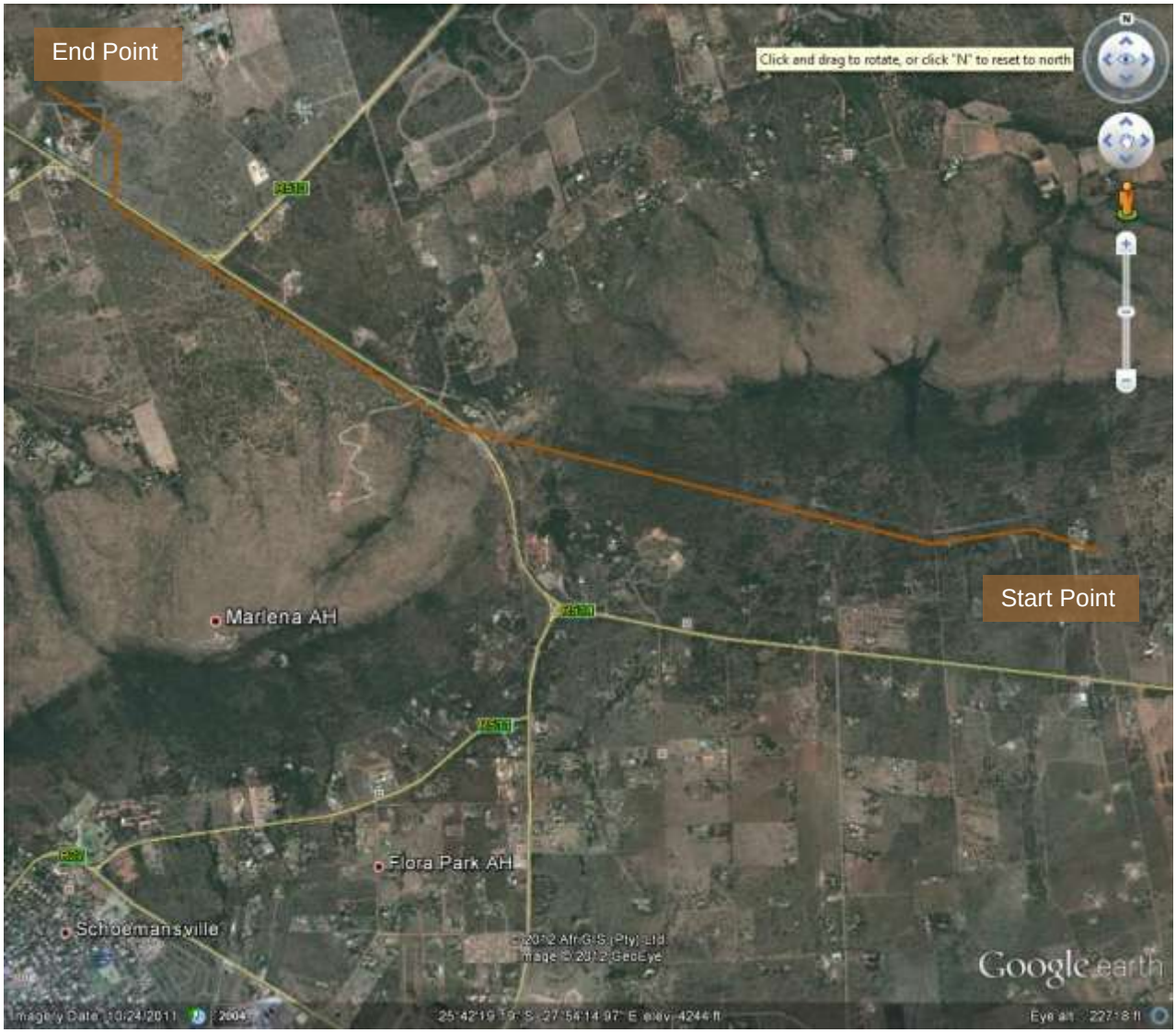

Figure 26: Aerial map showing the start and end point of the centre line of the western route-southern deviation corridor

The Western Route Alternative – Deviation 3 (Southern Deviation) is located within the North West Province and the Madibeng Local Municipal area. A total of 14 properties are currently directly affected by this proposed route alternative.

The coordinates for the bend points along the Western Route Alternative Deviation 3 are provided in **Table 14**.

Table 14: Western Route Alternative Deviation 3 bend points (start and end points from south to north)

No.	Latitude	Longitude	
1.	25°42'23.783"S	27°55'56.254"E	Start point
2.	25°42'20.134"S	27°55'42.971"E	
3.	25°42'23.039"S	27°55'22.944"E	
4.	25°42'3.254"S	27°53'47.26"E	
5.	25°41'24.152"S	27°52'38.216"E	
6.	25°41'10.754"S	27°52'38.622"E	
7.	25°41'2.423"S	27°52'23.661"E	End point

Figure 27: South-eastern view along the Western Route Alternative – Deviation 3 - route situated to the right of the R511

8.2 Upgrade of the Existing 88kV Line

The proposed Madibeng substation project, which is undertaken by Eskom Distribution, forms part of the Tshwane Strengthening Scheme. This project entails the construction of a proposed Madibeng Substation which will be located at about 8km south-west of the Dinaledi Substation. The Madibeng Substation will be fed from Dinaledi MTS through two 132kV lines and thereby split the existing 88kV network in the Tshwane and Brits area. The existing 88kV network in and around the Brits and Tshwane area will be split in such a way that an existing 88kV Lomond-De Wildt line becomes

redundant. The Lomond-De Wildt line route is located within the Anderson-Dinaledi 400kV line study area and thus it can be decommissioned after the construction of the Madibeng Substation in order to accommodate the proposed Anderson-Dinaledi 400kV line (Figure 28).

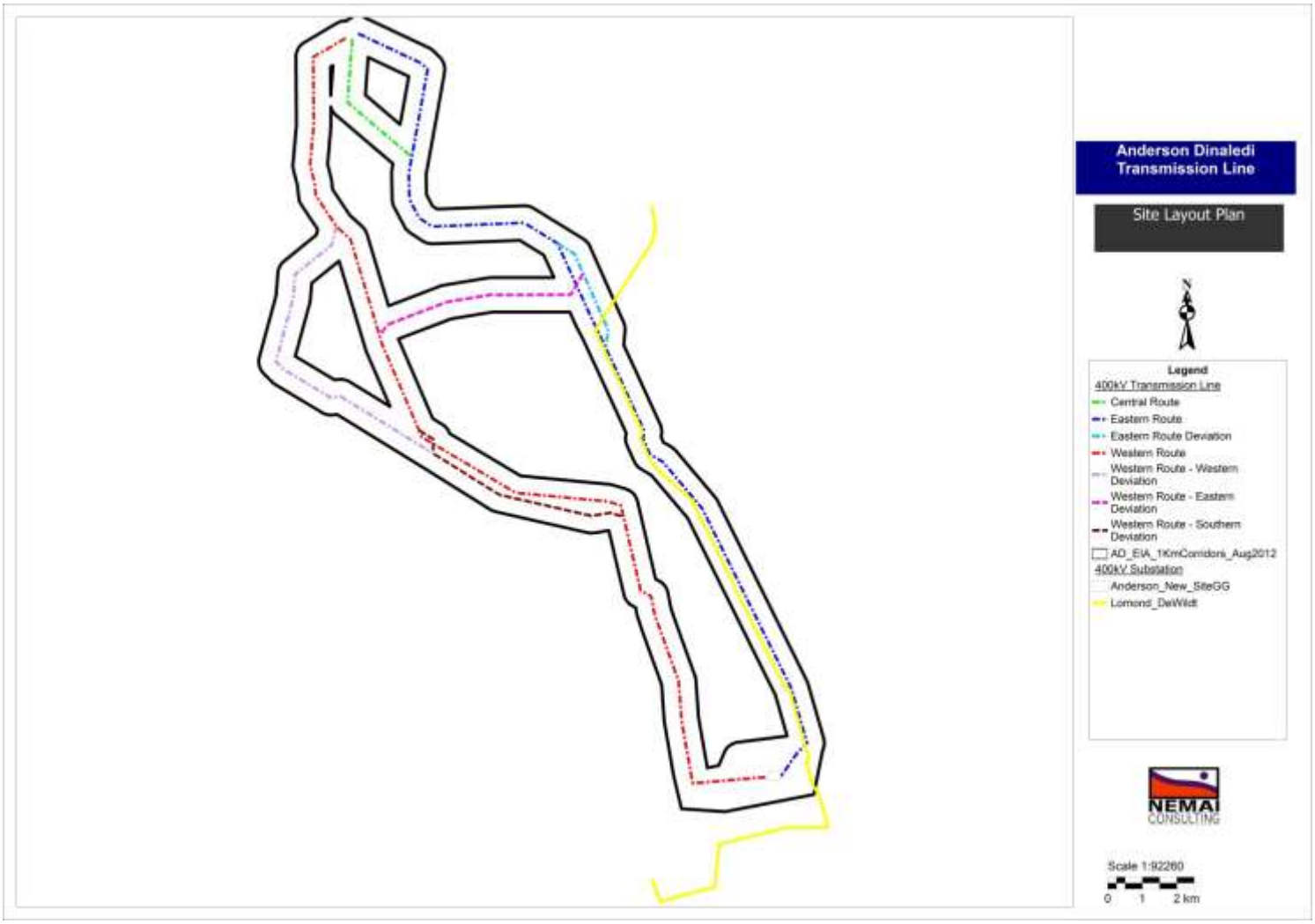

Figure 28: Map illustrating the Le-Mondt line that will be decommissioned in yellow

The Madibeng substation project is scheduled to be commissioned by 2014 depending on the prompt acquisition of servitudes. The current 88kV Lomond-De Wildt line route servitude is designed for 88kV lines and therefore becomes inadequate for a 400kV line route. The majority of the existing line towers are wood poles which were designed for 88kV lines in terms of clearances and insulations. It is thus necessary that the servitude be extended from 22m to 55m and the towers be re-designed or changed for the 400kV line. The foundation of the towers will most probably change as the centre line servitude may change due to the servitude extension and different towers.

The centre line will change because the existing line runs closer to another existing 88kV line, however it is very close to the proposed Eastern route centre line. It is therefore worth noting that the decommissioning and dismantling of the existing 88kV Lomond-De Wildt line for the proposed 400kV Anderson-Dinaledi line can only begin when Madibeng substation is successfully commissioned.

8.3 Power Line Servitude

Following a contractual agreement with a landowner, an application for registration of the servitude (55m for a 400 kV transmission line) 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.

Refer to ***Appendix F*** for an overview of the servitude negotiation process.

8.4 Design Considerations

Certain standard design considerations for a 400 kV transmission line include:

- Standard servitude width is 55 m (i.e. 27.5 m on either side of centre line);
- Minimum spacing between pylons is ± 300 m and the maximum spacing is ± 500 m (depending on the topography of the area);
- Line may be no closer than 95 m from the centre line of a national road, unless a relaxation on this is granted by the roads department;
- Minimum clearance between the midspan point of the line and the ground is 8.1 m,
- Minimum distance between any part of a tree or shrub and any bare phase conductor must be 5.6 m; and
- Minimum safe distance required from the centre of the power line to the beginning of a domestic house is 27.5 m.

8.5 Tower Structures

The selection of a tower types depends on several factors, including terrain, expense and recommendations that emanate from the visual impact study.

The towers type has not been finalised as yet, as the type of structure is dependent on the abovementioned factors as well as the final route of the power line. Below are several examples of towers that could be considered for a 400 kV transmission line.

Cross-rope suspension tower (**Figure 29**);

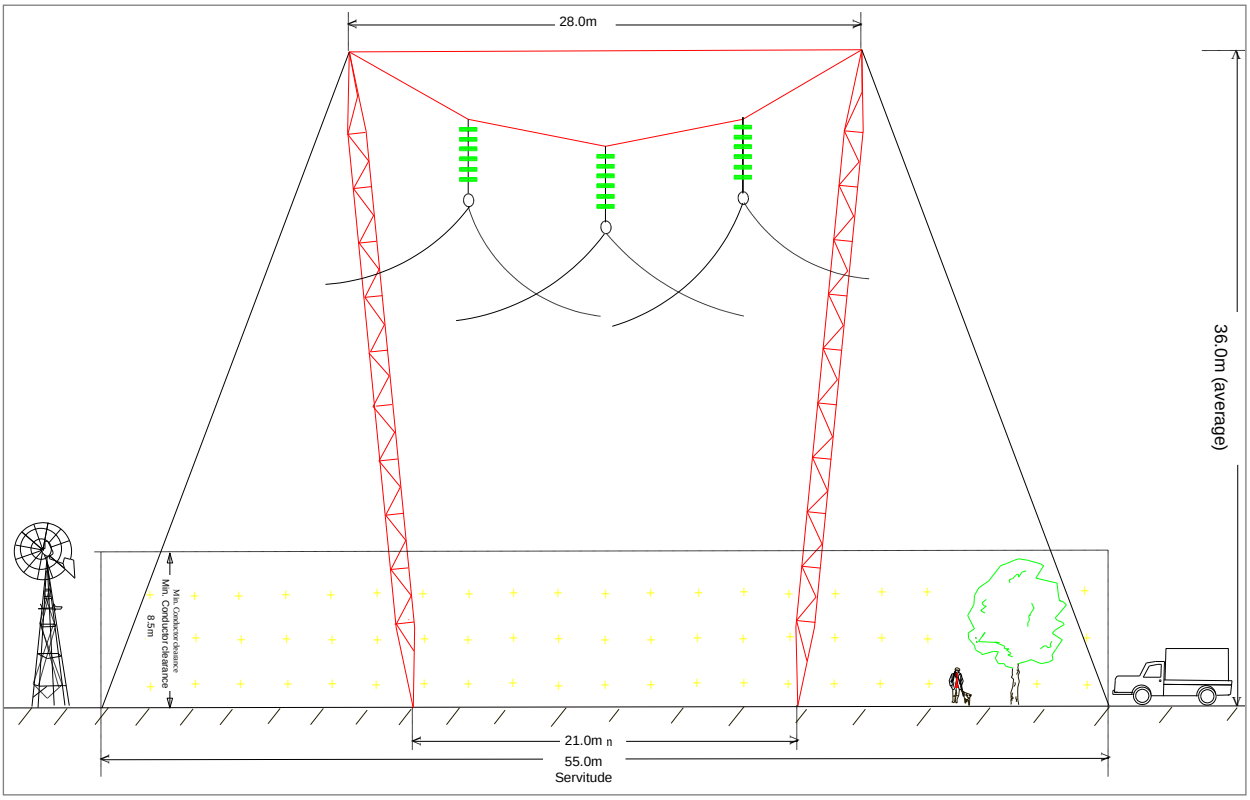

Figure 29: Cross-rope suspension tower

Self-supporting tower (**Figure 30**);

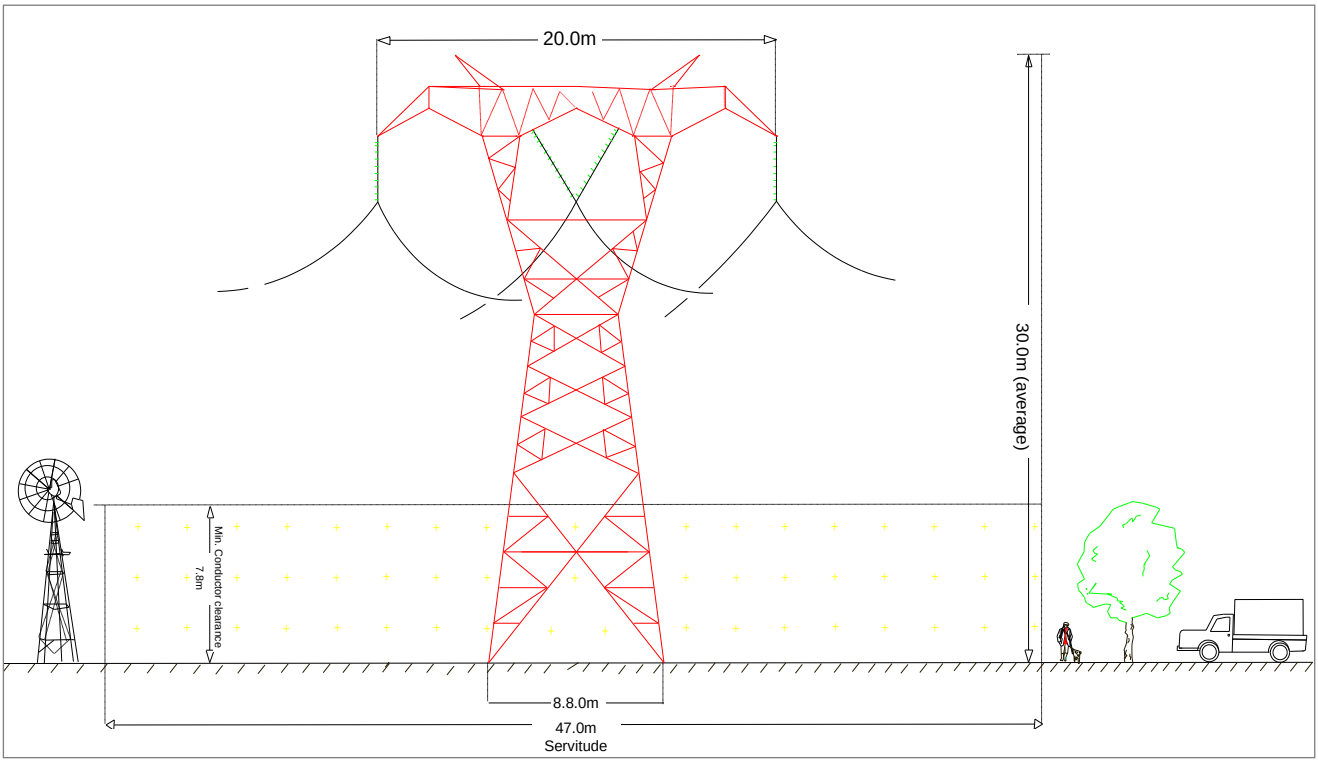

Figure 30: Self-supporting tower

- Guyed suspension tower (**Figure 31**); and

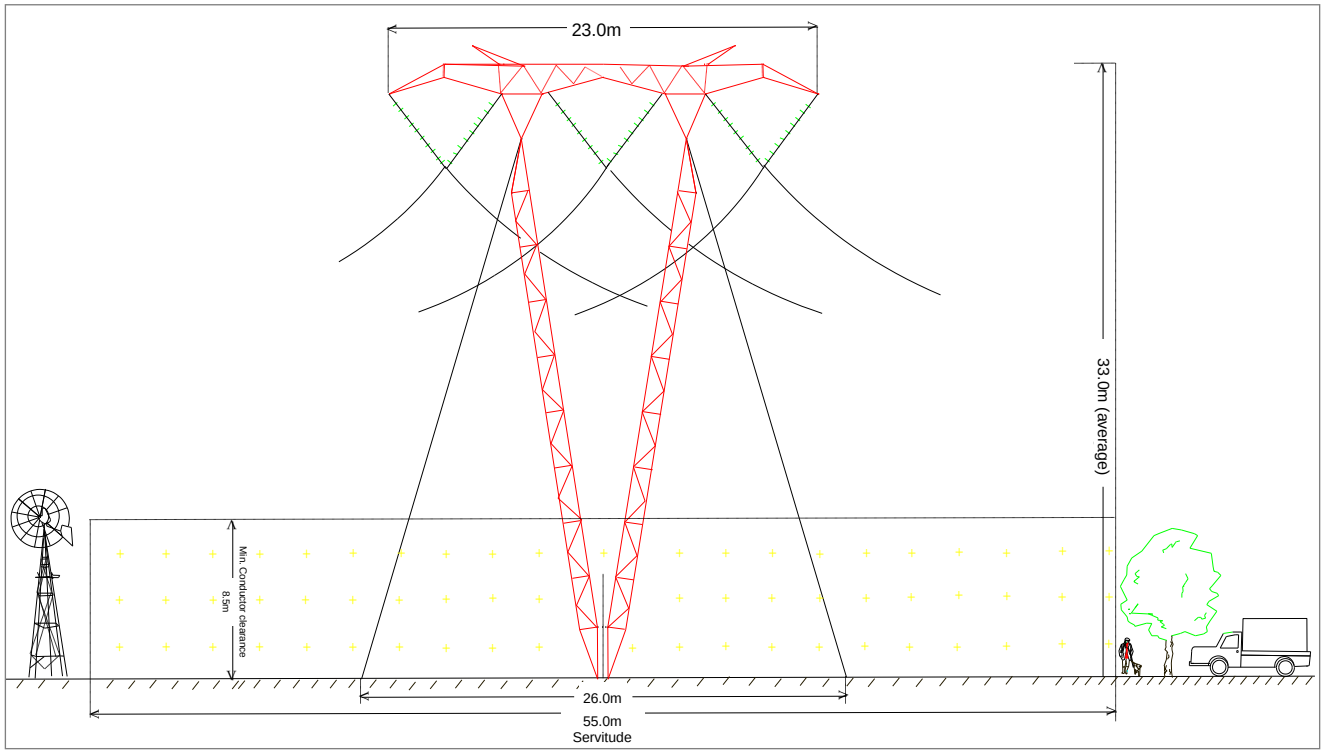

Figure 31: Guyed suspension tower

Strain or bend towers, which will be required at points where the line deviates at an angle of greater than 3 degrees or on difficult terrain.

8.6 Substations

An electrical substation is a subsidiary station of an electrical generation, transmission and distribution system where voltage is transformed from high to low (or the reverse) for distribution to users (e.g. domestic, commercial).

8.6.1 Dinaledi Substation

The Dinaledi Substation (see **Figures 32**) is situated approximately 8 km north east of Brits, on Portion 843 of the Farm Roodekopjes of Zwartkopjes 427 JQ. The substation is surrounded by vacant land and the small rural village of Rankotia lies approximately 350 m to the north-east.

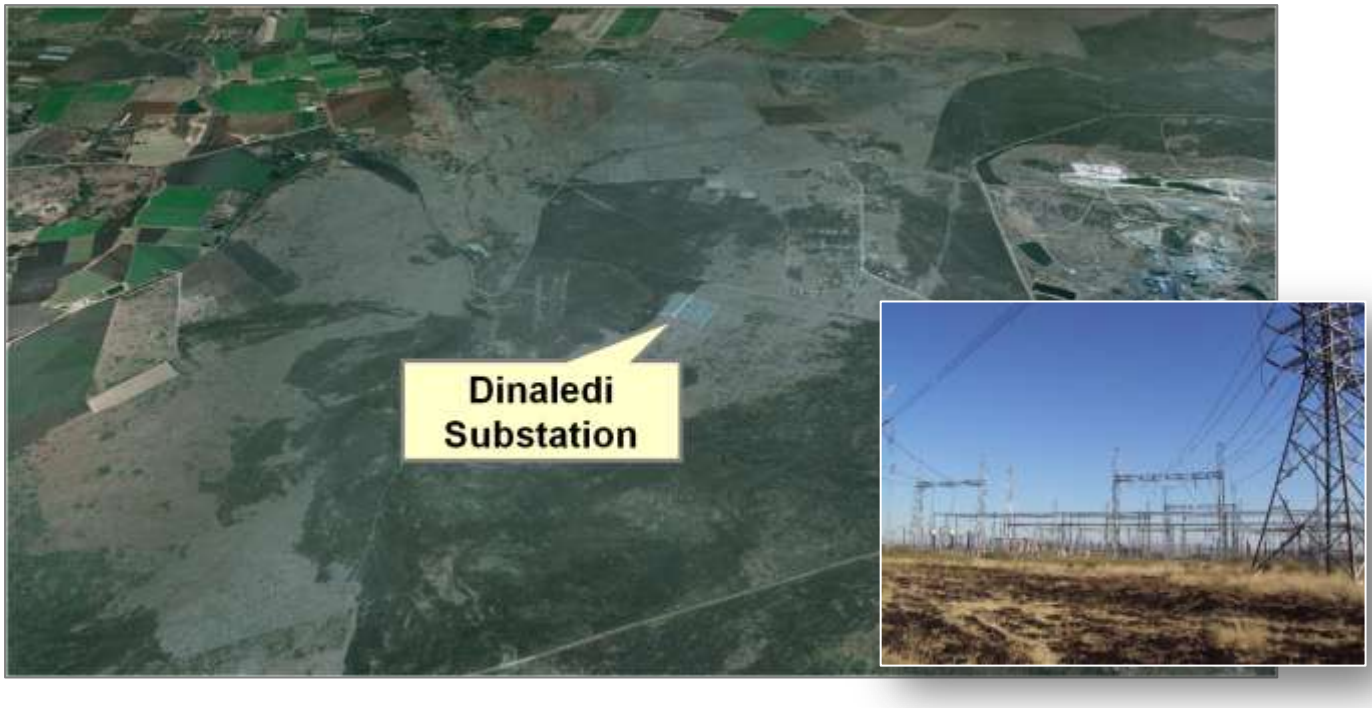

Figure 32: Dinaledi Substation (feeder bays shown in inserted photograph)

In order to accommodate the new Anderson-Dinaledi 400kV power line, two 400kV feeder bays need to be constructed at the Dinaledi Substation. The proposed civil works will be undertaken within the existing terrace and no earthworks are anticipated. The safety fences will be modified to enclose the new 400kV yard extension. Existing roads will be utilised. The storm water drainage system will be extended to accommodate the expansion. Operational lighting will be provided for the new 400kV yard extension.

8.6.2 Anderson Substation

The Anderson-Dinaledi 400kV power line will terminate at the proposed Anderson Substation. The proposed Anderson substation will be on Portions 82, 83 and 76 of Farms Schurveberg 488 JQ.

8.7 Project Life-cycle

The entire life cycle for a new transmission line includes the following primary phases:

- Feasibility phase - This includes selecting a suitable corridor for the route of the proposed transmission line following the execution of an EIA process. Servitude negotiations are also initiated during this phase.
- Planning and design phase - 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.
  - Preparation of relevant planning documentation, including technical and design documentation.
- Construction phase – During the implementation of the project, the construction activities related to the installation of the necessary infrastructure and equipment is undertaken.
- Operational phase - This includes operational activities associated with the maintenance and control of the transmission line.
- Decommissioning - This phase will include measures for complying with regulatory requirements, rehabilitation and managing environmental impacts in order to render the affected area suitable for future desirable use.

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

8.7.1 Construction

The construction period of the Anderson-Dinaledi transmission line will take approximately 24 months. It involves the following activities, which are most often undertaken sequentially and by different construction crews.

8.7.1.1 Vegetation Clearance

An 8 m-wide strip is generally required to be cleared of all trees and shrubs down the centre of a transmission power line servitude for stringing purposes only (see example in **Figure 33**). Any tree or shrub in other areas that will interfere with the operation and/or reliability of the transmission power line must be trimmed or completely cleared.

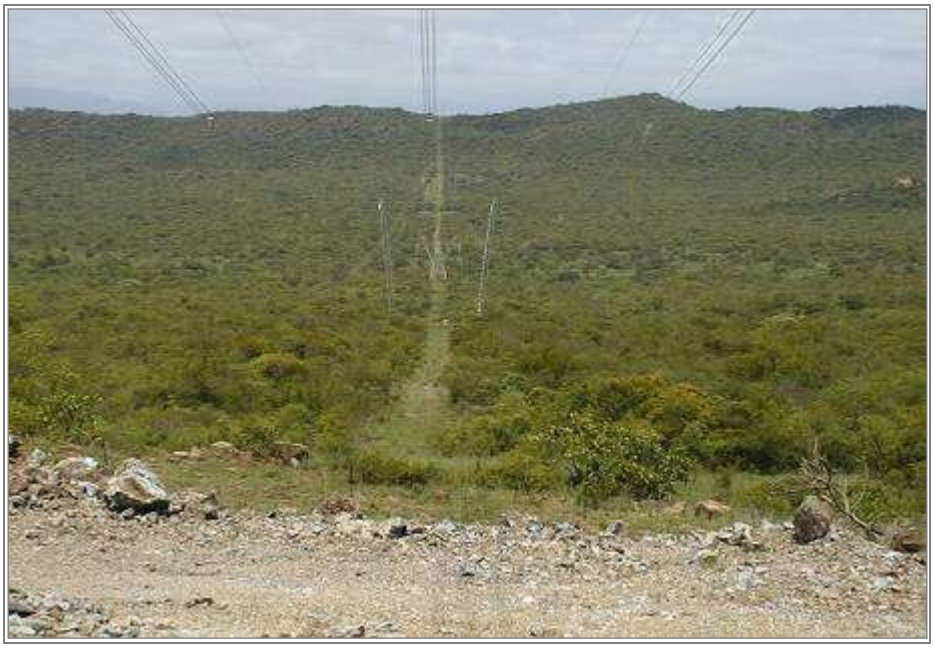

Figure 33: Vegetation clearance for stringing

The clearing of vegetation will take place in accordance with Eskom's minimum standards for the construction of new Transmission power lines, as listed below in **Table 12**.

Table 15: Minimum standards for vegetation clearing for new Transmission power line

Item	Standard	Follow up
Centre line of the proposed Transmission power line	Clear to a maximum (depending on tower type and voltage) of a 4-8 m wide strip of all vegetation along the centre line. Vegetation to be cut flush with the ground. Treat stumps with herbicide.	Re-growth shall be cut within 100 mm of the ground and treated with herbicide, as necessary.
Inaccessible valleys (trace line)	Clear a 1 m strip for access by foot only, for the pulling of a pilot wire by hand.	Vegetation not to be disturbed after initial clearing – vegetation to be allowed to regrow.
Access/service roads	Clear a maximum (depending on tower type) 6 m wide strip for vehicle access within the maximum 8 m width, including de-stumping/cutting stumps to ground	Re-growth to be cut at ground level and treated with herbicide as necessary.

	level, treating with a herbicide and re-compaction of soil.	
Proposed tower position and proposed support/stay wire position	Clear all vegetation within proposed tower position in an area of 20 x 20 m (self-supporting towers) and 40 x 40 m (compact cross-rope suspension towers) around the position, including de-stumping/cutting stumps to ground level, treating with a herbicide and re-compaction of soil. Allow controlled agricultural practices, where feasible.	Re-growth to be cut at ground level and treated with herbicide as necessary.
Indigenous vegetation within servitude area (outside of maximum 8 m strip)	Area outside of the maximum 8 m strip and within the servitude area, selective trimming or cutting down of those identified plants posing a threat to the integrity of the proposed Transmission power line.	Selective trimming
Alien species within servitude area (outside of maximum 8 m strip)	Area outside of the maximum 8 m strip and within the servitude area, remove all vegetation within servitude area and treat with appropriate herbicide.	Cut and treat with appropriate herbicide.

8.7.1.2 Tower pegging

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

Through continual vehicular use, the surveying team will make the first basic track (access route) during their site work. If any flaws with a site are encountered (e.g. gully erosion) the site may need to be relocated.

8.7.1.3 Construction camp establishment

Note that the locations of the construction camps were not yet known during the preparation of the EIA Report, although it is anticipated that they will be located within the transmission line corridor investigated during the EIA. 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'. In addition, the EMPr provides suitable mitigation measures to safeguard the environment from impacts associated with the construction camps.

The constructions camp is expected to be approximately 50m X 50m in size. The following areas / tasks may occur within a construction camp:

- Fuel storage and re-fuelling areas;
- Workshops and offices;

- Laydown areas;
- Portable ablution facilities and / or wash areas;
- Designated eating areas;
- Accommodation facilities for contractors;
- Security guardhouse / checkpoint;
- Hazardous chemical store;
- Vehicle, plant, equipment and material storage areas;
- Cement mixing areas; and
- Any other infrastructure required for the construction of the substation.

See **Figure 34** for examples of construction camps for Eskom transmission lines.

Figure 34: Examples of Construction camps

8.7.1.4 Gate installation

After tower pegging, gates will be installed at the most appropriate locations to allow for future access to the servitude. An example of an access gate for a 400 kV transmission line is shown in **Figure 35**.

Figure 35: Access gate for an Eskom transmission line

8.7.1.5 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.

35). These roads will be constructed to a Type 6 gravel road that comprises the following:

- Widening to a final gravel carriageway width of 6 m on raised earthworks;
- Drainage is to be provided in the form of meadow drains (flat terrain) and “v” drains (steeper terrain). Some new culverts may be required;
- Fencing will be erected where required;
- The total width of carriageway and drainage ranges between about 14 m (flat terrain) and 16 m (rolling terrain); and
- Gravel will be obtained from the nearest existing borrow pit.

Suitable erosion control measures will be implemented at watercourse crossings. Examples include the construction of gabion structures to protect the watercourse (see **Figure 36**). Stormwater management measures will also be considered on steep gradients.

Figure 36: Access roads

At this stage it is not possible to identify which access roads will be affected by the project. However, the walk-down survey will identify sensitive environmental features that need to be avoided when creating these new roads and the final site specific EMPr will address the associated impacts.

8.7.1.6 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) (see **Figure 37**). Foundation sizes are dependent on *inter alia* the tower type and soil conditions. For example, the minimum working area required for the erection of a self-supporting strain tower is 40 m by 40 m, and for a cross-rope suspension tower is 50 m by 50 m. 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.

Figure 37: Drilling rig and generator (top) and excavation activities (bottom)

8.7.1.7 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 (see **Figure 38**).

Figure 38: Foundation work

8.7.1.8 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.

8.7.1.9 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 39**.

Figure 39: Delivery of steel (top) and assembly of tower (bottom)

A new team will then be responsible for the erection of the towers, with the use of a mobile 70-ton crane (see **Figure 40**).

Figure 40: Erection of towers

8.7.1.10 Stringing of transmission cables

Cable drums (see **Figure 41**), 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.

Figure 41: Cable drums

Two cable drums, with a winch in the middle, are placed approximately 5 km apart along 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 (see **Figure 42**). The line is generally strung in sections (from bend to bend). Once the tension has been exacted, the conductor cables are strung.

In mountainous regions, the pilot cables are flown in by helicopter or shot across valleys, to create the correct tension to pull through the conductor.

Tension is created, the conductors clamped at the tower and the excess cable cut off.

Figure 42: Stringing with pilot tractor (top) and pulleys (bottom)

8.7.1.11 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).

8.7.1.12 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.

8.7.2 Operation and Maintenance

During operations, Eskom Transmission 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.

Figure 43: Example of an access road used for maintenance

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 Environmental Management Programme (EMPr).

8.7.3 Decommissioning

GN No. R544 defines "decommissioning" as taking out of active service permanently or dismantling partly or wholly, or closure of a facility to the extent that it cannot be readily re-commissioned. Note that under the aforementioned notice, which represents Listing Notice 1 of the EIA Regulations (2010), the decommissioning of existing facilities or infrastructure for electricity transmission and distribution with a threshold of more than 132kV (which applies to this project) would need to undergo a Basic Assessment to seek authorisation in terms of NEMA.

Decommissioning of the Anderson-Dinaledi transmission line is not anticipated. However, should this be required in the future a decommissioning plan with suitable mitigation measures will need to be developed, including provision for the dismantling of the towers and the disposal or recycling of the material. This plan will also require a site-specific rehabilitation plan for the footprint of the project. All regulatory requirements will need to be complied with for the decommissioning phase.

8.8 Resources Required for Construction and Operation

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

8.8.1 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 towers. The necessary negotiations will be undertaken with the landowners / local authorities that are traversed by the transmission line to obtain water from approved sources.

8.8.2 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.

8.8.3 Roads

Refer to **Section 8.7.1.5** for a discussion on access roads.

8.8.4 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 within each of the local municipalities that are affected by the project. 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.

8.8.5 Electricity

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

8.8.6 Construction Workers

It is anticipated that when construction activities are at it's peak, which is when the civil related construction activities are being undertaken, there should not be more than approximately 80 people on the site at any time. Employment will be effected either directly with the main contractor, or through sub-contractors. The appointed Contractor will mostly make use of skilled labour to install the power line. In those instances where casual labour is required, Eskom will request that such persons are sourced from local communities as far as possible. Apart from direct employment, local people and businesses will benefit through the supply of goods and services to the appointed contractors.

9 PROFILE OF THE RECEIVING ENVIRONMENT

The sub-sections below provide a general description of the status quo of the receiving environment in the project area. This serves to provide the context within which the EIA was conducted. The study area included a 1 km wide corridor for each of the alternative routes.

The profile of the receiving environment to follow also provides local and site-specific discussions on those environmental features investigated by the respective specialists. The reader is referred to **Section 12** for more elaborate explanations of the specialist studies and their findings.

This section allows for an appreciation of sensitive environmental features and possible receptors of the effects of the proposed project. The potential impacts to the receiving environment are discussed further in **Section 11**.

9.1 Geology

The geotechnical conditions are of particular importance for establishing the appropriate sites for the tower foundations. A general description of the geological conditions in the project area is provided below. The vegetation cover found within the 1km study corridors of the three powerline alternatives are provided in the table below **(Table 16 and figure 44)**. A description of the geology found within areas where these vegetation types occur are also provided in this table. The details provided in this table are based on the SANBI data.

Table 16: Vegetation Cover and Associated Geology

Vegetation Type	Geology Description
Andesite Mountain Bushveld	In terms of the SANBI data the area predominately consist of tholeitic basalt of the Klipriviersberg Group (Randian Ventersdorp Supergroup), also dark shale, micaceous sandstone and siltstone and thin coal seems of the Madzaringwe Formation [Karoo Supergroup, and andesite and conglomerate of the Pretoria Group (Vaalian Transvaal Supergroup)].
Gauteng Shale Mountain Bushveld	In terms of the SANBI data the area is dominated by shale and some coarser clastic sediments as well as significant andesite from the Pretoria Group (Transvaal Supergroup), all sedimentary rocks. A part of the area is underlain by Malmani dolomites of the Chuniespoort Group (Transvaal Supergroup). (Although dolomite is found in areas where this vegetation type occurs, no dolomite is found within the specific 1km study corridors of

Vegetation Type	Geology Description
	the alternative proposed powerline routes in terms of the Environmental Potential Atlas Data).
Gold Reef Mountain Bushveld	In terms of the SANBI data the area predominately consist of quartzites, conglomerates and some shale horizons of the Magaliesberg, Daspoort and Silverton Formations (Vaalian Pretoria Group), and the Hospital Hill, Turfontein and Government Subgroups (Randian Witwatersrand Supergroup).
Marikana Thornveld	In terms of the SANBI data most of the area is underlain by the mafic intrusive rocks of the Rustenburg Layered Suit of the Bushveld Igneous Complex. Rocks found in the area include gabbro, norite, pyroxenite and anorthosite. Shales and quartzites of the Pretoria Group (Transvaal Supergroup) also occurs on the area.
Moot Plains Bushveld	In terms of the SANBI data most of the area is underlain by clastic sediments and minor carbonatesand volcanic of the Pretoria Group (including the Silverton Formation) and some Malmani dolomites in the west of South Africa, all of the Transvaal Supergroup (Vaalian). Mafic Bushveld intrusive are also found.
Norite Koppies Bushveld	In terms of the SANBI data most of the area is mostly underlain by gabbro and norite with interlayered anorthosite of the Pyramid Gabbro-Norite, Rustenbrug Layered Suite, with a small area of the Rashoop Granophyre Suite (felsic igneous rocks), both of the Bushveld Complex (Vaalian). Large rock boulders and very shallow lithosols occur.

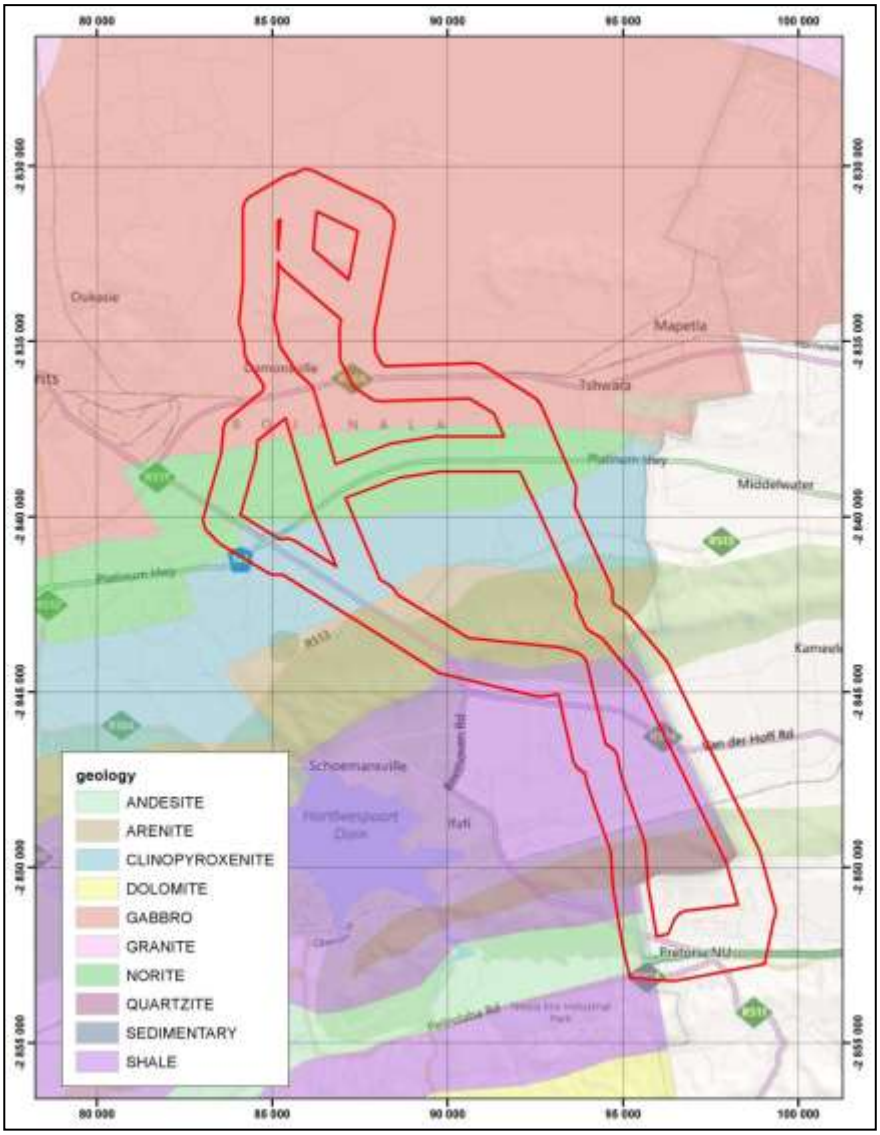

Figure 44: Map showing the geology within the proposed site

The proposed activity will be affected by the underlying geology of the area. As mentioned above the geological conditions of the site are of particular importance for establishing the appropriate sites for the tower foundations. Upon receipt of the EA and approval of a specific route by the DEA, a detailed geotechnical assessment will be undertaken to determin the exact locations of the tower site within the preferred route.

9.2 Topography

The North West Province has one of the most uniform terrains of all South African Provinces with altitudes ranging from between 920-1782 metres above mean sea level (mamsl). The eastern part of the province is mountainous and includes the scenic Magaliesberg, while the western and central

parts of the province is characterised by gently undulating plains. The surface topography of the area within the Gauteng Province which the proposed eastern route alternative will traverse is described as a rugged landscape with hills and slopes of the Magaliesberg and the Witwatersberg. Approximately 20 ridges occur in the Tshwane (Pretoria) area, of which the most sensitive ridges include the Bronberge, The Magaliesberg, Daspoort, Meintjieskop, Tuine Bult Koppies and the Witwatersberg.

The proposed alternative powerline routes and associated 1km study area traverses the Magaliesberg as well as the Witwatersberg. In terms of the South African National Biodiversity Institute (SANBI) data, the vegetation cover in the study area is comprised of Andesite Mountain Bushveld, Gauteng Shale Mountain Bushveld, Gold Reef Mountain Bushveld, Marikana Thornveld, Moot Plains Bushveld, and Norite Koppies Bushveld. The landscape character associated with each of these vegetation types are tabled below **(Table 17)**:

Table 17: Vegetation Types and Associated Topography

Vegetation Type	Associated Landscape Character
Andesite Mountain Bushveld	Undulating landscape with hills and valleys.
Gauteng Shale Mountain Bushveld	Low broken ridges varying in steepness with high surface rock cover.
Gold Reef Mountain Bushveld	Rocky hills and ridges often west-east trending.
Marikana Thornveld	Valleys and slightly undulating plains with some low hills.
Moot Plains Bushveld	Plains and some low hills.
Norite Koppies Bushveld	Plains, koppies and noritic outcrops.

Ridges (Phampe, 2012)

The majority of the proposed transmission alternative routes incorporate an area that forms part of the Magaliesberg rocky ridge system that runs roughly in an east-west direction. The quartzite ridges of Gauteng are one of the most important natural assets in the northern provinces of South Africa. These ridges support a wide diversity of fauna and flora species, some of which are on the Red Data List, rare or endemic. Various other important ecological functions are fulfilled by ridges, particularly important is the recharging of groundwater. Wetlands and rivers along the ridges act as migratory corridors for mobile faunal species and provide essential habitat for pollinators. The ridges also provide a socio-cultural function in that they provide aesthetically pleasing environments that are valued by residents, tourists and recreational users (Pfab, 2001 cited in Phampe 2012).

Ridges are specialized by high spatial heterogeneity due to the range of differing aspects (north, south, east, west and variations thereof), slopes and altitudes resulting in differing soil characteristics (e.g. depth, moisture, temperature, drainage, nutrient content), light and hydrological conditions

(Samways & Hatton, 2000 cited in Phampe 2012). Moist cool aspects are more conducive to leaching of nutrients than warmer drier slopes (Lowrey & Wright, 1987 cited in Phampe 2012). Variations in aspect, soil drainage (Burnett *et al*., 1998 cited in Phampe 2012) and elevation/altitude (Primack, 1995 cited in Phampe 2012) have been found to be especially important predictors of biodiversity. All ridges in Gauteng have been classified into four classes (**Table 1 of the fauna and flora report – Appendix D1**) based on the percentage of the ridge that has been transformed (mainly through urbanization) using the 1994 CSIR/ARC Landcover data. The study area falls within Class 2 (Table 18) of the Gauteng ridges (Gauteng C-Plan 3.3), as indicated in **Figure 45.**

Table 18: Class 2 of the four classes of ridges in Gauteng Province and the percentage of transformation

Ridge type	% of Gauteng ridges	Policy
Class 2 (5-35% transformed) includes parts of Magaliesberg, World Heritage site, Klipriviersberg, Bronberg, Skurweberg	28%	(a) The consolidation of properties on Class 2 ridges is supported. (b) The subdivision of property on Class 2 ridges will not be permitted. Development activities and uses that have a high environmental impact on a Class 2 ridge will not be permitted. (d) Low impact development activities, such as tourism facilities, which comprise of an ecological footprint of 5% or less of the property, may be permitted. (The ecological footprint includes all areas directly impacted on by a development activity, including all paved surfaces, landscaping, and property access and service provision). (e) Low impact development activities on a ridge will not be supported where it is feasible to undertake the development on a portion of the property abutting the ridge.

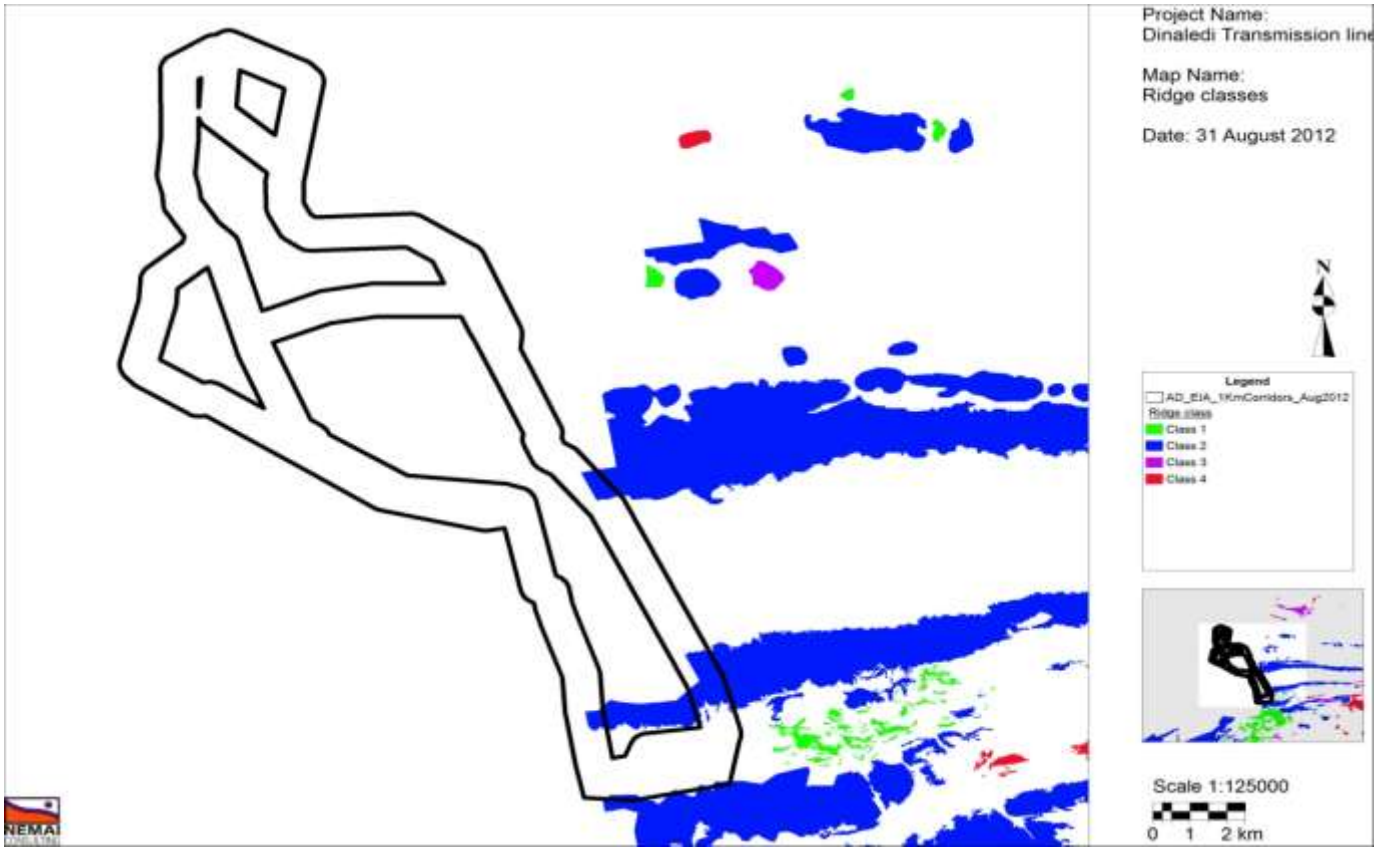

Figure 45: Gauteng Ridges in relation to the proposed transmission line

According to the North West Department of Agriculture, Conservation, Environment and Rural Development (2009), hills and ridges are identified as sensitive habitats in the existing provincial Spatial Development Framework dataset. Class 2 ridges fall within the Dinaledi transmission line route alternatives as indicated in **Figure 46**.

Figure 46: North West hills and ridges (in blue) in relation to the proposed transmission line

The majority of the study area is considered to have a moderate landscape character sensitivity due to the relative undeveloped and high topographic variation of the landscape. High terrain variability occurs through most of the study area where a moderate VAC can be expected. Generally the vegetation varies from medium to low shrubs and trees covers which will provide visual screening for the proposed transmission line. As such, the landscape type, through which the transmission line crosses, can mitigate the severity of visual impact through topographical or vegetative screening.

9.3 Climate

9.3.1 Temperature

There are wide seasonal and daily variations in temperature in the North West Province. The summers are warm to very hot with average daily maximum temperatures of 32 ºC in January.

The winter days are sunny and temperate while the winter nights are cool to cold, with average daily minimum temperatures of 0.9 ºC in July. The far western part of the province is arid, with the central part of the province being semi-arid, and the eastern part of the province being predominantly temperate.

Although Gauteng is quite close to the equator, the temperatures are moderate because of the high altitude above sea level. The Tshwane are experiences average daily maximum temperate of 30°C during summer (January), and average daily maximum temperatures of 18.3°C during winter (June). The Tshwane region is the coldest during July when the mercury drops to 1.7°C on average during the night.

9.3.2 Precipitation

The North West Province falls within a summer rainfall region, and rainfall often occurs in the form of late afternoon thundershowers. Rainfall in the province is highly variable both regionally and in time. The western part of the province which is classified as being arid receives less than 300mm of rain per annum, while the central semi-arid region receives 500mm of rain per annum. The eastern and south-eastern temperate part of the region receives over 600mm of rain per annum. Droughts and floods is a regular occurrence at a provincial and local scale. In most parts of the province, evaporation exceeds rainfall.

The Gauteng Province also falls within a summer rainfall region, and rainfall in this province occurs in the form of thunderstorms in the late afternoons from November to March. The average rainfall in the Tshwane area is 573-650mm per annum, with most rainfall occurring during summer. Rainfall in the Tshwane area is lowest during June (0mm) and highest in January (110mm).

9.3.3 Wind

The predominant wind direction in the Tshwane area is north-northeast. Historical wind speed and wind direction information for the Tshwane area was obtained from “MyForecast”. The annual average wind speed and direction of the area is tabled below.

Table 19: Average Wind Speed and Direction for the Pretoria (Tshwane Area)

Tshwane (Pretoria)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Average Windspeed (mph)	6	6	6	6	6	6	7	8	8	7	6	6
Average Wind Direction	NE	E	E	W	w	W	W	W	NE	NE	NE	NE

Historical wind data for the Hartbeespoort Dam area was obtained from Weather SA. Weather SA indicated that this wind information is the only available information for the study area. A wind rose is provided in Figure 47 which shows the average wind speed and direction in the Hartbeespoort Dam area from November 2009 to October 2010.

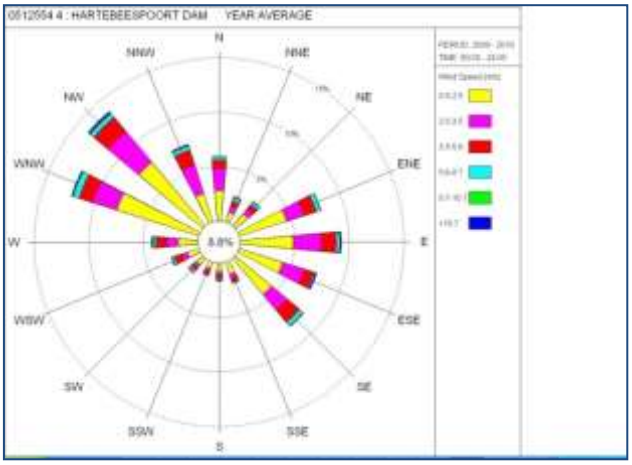

Figure 47: Wind Rose for Hartbeespoort Dam (November 2009-October 2010)

The predominant wind direction for this period as indicated on the wind rose is north-west and west-northwest. The average wind speed for this period was between 0.5-2.5m/s.

9.4 Soil and Land Capability

According to the North West Province State of the Environment Report the province in general is showing signs of increased land and soil degradation. Signs of degradation and desertification can be seen in all magisterial districts. The areas most severely affected are those areas that are communally managed. In terms of soil and land degradation, the province is ranked as the forth worst affected province in South Africa. Soil and land degradation in the province has numerous negative consequences for agriculture in the area, such as decreased productivity of the croplands. Water and wind erosion is the major contributors to soil degradation in the province.

In terms of the Gauteng State of the Environment Report, the Gauteng Province where ranked as the second least degraded province in South Africa. Gauteng has the lowest veld degradation index in South Africa (31 on a scale of 0-540) and the fourth lowest soil degradation index (113 on a scale of –97 to 650).

The map below indicates the dominant soils found within the proposed site as identified in the agricultural assessment (Index, 2012):

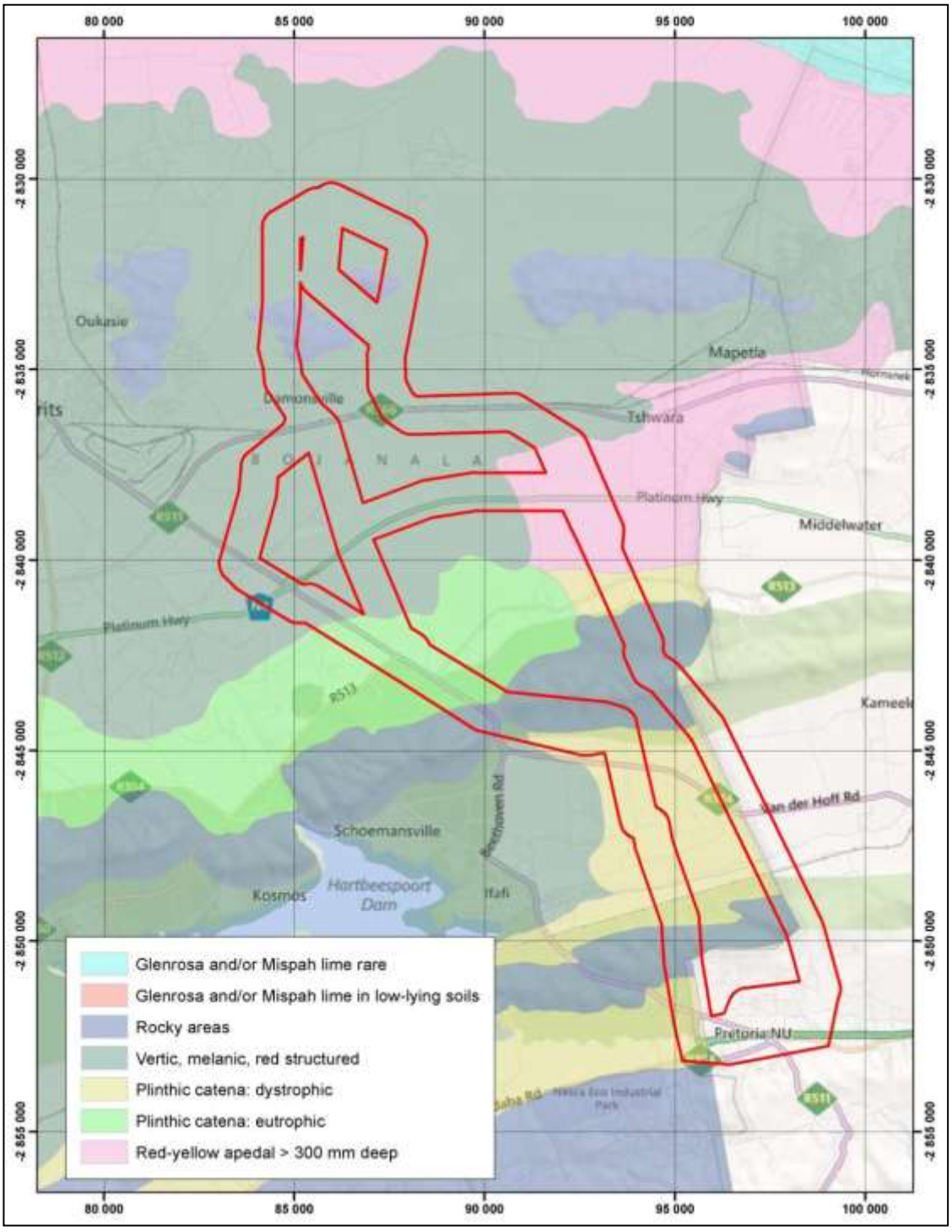

Figure 48: Soil Types for the proposed area

The following is a description of the soil types as identified as part of the desktop study undertaken by Index, 2012:

Red – yellow apedal soils and Plinthic Catena eutrophic soils

- The area just north and south of the Magaliesberg consists of predominantly deep reddish Hutton and Shortlands soil forms.
- The clay content varies greatly depending on the geology and topography. Stones and loose rock are common.
- Some land is serviced with irrigation by the canal from the Hartbeespoort and is considered as high potential land.

Rocky areas

- Predominantly the Magaliesberg and rocky ridges
- Mispah, Glenrosa and rock outcrops dominate

Vertic, melanic and red structured soil

a) These soils occur on most of the northern portion of the site
b) The dominant soils are Arcadia, Rensburg and Shortlands.
c) The canal supplies water to portions of this group, but it seems that much has been withdrawn for mining
d) Although some of the vertic soils have been irrigated in the past, the deteriorating water quality from Hartbeespoort is becoming problematic

Plinthic Catena dystrophic soils

- Consists mostly of Hutton soils, often rocky and difficult to cultivate
- They are normally dryland and with a low arable potential. Where that are irrigated, they are considered as moderate to high potential

9.5 Land Use

In terms of the North West Province State of the Environment Report, the North West Province is approximately 11,632,000 ha in extent. Land use in the North West Province mainly comprises of agriculture, mining, conservation, industrial, commercial, recreational and residential.

Approximately 9,421,920 ha (81%) of the total land area is considered as potential farming land. Of this total potential farming land, approximately 2,638,138 ha (28%) is potentially arable, approximately

4,334,083 ha (46%) is grazing land and approximately 603,002.9 ha (6,4%) is used for nature conservation. During 2001 the agricultural land use patterns included the following (Table 20);

Table 20: Land Use Patterns – North West Province (2001)

Agricultural Land Use Pattern	Approximate Area of Coverage
Field Crops	2,06 million ha
Horticultural crops	67 879 ha
Grazing land	2,97 million ha
Mixed farming	1,2 million ha

The land use patterns in the province are linked to ownership. Three main types of ownership occur within the province which includes, privately owned land, communal or tribal lands and state owner land. During 2001, most of the land in the Province was privately owned and the landowners where mainly committed to agriculture.

Livestock and cropping are the main agricultural activities undertaken in the eastern part of the province which is the higher rainfall area, whilst livestock and wildlife farming are prevalent in the western drier parts of the province. Three major irrigation schemes occur within the province which includes the Crocodlie, Vaal and Harts Rivers. The Vaalharts irrigation scheme is the largest scheme in the province. Details of this scheme are detailed below.

Table 21: Irrigation Schemes in the Vaal and Harts Rivers

Irrigation Scheme	Approximate Area of Coverage	Crops under Irrigation
Vaalharts irrigation area	43 700 ha	Wheat (36% of area) Maize (23% of area) Groundnut (22% of area)

Several smaller irrigation schemes also occur in the province which includes the Taung, Manyeding, Bodibe and Tlhaping-Tlharo schemes. The total area under irrigation by these smaller schemes is approximately 4,500 ha in extent. The total area under irrigation in the province is approximately 50,000 ha.

Mining forms a significant land use in the province, and several mining areas occur within the province. These mining areas are predominantly located within the Bushveld Complex which is described as a sill-like mineral-rich geological feature of approximately 50,000 km in extent.

Mining activities in the province mainly occur in the Rustenburg area and Southern Districts, and include the extraction of uranium, gold, iron, chrome, manganese, platinum, coal, granite, marble, slate, limestone, wonderstone, and andalusite. Stone crushing, clay and sand pits and quarries are also found in the province. Commercial, industrial, and residential land uses, as well as roads and dams are estimated to contribute to approximately 15% of the total land use.

In terms of the Gauteng State of the Environment Report, the land use in the area where the eastern route alternative traverse the Gauteng Province is mainly comprised of conservation, and unspecified land uses, with very small sections of cultivation (see figure 49).

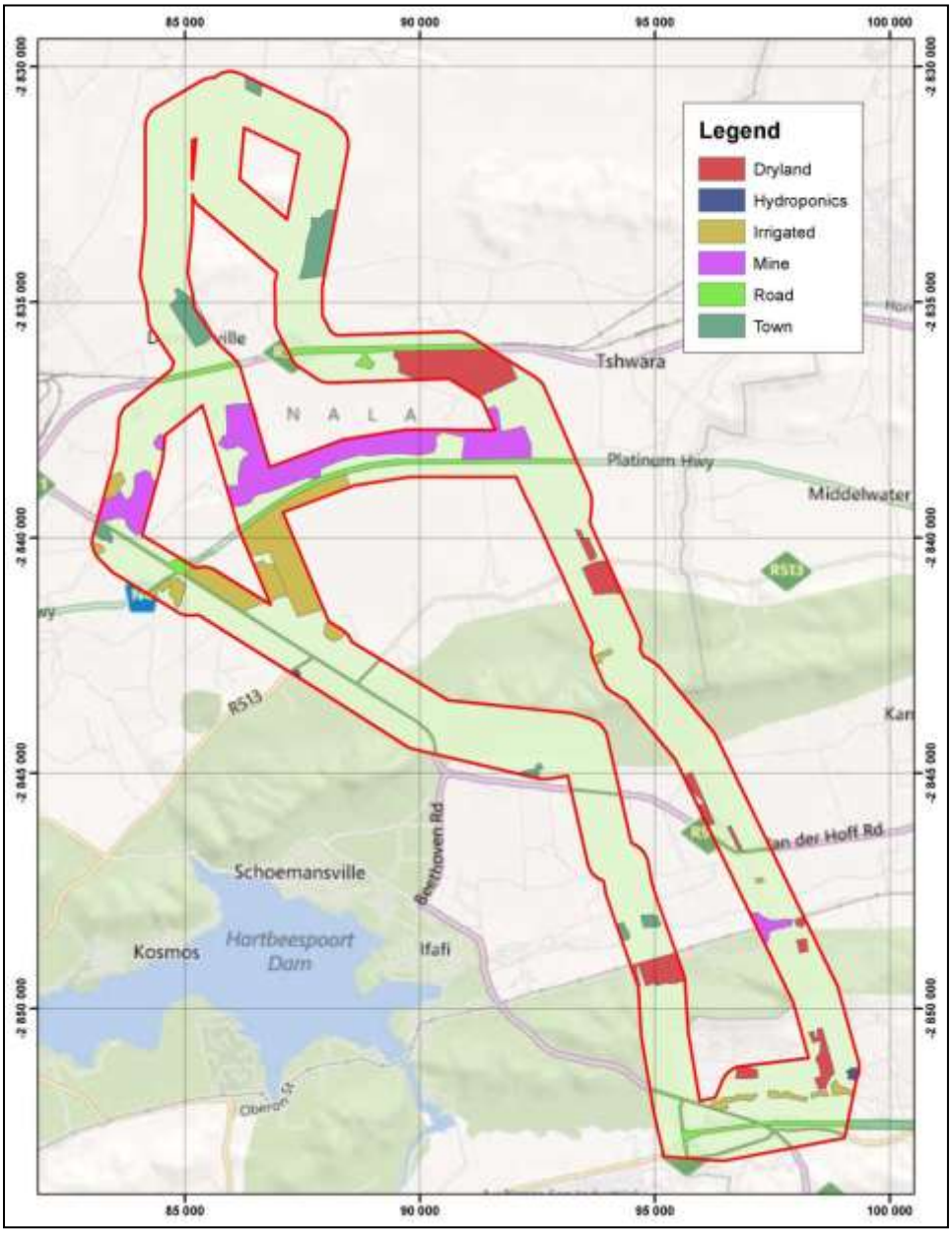

Figure 49: Map indicating the land use for the proposed routes

Most of the land is used for animal grazing with only a small portion that is cultivated. North of the Magaliesberg is an extensive canal system for irrigationand water is supplied by the Hartbeespoort Dam. Grazing and mining are the largest land users and it is expected that the role of mining will continue to increase as more mines open. (Index, 2012)

The transmission line has the potential to impact the portions of land where irrigation occurs, as towers will need to be located along the route, access roads will be required during the construction and operational phases, as well as the construction camps. These potential impacts can be prevented or mitigated by ensuring that the tower sites, access road and construction camp areas are not located on any portion of land used for irrigation purposes.

9.6 Flora

In terms of the North West State of Environment Report two major biomes occur within the Province which includes the Grassland Biome and the Savanna Biome. The eastern part of the province is mountainous and includes the scenic Magaliesberg, while the western and central parts of the province is characterised by gently undulating plains.

The proposed alternative powerline routes and associated 1km study area traverses the Magaliesberg as well as the Witwatersberg. In terms of the South African National Biodiversity Institute (SANBI) data, the vegetation cover in the study area is comprised of Andesite Mountain Bushveld, Gauteng Shale Mountain Bushveld, Gold Reef Mountain Bushveld, Marikana Thornveld, Moot Plains Bushveld, and Norite Koppies Bushveld. The table below (Table 22) provides details on the conservation status of the vegetation types found within the study area.

Table 22: Study Area Vegetation Types and Associated Conservation Status

Vegetation Type	Associated Landscape Character	Conservation Status
Andesite Mountain Bushveld	Undulating landscape with hills and valleys.	Least Threatened
Gauteng Shale Mountain Bushveld	Low broken ridges varying in steepness with high surface rock cover.	Vulnerable
Gold Reef Mountain Bushveld	Rocky hills and ridges often west-east trending.	Least Threatened
Marikana Thornveld	Valleys and slightly undulating	Endangered

Vegetation Type	Associated Landscape Character	Conservation Status
	plains with some low hills.	
Moot Plains Bushveld	Plains and some low hills.	Vulnerable
Norite Koppies Bushveld	Plains, koppies and noritic outcrops.	Least Threatened

Mucina & Rutherford (2006) classified the study area as comprised of the following vegetation type units: Andesite Mountain Bushveld, Gauteng Shale Mountain Bushveld, Gold Reef Mountain Bushveld, Marikana Thornveld, Moot Plains Bushveld, and Norite Koppies Bushveld, as indicated in **Figure 50.** Refer to Figure 11 for an illustration of the Vegetation types found within the study area.

Figure 50: Vegetation units identified in the study area

The proposed transmission alternative lines will traverse through the Magaliesberg Protected Natural Environment (MPNE), Magaliesberg Natural Area and Wonderboom Municipal Nature Reserve as indicated in **Figure 51**. According to Greater Pretoria Metropolitan Council (2001), the MPNE is

considered to be almost 100 times older than Mount Everest and has unique geology, topography and bio diverse habitats as well as heritage features. The areas proclaimed as PNE are mostly privately owned and no formal fence clearly demarcates the MPNE boundary. This adds to the ad hoc nature of management and activities especially on the edges of the MPNE. The different ecological systems that occur in the study area include mountainous areas, streams, rivers, indigenous woodland and grassland floral communities and these ecological systems are observed in the MPNE.

Figure 51: Protected areas in the study area

Plant communities recorded in the study area (Phampe, 2012)

The following plant communities were identified during the field visit and are described below.

Figure 52: *Hypoxis hemerocallidea* recorded along the propseod routes

Eastern Route Alternative and Eastern Route Alternative Deviation

A number of indigenous trees as well as exotic plants were identified along this route. A list of identified species is available in the Fauna and Flora Report (Appendix D1). Two species, *Hypoxis hemerocallidea* and *Boophane distacha,* declared as "Protected" by the Nature Conservation Ordinance 1974 (No. 19 of 1974) were recorded along this route during the surveys. Species of *Sclerocarya birrea* subsp. *caffra* (Marula) were recorded along the proposed route. This species is protected according to National Forests Act 1998 (Act No 84 of 1998).

Central Route Alternative

The koppie/ridge, through which the proposed transmission will traverse, provides suitable habitats for Red Data listed species. Species of *Sclerocarya birrea* subsp. *caffra* (Marula) were recorded along the proposed route and this species, as previously mentioned, is protected according to National Forests Act 1998 (Act No 84 of 1998). No Red Data or Orange-Listed plant species were recorded on this route.

Western Route Alternative, Deviations Western, Eastern and Southern

The western route alternative incorporates the existing powerlines, mostly along the R511 to Brits and passes through the Xstrata Eland Platinum Mine. The vegetation on this route is highly disturbed due to previous construction of the transmission lines and is dominated by weeds and alien invasive species such as *Melia azedarach, Opuntia ficus-indica, Campuloclinium macrocephalum,* and *Solanum mauritianum* (**Figure 53**).

Figure 53: Alien invasive plant species recorded along the proposed routes

The sensitive areas that the proposed route will traverse are the Magaliesberg Natural Area, MPNE, and Magaliesberg & Witwatersberg IBA. Only one protected plant species was recorded on this proposed route, *Sclerocarya birrea* subsp. *Caffra* (Marula).

There is potential for the proposed construction of the transmission line and associated rotues to have an impact on the sensitive areas and flora identified along the proposed routes. Of the three proposed routes, the Eastern route is regarded as the route alternative that would pose the greatest threat to the overall biodiversity of the area during construction of the proposed transmission line. This route as it traverses sensitive areas such as MPNE, and the number of Orange Listed plant species recorded on this route were higher than the other route alternatives. The preferred route, in terms of fauna and flora sensitivity, is the Western Route-Western deviation, as most parts of the route are along a main road near an existing powerline. These sections are considered less sensitive in terms of biodiversity compared to the other alternative routes.

These activities have the potential to affect the sensitive vegetation identified along the routes; however the potential impacts however can be mitigated against by ensureing that no protected vegetation is removed, furthmore all proetected or sensitive areas must be clearly demarcated prio to commcement of construction activities. Provided that recommendations by all specialists are adhered to, the potential impacts are anticipated to minimal. Rehabilitaiton of affected areas is an important

part of the post-construction phase to ensure that should any damage occur, those areas are then immedialtey

9.7 Fauna

The Magaliesberg Protected Natural Environment (MPNE), which forms part of the study area, provides large areas where species such as hyena and leopard can exist. Caves are known to be found in the MPNE, and they are very important as roosting or breeding sites for bats and other animal species and should be conserved in its natural state.

In terms of Avifauna, the study area falls within the Magaliesberg and Witwatersberg (ZA018) Important Bird Area (IBA) (Barnes, 1988).

This large area includes the magisterial districts of the former Bophuthatswana, Brits, Rustenburg, Swartruggens, Ventersdorp, Koster and Oberholzer. The Magaliesberg range extends in an arc from just south of Rustenburg in the west to Hartbeespoort Dam near Pretoria in the east. Most of the area falls within the MPNE. Within the IBA, several publicly owned protected areas occur. The Diepsloot Nature Reserve, controlled by the Johannesburg Municipality, lies 10 km south of Hartbeespoort Dam. Other protected areas within the IBA include Rustenburg Nature Reserve, which is 2 km south-west of the town, Mountain Sanctuary Park and Hartbeespoort Dam Nature Reserve as well as several private reserves and conservancies. According to Wesson (2006), total 46.6% of the bird species recorded for southern African subregion (including Botswana, Lesotho, Mozambique south of the Zambesi River, Namibia, South Africa, Swaziland and Zimbabwe) have been recorded from the Magaliesberg.

According to Carruthers (2000), the MPNE is ideal for a high diversity of reptiles especially among the rocks, cliffs and crevices and the substrate is an important factor in determining which habitats will be suitable for particular reptile species. Reptiles that are present in the Magaliesberg, ranging from poisonous snakes to agamas and skinks have been recorded by Carruthers (2000). The rivers in the study area provide an ideal habitat for amphibians to occur.

According to Hokka (2006), a total of 140 butterfly species were identified for the MPNE, while Two 221 species of butterfly have been confirmed to occur in the North West Province. This implies that 63% of the butterfly species that occur in the North West Province have been recorded in the MPNE.

9.7.1 Mammals (Phampe, 2012)

Human activity in some sections of the study area is quite high, and it is unlikely that these areas will comprise significant habitat for any species of threatened larger mammals, except in the MPNE.

According to the Magaliesberg Protected Environment: Environmental Management Framework and Plan - Status Quo Report (2007), Carruthers (2000) has recorded 90 indigenous mammal species in the Magaliesberg. The Sable Antelope (Hippotragus niger) is one of the mammal species which historically naturally occurred within the area that was re-introduced into the MPNE. According to Hokka (2006), the following species have been recorded in the MPNE (Table 23).

Table 23: Red Data Mammal Species Recorded in the MPNE

Species	Colloquial Names	Red Listed Status
Suncus infinitesimus	Least dwarf shrew	Indeterminate
Atelerix frontalis	South African hedgehog	Rare
Proteles cristatus	Aardwolf	Rare
Hyaena brunnea	Brown hyaena	Rare
Panthera pardus	Leopard	Rare
Mellivora capensis	Honey badger	Vulnerable
Ourebia ourebi	Oribi	Vulnerable

Mammal species diversity was low across the alternative sites. Good habitat cover is present, especially along the rivers and mountains, and therefore a wide diversity of small to medium mammalian species is expected to flourish. Riparian vegetation promotes ecological functionality as the river forms an ecological corridor that highly-mobile species would utilize for migratory purposes. Mammals are sensitive to disturbances and habitat destruction and degradation and as such more species would occur on or near the MPNE than near the residential areas. Settlement areas have negated the possibility of encountering any medium to large mammals. The presence of dogs in the study area, especially on the western route, poses a threat to the presence of mammals on sites. Table 24 indicates 11 mammals actually observed in the study area. No sensitive or endangered mammals were visually recorded during the site visits.

Table 24: Mammals recorded on the proposed transmission lines

Common name	Species	Route alternative
Impala	*Aepyceros melampus*	Eastern Route Alternative
Kudu	*Tragelaphus strepsiceros*	Eastern Route Alternative, Western Route Alternative
Scrub Hare	*Lepus saxatilis*	Eastern Route Alternative, Western Route Alternative
African Mole-rat	*Cryptomys hottentotus*	Eastern Route Alternative, Western Route Alternative
Springhare	*Pedetes capensis*	Eastern Route Alternative, Western Route Alternative
Bushveld Gerbil	*Tatera leucogaster*	Eastern Route Alternative, Western Route

Common name	Species	Route alternative
		Alternative
Yellow Mongoose	*Cynictis penicillata*	Eastern Route Alternative, Western Route Alternative
Common Duiker	*Sylvicapra grimmia*	Eastern Route Alternative, Western Route Alternative
Chacma Baboon	*Papio ursinus*	Eastern Route Alternative, Western Route Alternative
Vervet Monkey	*Cercopithecus aethiops pygerythrus*	Eastern Route Alternative, Western Route Alternative
Blesbok	*Damaliscus pygargus phillipsi*	Western route-West Alternative

The proposed cosntruction of the access roads, construction camps, tower sites and other associated infrastructure has the potential to affect the fauna along the route, however most of the species are mobile and it is assumed that as areult of the exisitng disturbances, the senstive fauna would be located closer to the MPNE areas. As such caution must be taken when working in those sensitve areas not to disturb any faunal species. Furthermore provided that all recommended mitigation measures are adhered to, the ptoential impacts are anticipated to be minimal.

9.7.2 Avifauna (Phampe, 2012)

Human activities have transformed habitats in South Africa to a point where few pristine examples remain (Low & Rebelo, 1996). Continuing pressure on sensitive ridges is largely responsible for the decline of avifaunal species. Observations regarding the number and diversity of birds will provide valuable input to sound management practices for the fast changing environment.

Loss of habitat remains one of the biggest threats to birds and the environment in South Africa and the rest of the world. A number of distinct ecological systems occur in the study area. These include mountainous areas, streams and river courses, indigenous woodland and grassland floral communities. Sensitive ecological and natural systems also occur along the MPNE. Table 25 lists bird species recorded in the study area. The species marked with an asterix (*****) were based on anecdotal information provided by the land owners of potentially affected properties.

Table 25: Bird species recorded in the study area

Species	Common name	Route alternative
Apus barbatus	African black swift	Eastern Route Alternative, Western Route Alternative
Ardea melanocephala	Black-headed heron	Eastern Route Alternative, Western Route Alternative
Bostrychia hagedash	Hadeda ibis	Eastern Route Alternative, Western Route Alternative
Bubulcus ibis	Cattle Egret	Eastern Route Alternative, Western Route Alternative
Cercomela familiaris	Familiar Chat	Eastern Route Alternative, Western Route Alternative

Species	Common name	Route alternative
Charadrius pallidus	Three-banded plover	Eastern Route Alternative, Western Route Alternative
Cisticola juncidis	Zitting Cisticola	Eastern Route Alternative, Western Route Alternative
Columba guinea	(Speckled) Rock pigeon	Eastern Route Alternative, Western Route Alternative
Corythaixoides concolor	Grey go-away-Bird (Lourie)	Eastern Route Alternative, Western Route Alternative
Corvus albus	Pied Crow	Eastern Route Alternative, Western Route Alternative
Elanus caeruleus	Black-shouldered Kite	Eastern Route Alternative, Western Route Alternative
Euplectes orix	Southern Red Bishop	Eastern Route Alternative, Western Route Alternative
Gyps africanus*	White-backed vulture	Eastern Route Alternative, Western Route Alternative
Gyps coprotheres*	Cape vulture	Eastern Route Alternative, Western Route Alternative
Hirundo cucullata	Greater Striped Swallow	Eastern Route Alternative, Western Route Alternative
Lanius collaris	Common Fiscal	Eastern Route Alternative, Western Route Alternative
Lamprotornis nitens	Cape Glossy Starling	Eastern Route Alternative, Western Route Alternative
Numida meleagris	Helmeted guineafowl	Eastern Route Alternative, Western Route Alternative
Mirafra africana	Rufous-naped Lark	Eastern Route Alternative, Western Route Alternative
Phylloscopus trochilus	Willow Warbler	Eastern Route Alternative, Western Route Alternative
Ploceus velatus	Southern masked-Weaver	Eastern Route Alternative, Western Route Alternative
Polemaetus bellicosus*	Martial eagle	Eastern Route Alternative, Western Route Alternative
Pternistes swainsonii	Swainson's spurfowl (francolin)	Eastern Route Alternative, Western Route Alternative
Pycnonotus tricolor	Dark-capped (Blackeyed) Bulbul	Eastern Route Alternative, Western Route Alternative
Sigelus silens	Fiscal Flycatcher	Eastern Route Alternative
Struthio camelus	Common Ostrich	Eastern Route Alternative
Streptopelia senegalensis	Laughing Dove	Eastern Route Alternative, Western Route Alternative
Streptopelia capicola	Cape Turtle-Dove	Eastern Route Alternative, Western Route Alternative
Streptopelia semitorquata	Red-eyed Dove	Eastern Route Alternative, Western Route Alternative

In terms of avifauna, the study area falls within the Magaliesberg and Witwatersberg (ZA018) Important Bird Area (IBA). IBAs form a network of sites, at a biogeographic scale, which are critical for the long-term viability of naturally occurring bird populations. The MPNE provides a suitable habitat for Red data bird species that are known to occur in the area. The proposed transmission lines fall within the savanna biome. The savanna biome is rich in large raptors, such as the white-backed vulture, Cape vulture, Martial eagle, Tawny eagle, Lappet-faced vulture, Brown Snake Eagle, Black-chested Snake Eagle, Steppe Buzzard, African Harrier Hawk, and African Hawk Eagle.

Negative interactions between wildlife and electrical infrastructures take many forms, but the two most familiar problems in southern Africa are electrocution of birds and collision of birds with transmission lines (Van Rooyen, 2004). Initial destruction and then the maintenance of vegetation clearing within servitudes have a greater impact within savanna areas than in grassland-dominated areas. Grasslands are allowed to re-establish within the servitudes following completion of the construction phases, whereas savanna areas are not allowed to re-establish. It is anticipated that provided the

relevant mitigation measures are adhered to especially during the operational, the potential impacts can be mitigated against.

It is also important to note that there are positive interactions between overhead powerlines and avifauna as well (van Rooyen, 2004):

1. Pylons can provide a safe nesting and perching sites away from predators. Some Lesser kestrel colonies have been shown to use overhead lines almost exclusively as perching sites;
2. Pylons can also provide nesting sites within areas devoid of tall trees. This has enabled certain species to expand their range.

According to African Centre for Energy and Evironment (2003), Bird Flappers have proven to be more effective than the Bird Flight Diverter. In South Africa, It has been found that more collisions are common with shield wire than collisions with the overhead conductor and birds usually avoid the highly visible bundled conductor on higher voltage overhead lines but fail to recognise the smaller shield wire (Alonso & Alonso, 1999a).

9.7.3 ***Reptiles (Cook, 2012)***

Reptile lists require intensive surveys conducted for several years. Reptiles are extremely secretive and difficult to observe even during intensive field surveys conducted over several seasons. The majority reptile species are sensitive to severe habitat alteration and fragmentation. Large areas surrounding the site have resulted in increased habitat modification and transformation as well as increased human presence and associated disturbances (illegal reptile collecting, indiscriminate killing of all snake species, frequent fires) surrounding the site coupled with increased habitat destruction and disturbances on the neighbouring properties are all causal factors in the alteration and disappearance of reptile diversity in the area.

The Magaliesburg mountainous ridge contains large rocky outcrops and cliffs around the crests and provides favourable refuges for certain snake and lizard species (rupicolous species). Termite mounds were present on the lower rocky lower slopes of the Magaliesburg increasing in abundance along the mid slope. Most of the termite mounds were small but some larger mounds were also present on the plains extending northwards towards Brits. Some large mounds were moribund or had been damaged by previous foraging by Antbears as well as gouging by cattle. This resulted in the exposing of tunnels into the interior of the termite mound. Moribund (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. Large number of species of mammal, birds, reptiles and amphibians feed on the emerging alates (winged termites). These mass emergences coincide with the first heavy summer rains and the emergence of the majority of herpetofauna. No termite mounds

were destroyed during the brief field survey. All overturned rock material was carefully replaced in its original position.

Figure 54: A collage of photographs displaying the granitic outcrops and low-lying rocky sheets to the north-east of Brits

Several granite mines within the area are an immediate threat for remaining rupicolous reptile species. The rocky crests and slopes of the Magaliesburg ridge contain low-lying rocky outcrops as well as large granitic outcrops towards Brits and offer favourable habitat for several rupicolous reptile species. Reptile species recorded from under loosely embedded rocks or low-lying rocky areas included Yellow-Throated Plated Lizard (*Gerrhosaurus flavigularis*), Montane Speckled Skink (*Trachylepis* (*Mabuya*) *punctatissima*), Variable Skink (*Trachylepis (Mabuya) varia*) Ground Agama (*Agama aculeate distanti*) and Transvaal Thick-toed Gecko (*Pachydactylus affinis)*. Trees including stumps; bark and holes in trees are vital habitats for numerous arboreal reptiles (chameleons, snakes, agamas, geckos and monitors). Reptile species recorded in the open and closed *Acacia caffra* woodland areas included Flap-neck Chameleon (*Chamaeleo dilepis*) and Cape Dwarf Gecko (*Lygodactylus capensis*). Limited logs and stumps were observed in the closed and open woodland areas opposite the proposed alignment. Reptiles recorded under logs included Wahlberg's Snake Eyed Skink (*Panapsis walbergii*) and Variable Skink (*Trachylepis varia*).

Figure 55: Reptile species recorded along the alignment included A: Distant's Ground Agama; B Herald Snake; Flap-necked Chameleon; Rhombi Night Adder

A list of reptile species observed on the site as well as species likely to occur on the site using habitat as an indicator of presence; is presented in the Herpetological specialist report (Appendix D).

There is a potential for the reptiles and their habitats to be impacted on mainly during the construction phase of this project. As indicated above reptiles are mostly found in the rocky crests and slopes of the Magaliesburg ridge contain low-lying rocky outcrops as well as large granitic outcrops towards Brits. Due to the terrain, it is not likely that many construction activities will occur in these areas however measures must be put in place to ensure that minimal disturbance occurs to these areas.

9.7.4 Amphibians (Cook, 2012)

Amphibians are an important component of South Africa's exceptional biodiversity (Siegfried 1989, cited in Cook, 2012) and are such worthy of both research and conservation effort. This is made additionally relevant by international concern over globally declining amphibian populations, a phenomenon currently undergoing intensive investigation but as yet is poorly understood (Wyman 1990; Wake 1991 cited in Cook, 2012). Frogs are useful environmental bio-monitors (bio-indicators) and may acts as an early warning system for the quality of the environment.

The Giant Bullfrog (Pyxicephalus adspersus) has been chosen as a flagship species for the grassland eco-region (Cook in le Roux 2002 cited in Cook, 2012) Breeding in African frogs is strongly dependent

on rain, especially in the drier parts of the country where surface water only remains for a short duration. The majority of frog species
in Gauteng and North-West Provinces can be classified as explosive breeders. Explosive breeding frogs utilise ephemeral pans or inundated grasslands for their short duration reproductive cycles. The general type of reproductive habitat chosen has a strong influence on the entire developmental strategy followed by many species. Most anuran larvae within Gauteng and North-West provinces inhabit temporary habitats that range from small pools to larger artificial dams/pans situated in lower lying areas or depressions. Unpredictable temporal and spatial distributions and cyclic patterns of nutrient availability are common features of these habitats. Others develop in more complex permanent aquatic habitats as temporary invaders in established communities such as rivers (Crocodile and Swartspruit), streams and the artificially created dams.

During survey undertaken by the specialist; fieldwork was augmented with species lists compiled from personal records (1999- 2012); data from the Brits-Magaliesburg area collected for the South African Frog Atlas Project (SAFAP) (1999-2003) and published data, and the list provided in Table 26 below is therefore regarded as likely to be fairly comprehensive.

Table 26: Frog species recorded by the Southern African Frog Atlas Project (SAFAP) for the combined locus 2527DB and 2527DD quarter degree grid squares

Family	Genus	Species	Common name	Red list category	Atlas region endemic
Breviceptidae	*Breviceps*	*adspersus*	Bushveld Rain Frog	Least Concern	0
Bufonidae	*Amietophrynus*	*garmani*	Eastern Olive Toad	Least Concern	0
Bufonidae	*Amietophrynus*	*gutturalis*	Guttural Toad	Least Concern	0
Bufonidae	*Poyntonophrynus*	*fenoulheti*	Northern Pygmy Toad	Least Concern	0
Bufonidae	*Schismaderma*	*carens*	Red Toad	Least Concern	0
Hyperoliidae	*Kassina*	*senegalensis*	Bubbling Kassina	Least Concern	0
Microhylidae	*Phrynomantis*	*bifasciatus*	Banded Rubber Frog	Least Concern	0
Phrynobatrachidae	*Phrynobatrachus*	*natalensis*	Snoring Puddle Frog	Least Concern	0
Ptychadenidae	*Ptychadena*	*anchietae*	Plain Grass Frog	Least Concern	0
Pyxicephalidae	*Amietia*	*angolensis*	Common or Angola River Frog	Least Concern	0
Pyxicephalidae	*Cacosternum*	*boettgeri*	Common or Boettger's Caco	Least Concern	0
Pyxicephalidae	*Pyxicephalus*	*edulis*	African Bullfrog	Least Concern	0

Pyxicephalidae	*Tomopterna*	*cryptotis*	Tremelo Sand Frog	Least Concern	0
Pyxicephalidae	*Tomopterna*	*natalensis*	Natal Sand Frog	Least Concern	0

A: Banded Rubber Frog (*Phrynomantis bifasciatus*);

B: Giant Bullfrog (*Pyxicephalus adspersus*);

C: Eastern Olive Toad (*Amietophrynus garmani*);

D: Tremelo Sand Frog (*Tomopterna cryptotis*);

E: Plain Grass Frog (*Ptychadena anchietae*);

F: Bubbling Kassina (*Kassina senegalensis*);

G: Boettger's Caco (*Cacosternum boetgeri*) and

H: Bushveld Rain Frog (*Breviceps adspersus*).

Figure 56: A conglomerate of photographs displaying frog species likely to occur along the alignments in a suitable habitat

According to The North West Biodiversity Site Inventory and Database Development (2003), the following Red Data amphibian is are recorded for the North West Province (Table 27).

Table 27: Red Data Herpetofauna Species Recorded for the North West Province

Scientific name	English name	Status
Pyxicephalus adspersus	Giant Bullfrog	Near Threatened

Due to the occurrence of various water bodies in the study area, the Giant Bullfrog is adapted to opportunistic breeding in pans and rainwater pools. According to Yetman (2004) (cited in Cook, 2012), the Giant Bullfrog is listed as "Near-Threatened" in Southern Africa and is considered a flagship species for southern African grasslands. There is also reason to believe that this species may be far more threatened within the sub-region, where Giant Bullfrogs are suffering a precipitous decline due to industrial and urban development. Although the destruction, degradation and

fragmentation of grasslands and wetlands contribute the most to the decline of the Giant Bullfrog, the high mortality of these frogs on roads (usually at night after heavy thunder showers) is also of great concern.

9.7.5 Invertebrates(van de Merwe, 2012)

The invertebrate assessment recorded a large number of insects representing 63 families and 15 orders during the survey period, a table has been included in the invertebrate specialist report for review, Appendix D. Data for those that were seen active on the surface or sampled by any of the collecting methods utilised are listed in the table below. Representatives from nine Arachnid families were collected or observed. All invertebrates sampled were stored in absolute ethanol and positively identified to family (or subfamily) level in the laboratory. When a particular specimen was found to belong to a family that contained invertebrates of conservation concern known to occur in the vicinity of the site, then further identification to genus or species level was carried out.

Invertebrate species of conservation concern known to occur in the vicinity of the site

Records indicate that six Red Data lepidopteran species of conservation concern are known to occur in the vicinity of the alternative routes for the proposed transmission line, namely *Spialia paula*, *Metisella meninx*, *Acraea machequena*, *Lepidochrysops hypopolia*, *Lepidochrysops praeterita* and *Platylesches dolomitica*. Two cetonid beetles of conservation concern are known to occur in the area, namely *Ichnestoma stobbiai* and *Trichocephala brincki*. *Hadogenes gunningi*, formerly listed as a scorpion species of conservation concern is also known to occur in the vicinity of the site.

1. *Spialia paula*, 2. *Metisella meninx*, 3. *Acraea machequena*, 4. *Lepidochrysops praeterita*, 5. *Platylesches dolomitica* and *Lepidochrysops hypopolia* (not observed since 1879), 6. *Ichnestoma stobbiai,* 7. *Trichocephala brincki and* 8. *Hadogenes gunningi.*

Figure 57: Species of concern known to occur in the vicinity of the alternative routes

9.8 Surface Water

9.8.1 Regional Description

The North West Province is situated within the Crocodile West - Marico Water Management Area (WMA 3) which borders on Botswana. This WMA includes two major river systems, the Crocodile and Groot Marico, which give rise to the Limpopo River at their confluence. Surface water in the North West Province occurs in the form of rivers, dams, pans, wetlands, as well as dolomitic eyes which is fed by aquifers. In the semi-arid western portion of the province surface water resources are generally scarce. The main rivers in the province include the Crocodile, Groot Marico, Hex, Elands, Vaal, Mooi, Harts and Molopo rivers. There are over 40 wetland areas in the province of which one, the Barbers Pan, is a Ramsar site (recognised as a wetland of international importance).

Surface water runoff from precipitation in the North West Province ranges from less than 1% in the semi-arid western area to approximately 7% in the eastern region, with the average runoff being 6%

which is below the national average of 9%. In order to meet water supply needs, the North West Province relies heavily on ground water resources.

Surface waters in the Gauteng Province comprise both flowing rivers and lakes or dams, with many of the smaller tributaries being seasonal in nature (i.e. dry in the winter). The Gauteng Province is situated within the upper reaches of three water management areas (WMAs). These WMAs includes the Crocodile West-Marico, Upper Vaal and Olifants River areas. Gauteng's natural water resources comes from surface water runoff as well as from ground water, however due to the high demand for water in the province, raw water is imported from outside the province. The province's main water supply comes from the Vaal River which receives input from the Lesotho Highlands Project. The main rivers and streams in the Tshwane (Pretoria) area are the Apies River, the Pienaars River and the Moreleta spruit. Approximately 2.1% of surface area in Pretoria is covered by wetlands. Figure 58 below shows the rivers found within the study area.

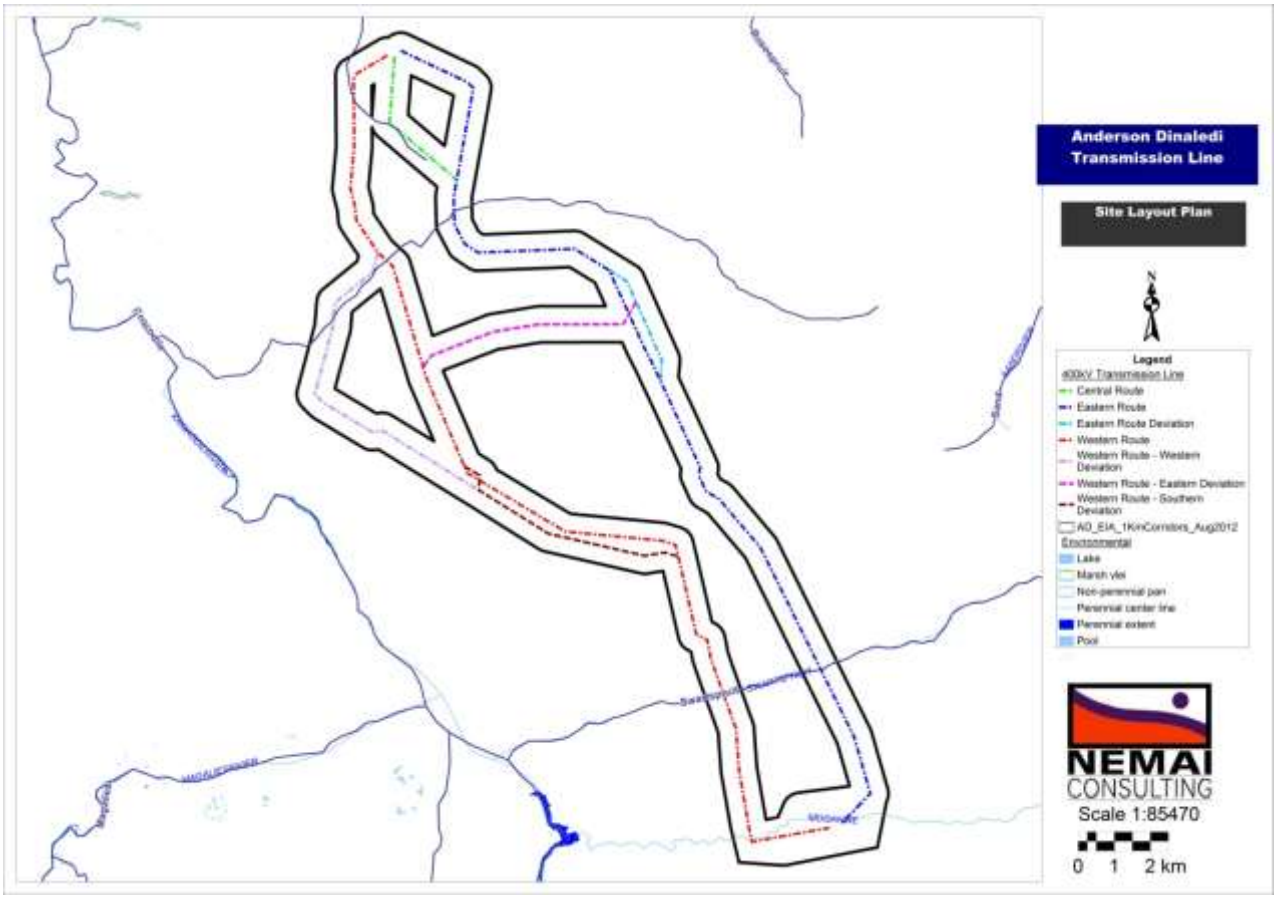

Figure 58: Rivers found within the study area

9.8.2 Site Description

The proposed alternative powerlines traverse various watercourses and associated riparian areas. Some wetland areas may also occur within the study area. Based on the desktop level through an appraisal of the topographical map and the National Wetlands Map II of the South African National Biodiversity Institute (SANBI), which was extracted from the National Land Cover 2000 dataset, no wetlands, including non-perennial pans were identified along any of the transmission line routes (see figure 57). The desktop analysis is not necessarily regarded as comprehensive and a more detailed identification of wetlands will be conducted during the walk-down survey, to ensure that these systems and adequate buffer zones are avoided during the siting of the towers. Streams in the area include many tributaries of the Crocodile River, as well as the Swartspruit, the Moganwe River, as well as many unnamed tributaries.

9.9 Groundwater

9.9.1 Regional Description

The fractured aquifers and dolomitic compartments which occur within the North West Province have resulted in a large reservoir of subterranean water. Although this precious resource occurs in the province, the recharge to this reservoir is considered to be one of the lowest in South Africa with an average of less than 10 mm per annum in the western region of the province. In order to meet water supply needs, the North West Province relies heavily on ground water resources. Groundwater resources in the province are polluted by mining and industrial activities, as well as by agriculture and domestic use. High levels of dissolved minerals, nitrates and fluoride concentrations in certain areas in the province as a result of both natural and human-induced factors are the main groundwater water quality issues in the province.

Due to the varied and complex geology of the Gauteng Province, aquifers found within this province are diverse. Four main types of aquifers occur within the Gauteng Province. These aquifers are grouped into four hydrogeological types which includes intergranular (alluvial – found in valley bottoms); fractured aquifers; karstic (dolomitic) aquifers; and intergranular and fractured aquifers (in the weathered zone). The quality of water in these aquifers found in the Gauteng Province is highly variable depending on the geology, ecological setting and influence of man.

9.9.2 Site Description

In terms of the North West State of the Environment Report the groundwater storage rock types found within the study area is mainly comprised of fractured igneous rock/metamorphic rock and fractured compact sedimentary rock. No karstic aquifers occur within the study area. No dolomites occur along the section of the eastern route alternative which traverses the Tshwane Municipal area and therefore no karstic aquifers within the area.

9.10 Air Quality

9.10.1 Regional Description

Air quality in the majority of the North West Province is not considered to be a major problem. Areas where air quality in the province shows deterioration includes urban, mining and industrialised areas such as Brits, Rustenburg and Potchefstroom. Vehicular emissions in the urbanised and industrialised areas also contribute to deterioration in air quality in the province. Furthermore the use of wood and coal for heating and cooking purposes in informal areas contributes to poorer air quality.

The state of air quality in the Pretoria (Tshwane) area is influenced by industrial activities, petrol stations, vehicular emissions from nearby roads and highways, informal settlements, sewerage effluent, and waste dumping. All of these activities contribute to air emissions which deteriorates air quality in the area.

9.10.2 Area/Local Description

Land uses in the study area are comprised of many minor and major roads, agriculture, mining, conservation, industrial, commercial, recreational and residential. Emissions from mining activities, industrial activities as well as and vehicular emissions affects the status of air quality in the study area. Furthermore various informal settlements occur and air emissions as a result of coal and wood burning for heating and cooking purposes also impacts on the state of air quality in the study area.

9.11 Noise

9.11.1 Area/Local

As mentioned previously, land uses in the study area are comprised of many minor and major roads, agriculture, mining, conservation, industrial, commercial, recreational and residential. Noise levels in the study area are currently generated by vehicles traffic on the major and minor roads, by heavy vehicles used by the mines and industries in the area, as well as by operational activities undertaken by the mines, quarries and industries. There are various properties which is not located in close proximity to mining and industrial area, where noise levels are lower.

9.12 Visual

9.12.1 Area/Site Description

As mentioned in Section 5.1.2, the North West Province has one of the most uniform terrains of all South African Provinces with altitudes ranging from between 920-1782 metres above mean sea level (mamsl). The eastern part of the province is mountainous and includes the scenic Magaliesberg, while the western and central parts of the province is characterised by gently undulating plains. The surface topography of the area within the Gauteng Province which the proposed eastern route alternative will traverse is described as a rugged landscape with hills and slopes of the Magaliesberg and the Witwatersberg. Approximately 20 ridges occur in the Tshwane (Pretoria) area, of which the most sensitive ridges include the Bronberge, The Magaliesberg, Daspoort, Meintjieskop, Tuine Bult Koppies and the Witwatersberg

The study area consists of cultivated, residential areas, subsistence farming and mining. Extensive mining and farming is located more to the northern side of the study area with scattered farms in the central parts and southern parts. Residential development activities are more intense from the central to southern side of the study area where the cultural homelands is located. Human settlements are scattered throughout the study area and the landscape is degraded around these settlements.

The majority of the study area is considered to have a *moderate* landscape character sensitivity due to the relative undeveloped and high topographic variation of the landscape, the generally high visual quality and the related tourism value that is placed on the visual resource. High terrain variability occurs through of the study area where a moderate VAC can be expected. Generally the vegetation varies from medium to low shrubs and trees covers which will provide visual screening for the proposed transmission line.

The landscape character is considered moderately susceptible to change, whether it is a low intensity change over an extensive area or an acute change over a limited area. Generally, the vegetation occurring in the study area is resilient and recovers very quickly from surface disturbances.

Previous human induced activities and interventions have negatively impacted the original landscape character of the different landscape types. In this case the mines and existing infrastructure, including transmission lines, roads, etc., can be classified as landscape disturbances and elements that cause a reduction in the condition of the affected landscape type and detrimentally affect the quality of the visual resource.

Landscape impacts are alterations to the fabric, character, visual quality and/or visual value which will either positively or negatively affect the landscape character. During the construction and operational phases, the project components are expected to impact on the landscape character of the landscape types it traverses.

Within the receiving environment, specific viewers (visual receptors) experience different views of the visual resource and value it differently. They will be affected because of alterations to their views due to the proposed project.

9.13 Traffic

Various major and minor roads occur within the study area. The proposed routes both eastern and western alternative traverse the following national and provincial roads as indicated in the figure 59 and 60 below:

- N4;

- R566;
- R513;
- R511; and
- R514.

The western alternative will traverse the R104. Little information is available on traffic volumes in the study area and whether major traffic issues occur. The North West Province has relatively good general infrastructure, including a roads, and a well developed network of tarred roads links the main urban centres in the Province. Many rural settlements in the province are serviced by gravel roads.

Figure 59: Aerial Map showing major traffic routes

The routes also cross a number internal roads, which grant access to farms and settlements.

The project will require the use of access roads during the construction and operational phases. Existing roads will be used as far as possible, and these roads (including river crossings) will be upgraded where deemed necessary. Where the transmission line runs parallel to existing powerlines, existing access / service roads will be used wherever possible. New roads may need to be created where required. All requisite access arrangements will be made with the affected landowners. At this stage it is not possible to identify which access roads will be affected by the project. However, the EMPr walk-down survey will identify sensitive environmental features that need to be avoided when creating these new roads and the EMPr will address the associated impacts.

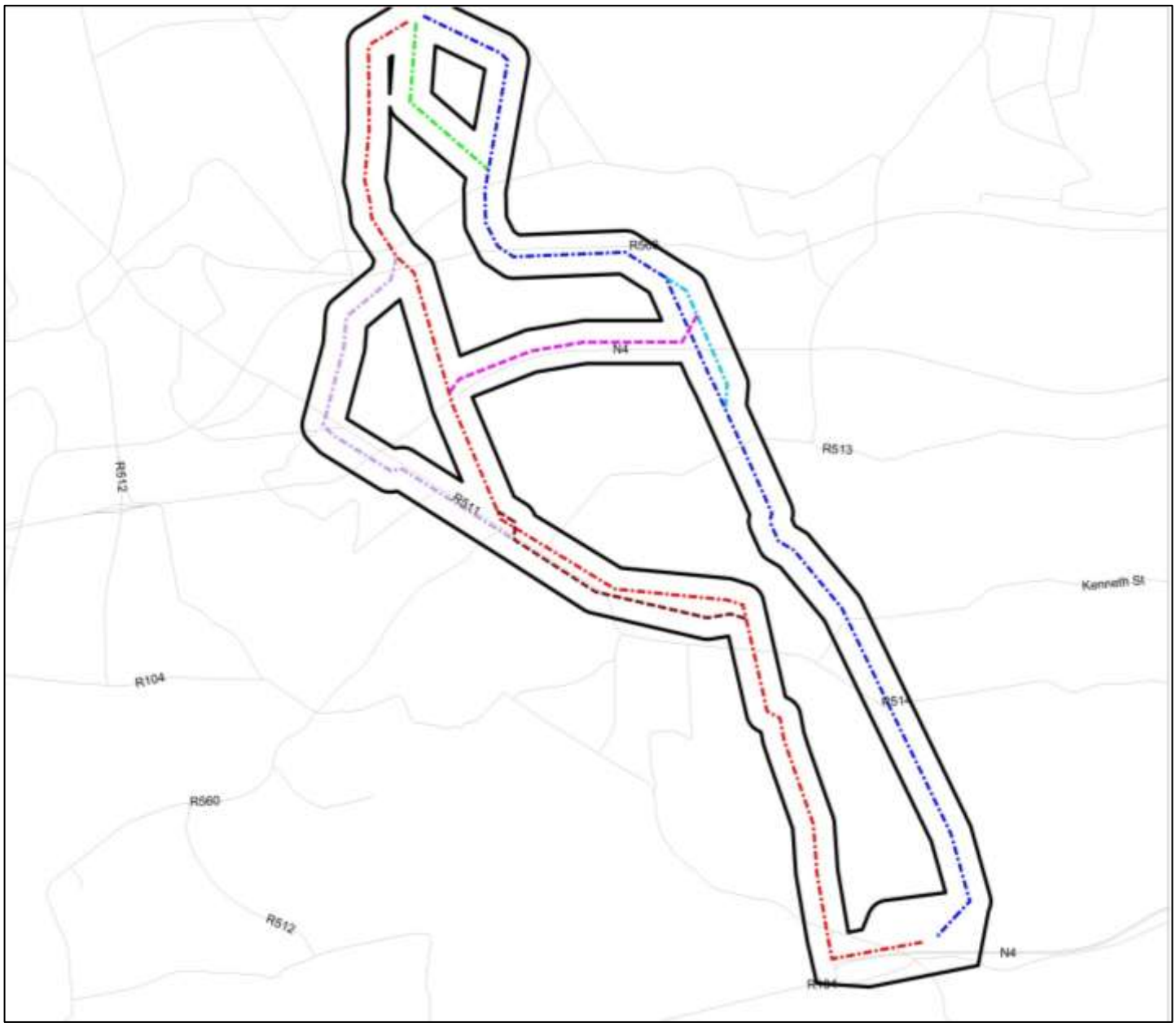

Figure 60: Map showing the major traffic routes

9.14 Socio-Economic Environment (Munshi, 2012)

9.14.1 Regional Description

9.14.1.1 North West Province

The Madibeng Local Municipality is located within the North West Province. The total population number of the North West Province is estimated at 3.043 million. The North West Province is home to 9.5% of South Africa's total population and has four district municipalities and twenty one local municipalities.

9.14.1.2 Gauteng Province

The City of Tshwanelocal municipality is located within the Gauteng Province, which is bounded to the north by the Limpopo Province; to the south by the Vaal River, which separates it from the Free State Province; to the east by the Mpumalanga Province and to the west by the North West Province.

The Gauteng Province is the smallest province in South Africa, with only 1.4% of the land area. The Gauteng Province covers an area of 16 548 km2. The province is highly urbanised containing the cities of Johannesburg and Pretoria. Although it is South Africa's smallest province, the Gauteng Province has the largest population, in 2007, of nearly 10.5 million, almost 20% of the total South African population.

This province comprises of three metropolitan municipalities and three district municipalities which are further divided into nine local municipalities. In addition, this province is considered the fastest growing province, experiencing a population growth of over 20% between the 1996 and 2001 Censuses. The Gauteng Province is highly urbanised with 97% of its population living in urban centres.

9.14.2 Sub-Place Description

The proposed alternative powerlines and associated 1km study corridor are located within seven (7) sub-places in terms of the Census 2001 data. The sub-places and associated Local Municipality and Province are provided in the Table below (Table 28):

Table 28: Affected Sub-Places in terms of Census 2010

Sub-Place	Local Municipal Area	Province	Powerline Alternative Traversing the Sub-Place

Sub-Place	Local Municipal Area	Province	Powerline Alternative Traversing the Sub-Place
Brits NU	Madibeng Local Municipality	North West	All alternatives
Rankotia	Madibeng Local Municipality	North West	Eastern Route Alternative
Ga-Rankuwa SP	Madibeng Local Municipality	North West	Eastern Route Alternative
Mothutlung	Madibeng Local Municipality	North West	Eastern Route Alternative
Pretoria NU	City of Tshwane Local Municipality	North West	Eastern Route Alternative
Magalies Nature Reserve SP	Madibeng Local Municipality	North West	Western Route Alternative
Damonsville	Madibeng Local Municipality	North West	Western Route Alternative

Census data on each of these Sub-Places was used to describe the social and economic conditions of the study area.

9.14.3 Social Issues

The population in the study area totals 20 710. The Brits NU has the largest population of 12 188 while Ga-Rankuwa only has four persons.

Table 29: Population figures for the study area (Statistics South Africa, 2001)

Sub Place	Total
Mothotlung	2 727
Rankotia	144
Damonsville	415
Ga-Rankuwa	4
Brits NU	12 188
Magliesburg Nature Reserve	114
Pretoria NU	5 118
Total	**20 710**

Unemployment rates in some of the sub-places are quite high and influx of job seekers and workers could create a negative attitude under the unemployed community.

9.14.4 Economic Issues

The map below indicates the type of land use that occurs in the study. Please note that these are indicative locations of economic activity found:

- Commercial activity - Pink
- Tourism - Blue
- Agriculture - Green
- Mining - Grey
- Industrial - Yellow
- Residential - Orange

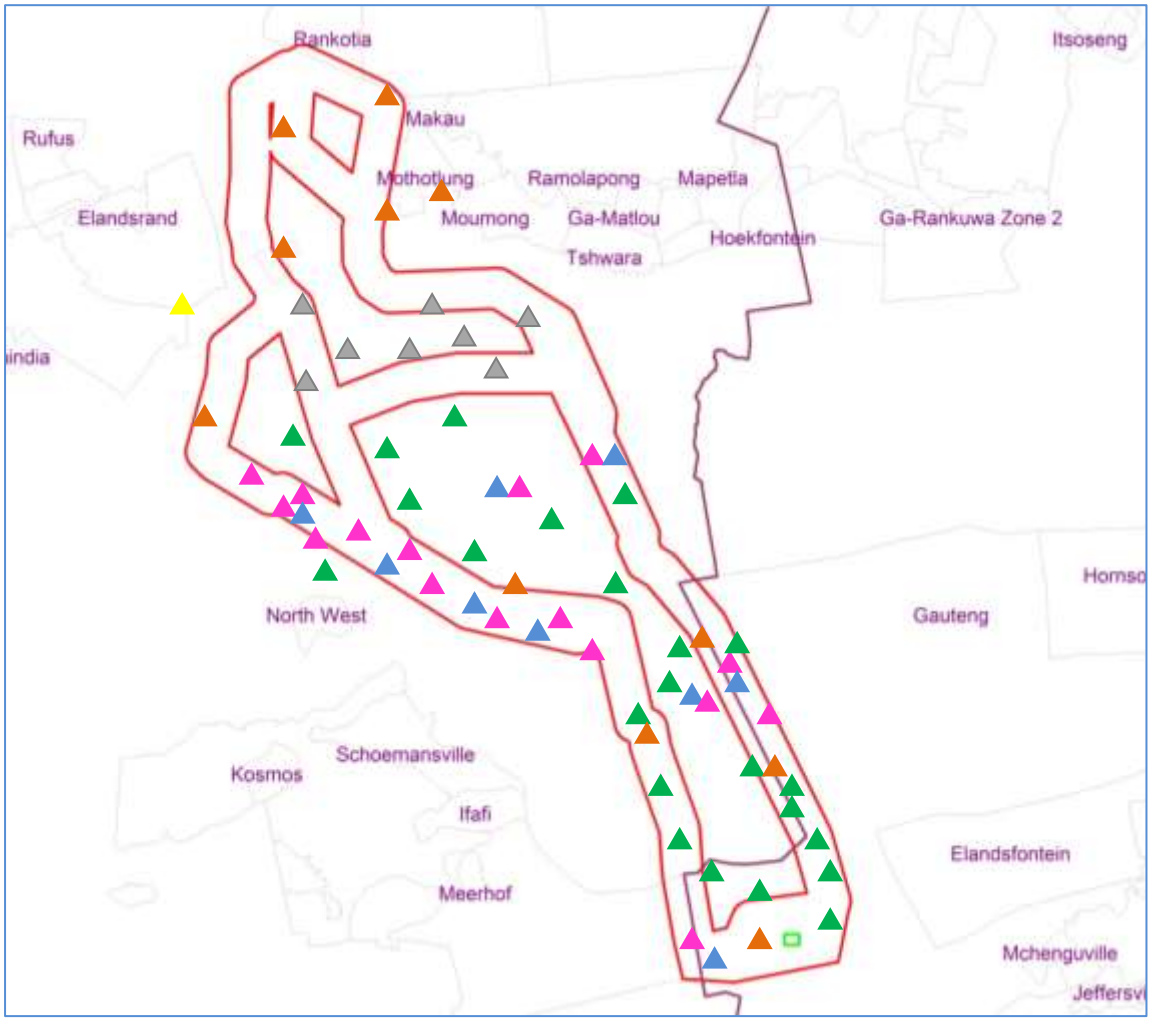

Figure 61: Land Use Map

The key economic activity of North West Province is mining. This economic activity generates more than half of the North West Province gross domestic product and provides jobs for more than a quarter of the workforce. The main minerals are gold, mined at Orkney and Klerksdorp; uranium, mined at Klerksdorp; platinum, mined at Rustenburg and Brits; and diamonds, mined at Lichtenburg,

Christiana, and Bloemhof. The northern and western parts of the North West Province are characterised by sheep farming and cattle and game ranches. The eastern and southern parts of the North West Province, including the study area, are characterised by crop-growing regions producing maize, sunflowers, tobacco, cotton and citrus fruits.

The key economic activities of the Gauteng Province are financial and business services, logistics and communications, and mining. Gauteng is the financial capital of Africa and is home to a high number of foreign and South African banks; stockbrokers and insurance corporations.

9.15 Infrastructure and Services

9.15.1 Regional Description

In terms of the North West State of the Environment Report, infrastructure in the Province is described as being relatively good. Infrastructure in the Province includes a road and rail network, air transport, post and telecommunication, electricity and bulk water supply. Major infrastructure issues in the province include development and delivery of infrastructure services to areas that did not have such infrastructure in the past. The Province has inherited a considerable amount of backlogs in meeting basic infrastructure delivery standards.

9.15.2 Site Description

Exiting roads, railway lines, telecommunication infrastructure and a few centre pivots occur within the study area which the proposed powerline will traverse.

9.16 Archaeology and Cultural Historical

9.16.1 Regional Description

Many important cultural heritage sites occur within the North West Province. These sites includes well represented Stone Age and Iron Age sites, including the Kruger Cave; the Bosworth Rock Engraving site, Thaba Sione near Mafikeng and the stone-walled settlement of Kaditshwene in the Madikwe area. Furthermore, battlefields from the South African War occur in this province such as the Battle of Silikaatsnek (1900), and a number of forts, graves and blockhouses from this period also occur within the province. A small portion of the Cradle of Humankind World Heritage Site (COHWHS) is located within the province. The condition of the known cultural heritage resources found within North West Province is considered to be relatively good.

Various important cultural assets are found within the City of Tshwane area, and some of these places are of high archaeological value. The Schurveberg area in the Centurion area has many valuable cultural and historical assets, which could be restored and conserved. Another important cultural asset in the study area includes the Tswaing Crater. Furthermore the section of the Magaliesberg in the Crocodile River area has a rich settlement history from the time of Mzilikasi, and British stone blockhouses occur within this area which dates back from the Boer war.

9.16.2 Site Description (Marais-Botes, 2011)

Based on the regional/provincial description it is clear that many areas of cultural and historical value occur in the province.

There are a few structures scattered in the study area older than 60 years. But none of these structures are of a particular cultural significance. The main types and ranges of heritage resources that were identified in the greater study area were:

- Graves
- Structures
- Historic Trees

The following heritage sites that are protected by legislation were idenitifed along the Eastern and Western Routes:

Table 30: List of Heritage Sites along the Western and Eastern Routes

Western Route	Eastern Route
• Rietfontein Pinoeer Dwelling and Cemetry • Silkaatsnek Anglo-Boer War Sites • Military Cemetry and 4 Outlaying Graves (Ifafi) • Old Mine Schurveberg • Vredesboom (Peace Treaty Tree) • Skurweberg	• De Wildt Tree • Margaret Roberts Herb Centre • Jo Roos Studio

10 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. According to Minster of Environmental Affairs (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 necessary specialist studies triggered by the findings of the Anderson-Dinaledi 400kV Scoping process, aimed at addressing the identified key issues and compliance with legal obligations, include the following:

- Ecological Study (termed Faunal, Floral and Avifaunal Ecological Surveys);
- Invertebrate Impact Assessment;
- Herpetological Impact Assessment;
- Heritage Impact Assessment;
- Agricultural Potential Assessment;
- Visual Impact Assessment; and
- Socio-economic Assessment.

For the inclusion of the findings of the specialist studies into the EIA report, the following guideline was used: *Guideline for the review of specialist input in EIA processes* (Keatimilwe & Ashton, 2005). Key considerations included:

- Ensuring that the specialists have adequately addressed any potential issues;
- Ensuring that the specialists' input is relevant, appropriate and unambiguous; and
- Verifying that information regarding the receiving ecological, social and economic environment has been accurately reflected and considered.

The information obtained from the respective specialist studies was incorporated into the EIA report in the following manner:

- The information was used to complete the description of the receiving environment (**Section 9**) in a more detailed and site-specific manner;
- A summary of each specialist study is contained in the sub-sections to follow, focusing on the approach to the study, key findings and conclusions drawn;
- The evaluations performed by the specialists on the alternative routes were included in the comparative analysis (**Section 12**) to identify the most favourable option;
- The specialists' impacts assessment, and the identified mitigation measures, were included in the overall project impact assessment contained in **Section 11**; and

- Salient recommendations made by the specialists were taken forward to the final EIA Conclusions and Recommendations (**Section 14**).

10.1 Fauna, Flora and Avifauna Survey

Details of the nominated specialist:

Specialist	
Organisation:	Nemai Consulting
Name:	Ronald Phamphe
Qualifications:	MSc Botany
No. of years experience:	8
Affiliation (if applicable):	**Professional Member** of South African Institute of Ecologists and Environmental Scientists **Candidate Natural Scientist**: South African Council for Natural Scientific Professions **Professional Member**: South African Association of Botanists.

This section provides a summary of the Fauna and Flora Surveys for the Anderson-Dinaledi 400kV power line project, as undertaken by Ronald Phamphe (2012), which is contained in ***Appendix D1***.

Flora and Fauna surveys were carried out in October 2010, February 2011 and August 2012 to determine the impacts of the proposed construction of a new 400kV Transmission Line as part of Eskom's Tshwane Strengthening Scheme Project. The proposed transmission line will be constructed in Madibeng Local Municipality (North West) and the City of Tshwane Metropolitan Municipality (Gauteng Province). During the field surveys, it was observed that the majority of the survey area (with the exception of Magaliesberg Protected Natural Environment (MPNE)) had been transformed through agriculture, formal settlements and other forms of infrastructure development, such as powerlines, roads and Telkom lines. The three alternative routes (Eastern, Western and Central) incorporate habitat units that would support a variety of both floral and faunal biodiversity, particularly along the MPNE and riparian habitats.

According to North West State of Environment Report (2002), the North West Province encloses the Grassland Biome and the Savanna Biome. The study area falls within the following vegetation types: Andesite Mountain Bushveld; Gauteng Shale Mountain Bushveld; Gold Reef Mountain Bushveld; Marikana Thornveld; Moot Plains Bushveld and Norite Koppies Bushveld. Magaliesberg Pretoria Mountain Bushveld, Marikana Bushveld and Witwatersberg Pretoria Mountain Bushveld are listed as threatened terrestrial ecosystems occurring on site.

The proposed transmission lines will traverse the Magaliesberg mountain range, which is a unique mountain range of great ecological, geological and cultural importance and value. In order to preserve this unique area, a section of the Magaliesberg was proclaimed a Protected Natural Environment (PNE) in Administrator's Notice 126 of 4 May 1994 in accordance with section 16 of the Environment Conservation Act, 1989 (Act 73 of 1989). The two provincial departments responsible for controlling and managing the MPNE are the North West Department of Agriculture, Conservation and Environment (NW-DACE) and Gauteng Department of Agriculture, and Rural development (GDARD).

Two Red Data plant species, *Hypoxis hemerocallidea* (Star-flower or African potato) and *Boophane disticha* (Sore-eye flower) were observed in abundance on the study area. These species are listed as Declining and will have to be relocated to another area of the same habitat during construction. GDARD has developed a Plant and Rescue Policy which deals specifically with the management of Orange listed species and medicinal plants and this policy should be adopted during the construction of the transmission line. Exotic plant species *Melia azedarach* (Syringa trees), *Lantana camara* (Common lantana) and *Solanum mauritianum* (Bugweed) were common on the study area. Invader and weed species must be controlled to prevent further infestation and it is recommended that all individuals of the invader species be eradicated.

According to National Forests Act 1998 (Act No 84 of 1998), the protected trees that have a geographical distribution that includes the study area are *Acacia erioloba, Boscia albitrunca, Combretum imberbe, Pittosporum viridiflorum, Prunus africana* and *Sclerocarya birrea* subsp *caffra*. Only one protected tree was recorded (*Sclerocarya birrea* subsp *caffra).* Under the Act, *"No person may (a) cut, disturb, damage, destroy or remove any protected tree; or (b) collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, except under a license granted by the Minister."* The Act does not distinguish between dead and live trees, and so removal of dead wood is also against the law.

Mammals are sensitive to disturbances and habitat destruction and degradation. As such more mammal species would occur on or near the MPNE than near the residential areas. Thirteen mammals were recorded in the study area and records of certain species including Black-backed Jackal and Honey Badger were based on anecdotal information provided by the land owners of affected properties. No sensitive or endangered mammals were visually recorded during the site visits.

In terms of avifauna, the study area falls within the Magaliesberg and Witwatersberg (ZA018) Important Bird Area (IBA). IBAs form a network of sites, at a biogeographic scale, which are critical for the long-term viability of naturally occurring bird populations. The MPNE provides a suitable habitat for Red data bird species that are known to occur in the area. Cape Vultures and eagles are known to occur in the MPNE.

Of the three proposed routes, the Eastern route is regarded as the route alternative that would pose the greatest threat to the overall biodiversity of the area during construction of the proposed transmission line as it traverses through the sensitive areas such as MPNE, and the number of Orange Listed plant species recorded on this route were higher than the other route alternatives. **The preferred route in terms of flora and fauna sensitivity would be the Western route-Western deviation,** as most parts of the route are along the main road and existing powerline and are considered less sensitive than the alternative routes in terms of biodiversity. Resident birds in an area become accustomed to a power line that crosses their flight paths, and learn to avoid it during their everyday activities and hence adding a new power line adjacent to an exisiting line would probably have less impact than putting it in totally new area, where the resident birds are not yet accustomed to overhead lines.The use of existing degraded habitat is preferable and habitat units known to be highly productive in supporting breeding, foraging and roosting sites, such as wetlands and ridges should be avoided.

10.2 Invertebrate Assessment

Details of the nominated specialist:

Specialist	
Organisation:	Endangered Wildlife Trust
Name:	Mr Vincent van der Merwe
Qualifications:	BSc Entomology (UP), BSc (Hons) Zoology (UP), MSc Conservation Biology (UCT)
No. of years experience:	7 years
Affiliation (if applicable):	Endangered Wildlife Trust, Percy FitzPatrick Institute of Ornithology, Scarab Research Unit, Lepidopterists Society

This section provides a summary of the Invertebrate Impact Assessment for the Anderson-Dinaledi 400kV power line project, as undertaken by Mr Vincent van der Merwe (2012), which is contained in ***Appendix D2***

An invertebrate impact assessment for the proposed Anderson-Dinaledi 400kV transmission line was carried out in accordance with regulations stated in *DEAT (2005) Guideline 3: General Guide to the Environmental Impact Assessment Regulations, 2005, Integrated Environmental Management Guideline Series, Department of Environmental Affairs and Tourism (DEAT), Pretoria.*

The aim of this report was to provide the client with a description of potential status of Red Data Invertebrate species and habitat that could be potentially suitable for their presence along the alternative routes for the proposed 40km Anderson-Dinaledi transmission line and to recommend a preferred route from the 7 alternative routes identified for the proposed transmission line.

The proposed transmission line will traverse land currently utilised for mining, conservation, tourism, commercial, recreational and residential purposes, as well as vacant land. Results obtained from the sensitivity scan are considered sufficient to highlight sensitive habitat types and potential Red Data habitat. None of the eight invertebrate species of conservation concern known to occur in the vicinity of the site were observed during site visits. It must however be mentioned that surveys were not carried out during the known flight period of *Trichocephala brincki* and *Acraea machequena*. Although *Lepidochrysops praeterita* is known to be on the wing from early September, there is a possibility that this species may have emerged after the time of surveying. The sensitivity scan was conducted just before and just after the first spring rains. Initial site visits were carried out during a very dry time of the year when invertebrate activity is greatly reduced. Follow up surveys are recommended in late October 2012 in order to confidently establish the absence of *Trichocephala brincki, Lepidochrysops praeterita* and *Lepidochrysops hypopolia*. Additional surveys are also recommended in late summer to confidently establish the absence of *Acraea machequena* from area that the transmission line will traverse.

The site was visited on the 25th of August 2012 by Vincent van der Merwe and Clayton Cook. Follow up site visits were carried out on the 8th, 9th and 10th of September by Vincent van der Merwe. The proposed transmission line will traverse two mountainous areas (Magaliesberg and Witwatersberg) that have not been heavily impacted by anthropogenic activities and are in a largely natural state. There is a strong possibility that invertebrate species of conservation concern are present in these natural areas. There are a large number of Norite koppies in the close vicinity of the existing Dinaledi substation. Although heavily impacted by granite mining, these koppies may constitute suitable habitat for the presence of invertebrate species of conservation concern.

It is recommended that the transmission line follow the Western route. The possible southern, eastern or western deviations do not need to be followed. The main reason for the recommendation is that this route has been most impacted by anthropogenic activities. The establishment of a transmission line along a route heavily impacted by the development of roads and existing powerlines will have reduced impact on invertebrate diversity compared to its establishment along a route that has been considerably less impacted by anthropogenic activities. The existing Lomondt De Wildt 88kV line (with a servitude of 22m) that traverses the eastern route will be decommissioned by Eskom in 2014. Relatively natural areas currently traversed by these powerlines could then return to a healthier level of ecosystem functioning with reduced anthropogenic disturbance. It is preferable to have multiple transmission lines following a single route rather than several transmission lines following several routes. This makes sense from an environmental and a transmission line maintenance point of view. Environmental disturbance could then be focused in the same areas rather than disturbance along multiple routes. The western route also traverses less natural Marikana Thornveld, the most threatened vegetation type transverse by the alternative routes.

10.3 Herpetological Assessment

Details of the nominated specialist:

Specialist	
Organisation:	N/A
Name:	Mr Clayton Cook
Qualifications:	MSc. Zool. U.P
No. of years experience:	15
Affiliation (if applicable):	Registered professional member of The South African Council for Natural Scientific Professions (Zoological Science), registration number 400084/04

This section provides a summary of the Herpetological Impact Assessment for the Anderson-Dinaledi 400kV power line project, as undertaken by Mr Clayton Cook (2012), which is contained in ***Appendix D3***.

Eskom Holdings Limited is proposing the construction of a new 400kV Transmission Line as part of their Tshwane Strengthening Scheme Project. The proposed powerline will be approximately 40km in length and will run between the proposed new Anderson Substation, which will be located to the north of the N4 highway), located in Flora Park, to the existing Dinaledi Substation which is located approximately 8km North East of Brits. The proposed powerline will be constructed in the following two Municipal Areas: Madibeng Local Municipality (North West) and the City of Tshwane Metropolitan Municipality (Gauteng Province).

The Dinaledi Substation is located on Portion 843 of the Farm Roodekopjes of Zwartkopjes 427 JQ, which is located approximately 8km North East of Brits. Three alternative powerline routes have been identified for the proposed transmission lines. A 1km buffer area has been placed around each alternative route, which will form the study area/corridor to be investigated. According to Mucina and Rutherford (2006), the North West Province encloses two major biomes, viz. the Grassland Biome and the Savanna Biome. The study area falls within the following vegetation types, namely Andesite Mountain Bushveld, Gauteng Shale Mountain Bushveld, Gold Reef Mountain Bushveld, Marikana Thornveld, Moot Plains Bushveld, and Norite Koppies Bushveld.

The proposed transmission lines will traverse through the Magaliesberg mountain range, which is a very unique mountain range of great ecological, geological and cultural importance and value. In order to preserve this uniqueness of the mountain, a section of the Magaliesberg was proclaimed a Protected Natural Environment (PNE) in Administrator's Notice 126 of 4 May 1994 in accordance with section 16 of the Environment Conservation Act, 1989 (Act 73 of 1989) and the two provincial departments responsible for controlling and managing the MPNE are the North West Department of Agriculture, Conservation and Environment (NW-DACE) and Gauteng Department of Agriculture, and Rural development (GDARD).

The preliminary herpetological survey/ habitat assessment focused on the description of the available and sensitive habitats along the proposed Anderson-Dinaledi 400kV Transmission Line alternatives as well as new Anderson substation; with special reference to the current status of threatened amphibian and reptile species occurring, or likely to utilize the areas within and surrounding the proposed alignment. It must be stressed that no actual amphibian or reptile surveys were conducted due incorrect timing of survey (late winter months August). Access was also restricted due to several fenced off private properties.

According to the Southern African Frog Atlas Project (SAFAP) fourteen frog species have been recorded for the combined locus 2527DB and 2527DD quarter degree grid squares. Giant Bullfrogs have been recorded around the Magaliesburg-Brits area during the South African Frog Atlas Project as well as by the consultant. The majority of records are of road fatalities of migrating or dispersing males. There is a high occurrence of suitable habitat for Giant Bullfrogs in North-west Province and although they appear to be relatively abundant in the province; the Giant Bullfrog is severely impacted on by the degradation of the wetland habitat in the province. The Giant Bullfrog (*Pyxicephalus adspersus*) is a protected frog species whose conservation status is currently listed as **"near threatened"** (Minter et al. 2004 cited in Cook, 2012).

AMPHIBIANS

No major breeding habitats ((hydrophilic grass and sedge dominated seasonal pans) of Giant Bullfrogs were observed along the proposed Anderson-Dinaledi 400kV Transmission Line alternatives. The majority of the wetland habitats along the alternative alignments are artificially created dams. These dams offer marginally suitable breeding habitat for Giant Bullfrogs in the form of the shallow seasonally inundated margins but often contain permanent fish predators which restrict the breeding success). The open thornveld and grassland plains with several termite mounds offer suitable foraging as well as dispersal areas for remaining Giant Bullfrogs The alluvial sand deposits along certain sections of the servitude have soft sandy soils suitable for burrowing and aestivation. Burrowing generally takes place some distance away from the breeding site with females travelling further to burrow (up to 1km).

REPTILES

Southern African Python (*Python natalensis*)

Southern African Pythons have been recorded from the Magaliesburg Protected Natural Environment (MPNE). The granitic outcrops to the north of the Magaliesburg offers favorable habitat for Southern African Pythons in the form of the rocky mountainous areas, wetland habitats as well as open and closed woodland vegetation units. The present granite mining activities as well as surrounding human settlements severely restricts the likelihood of significant populations remaining. Several private properties and farms have electric fences with low-lying strands approximately 15cm from the ground which severely restricts the likelihood of any large adult pythons on the site.

No Southern African Pythons or evidence of pythons was observed during the brief field survey. Remaining Python populations would have been impacted on during the previous agricultural activities. According to the information provided by a landowner, a python was recorded two years ago at the Farm Rietfontein 484 JQ. The python was unfortunately killed. As a precautionary measure an educational programme on

Southern African Pythons should be implemented for all staff and contractors working on the project. If any pythons are discovered on the site during construction activities the relevant conservation authorities should be informed and the python relocated in suitable habitat away from the site (Magaliesburg Protected Natural Environment (MPNE).

Striped Harlequin Snake (*Homoroselaps dorsalis*)

The Striped Harlequin Snake (*Homoroselaps dorsalis*), which is categorised as Rare in the outdated Red Data List (Branch 1988) has been recorded from the grid squares in which the alignments are situated (SARCA). According to the habitat description (moribund/old termite mounds and scattered loose rock) provided for this species by Broadley (1990) and Branch (1988) (cited in Cook 2012); suitable habitat exists in the form of moribund termite mounds along the alignment as well as loosely embedded rocks on the mid to lower slopes on the Magaliesburg for the Striped Harlequin Snake.

All large and especially moribund or abandoned termite mounds and any major rocky outcrops should ideally be conserved. This is especially pertinent during the construction phase. The towers should ideally be erected away from any rocky outcrops or moribund termite mounds. If however any moribund termite mounds have to be destroyed; a rescue and relocation project should be implemented for any termite mounds and loosely embedded rocky material in the areas proposed for the towers or access roads. This is especially pertinent for the towers on the grassy hills where termite mounds and rock outcrops remain. Specimens discovered can be relocated away from the disturbances as well as increasing the information basis of what reptile species are utilising the moribund termite mounds along the alignment.

Blunt-tailed Worm Lizard (*Dalophium pistillum*)

By far the largest local worm lizard with a broad horizontal ‘spade’ that is covered by a single horny shield. Only known for a few localities in South Africa near Vryheid in the Northern Cape Province and between Vaalwater and the Waterberg in Limpopo Province (Branch 1988). A fossorial species occurring in varied habitats from Kalahari Sand to coastal alluvium. As minimal soil disturbances should occur mainly around the pylons no significant impact is expected on any Blunt-tailed Worm Lizard populations.

Nile Crocodile (*Crocodylus niloticus*)

Although Nile Crocodiles (*Crocodylus niloticus*) historically (in the early 19th century) occurred in abundance in the rivers around Magaliesburg; none remain today. Crocodile farms are however growing in popularity (Carruthers 1990, cited in Cook 2012).

Preferred Alignment

During the preliminary herpetological habitat assessment or sensitivity scan the majority of habitats and vegetation along the proposed western alignment; except for the Magaliesburg Natural Protected Environment and a few scattered granitic hills and outcrops; has been transformed through agriculture, formal settlements and other forms of infrastructure development, such as powerlines, roads (R511) and Telkom lines. The Eastern route is regarded as the route alternative that would pose the great threat to the

overall biodiversity of the area during construction of the proposed transmission line as it traverses through the sensitive areas (rocky cliffs) of the Magaliesburg Natural Protected Environment, Wonderboom Municipal Nature reserve. **It is recommended that the transmission line follow the Western route.** The southern, eastern or western deviations will not ameliorate any potential impacts on the herpetofauna. The main reason for the recommendation of the western alignment is that there are existing powerlines along the majority of the proposed alignment and higher levels of anthropogenic disturbances along this route. The establishment of new transmission line servitudes along a formerly undisturbed area will have greater impact on herpetofauna diversity than if following adjacent to existing servitudes. From an ecological perspective the Western route is considerably more degraded than the Eastern route. The Western route also traverses less natural Marikana Thornveld, the most threatened vegetation type transverse than the alternative alignments.

General Faunal Mitigatory Measures

The construction of the proposed Anderson-Dinaledi 400kV Transmission line will most likely result in limited opening-up of the vegetal cover during the construction phase. The opening up of existing vegetated areas, thereby creating corridors along which animals can move, may result in increased predation levels on small mammals, reptiles, amphibians, arachnids and scorpions along these corridors. The limitation of the disturbance of vegetation cover as well as rocky outcrops, logs, stumps, termite mounds within sensitive areas will ameliorate this impact. Impact will be short-long term depending on the amount of vegetation to be cleared. Excessive habitat destruction during construction could reduce the amount of habitat available. This impact is anticipated to be localised, of a long-term nature and of low significance, provided that appropriate mitigation measures are implemented (e.g. the limitation of vegetation clearance within sensitive areas). Prior to construction and vegetation clearance a suitably qualified zoologist (herpetologist) should undertake a walk-through of the preferred alignment and closely examine the proposed tower/pylon construction areas (concrete supports) for the presence of any animal burrows (including spiders and scorpions), rocky outcrops, logs, stumps and other debris and relocate any affected animals to appropriate habitat away from the servitude or tower.

10.4 Visual Impact Assessment

Details of the nominated specialist:

Specialist	
Organisation:	Axis Landscape Architect

Organisation:	i-Scape
Name:	Mr Mader van den Berg
Qualifications:	Masters in Landscape Architecture (University of Pta)
No. of years experience:	7 years
Affiliation (if applicable):	N/A

This section provides a summary of the Visual Impact Assessment for the Anderson-Dinaledi 400kV power line project, as undertaken by Axis Landscape Architect (2011), which is contained in ***Appendix D4***. An addendum was undertaken to assess the amended transmission line route) as undertaken by Mr Mader van den Berg (2012) contained in ***Appendix D4.***

Three alternative alignments have been proposed to connect to the two substations. The proposed alignments stretch over approximately 40km. The study area contains the extent of the alignments and includes an approximate 5 km buffer area around the alignments.

The following project components will occur during the construction and operational phases of the project and are identified as elements that may cause a potential landscape and/or visual impact:

- Construction camps and lay-down yards;
- Access roads; and
- Transmission line.

Of the three project components, the towers of the transmission line and the substation are expected to cause the greatest impacts.

Study Area

The area is characterised by a rolling, undulating landscape with high topographic variation. Drainage lines meander through to the study area and cause shallow incisions where it meets up with rivers. The study area is characterised by the Hartebeestpoort dam, the surrounding Magaliesberg Mountains with a rolling, undulating landscape with high topographic variation. Drainage lines meander through to the study area and cause shallow incisions where it meets up with rivers.

The study area consists of cultivated, residential areas, subsistence farming and mining. Extensive mining and farming is located more to the northern side of the study area with scattered farms in the central parts and southern parts. Residential development activities are more intense from the central to southern side of

the study area where the cultural homelands is located. Human settlements are scattered throughout the study area and the landscape is degraded around these settlements.

The majority of the study area is considered to have a moderate landscape character sensitivity due to the relative undeveloped and high topographic variation of the landscape, the generally high visual quality and the related tourism value that is placed on the visual resource. High terrain variability occurs through of the study area where a moderate VAC can be expected. Generally the vegetation varies from medium to low shrubs and trees covers which will provide visual screening for the proposed transmission line.
The landscape character is considered moderately susceptible to change, whether it is a low intensity change over an extensive area or an acute change over a limited area. Generally, the vegetation occurring in the study area is resilient and recovers very quickly from surface disturbances.

Previous human induced activities and interventions have negatively impacted the original landscape character of the different landscape types. In this case the mines and existing infrastructure, including transmission lines, roads, etc., can be classified as landscape disturbances and elements that cause a reduction in the condition of the affected landscape type and detrimentally affect the quality of the visual resource.

Potential Impacts

The two alternative routes and their deviations have been evaluated against international accepted criteria to determine the impact they will have on the landscape character and the viewers that have been identified in the study area.

Landscape impacts: The greatest landscape impact of the proposed alignments is in the construction phase on sensitive landscape types. The operational phase is characterised by a moderate landscape impact on a regional scale on the proposed alignments.

Impacts on residents: The severity can be reduced in both the construction and operational phases through mitigation measures.

Impacts on tourists: The tourism value for the study area is very high. Both the construction and operational phases are characterised with a moderate visual impact reduced to low with mitigation.

Impacts on motorist: Low impacts on motorists are expected in both the construction and operational phases.

The Routes are rated according to preference by using a two-point rating system, one (1) being the most preferred, to two (2) being the least preferred. The deviations of the Routes will be rated as a, b or c where (a) being the most preferred. The preference rating is informed by the impact assessment discussions in

Section 5 and the overall performance of each alternative with regards to the impact on the landscape character and the identified viewers.

Evaluation of alternative alignments

ALTERNATIVES	PREFERENCE RATING
Eastern Route	1
Eastern Route Deviation	a
Central Route	b
Western Route	2
Western Route Deviation 1 (Western Deviation)	a
Western Route Deviation 2 (Eastern Deviation)	c
Western Route Deviation 3 (Southern Deviation)	b

The Eastern Route is regarded as the most preferred alternative. Its location and position in the landscape is considered to cause the least impact on the landscape character due to the reduced sensitivity of the landscape along the servitudes and the local roads. The impact of the Eastern Route on visual receptors varies between residents, tourists and motorists. The Eastern Route's great advantage lies in the less significant landscape and visual impact on motorists and residents as compared to the other alternatives.

Recommended Mitigation Measures

In most cases, the landscape and visual impacts occurring during the construction phase can be mitigated relatively effectively. Rehabilitation of the disturbed areas will prevent the exposure of soil, which may cause a reduction in the visual quality of the study area. Sensitive positioning of the construction camps and lay-down yards should take advantage of the natural screening capacity of the study area by locating the camps outside of the views of sensitive visual receptors. The proposed alignments traverse landscapes with a moderate VAC. Little or no screening will be provided by the landscape types through which the above mentioned alignment cross.

10.5 Socio-Economic Impact Assessment

Details of the nominated specialist:

Specialist	
Organisation:	Nemai Consulting
Name:	Sameera Munshi
Qualifications:	Nemai Consulting
No. of years experience:	2 years
Affiliation (if applicable):	N/A

This section provides a summary of the Socio-Economic Assessment for the Anderson-Dinaledi 400kV power line project, as undertaken by Sameera Munshi (2012), which is contained in ***Appendix D5***.

A socio-economic assessment was undertaken to determine the potential impacts that may occur as a result of the 400kV Anderson-Dinaledi Transmission lines.

The proposed power line will be approximately 40km in length and will run between the proposed Anderson Substation, which is located on Portions 82, 83 and 76 of Farms Schurveberg 488 JQ in the City of Tshwane Metropolitan Municipality to the existing Dinaledi Substation. The proposed power line will be constructed in the following two Municipal Areas: Madibeng Local Municipality, North West and City of Tshwane Metropolitan Municipality, Gauteng.

The Madibeng Local Municipality, which houses the Dinaledi MTS, is found in the North West Province. The total population number of the North West Province is estimated at 3.043 million. The North West Province is home to 9.5% of South Africa's total population. The North West Province has four district municipalities and twenty one local municipalities.

The City of Tshwane Metropolitan Municipality, which is to house the new proposed Anderson Substation is found in Gauteng Province. The Gauteng Province is bounded to the north by the Limpopo Province; to the south by the Vaal River, which separates it from the Free State Province; to the east by the Mpumalanga Province and to the west by the North West Province.

The Gauteng Province is the smallest province in South Africa, with only 1.4% of the land area. The Gauteng Province covers an area of 16 548 km2. The province is highly urbanised containing the cities of Johannesburg and Pretoria. Although it is South Africa’s smallest province, the Gauteng Province has the largest population, in 2007, of nearly 10.5 million, almost 20% of the total South African population. The Gauteng Province comprises of three metropolitan municipalities and three district municipalities which are further divided into nine local municipalities.

The Gauteng Province is considered the fastest growing province, experiencing a population growth of over 20% between the 1996 and 2001 Censuses. The Gauteng Province is highly urbanised with 97% of its population living in urban centres.

The study area is made up of the following land uses:

- Commercial activities;
- Tourism;
- Agriculture;
- Mining;
- Industrial; and
- Residential.

The land use for the area is for the most part dominated by agriculture. This is particularly evident in along the eastern route. Along the main roads there are commercial activity, thus the R511 Western Route South Alternative is mostly dominated by commercial activity.

Economic Impacts

There is likely to be a short term increase in economic activity as a result of the transmission line. Through the employment of local labour, skills and knowledge transfer is likely to take place which can increase the employability of these workers. Employment will also increase the income of households and capacity to be more productive.

Visual, Tourism and Leisure Impacts

The tourism and leisure attractions in the Hartbeespoort area are well established. The mountains and dam provides opportunity for tourism. A large proportion of the study area is used for conservation, nature reserves, and accommodation and tourism facilities. Thus there is a visual appeal to the land which has been used to generate income.

The impact of having a transmission line in such an environment could result in loss of income. The visual appeal of the land will be negatively impacted by having a transmission line.

Nature Reserves, when associated with tourism and leisure, derives their economic value from offering a glimpse of the natural wonders of the area, with a focus upon viewing game and the ecological habitat.

Transmission lines impact upon the value proposition by bringing modern development to this natural environment, thereby reducing the rural and undeveloped sense of place.

The construction phase can impact negatively through loss of income or reputation as the natural environment is disturbed. Impacts associated with construction crew actions, resulting in the loss of stock or equipment should also be considered.

Land, Value and Servitude Impacts

A servitude of 55m or 27.5m on either side of the centre of the power line will need to be purchased. The purpose of the servitude is to ensure public safety, safe construction, maintenance and operation of the line. Eskom will be entitled to unrestricted access. Negotiation with land owners on access control measures and security issues with regards to locking and unlocking of gates on private properties and damage to fences and gates will need to take place.

The land beneath the overhead lines and within the 55m wide servitude may continue to be used for some activities by the landowners, however, no crops or trees higher than 4m will be allowed along the route, and no structures may be developed underneath the line or within the servitude area.

The proposed power line can negatively impact the development and infrastructure plans for the area. Development within the 55m wide servitude will be restricted. Certain farming and current land use may need to be stopped completely or altered resulting in potential loss of income.

With regards to land values and compensation for the use of a servitude, impacts and mitigation should take into account the following categories of concern:

- the visual impacts on lines;
- maintenance issues during operation;
- multiple lines on a single property;
- larger relative impacts on small properties than on large farms;
- the public relations aspects of Eskom's business; and
- loss of business caused by the servitude.

Loss of Production

The project area is generally rural in nature, with urban and commercial activity increasingly occurring. Land used for agriculture is the most common on the project study area with citrus and maize being farmed. Current farming practices may be disturbed due to the development of the transmission lines. This will be through loss of land available for produce as well as a capital cost on the value of the land. The will be an expected decline in output as agricultural activity in the servitude area will be limited. Thus there is likely to be a loss of potential and existing income.

The biggest lost of productive land is expected to occur during the construction phase of this development. There may an expected removal of all crops within the servitude land for construction and road purposes. Furthermore there is an impact on the way in which agriculture can take place. Transmission lines place a restriction on the types of agriculture that can occur on the land. Thus there is a loss of production capacity.

Agriculture accounts for 36 percent of employment in the area which means that land use has a significant economic impact on production and income generation. Thus the impact on the loss of agricultural land and limitation on agricultural activity is likely to be very significant.

These communities are economically vulnerable and disruption to agricultural production will have disproportionately large impacts on those affected.

Impacts on the Social Environment

The study area has a high population growth rate and is developing rapidly. With the proposed project which is likely to attract workers, this population growth rate may increase and cause further strain on development needs.

When workers come into an area, there is a need to supply municipal services to these workers. The municipality may or may not have the capacity to support a larger number of people. Thus causing strain on social services.

As is common with migrant workers in an area, there may be some social disruption. The relations between locals and new job seekers may not be smooth and lead to conflict in the community.

Workers entering the area will also be competing with locals for employment which may cause tension in the community. Locals and new job seekers will be competing for the same jobs. Thus it is important to deter job seekers and stress on local employment.

Relations between migrant workers and locals can potential cause health problems by rising HIV and AIDS or other sexually transmitted diseases. This is a typically the case when a large number of males enter into an area. Hostel like structures will need to be prevented and awareness campaigns should be conducted.
During construction, the safety and security of labourers around may be at risk when working with transmission lines. Thus effective mitigation measures will need to be in place to avoid loss of life or injury. There safety of farming livestock will also need to be ensured.

Employment and Skills Transfer

There is likely to be a positive impact on employment especially during the construction phase. Construction of the power lines will require labour for building the power lines while the operation phase will require labour for maintenance. Potential secondary employment impacts can result as small business employs more persons to sell goods to labourers.

The project has the potential to positively impact upon household incomes during the construction phase. In the study area, most people are low income earners thus employment of locals will create a positive impact

on local communities who can derive some economic benefit from the project. The project also has the potential to positively impact upon the skills levels in local communities during the construction phase.

This conclusion is valid if the contractor implements skills-based training programmers at the site. Unskilled workers could be taught a skill and achieve a certificate to support the skill. This would provide a degree of assistance with the worker's future search for work and allow the project to leave a lasting legacy on the economic wellbeing of the affected community. Thus if all other aspects are ambivalent about which routing to follow, the employment and skills transfer aspect would dictate which of the routes would most benefit the affected communities. This conclusion is modified by the proviso that the employment and skills impacts are relatively small and short-term in nature and that the populations of all routes would benefit from the employment and skills transfer potential offered by the proposed project.

Comparative Analysis of Routes

	Advantages	Disadvantages	Priority* (1/2/3/4)
Eastern Route	✓ Lowest Cost Alternative ✓ Less economic activity than the western route; ✓ Less tourism and visual impacts; ✓ Impacts on agricultural production able to be mitigated.	• Passes through productive agricultural land; • Higher potential loss of income due to agricultural activities; • Traverse through the Eland Mine should be negotiated with mine owners, this traverse is easier when using the Eastern Route	2
Eastern Route Alt – Central Route Diversion away from Mothutlung	✓ Moves away from potential development near Mothutlung; ✓	• Same as eastern route alternative;	1
Western Route	✓ Easily accessible along the R511; ✓ Avoids large scale agriculturally productive land;	• Highest Cost Alternative • Passes through a more broadly based economy; • Will have a higher impact on residential development; • Difficult to pass through the Eland Mine; • This route has the highest potential impact on tourism and leisure activities.	3
Western Route Alt– Eastern Diversion through Eland Mine	✓ Same as western route alternative;	• Very difficult to pass through the centre of the Eland Mine;	4

Recommended Route

The impacts of the cost of servitude acquisition, the potential disruption to economic and social activity along the Western Route are estimated to be higher than that posed by the Eastern Route.

10.6 Heritage Impact Assessment

Details of the nominated specialists:

Specialists	
Organisation:	N/A
Name:	Leonie Marais-Botes
Qualifications:	BA (Cultural History and Archaeology) (UP), BA (Hons) Cultural History (UP), Post Grad Dip Museology (UP), Conservation of Traditional Buildings Cert. (University of Canberra), Post Grad Dip: Heritage (Wits)
No. of years experience:	17
Affiliation (if applicable):	N/A

Organisation:	Nemai Consulting cc
Name:	Khosi Mngomezulu
Qualifications:	BSc (Hons) Archeology
No. of years experience:	1 year
Affiliation (if applicable):	Member of ASAPA

This section provides a summary of the Heritage Impact Assessment for the Anderson-Dinaledi 400kV power line project, as undertaken by Ms Leonie Marais-Botes (2011), amended in November 2012 which is contained in ***Appendix D6***. An addendum was undertaken to assess the amended transmission line route) as undertaken by Khosi Mngomezulu (2012) (reviewed by Jean Beater) contained in ***Appendix D6***.

Eskom is proposing the construction of a new 400kV Transmission Line as part of their Tshwane Strengthening Scheme Project. The proposed powerline will be approximately 40km in length and will run between the proposed new Anderson Substation, and the existing Dinaledi Substation which is located approximately 8km North East of Brits.

The main town in the greater study area is Brits and the surrounds are well known for citrus, vegetable and grain production. The greater study area is in close proximity to Tshwane. In addition to being a centre for agriculture, the town is home to several heavy industries. The town also plays an important role in the South African mining industry: 94% of South Africa's platinum comes from the Rustenburg and Brits districts. Near to the Eastern Route Garankuwa is situated. The Township of Ga-Rankuwa was founded on communal land in the 1960's as part of the forced removal of the black community from the City of Tshwane. The establishment of this settlement and several others was coupled with the start of the "Border Industrial Area" that was created in the independent state of Bophuthatswana.

A survey was undertaken on 27 February and 1 March 2011. The entire study area was covered with a vehicle. At certain pre-determined points foot surveys were conducted to establish an overall understanding of the study area and the sensitivities associated with it in heritage context. 1:50 000 maps were studied to determine possible sensitive areas previously identified. The initial study took place in late summer, early

autumn. Due to good rainfall the vegetation was dense and visibility limited. In addition a literature and archival search were conducted to find additional and contextual information and in order to establish heritage significance the following method was followed:

- Investigation of primary resources (archival information);
- Investigation of secondary resources (literature and maps);
- Physical evidence (site investigation); and
- Determining Heritage Significance.

The following heritage resources were identified in the greater study area:

- Graves;
- Structures; and
- Historic Trees.

The following heritage sites that are protected by legislation were idenitifed along the Eastern and Western Routes:

Table 31: List of Heritage Sites along the Western and Eastern Routes

Western Route	Eastern Route
• Rietfontein Pinoeer Dwelling and Cemetry • Silkaatsnek Anglo-Boer War Sites • Military Cemetry and 4 Outlaying Graves (Ifafi) • Old Mine Schurveberg • Vredesboom (Peace Treaty Tree) • Skurweberg	• De Wildt Tree • Margaret Roberts Herb Centre • Jo Roos Studio

The specialist has recommended that the Eastern route be followed in terms of heritage significance, if the powerline is kept near existing infrastructure where mitigation is already in place, and then the potential impacts can be reduced. Any potential impact can be mitigated against provided that all recommendations made by the specialist are adhered to.

An addendum to the March 2011 Phase 1 Heritage Impact Assessment for the proposed Dinaledi-Substation to Anderson-Substation 400kV transmission power line was undertaken to update the heritage impact report that was conducted for the proposed transmission power line to the new.

Two site alternatives were originally investigated for the proposed construction of the Anderson Substation. These two site alternatives were located directly to the north of NECSA, in Broederstroom. Due to the sensitivity of the biodiversity the two sites have been changed to one new site for the Anderson substation

that is located in Flora Park. As indicated in figure below, the change made for the amended route is the removal of extended route towards the west that is indicated with the circle.

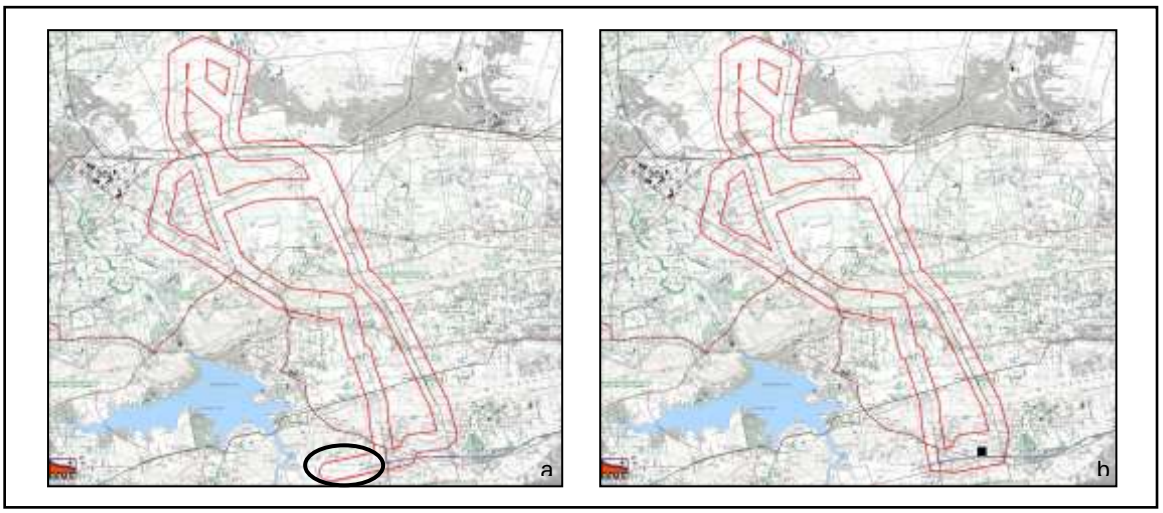

Figure 62: Maps showing the old transmission line (a) and the amended transmission line route (b)

Archaeological material, namely stone tools, as well as at least two graves were found in and around the new Anderson substation. Therefore, scatters of stone tools and graves were found in the southernmost portion of the Dinaledi-Anderson transmission powerline route. It should be noted that a separate HIA was undertaken for the new site for the Anderson substation.

10.7 Soil Survey and Agricultural Potential Study

Details of the nominated specialist:

Specialist	
Organisation:	INDEX
Name:	Dr A Gouws
Qualifications:	PHD – Integrated Agricultural Development
No. of years experience:	33 years
Affiliation (if applicable):	• Registered with the Counsel of Natural Sciences. No: 400036/93 (Agricultural sciences); and • Member of the Soil Science Society of South Africa

This section provides a summary of the Soil Survey and Agricultural Potential Study for the Anderson-Dinaledi 400kV power line project, as undertaken by INDEX (2012), which is contained in ***Appendix D7***.

Index was requested by Nemai Consulting to undertake a desk study to indicate the agricultural potential and land capability for the proposed Anderson - Dinaledi Transmission Line and for the new Anderson Substation.

The central western portion of the study area, just north of the Magaliesberg consists of deep, reddish and vertic soils that is high potential if they can be irrigated. The balance of the land is either too shallow or rocky to cultivate and only suitable as grazing. Approximately 400 hectares is under irrigation, of which 350 is from the Hartbeespoort Dam. All the irrigated land is within the western alignment. According to the guidelines of NDA all irrigated land is considered as high potential land.

Impact rating

- Loss of irrigated land

The impact on loss if irrigated land is difficult if not impossible to mitigate against. The impact therefore is high. The extent of impact is high on Western Route – Western Deviation and Western Route and moderate on C Western Route – Eastern Deviation. It is low in D Central Route and Eastern Route.

- Loss of grazing land:

All routed will equally be influenced. The impact is low.

Recommended Mitigation Measures

For irrigated crops, pivot irrigation may change in favour of less desirable movable pipes and can be costly. If the pylons, however, are placed next to the lands or on road reserves, then the impact will be very small.

The following mitigation measures must be adhered to:

- Keep the footprint during construction as small as possible;
- Maintain security of the sites by appointing guards and providing support to the local farmers;

- Spray water on roads to reduce dust, especially during harvest time.

Summary of impacts and preferred route

Central route and Eastern Route are preferred because of the lower impact that it will have on farming. It will lead to the lowest loss of high potential land and of income.

11 IMPACT ASSESSMENT

11.1 Overview

This section focuses on the pertinent environmental impacts that could potentially be caused by the proposed Anderson-Dinaledi 400kV transmission line during the pre-construction, construction and operation phases of the project.

The impacts to the environmental features are linked to the project activities, which in broad terms relate to the physical infrastructure (emphasis on construction and operation stages). Impacts were identified as follows:

- An appraisal of the project description and the receiving environment;
- Impacts associated with listed activities contained in GN No. R386 and R387;
- Issues highlighted by environmental authorities;
- Findings from specialist studies; and
- Comments received during public participation.

11.1.1 Impacts associated with Listed Activities

As mentioned, the project requires authorisation for certain activities listed in the EIA Regulations (2006), which serves as triggers for the environmental assessment process. The impacts associated with the key listed activities follows (note that list is not exhaustive – refer to complete list under **Section 3.1**).

The potential impacts linked to the listed activities are then addressed in the subsequent sections.

Table 32: Impacts associated with the key listed activities

GN No.	Activity	Description	Potential Impact Overview
R387	**1(l)**	The construction of facilities or infrastructure, including associated structures or infrastructure, for the transmission and distribution of above ground electricity with a capacity of 120 kilovolts or more.	Ecological, social and economic impacts associated with the project life-cycle of the proposed transmission line.
R386	**1(m)**	The construction of facilities or infrastructure, including associated structures or infrastructure, for any purpose in the one in ten year flood line of a river or stream, or within 32 metres from the bank of a river or stream where the flood line is unknown, excluding purposes associated with existing residential use, but including - (vi) canals; (vii) channels; (viii) bridges; (ix) dams; and (x) weirs.	Effects to resource quality (i.e. flow, habitat, biota and water quality) associated with watercourse crossings / erecting the towers in close proximity to watercourses.
R386	**4**	The dredging, excavation, infilling, removal or moving of soil, sand or rock exceeding 5 cubic metres from a river, tidal lagoon, tidal river, lake, in-stream dam, floodplain or wetland.	Effects to resource quality (i.e. flow, habitat, biota and water quality) associated with watercourse crossings / erecting the towers in close proximity to watercourses.
R386	**7**	The above ground storage of a dangerous good, including petrol, diesel, liquid petroleum gas or paraffin, in containers with a combined capacity of more than 30 cubic metres but less than 1 000 cubic metres at any one location or site.	Pollution of bio-physical environment through poor practices associated with onsite storage of dangerous goods.
R386	**12**	The transformation or removal of indigenous vegetation of 3 hectares or more or of any size where the transformation or removal would occur within a critically endangered or an endangered ecosystem listed in terms of section 52 of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004).	Adverse impacts associated with the installation of the transmission line in sensitive, threatened or protected ecosystems.

GN No.	Activity	Description	Potential Impact Overview
R386	**14**	The construction of masts of any material or type and of any height, including those used for telecommunication broadcasting and radio transmission, but excluding - (a) masts of 15 metres and lower exclusively used, (i) by radio amateurs; or (ii) for lighting purposes; (b) flag poles; and (c) lightning conductor poles.	Ecological, social and economic impacts associated with the project life-cycle of the proposed transmission line.
R386	**15**	The construction of a road that is wider than 4 metres or that has a reserve wider than 6 metres, excluding roads that fall within the ambit of another listed activity or which are access roads of less than 30 metres long.	Access roads to the construction site, borrow pits and construction camps. In most cases, access is easily available from existing road network.
R386	**20**	The transformation of an area zoned for use as public open space or for a conservation purpose to another use.	Adverse impacts associated with the installation of the transmission line in sensitive, threatened or protected ecosystems.

11.1.2 Issues raised by Environmental Authorities and I & APs

The issues highlighted by authorities (both regulatory and commentary) during meetings and contained in correspondence received (refer to ***Appendix H)***.

11.1.3 Project Activities and Environmental Aspects

The main project components include the following:

- Installation of a new 400kV transmission line (including concrete foundations, towers, conductors and anchors);

In order to understand the impacts related to the project it is necessary to unpack the activities associated with the project life-cycle, as shown below:

Table 33: Activities associated with the Anderson-Dinaledi 400kV Power Line Project Life-Cycle

Pre-construction
Project Activities
• Detailed engineering design
• Detailed geotechnical investigations
• Geophysical investigations
• Walk-down survey to identify most suitable sites to position towers

• Arrangements with individual landowners and/or land users
• Procurement process for Contractors
Construction
Project Activities
• *On-going consultation with affected parties*
• Vegetation clearance
• Pegging of central line and overall footprint
• Site establishment
• Establish construction camps (including material lay-down areas)
• *Construction employment*
• Delivery of construction material
• Storage and handling of material
• Transportation of equipment, materials and personnel
• Install access gates
• Upgrade existing access roads / build new access roads (where necessary)
• Grading of site (where necessary)
• Excavations for foundations and anchors of towers
• Position premade foundation structures into excavations
• Concrete filling of the foundation
• Erection of steel structures
• Stringing of transmission cables
• *Construction employment*
• *Refuelling*
• *Crossing* inaccessible sites
• *Crossing* sensitive areas
• *Managing construction sites*
• *Reinstatement and rehabilitation*
• Signing off by landowners
• Handing and taking over of the servitude
Operation
Project Activities
• Access arrangements and requirements
• Routine maintenance inspections
• Management of vegetation clearance
• Repair and maintenance works
• On-going consultation with directly affected parties

Environmental aspects are regarded as those components of an organisation's activities, products and services that are likely to interact with the environment. The following environmental aspects have been identified for the proposed 400kV transmission line, substation upgrades and new turn-in lines, which are linked to the project activities (note that only high-level aspects are provided):

Table 34: Environmental Aspects associated with the Anderson-Dinaledi 400kV Power Line Project Life-Cycle

Pre-construction
Environmental Aspects
• Poor construction site planning and layout
• Inaccurate walk-down survey
Construction
Environmental Aspects
• *Lack of environmental awareness creation*
• *Poor consultation with affected parties*
• Indiscriminate site clearing
• Poor site establishment
• Poor management of access and use of access roads
• Poor transportation practices
• Poor fencing arrangements
• Erosion
• Disruptions to existing services
• *Disturbance of topsoil*
• Poor management of excavations
• Inadequate s*torage and handling of material*
• Inadequate s*torage and handling of hazardous material*
• Lack of *equipment maintenance*
• Poor management of labour force
• Pollution from *ablution facilities*
• Inadequate management of *construction camp*
• Poor waste management practices
• *Wastage of water*
• *Disturbance to landowners*
• Poor management of pollution generation potential
• *Damage to significant flora*
• *Damage to significant fauna*
• *Environmental damage at crossings of* inaccessible sites
• *Environmental damage at crossings of* sensitive areas
• *Disruption of* archaeological and cultural features
• Poor reinstatement and rehabilitation
Operation
Environmental Aspects
• Inadequate management of access, routine maintenance and maintenance works
• Inadequate management of vegetation

11.1.4 Significant Environmental Impacts

Environmental impacts are the change to the environment resulting from an environmental aspect, whether desirable or undesirable. 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 significant environmental impacts are listed in **Table 33**.

The EMPr strives to provide a comprehensive list of mitigation measures associated with the overall project-related aspects and impacts for the entire project life-cycle (i.e. pre-construction, construction, operation and decommissioning).

The cumulative impacts are discussed in **Sections 11.11**.

Table 35: Significant environmental impacts associated with the project

CONSTRUCTION PHASE	
Feature	**Impact**
Topography	• Visual impact on ridges • Erosion of affected areas on steep slopes
Surface Water	• Impacts where access roads and the transmission lines cross watercourses
Geology and Soil	• Erosion on steep slopes
Flora	• Removal of vegetation for stringing, building of new access roads, tower construction and construction camp(s) establishment
Fauna	• Impacts to animals • Impacts to livestock
Socio-economic	• Loss of income • Reduction in property value • Damage to property • Relocation of structures situated within servitude
Agricultural Potential	• Loss of agricultural land • Impacts to livestock
Archaeological and Cultural Features	• Damage to heritage resources
Transportation	• Damage to roads by heavy construction vehicles
Aesthetics	• Clearing of vegetation. • Construction-related operations.
Tourism	• Visual and noise impacts from construction operations. • Influence to ecotourism. • Reduction in tourism to areas affected by construction
OPERATIONAL PHASE	
Feature	**Impact**
Topography	• Visual impact on ridges from disturbed area and infrastructure. • Erosion along access roads on steep slopes.
Surface Water	• Inadequate stormwater management on access roads • Damage to towers from major flood events
Geology and Soil	• Erosion on steep slopes
Flora	• Encroachment by exotic species through inadequate eradication programme. • Clearing of vegetation along maintenance road.
Fauna	• Risk to birds from collision with infrastructure and from electrocution
Socio-economic	• Loss of land with extension of existing servitude • Reduction in property value • Threats to human and animal health from EMF
Agricultural Potential	• Loss of agricultural land
Transportation	• Use of maintenance roads
Aesthetics	• High visibility of transmission lines. • Inadequate reinstatement and rehabilitation of construction footprint.
Tourism	• High visibility of transmission lines • Loss of “sense of place”

The findings of the specialists are of particular importance in terms of understanding the impacts of the project and managing the adverse implications of the project life-cycle, as these studies focused on the significant environmental issues identified during the execution of the EIA. As can be seen from the various

impact assessments performed by the specialists, there are a host of cross-cutting impacts that are addressed in a number of these studies, with particular reference to the visual, social and economic effects of the proposed transmission line. The mitigation measures proposed by the specialists for these similar types of impacts are not regarded as contradictory, as they are aligned with best practices and principles.

11.1.5 Impact Assessment Methodology

The impacts and the proposed management thereof are first discussed on a qualitative level and thereafter quantitatively assessed by using the methodology provided below. Where applicable, the impact assessments and significance ratings provided by the respective specialists are included.

In the case of the specialist studies, most of the impact assessment methodologies deviated from the approach to follow. However, the quantitative basis for these specialist evaluations of the impacts to specific environmental features still satisfied the intention of EIA.

For the methodology of the impact assessment, the analysis is conducted on a quantitative basis with regard to the nature, extent, magnitude, duration, probability and significance of the impacts. The following definitions and scoring system 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 / some loss of populations and habitats of non-threatened species.
3- Impact cannot be mitigated / exceeds legal or regulatory standard / increases level of risk to public health / extinction of biological species, loss of genetic diversity, rare or endangered species, critical habitat.

11.1.6 Impact Mitigation

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 doing things;
- Enhance the environmental benefits of a proposed activity;
- Avoid, minimise or remedy negative impacts; and
- Ensure that residual negative impacts are within acceptable levels.

Mitigation should strive to abide by the following hierarchy – (1) prevent; (2) reduce; (3) rehabilitate; and/or (4) compensate for the environmental impacts.

Figure 63: Mitigation Hiearchy

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

The EMPr (refer to ***Appendix E***) provides a comprehensive list of mitigation measures for the entire project, which extends beyond the impacts evaluated in the body of the EIA Report.

	Overview of the EMPr
	The scope of the Anderson-Dinaledi 400kV power line 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 environmental authorisation) lies with the project proponent (i.e. Eskom).

11.2 Watercourses

11.2.1 Impact Overview

For the discussion to follow watercourses are considered as rivers, streams, natural channels (perennial and seasonal), wetlands and dams. The alternative routes traverse various major rivers (Swartspruit, Crocodile and the Moganwe). The construction of the line and upgrading or building of new access roads could cause impacts to the "resource quality" of the affected watercourses, which is defined by the National Water Act (Act No. 36 of 1998) as the following:

- Quantity, pattern, timing, water level and assurance of instream **flow**;
- **Water quality**, including physical, chemical and biological characteristics of the water;
- Character and condition of the instream and riparian **habitat**; and
- Characteristics, condition and distribution of the **aquatic biota**.

Impacts to the resource quality of the affected watercourses could include:

- Damage to / loss or habitat (both instream and riparian zone) within the works area;
- Destabilisation of morphology (i.e. river structure);
- Reduction of water quality through sedimentation and poor construction practices;
- Alteration of the flow regime caused by temporary diversions; and
- Reduction in biodiversity of aquatic biota.

Should construction activities encroach upon the regulated area of a watercourse (i.e. 1:100 year floodline / delineated riparian or wetland habitats) 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 DWA before an authorisation may be issued:

- Existing lawful water uses;
- The need to redress the results of past racial and gender discrimination;
- Efficient and beneficial use of water in the public interest;
- The socio-economic impact of the water use or uses if authorised; or of the failure to authorise the water use or uses;
- Any catchment management strategy applicable to the relevant water resource;
- The likely effect of the water use to be authorised on the water resource and on other water users;
- The class and the resource quality objectives of the water resource;

- Investments already made and to be made by the water user in respect of the water use in question;
- The strategic importance of the water use to be authorised;
- The quality of water in the water resource which may be required for the Reserve and for meeting international obligations; and
- The probable duration of any undertaking for which a water use is to be authorised.

Abstraction of water for construction purposes will not be permitted without the requisite authorisations.

11.2.2 Impact Assessment

Environmental Feature	1. Flow
Relevant Alternatives & Activities	All alternatives; watercourse crossings; construction camps; access roads
Project life-cycle	Construction phase

Potential Impact	Proposed Management Objectives / Mitigation Measures
• Alteration of the flow regime caused by instream and riparian construction activities; • Wetlands may be susceptible to erosion during the clearing, grading and excavation activities.	1.1 No construction activities to encroach upon the regulated area of any watercourse (including buffer zones for wetlands). 1.2 Construction camps to be located not closer than 50m from the edge of riparian habitat / wetland buffer zone. 1.3 Special arrangements for stringing activities to avoid impacts to sensitive watercourse features (including sensitive riparian zones) 1.4 As far as possible, use existing bridge crossings as access roads. 1.5 Manage flow passing through works area for access roads to minimise disturbance to flow regime and to prevent erosion. 1.6 Prevent possible erosion caused by temporary instream diversion, associated with construction of access roads. 1.7 Remove diversion following construction of access roads and reinstate and rehabilitate affected works area.

	+/- Impacts	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	–-	local	medium	short-term	likely	2
After Mitigation	–-	local	medium	short-term	unlikely	1

Environmental Feature	2. River Morphology
Relevant Alternatives & Activities	All alternatives; watercourse crossings; access roads; maintenance
Project life-cycle	Construction & operation phases

Potential Impact	Proposed Management Objectives / Mitigation Measures
• Destabilisation of morphology (i.e. river structure); • Erosion of watercourse structure; • Damage to / loss of habitat (both instream and in the riparian zone) within the works area.	2.1 Repeat mitigation measures 1.1 – 1.7. 2.2 Select most appropriate crossing point based on geotechnical conditions. 2.3 Select most appropriate crossing point based on sensitivity of riparian habitat (e.g. protected trees, large trees that afford bank stabilisation) and instream habitat, depending on technical feasibility. 2.4 For access roads, reinstate (shaping) and rehabilitate (indigenous riparian vegetation) affected areas. Install suitable buttressing to prevent future erosion, if required.

	+/- Impacts	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	–-	local	medium	permanent	likely	2
After Mitigation	–-	local	low-medium	short-term	moderate	1

Environmental Feature	3. Water Quality
Relevant Alternatives & Activities	All alternatives; watercourse crossings; construction camps; access roads; maintenance
Project life-cycle	Construction phase & operation phases

Potential Impact	Proposed Management Objectives / Mitigation Measures
• Contamination of surface water through sedimentation from instream works, silt-laden runoff from disturbed areas, and improper practices (e.g. poor management of waste water and disposal of solid waste).	3.1 Repeat mitigation measures 1.1 – 1.7 and 2.2 – 2.4. 3.2 Temporary diversion and other dewatering techniques (e.g. pumping) to maintain a dry works area. 3.3 Where necessary for access roads, install instream silt traps during construction within the watercourse channel and along the riparian habitat. Instream silt traps are to be maintained and serviced on a regular basis. 3.4 Implement suitable stormwater measures during construction to manage ingress of runoff into watercourses. 3.5 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. 3.6 Ensure proper waste management and housekeeping.

	+/- Impacts	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	–-	local	medium	short-term	likely	2
After Mitigation	–-	local	low-medium	short-term	moderate	1

Environmental Feature	4. Aquatic Biota
Relevant Alternatives & Activities	All alternatives; watercourse crossings; access roads; maintenance
Project life-cycle	Construction phase

Potential Impact	Proposed Management Objectives / Mitigation Measures
• Clogging of gills from increased silt loads; • Alteration of habitat; • Disturbance to migration patterns; • Poaching / illegal fishing.	4.1 Repeat mitigation measures 1.1 – 1.7, 2.2 – 2.4 and 3.2 – 3.6. 4.2 Temporary diversion for construction of access roads to allow for movement of aquatic fauna, as far as possible. 4.3 Environmental induction of all construction workers and implementation of disciplinary procedures for non-compliance.

	+/- Impacts	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	–-	local	medium	short-term	likely	2
After Mitigation	–-	local	low-medium	short-term	moderate	1

Environmental Feature	5. Pans and Wetlands
Relevant Alternatives & Activities	All alternatives; watercourse crossings; access roads; maintenance
Project life-cycle	Construction & operation phase

Potential Impact	Proposed Management Objectives / Mitigation Measures
Damage to drainage lines / wetlands from crossings, including erosion, loss of vegetation, adverse effects to biota, and disturbance of flow.	5.1 Repeat mitigation measures 1.1 – 1.7, 2.2 – 2.4, 3.2 – 3.6 and 4.2 – 4.3. 5.2 Identify wetlands during walk-down survey. Wetland systems and their buffer zones are regarded as no-go areas during the project life-cycle.

	+/- Impacts	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	–-	local	medium-high	short-term	likely	3
After Mitigation	–-	local	medium	short-term	unlikely	1

11.3 Geology and Soil

11.3.1 Impact Overview

In areas of steep terrain soil erosion could occur following the clearing of vegetation, grading of tower sites, and use of access roads. Use of heavy equipment during the construction phase could lead to soil compaction.

11.3.2 Impact Assessment

Environmental Feature	6. Geology & Soil
Relevant Alternatives & Activities	All alternatives; access roads; construction camps
Project life-cycle	Construction & operation phase

Potential Impact	Proposed Management Objectives / Mitigation Measures
• Soil erosion on steep slopes. • Erosion along access roads.	• No cutting and filling in areas of 4% sideslope and less. • 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 minimisation of potential erosion on access roads. • Acceptable reinstatement and rehabilitation to prevent erosion during operation phase. • A detailed geotechnical assessment must be undertaken for each tower site prior to commencement of construction activities.

	+/- Impacts	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	–-	local	medium-high	short-long	likely	3
After Mitigation	–-	local	low	short-term	unlikely	1

11.4 Flora

11.4.1 Impact Overview

The main reasons for managing the vegetation under power lines include the following:

- Ensuring safe clearances under and around power lines;
- Ensuring adequate access for inspection, maintenance and repair activities; and
- Reduction of fuels for fires under power lines that cause flashovers.

Potential impacts to vegetation resulting from the construction of the proposed transmission line include the clearance of an 8 m-wide strip down the centre of a transmission line servitude for stringing purposes.

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. In terms of the Conservation of Agricultural Resources Act (Act No. 43 of 1983), all alien invasive species in the servitude is cleared and chemically treated for the total width of the servitude.

Refer to **Section 12.2.1** for an overview of the impacts to floral features associated with the alternative routes, as identified through the Fauna and Flora Survey (Nemai, 2012), which is contained in ***Appendix D1***. Based on the potential impact to RDL species, vegetation unit conservation and natural or protected areas, the specialist study preferred the following options:

- Western alternative – Eastern Deviation

The project is to be executed in accordance with Eskom's Transmission Vegetation Management Guideline (TGL41-334) (contained in EMP
- ***Appendix E***), which includes provision of the following:

1.1. Integrated Vegetation Management;
1.2. Biomes, Plant Species and Right of Way Management;
1.3. Atmospheric and Climatic Conditions and Vegetation Management;
1.4. Veld Management Practices;
1.5. Laws and Policies;
1.6. Suggested Vegetation Management Practices;
1.7. Commercial Forests;
1.8. Sugar Cane;
1.9. Karoo Biome;
1.10. Fynbos;
1.11. Indigenous Forests; and
1.12. Fire Protection and Fire Fighting Associations.

The walk-down survey team will include an ecological specialist who will identify sensitive floral species within the corridor. The necessary permits will be obtained under the National Forests Act (Act No. 84 of 1998) if avoidance of sensitive species is not possible during the siting of the towers and confirmation of the development footprint.

Note that the potential impacts to the riparian habitat and the associated mitigation measures are discussed under **Section 11.4.2**.

11.4.2 Impact Assessment

The following impacts assessment for floral features and associated attributes was extracted from the Faunal, Floral and Avifaunal Ecological Surveys (Nemai, 2011) (refer to ***Appendix D1*** for an overview of the rating system).

Environmental Feature	**Flora**
Relevant Alternatives & Activities	**All alternatives**
Project life-cycle	**Construction and Operational**
Potential Impact	**Proposed Management Objectives / Mitigation Measures**
Destruction of species of conservation importance and their natural habitats	• The removal of any plant material from site, including flowers or bulbs is strictly prohibited unless unavoidable and essential for the purposes of construction. • Relocation of plants of conservation importance (such as Sclerocarya birrea and Boophane disticha) should be implemented by a qualified specialist, following issue of relevant permits. • The contractor for vegetation clearing must demonstrate competence and knowledge to be able to identify different species, declared weeds and alien species correctly. • Leave as much of the natural vegetation intact as possible in order to maintain ecological corridors for the movement of species and make an effort to increase the natural areas around sensitive features such as ridges and rivers. Minimise the width of the servitude, particularly in sensitive areas.

Damage to sensitive important habitats	• Prior to the onset of the construction phase, a thorough search through the preferred site should be undertaken during the flowering season of known RDL floral species in order to remove and rescue potentially affected species. • The removal of any plant material from site, including flowers or bulbs is strictly prohibited unless unavoidable and essential for the purposes of construction. • The contractor for vegetation clearing must demonstrate competence and knowledge to be able to identify different indigenous species, protected species, declared weeds and alien species correctly. • Leave as much of the natural vegetation intact as possible in order to maintain ecological corridors for the movement of species and make an effort to increase the natural areas around sensitive features such as ridges and rivers. Minimise the width of the servitude, particularly in sensitive areas.

	+/- Impacts	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	Negative	Local	High	Long-term	Likely	3
After Mitigation	Negative	Local	Medium	Long-term	Likely	1

Environmental Feature	**Flora**
Relevant Alternatives & Activities	**All Alternatives**
Project life-cycle	**Construction phase**

Potential Impact	Proposed Management Objectives / Mitigation Measures
Vegetation and soil disturbance around construction sites due to general construction activities	• Minimize topsoil disturbance as far as possible. • Level and landscape disturbed topsoil areas to facilitate plant succession. • Erosion control measures, such as stone packing, brush packing and reseeding, should be included on disturbed areas.
Soil contamination, vegetation loss and vegetation disturbance due to fuel and chemical spills.	• Employ on-site personnel responsible for preventing and controlling potential soil pollution through fuel and oil leaks and spills. • 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. • Containers containing potential contaminating substances must be kept on drip-trays or tarpaulins in case of spills. • Drip-trays must be placed under vehicles and equipment when not in use.
Loss of aesthetic value and sense of place of ridges	• Ensure that development designs compliment the natural surroundings in order to preserve a sense of place.

Damage to plant life outside of the proposed transmission line routes area	• Any plant accidentally removed outside the proposed routes should be replaced or rehabilitated at the expense of the contractor. • Measures must be taken to penalize construction workers who damage plants intentionally or remove plants accidentally without reporting the incident.

	+/- Impacts	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	Negative	Local	High	Long-term	Likely	2
After Mitigation	Negative	Local	Medium	Long-term	Likely	1

Environmental Feature	**Flora**
Relevant Alternatives & Activities	**All Alternatives**
Project life-cycle	**Operational**

Potential Impact	Proposed Management Objectives / Mitigation Measures
The construction of the proposed transmission line may affect biodiversity through the encroachment of exotic vegetation following soil disturbance, in addition the maintenance of the area would disturb naturalized species within the area.	• Encroachment of alien vegetation should be monitored regularly and controlled; the area must be kept clear of all invader plants as per the Conservation of Agricultural Resources Act, 1983 (Act No 43 of 1983). Rehabilitation measures must be employed until such a time as indigenous species are established. If herbicides are used then correct licenses and permits must be acquired prior to use.
Impacts on local and national conservation obligations & targets	• This impact affects the status of conservation strategies and targets on a local as well as national level and is viewed in conjunction with other types of local and regional impacts that affects conservation areas. Impacts that could potentially affect the status of protected areas are regarded as unacceptable and should be avoided at all costs. Witwatersberg Pretoria Mountain Bushveld and Magaliesberg Pretoria Mountain Bushveld are listed as Critically Endangered (CR) Threatened Terrestrial Ecosystems and as such any further negative impacts on this ecosystem should be avoided.

	+/- Impacts	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	Negative	Local	High	Long-term	Likely	3
After Mitigation	Negative	Local	Medium	Long-term	Likely	1

11.5 Fauna

11.5.1 Impact Overview

Mammals are sensitive to disturbances and habitat destruction and degradation and as such many more species would occur on or near the MPNE than near the residential areas. Thirteen mammals were recorded in the study area from a combination of observations during site-visits and anecdotal evidence provided by local landowners. No sensitive or endangered mammals were visually recorded during the site visits. During the construction of the pipeline it is anticipated that there would be a loss of ecologically sensitive and important habitat units; ecosystem function and faunal habitat. These effects should be temporary as any mammals residing on site would move probably to another area nearby and could move back after the pipeline construction has been completed and rehabilitated.

In terms of avifauna, the study area falls within the Magaliesberg and Witwatersberg Important Bird Area (IBA(ZA018)). IBAs form a network of sites, at a biogeographic scale, which are critical for the long-term viability of naturally occurring bird populations. MPNE provides a suitable habitat for Red data bird species that are known to occur in the area. Cape Vultures and eagles are known to occur on the MPNE. It is however recommended that for areas where the transmission line will run in close proximity to sensitive habitats, the disturbance factors must be limited as much as possible to avoid displacement of sensitive species. Route alternatives would be preferred that are located in close proximity to the existing main transmission system infrastructure as studies have shown that migratory birds become familiar with the powerline patterns within an area and therefore learn to avoid them (van Rooyen, 2009).

According to the specialist, the Eastern route is regarded as the route alternative that would pose the greatest threat to the overall biodiversity of the area during construction of the proposed transmission line as it traverses through the sensitive areas such as MPNE, and the number of Orange Listed plant species recorded on this route were higher than the other route alternatives. The preferred route in terms of flora and fauna sensitivity would be the Western Route-Western deviation, as most parts of the route are along the main road and existing powerline and are considered less sensitive than the alternative routes in terms of biodiversity. The use of existing degraded habitat is preferable and habitat units known to be highly productive in supporting breeding, foraging and roosting sites, such as wetlands and ridges should be avoided.

Various mitigation measures have been proposed to reduce the impacts of collisions of birds with power lines. It is well-known that collisions with the overhead shield (earth) wire far outnumber collisions with the phase (conductor) wires. This is because the earth wire is a single line suspended above the conductor lines, which are often bundled together in groups of four or five lines. These bundled lines are therefore far

more visible in comparison to the earth wire. Mitigation measures should therefore be aimed to making the earth wire more visible.

The most favourable mitigation measure to lessen the impacts of bird collisions is to plan the alignment in such a way that migratory routes are avoided. In a linear construction of this magnitude there are numerous factors to consider when choosing a preferred route, therefore making major alignment shifts are very often not feasible. Bird Flight Diverters (BFD's) were developed in Europe and are attached to the conductor wires. Studies, however, have indicated that their use has had limited success in averting collision impacts in South Africa. Another device, known as a Bird Flapper, has been used on a large scale in South Africa since 2001 and has proven to be more effective than the use of BFD's. A Bird Flapper is a reflective metallic disc-type device that is loosely attached to the earth wire. The loose-fitting attachment allows the disc to move freely in the wind. The resulting intermittent reflecting of the sun off the disc allows for a device that is highly visible from a greater distance. Fitment frequency of these Bird Flappers has been suggested at 10m intervals and staggered along parallel lines, resulting in a bird Flapper device being visible along every 5m of line. These devices should be fitted along all areas were migratory routes have been identified within the survey area along the chosen preferred route alternative. Some RDL species are known to migrate at night, when line visibility is at its lowest. Fluorescent tubes that derive power from the conductor fields of the lines have been shown to avert this impact in high impact areas.

Another mitigation measure that has been suggested is the removal of the earth shield wire from areas where migratory routes have been identified, as long as these areas do not fall within areas that are subjected to major electrical storms. This is considered non-feasible due to technical constraints and implications.

Habitat destruction and the associated displacement of various avifaunal species is thought to be a lesser potential impact on the general avifaunal conservation within the survey area. The general aridity of the survey area, especially within the western regions, means that clearing of vegetation within the servitude to an acceptable height to safeguard against fire hazards and therefore habitat loss could be minimised. River valleys harbour a greater density of taller vegetation. This is especially evident in the riparian forests within the eastern regions of the survey area. These tall trees support breeding of many avifaunal species that will be displaced if the vegetation is cleared to accommodate the servitude. The river valleys occur within lower-lying areas that could be spanned in a manner that would not necessitate vegetation clearing. It is recommended that minimal vegetation be removed from within servitude areas and only limited to a height class that could pose a fire risk to the overhead lines.

The project will adhere to Eskom's Transmission Bird Collision Prevention Guideline (TGL41-335).

As with the flora, the walk-down survey team will include an ecologist who will identify suitable habitat for sensitive faunal features. Where possible, these sites will be regarded as no-go for the location of towers.

11.5.2 Impact Assessment

Environmental Feature	Fauna
Relevant Alternatives & Activities	All Alternatives
Project life-cycle	Pre - Construction phase

Potential Impact	Proposed Management Objectives / Mitigation Measures
Distrubance to fauna and avifauna	• During site preparation special care must be taken during the clearing of the works area to minimize damage or disturbance of roosting and nesting sites. • Barricading measures to be utilised should not restrict the movement of the fauna in the area. • As a pre-requisite to construction, it is strongly recommended that a rigorous monitoring programme is implemented to detail avian densities in the impact zone, better quantify flight paths and routes on site and in the immediate surrounding area. Careful installation of bird flappers on the conductors,at the Saartjies Nek will be required in order to mitigate collision risks at this vulnerable flight path area. Bird species, such as Bustards and cranes, which have slow, heavy flight pattern, are prone to collisions.

	+/- Impacts	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	Negative	Local	High	Long-term	Likely	2
After Mitigation	Negative	Local	Medium	Long-term	Likely	1

Environmental Feature	Fauna
Relevant Alternatives & Activities	All Alternatives
Project life-cycle	Construction phase

Potential Impact	Proposed Management Objectives / Mitigation Measures
Disturbance to animals and livestock	• Animals residing within the designated area shall not be unnecessarily disturbed. • Before construction starts, construction workers must be educated with regards to littering and poaching. • The Contractor and his/her employees shall not bring any domestic animals onto site. • Photographs of sensitive animals must be displayed in the construction camp to heighten awareness of the creatures. • Toolbox talks should be provided to contractors regarding disturbance to animals. Particular emphasis should be placed on talks regarding snakes.
Bird streamers causing electrical faults.	• Perch management through the use of perch deterrents (bird guards) can be used and fitted at least 1m directly above and on both sides of the phase conductor. Open perch areas should be allowed to remain after construction.

Potential impact on animal passage through and specifically out of the construction site.	• Construction areas must be fenced using palisades for the migration of small faunal species out of the construction zone. This excludes areas where animal activity could be hazardous, such as around excavations, where such areas should be appropriately blocked off. • Site camps should be placed in areas that do not impact on animal movement corridors.
Potential impact to habitats of sensitive species.	• Important sensitive habitats such as rivers and ridges need to be preserved in order to protect species that utilize these areas as their preferred habitats. A buffer-zone around sensitive areas must be demarcated with hazard tape or orange mesh netting to prevent accidental disturbance.

Potential impact on sensitive habitats related to invertebrates	• Building activities must be restricted and carefully monitored to keep disturbance to a minimum, and must be appropriately rehabilitated and managed. This entails the removal and proper disposal of all rubble and litter previously dumped along the proposed route illegally (considerable dumping was observed in Marikana Thornveld close to Damonsville), as well as all scrap materials, building rubble and rubbish dumped on the route during construction, at official municipal dumping grounds. • Dumping of any materials in undeveloped open areas is not allowed and this must be actively managed. • Construction must preferably take place during the dry season and no temporary housing, temporary ablution, disturbance of natural habitat, storing of equipment or any other use of the buffer/flood zone whatsoever, may be permitted during the construction phase. • All construction-related impacts (including service roads) must be contained within the fenced-off development areas. • Adequate erosion preventative mechanisms must be implemented throughout the construction phase. Erosion resulting from the development must be appropriately rehabilitated preventing further habitat deterioration. • Stormwater runoff must be correctly managed during the development. Special care needs to be taken during the construction phase to prevent surface stormwater containing sediments and other pollutants from entering pans, drainage lines and wetlands. A surface runoff and stormwater management plan must be put in place prior to commencement of construction activities. The total sealing of walkways, pavements, drive ways and parking lots should not be permitted in the free space system. These should form part of and be contained within the areas earmarked for development. This would aid in the minimising of artificially generated surface stormwater runoff. • The use of insecticides, herbicides and other chemicals is not permitted within 200m of an open space system. • An integrated pest management programme, where the use of chemicals is considered as a last option, should be employed. However, if chemicals are used to clear invasive vegetation and weedy species or for the control of invertebrate pests, species-specific chemicals should be applied and in the recommended dosages. General spraying is prohibited and the application of chemicals as part of a control programme is not permitted to take place on windy days. • Outside lighting must be designed to minimize impacts, both directly on especially rare or endangered invertebrate species and indirectly by impacts on populations of prey species. All outside lighting must be directed away from sensitive areas. • All disturbed drainage lines that the proposed route will traverse must be rehabilitated and maintained as important biological corridors or migratory passages. The crossing of natural drainage systems must be minimized and should only be constructed along the shortest possible route, perpendicular to the natural drainage system. Transmission line crossings must span the entire stretch of the flood line or buffer zone (see *Sensitivity Mapping Rules for Biodiversity Assessments* for buffer zone and flood line requirements)".

• Potential impact to sensitive vegetation that houses reptiles and amphibians	• Minimal vegetation clearance and disturbances must occur along the proposed pipeline route. • Vegetation clearance to be restricted to the actual transmission line servitude (55m) and not into surrounding grassland or bushveld areas. • As certain sections of the proposed transmission line is situated on a sloping gradient; erosion/siltation preventative measures must be implemented throughout all phases of the project. • The object of vegetation clearing is to trim, cut or clear the minimum number of indigenous trees (*Sclerocarya birrea, Acacia caffra, Acacia nilotica*) and vegetation necessary for the safe mechanical construction and electrical operation of the transmission line. • Vegetation clearing on tower sites must be kept to a minimum and the alignment shifted away from open and closed *Acacia* woodland areas. • Large exotic trees with large root systems shall be cut manually and removed, as the use of a bulldozer will cause major damage to the soil when the root systems are removed. • Stumps shall be treated with herbicide. Smaller vegetation can be flattened with a machine, but the blade should be kept above ground level to prevent scalping. • Any vegetation cleared on a tower site shall be removed or flattened and not be pushed to form an embankment around the tower. Disturbed areas of natural vegetation as well as cut and fills must be rehabilitated immediately to prevent soil erosion. • The use of herbicides shall only be allowed after a proper investigation into the necessity, the type to be used, the long-term effects and the effectiveness of the agent. Application shall be under the direct supervision of a qualified technician. All surplus herbicide shall be disposed of in accordance with the supplier's specifications. All alien vegetation in the total servitude and densifiers creating a fire hazard shall be cleared and treated with herbicides. • Re-seeding shall be done on disturbed areas as directed by the Environmental Control Officer. • In accordance with the Conservation of Agricultural Resources Act, No 43 of 1983, slopes in excess of 2% must be contoured and slopes in excess of 12% must be terraced. • Other methods of rehabilitation of tower sites may also be used at the discretion of the Environmental Control Officer, e.g. stone pitching, logging, etc. • Contour banks shall be spaced according to the slope on tower sites. The type of soil shall also be taken into consideration. • No open fires are allowed on site. • Fire-fighting equipment must be available on all construction vehicles at all times.

• Potential impact to threatened amphibian species either directly or indirectly	• Construction activities of the Anderson-Dinaledi transmission line must be restricted to daylight hours reducing the potential impact on the nocturnal breeding activities of the majority of amphibian species. • Ideally the installation of the new towers/pylons must be undertaken during the dry winter months (May-September) when the majority of amphibian species are dormant. • All pylons must be positioned 32m from the edge of the riparian zone of the Crocodile River and Swartspruit. • Activities around the Crocodile River and Swartspruit must be strictly limited to the proposed servitude. • No Giant Bullfrogs must be collected for food or illegal pet trade. • No activities must be allowed within any adjacent wetland habitat. • As a precautionary mitigation measure it is recommended that the construction contractor as well as an independent environmental control officer (ECO) be made aware of the possible presence of certain threatened amphibian species (Giant Bullfrog) prior to the commencement of the construction of the new transmission line.

Potential impact to threatened reptile species either directly or indirectly	• Termite mounds also provide nesting site for numerous snakes, lizards (varanids) and frogs. If any termite mounds have to be destroyed a qualified herpetologist must be present in case any lizard, snake and blind snakes, or the red data Striped Harlequin Snake (Rare) are unearthed. • Wherever possible, large expanses of termite mounds should ideally be avoided wherever possible by the proposed transmission line servitude. • As a **precautionary measure**; prior to earth-clearing activities a suitably qualified environmental officer/herpetologist must carefully excavate larger termite mounds as well as around the termite mounds or burrow systems, logs, loosely embedded rocks and other surface material and remove affected animal species (reptiles, amphibians, small mammals). • Any termite mound which must be destroyed should be carefully excavated by hand and pick. • Any animals rescued or recovered must be relocated in suitable habitat away from the transmission tower and line. • Trees including stumps; bark and holes in trees are vital habitats for numerous arboreal reptiles (chameleons, snakes, agamas, geckos and monitors). The removal of indigenous tree species as well as vegetation clearance must be kept to the minimum area required and be restricted to the servitude. • Indigenous cleared vegetation should form wood piles and logs and stumps. Dead or decaying wood piles should be created as these will provide valuable refuge areas especially due to the clearance of vegetation cover. • Any lizards, geckoes, agamids, monitors or snakes encountered should be allowed to escape to suitable habitat away from the disturbance. No reptile should be intentionally killed, caught or collected during any phase of the project. • Vegetation clearance on the Magaliesburg ridge crossing of the powerline servitude must be limited to the minimum requirements. Activities should be restricted to the current and proposed servitude especially in these sensitive environments. • Disturbance of topsoil on tower sites with severe slopes shall be minimised at all costs. • At any tower sites where conventional foundations are installed, the Contractor shall remove the topsoil separately and store it for later use during rehabilitation of such tower sites. • During backfilling operations, the Contractor shall take care not to dump the topsoil in the bottom of the foundation and then place spoil on top of that. • In sensitive areas, foundations for tower constructions must be excavated by hand. • Should any threatened animal species (Striped Harlequin Snake, Blunt-tailed Worm Lizard) be exposed during excavation, the construction in the vicinity of the finding must be stopped. A suitably qualified herpetologist must be called to the site to inspect and determine the significance of the discovery. The relevant conservation authorities must be informed within 24hours of the discovery.

• Excessive habitat destruction during construction could reduce the amount of habitat available for reptiles and other herpetofauna.	• This impact is anticipated to be localised, of a long-term nature and of low significance, provided that appropriate mitigation measures are implemented (e.g. the limitation of vegetation clearance within sensitive areas). Prior to construction and vegetation clearance a suitably qualified zoologist (herpetologist) should undertake a walk-through of the preferred alignment and closely examine the proposed tower/pylon construction areas (concrete supports) for the presence of any animal burrows (including spiders and scorpions), rocky outcrops, logs, stumps and other debris and any affected animals to appropriate habitat away from the servitude or tower.

	+/- Impacts	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	Negative	Local	High	Long-term	Likely	2
After Mitigation	Negative	Local	Medium	Long-term	Likely	1

Environmental Feature	**Fauna**
Relevant Alternatives & Activities	**All Alternatives**
Project life-cycle	**Operational**

Potential Impact	Proposed Management Objectives / Mitigation Measures
Maintenance of powerlines	• Use the existing road and look out for animals on the road. Speed limits must be maintained with the use of signs and speed bumps.
Collisions of birds with overhead lines	• People responsible for maintaining the area should monitor for collisions and report any incidents. • Ecologically sensitive areas should remain as prohibited areas. • Eskom employees and or subcontractors to remain inside construction footprint. All staff to be informed of disciplinary actions for the wilful damage to plants and animals. • Fitting bird flappers on the lines within migratory pathways and the major migratory routes pertaining to the project area to coincide with sensitive areas such as river valleys and prominent ridge systems. • Maintenance crews to monitor for bird collisions and to mitigate for this impact within areas identified as hotspot collision areas not previously identified during the pre-construction and construction and phase.
Bird streamers causing electrical faults	• Perch management through the use of perch deterrents (bird guards) can be used and fitted at least 1m directly above and on both sides of the phase conductor. Open perch areas should be allowed to remain.

	+/- Impacts	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	Negative	Local	High	Long-term	Likely	2
After Mitigation	Negative	Local	Medium	Long-term	Likely	1

11.6 Heritage Resources

11.6.1 Impact Overview

A Phase 1 Heritage Impact Assessment, in accordance with Section 38 of the National Heritage Resources Act (Act No. 25 of 1999), was conducted as the project exceeds 300m in length. SAHRA was consulted during the execution of the EIA, and this authority requested a copy of the Heritage Impact Assessment for review.

The National Heritage Resources Act (Act No. 25 of 1999) identifies the following categories of significant heritage sites:

- Grade I: Heritage resources with qualities so exceptional that they are of special national significance;
- Grade II: Heritage resources which, although forming part of the national estate, can be considered to have special qualities which make them significant within the context of a province or a region; and
- Grade III: Other heritage resources worthy of conservation, on a local authority level.

The Heritage Impact Assessment (Leonie Marais-Botes, 2011) provides a matrix that incorporates the above criteria for each identified site (see **Section 11.6.2**).

The occurrence of sites with a Grade I significance will demand that the development activities be drastically altered in order to retain these sites in their original state. For Grade II and Grade III sites, the application of mitigation measures would allow the development activities to continue.

The primary objective of the EMPr in terms of archaeology / historical resources is to ensure that no artefacts of historical or cultural value are negatively impacted, damaged or destroyed.

The project will endeavour to avoid heritage resources. To achieve this, a walk-down survey (which includes a heritage specialist) of the corridor will be undertaken prior to construction to document all heritage sites, features and objects. The siting of the towers will then be considered based on the findings of this survey. No heritage resources are to be affected without a valid permit from SAHRA.

11.6.2 Impact Assessment

Environmental Feature	**Heritage Resources**
Relevant Alternatives & Activities	**Eastern alternatives; access roads; construction camps**
Project life-cycle	**Construction phase**
Potential Impact	**Proposed Management Objectives / Mitigation Measures**

Disturbance of heritage resources.	• All heritage items as identified in the HIA, must be avoided and the line deviated slightly or pylon structures repositioned to avoid negative impact on these heritage items. • A HIA Specialist must be a part of the walk-down survey and clearly demarcated all heritage sites prior to commencmenet of construction. • Should any additional remains and/or artefacts be discovered on the site during earthworks, all work will cease in the area affected and the Contractor will immediately inform the Construction Manager. • Should any heritage resources be exposed during excavation or be found on site, a registered heritage specialist must be called to site for inspection. • Should any heritage resources be exposed during excavation or be found on site, the relevant heritage resource agency (i.e. SAHRA) must be informed about the finding. • Under no circumstances may any heritage material be destroyed or removed from site. • If any heritage structures cannot be avoided the relevant permit must be obtained from the relevant authority to remove the structures. • Should any remains be found on site that is potentially human remains, the South African Police Service should also be contacted.

	+/- Impacts	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	–-	local	medium-high	short-term	unlikely	2
After Mitigation	–-	local	low	short-term	unlikely	1

Environmental Feature	**Heritage Resources**
Relevant Alternatives & Activities	**Western alternatives; access roads; construction camps**
Project life-cycle	**Construction phase**

Potential Impact	Proposed Management Objectives / Mitigation Measures
Disturbance of heritage resources.	• All heritage items as identified in the HIA, must be avoided and the line deviated slightly or pylon structures repositioned to avoid negative impact on these heritage items. • A HIA Specialist must be a part of the walk-down survey and clearly demarcated all heritage sites prior to commencmenet of construction. • Should remains and/or artefacts be discovered on the site during earthworks, all work will cease in the area affected and the Contractor will immediately inform the Construction Manager. • Should any heritage resources be exposed during excavation or be found on site, a registered heritage specialist must be called to site for inspection. • Should any heritage resources be exposed during excavation or be found on site, the relevant heritage resource agency (i.e. SAHRA) must be informed about the finding. • Under no circumstances may any heritage material be destroyed or removed from site. • If any heritage structures cannot be avoided the relevant permit must be obtained from the relevant authority to remove the structures. • Should any remains be found on site that is potentially human remains, the South African Police Service should also be contacted.

	+/- Impacts	Extent	Magnitude	Duration	Probability	Significance

Before Mitigation	–-	local	medium-high	short-term	unlikely	3
After Mitigation	–-	local	low	short-term	unlikely	2

11.7 Visual Quality

11.7.1 Impact Overview

An extract from the Visual Impact Assessment (Axis Landscape Architecture, 2011) pertaining to the impacts to the visual quality of the project area follows.

11.7.1.1 Significance of Landscape Impacts

Landscape impacts are alterations to the fabric, character, visual quality and/or visual value which will either positively or negatively affect the landscape character. During the construction and operational phases, the project components are expected to impact on the landscape character of the landscape types it traverses.

Construction Phase

The activities that are expected to cause landscape impacts and that are associated with the construction phase, are the establishment of the construction camp, construction of access roads and the clearance of the servitude. These activities will create surface disturbances which will result in the removal of vegetation and the exposure of the underlying soil.

The extent of the disturbances will generally affect a relative small footprint area. Access roads to the towers are expected to be a two-track dirt road which will create the minimum disturbance. During construction, the area around the individual towers will be disturbed.

The construction camp and lay-down yards are anticipated to disturb a much larger area. The size and location of the construction camp will play a major role in the severity of the landscape impact.
Servitudes will generally be cleared of higher growing and dense vegetation to reduce biomass that may cause a fire hazard if ignited.

The presence of the roads, overgrazed fields and mines as well as existing power lines has caused a localised reduction in the visual quality. Areas along the proposed route are occupied by farms and drainage systems as well as rocky outcrops, which increases the quality of the landscape. The VAC between Anderson and Dinaledi Substations is considered Moderate. These factors limit the severity of landscape impact of the proposed alignment to a moderate degree.

Surface disturbances are also minimised through, for example, utilising existing roads. The severity of the landscape impact can however be mitigated to a low severity for the proposed alignment. Sensitive placement of the construction camp, limited surface disturbance and prompt rehabilitation are prerequisite conditions if the severity of impact is to be reduced.

Operational Impacts

Surface disturbances created during construction may remain for an extended period during the operational phase. These are seen as residual affects carried forward from the construction phase and can be completely or substantially mitigated if treated appropriately during the construction phase.

An additional impact will be caused as a result of the presence of the completed transmission line, i.e. that of the evenly spaced towers. The industrial character and the near monumental vertical scale of the towers will severely contrast with the uniform landscape character that prevails through most of the study area.

11.7.1.2 Significance of Visual Impacts

Empirical research indicates that the visibility of a transmission tower, and hence the severity of visual impact, decreases as the distance between the observer and the tower increases. The landscape type, through which the transmission line crosses, can mitigate the severity of visual impact through topographical or vegetative screening. Bishop *et al* (1988) noticed that in some cases the tower may dominate the view for example, silhouetted against the skyline, or in some cases be absorbed in the landscape. A complex landscape setting with a diverse land cover and topographical variation has the ability to decrease the severity of visual impact more than a mundane landscape (Bishop *et al*, 1985).

11.7.1.2.1 Visual Impacts on Residents

Generally, the study area is moderately populated, especially the residential developments and farming communities. These communities are normally situated along main transportation routes or adjacent to rivers or water resources.

Numerous other small villages and residents will experience an intrusion on their view due to the presence of the proposed Transmission line. It is unpractical to discuss all, but they are recognized as the general population of the study area and are identified as affected visual receptors. Some of the residents in the study area are farm residents, which are scattered across the study area. Residents of the affected environment are classified as visual receptors of *high* sensitivity owing to their sustained visual exposure to the proposed development as well as their attentive interest towards their living environment.
Figure 19-25 indicate that due to the scale of the project, the only sections of the proposed power line will be visible throughout of the study area. The topography provides moderate VAC to visually screen the

components of the project and it can therefore be stated that the general visibility of the project will be moderate.

Construction Phase

During the construction phase, unsightly views may be created by the presence of the construction camp and the lay-down yards. The duration of the potential visual impact will be temporary which will result in an anticipated *moderately-low* significance of visual impact for the proposed alignments. The visual exposure to the construction activity will initially be limited and only local farms and informal settlements will experience views of the site preparation activity. As the structures increase in scale and height, the ZVI increases, resulting in a greater number of affected viewers and a subsequent increase in visual exposure.
The visual intrusion will progressively increase in severity as the power line increase in scale. The cleared site, construction camp and material lay-down yards will appear unsightly and out of character. Large scale construction elements such as cranes will be highly visible and increase awareness of the construction activity over a considerable area. The visual intrusion caused during the construction stage will be high, but will be temporary in nature.

Operational Phase

The residents of informal settlements, residential developments and farming communities along the power line may experience a high degree of visual intrusion due to their proximity to the alignment. These residents are within 5 km and in some instances within 1 km from the proposed alignment. This is considered the zone of highest visibility in which the highest degree of visual intrusion can be expected.
The presence of a transmission line in the visual field of the residents in this part of the study area will minimally affect the views they currently experience. The silhouette of a transmission line on the horizon will be visible from a great distance and thus increase the ZVI considerably, potentially impacting on more residents.

11.7.1.2.2 Visual Impact on Tourists

The study area is renowned for its biodiversity and undulating landscapes. These characteristics provide the basis for the tourism industry which plays a major role in the economy of the North West and Gauteng Province. The entire study area is considered to have moderately-high tourism potential.

Construction Phase

The temporary duration of the construction phase is not expected to cause major visual impacts. The location, number and size of the construction camps and lay-down yards will be crucial in regulating the impact. Detail information is not available and it is anticipated that the visual impact will occur localised and that a small number of tourists will be adversely affected by these project components during construction.
The construction camps may however cause a higher visual intrusion on tourists visiting the more scenic, central areas of the study area. Their exposure to possible unsightly views of the construction camps and the associated activity will however be minimal and localised.

The potential visual impact on tourists during the construction phase of the proposed project can be mitigated with relative ease. The greatest factor to consider is the location of the construction camp out of potential views that may be experienced from scenic routes or tourist hotspots.

Operational Phase

Considering the extent of the proposed alignment, a great number of tourists will be affected during their visit. Although it is difficult to pinpoint particular locations in the study area that are of specific tourist value, since the entire study area bares value, the most obvious concentration of tourists can be expected in the eastern and central part of the study area. The presence of a transmission line in this undeveloped landscape will severely spoil the views that are currently experienced over the mountains.

It can be concluded that the proposed alignment will cause moderately-high visual intrusion for tourists travelling through the study area.

11.7.1.2.3 Visual Impact on Motorists

The major routes in the study area are the R511, R513, R514, R566, N4 and the old N4 connecting the towns, residential developments and informal settlements. The secondary and tertiary roads are a loose network of gravel roads linking smaller settlements and farms. These road networks in the study area carries a much lower volume of motorists. Their duration of views will be temporary and it is expected that the visual intrusion that they will experience will be low. For this report only motorists using the main routes will be considered as there are many countless smaller roads within the study area.

Construction Phase

The potential visual impact that may be experienced by motorists during the construction phase is considered to be minimal. Limited information is available and the number, location and size of the construction camps and lay-down yards are essential for accurately assessing the visual impact. It is anticipated that views of the construction camps and lay-down yards of the proposed alignment will be visible from the N4, R511, R513, R514, R566 and local roads.

The presence of the construction camp and lay-down yards may create unsightly views. Motorists' visual exposure to the impact will be brief and the severity of visual impact will be *low*. The significance of potential visual impact is expected to be *low.*

Operational Phase

On these roads, the N4 and R511 is the most prominent, carrying the highest volumes of traffic. The severity and significance of visual impact for the proposed alignments on motorists will be low for the Eastern Route and deviations and moderate for the rest. The speed at which motorists travel also has a moderating effect on the severity of the visual impact and further reduces visual exposure.

Mitigation measures are prescribed in the EMPr to ensure that the visual appearance of the construction site is not an eyesore the adjacent areas. Examples include the erection of a suitable fence and screen during construction and the reinstatement and rehabilitation of the development footprint.

11.7.2 Impact Assessment

Environmental Feature	Visual Quality
Relevant Alternatives & Activities	All alternatives; access roads; construction camps
Project life-cycle	Construction phase

Potential Impact	Proposed Management Objectives / Mitigation Measures
Reduction in visual quality due to construction activities.	• Suitable screening of works area. • Construction camps to be situated in areas with reduced impact to tourists. • On-going housekeeping to maintain a tidy construction area. • Proper reinstatement and rehabilitation of construction area.

	+/- Impacts	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	–-	local	medium-high	short-term	likely	2
After Mitigation	–-	local	medium	short-term	likely	1

The impacts assessment for the visual quality and associated attributes is supplemented by the following evaluation conducted as part of the Visual Impact Assessment (Axis Landscape Architecture, 2011).

SIGNIFICANCE OF LANDSCAPE IMPACTS

Activity	Nature of Impact	Extent of Impact	Duration of Impact	Severity of Impact	Probability of Impact	Significance without Mitigation	Significance with Mitigation	Level of Confidence
Construction phase								
Eastern Route	Negative – Impacting on the visual quality of the landscape due to the presence of foreign elements and a loss of vegetation cover.	Local	Permanent if not mitigated	Low	Definite	Low	Low	High
Eastern Route Deviation				Low	Definite	Low	Low	High
Central Route				Moderate	Definite	Moderate	Low	High
Western Route				Low	Definite	Low	Low	High
Western Route Deviation 1 (Western Deviation)				Low	Definite	Low	Low	High
Western Route Deviation 2 (Eastern Deviation)				Low	Definite	Low	Low	High
Western Route Deviation 3 (Southern Deviation)				Low	Definite	Low	Low	High
Operational phase								
Eastern Route	Negative – Impacting on the visual quality of the landscape due the presence of a transmission line.	Local	Permanent	Low	Definite	Low	Low	High
Eastern Route Deviation				Low	Definite	Low	Low	High
Central Route				Low	Definite	Low	Low	High
Western Route				Moderate	Definite	Moderate	Low	High
Western Route Deviation 1 (Western Deviation)				Moderate	Definite	Moderate	Low	High
Western Route Deviation 2 (Eastern Deviation)				Low	Definite	Low	Low	High
Western Route Deviation 3 (Southern Deviation)				Low	Definite	Low	Low	High

VISUAL IMPACTS ON RESIDENTS

Activity	Nature of Impact	Extent of Impact	Duration of Impact	Severity of Impact	Probability of Impact	Significance without Mitigation	Significance with Mitigation	Level of Confidence
Construction phase								
Eastern Route	Negative – Construction camp and lay-down yards may cause unsightly views.	Local	Temporary	Low	Probable	Low	Low	High
Eastern Route Deviation				Low	Definite	Low	Low	High
Central Route				Low	Definite	Low	Low	High
Western Route				Moderate	Definite	Moderate	Low	High
Western Route Deviation 1 (Western Deviation)				Moderate	Definite	Moderate	Low	High
Western Route Deviation 2 (Eastern Deviation)				Low	Definite	Low	Low	High
Western Route Deviation 3 (Southern Deviation)				Low	Definite	Low	Low	High
Operational phase								
Eastern Route	Negative – The presence of a transmission line intrudes on existing views and spoils the open views of the landscape.	Local	Permanent	Low	Definite	Low	Low	High
Eastern Route Deviation				Low	Definite	Low	Low	High
Central Route				Low	Definite	Low	Low	High
Western Route				Low	Definite	Low	Low	High
Western Route Deviation 1 (Western Deviation)				Low	Definite	Low	Low	High
Western Route Deviation 2 (Eastern Deviation)				Low	Definite	Low	Low	High
Western Route Deviation 3 (Southern Deviation)				Low	Definite	Low	Low	High

VISUAL IMPACTS ON TOURISTS

Activity	Nature of Impact	Extent of Impact	Duration of Impact	Severity of Impact	Probability of Impact	Significance without Mitigation	Significance with Mitigation	Level of Confidence
Construction phase								
Eastern Route	Negative – Construction camp and lay-down yards may cause unsightly views.	Local	Temporary	Low	Probable	Low	Low	High
Eastern Route Deviation				Low	Definite	Low	Low	High
Central Route				Low	Definite	Low	Low	High
Western Route				Moderate	Definite	Moderate	Low	High
Western Route Deviation 1 (Western Deviation)				Moderate	Definite	Moderate	Low	High
Western Route Deviation 2 (Eastern Deviation)				Moderate	Definite	Moderate	Low	High
Western Route Deviation 3 (Southern Deviation)				Moderate	Definite	Moderate	Low	High
Operational phase								
Eastern Route	Negative – The presence of a transmission line intrudes on existing views and spoils the open views of the landscape.	Local	Permanent	Low	Definite	Low	Low	High
Eastern Route Deviation				Low	Definite	Low	Low	High
Central Route				Low	Definite	Low	Low	High
Western Route				Moderate	Definite	Moderate	Low	High
Western Route Deviation 1 (Western Deviation)				Moderate	Definite	Moderate	Low	High
Western Route Deviation 2 (Eastern Deviation)				Moderate	Definite	Moderate	Low	High
Western Route Deviation 3 (Southern Deviation)				Moderate	Definite	Moderate	Low	High

VISUAL IMPACTS ON MOTORISTS

Activity	Nature of Impact	Extent of Impact	Duration of Impact	Severity of Impact	Probability of Impact	Significance without Mitigation	Significance with Mitigation	Level of Confidence
Construction phase								
Eastern Route	Negative – Construction camp and lay-down yards may cause unsightly views.	At a number of point locations	Intermittent	Low	Probable	Low	Low	High
Eastern Route Deviation				Low	Probable	Low	Low	High
Central Route				Moderate	Definite	Moderate	Low	High
Western Route				Moderate	Definite	Moderate	Low	High
Western Route Deviation 1 (Western Deviation)				Moderate	Definite	Moderate	Low	High
Western Route Deviation 2 (Eastern Deviation)				Moderate	Definite	Moderate	Low	High
Western Route Deviation 3 (Southern Deviation)				Moderate	Definite	Moderate	Low	High
Operational phase								
Eastern Route	Negative – The presence of a transmission line intrudes on existing views and spoils the open views of the landscape.	Local	Intermittent	Low	Definite	Low	Low	High
Eastern Route Deviation				Low	Definite	Low	Low	High
Central Route				Moderate	Definite	Moderate	Low	High
Western Route				Moderate	Definite	Moderate	Low	High
Western Route Deviation 1 (Western Deviation)				Moderate	Definite	Moderate	Low	High
Western Route Deviation 2 (Eastern Deviation)				Moderate	Definite	Moderate	Low	High
Western Route Deviation 3 (Southern Deviation)				Moderate	Probable	Moderate	Low	High

11.8 Agriculture

11.8.1 *Impact Overview*

The impacts of a transmission line of agricultural land use and activities depend on the transmission line design and the type of farming. Transmission lines can affect field operations, irrigation, aerial spraying, wind breaks, and future land development (land use restrictions). Tower placement in farm fields can:

- Create problems for turning field machinery and maintaining efficient fieldwork patterns;
- Create opportunities for weed encroachment;
- Compact soils;
- Result in safety hazards;
- Hinder or prevent aerial activities by planes or helicopters;
- Interfere with moving irrigation equipment; and
- Hinder future consolidation of farm fields or subdividing land for residential development.

It should be noted that the proposed transmission line will not result in the sterilisation of all the land within the servitude, and certain agricultural practices (e.g. some crop cultivation, grazing and the use of farm roads) are still possible.

The walk-down survey will aim to avoid (or minimise if avoidance is not possible) the placement of towers within cultivated land, depending of the possible distance that the line can be spanned in these areas.

The impacts associated with agriculture are managed through mitigation measures contained in the EMPr.

11.8.2 *Impact Assessment*

Environmental Feature	**Agriculture**
Relevant Alternatives & Activities	**All alternatives; access roads; construction camps**
Project life-cycle	**Construction & operation phase**

Potential Impact	**Proposed Management Objectives / Mitigation Measures**
Disturbance to farming practices and livestock.	• Wherever possible, avoid placing transmission line structures in agricultural areas (e.g. span croplands). • Negotiate with landowner the timing of the construction activities and the exact locations of towers within agricultural land. • Suitable access arrangements to be made with landowners. • Safeguarding of livestock against construction activities (e.g. barricading excavations). • Proper reinstatement and rehabilitation of construction area.

+/- Impacts	**Extent**	**Magnitude**	**Duration**	**Probability**	**Significance**

Before Mitigation	–-	local	medium-high	short-term	likely	2
After Mitigation	–-	local	medium	short-term	likely	1

The impacts assessment for the Agricultural Potential and associated attributes is supplemented by the following evaluation conducted as part of the Agricultural Impact Assessment (Index, 2012).

Criteria	Potential Impact on Irrigated Crops	Potential Impact on Grazing
Nature	Existing crops will be destroyed during construction. Afterwards they can be replanted. The footprint of the pylon will permanently be sterilised. Routes A, B and C will be influenced, with B the most severely. D and E have little irrigated land.	Access to grazing will be impossible during construction. Only the footprint of the site will permanently be sterilised
Extent	The land in the servitude will be impacted on. Routes A, B and to a lesser degree C will be lose high potential land.	All routes will be impacted on to a small degree. Only the footprint will be sterilised.
Duration	Total withdrawal during construction. Permanent for the footprint of the pylon. The irrigation type may need to change.	Total withdrawal during the construction period. Permanent for the footprint of the pylon.
Intensity	Destructive during construction.	Benign after construction period.
Probability	Very likely to occur.	Very likely to occur.
Status	Negative.	Negative.
Significance	Moderate impact because a small portion of land is influenced. The loss on income cannot be calculated from the available data.	Low. The land us withdrawn for the construction period.

11.9 Social Environment

11.9.1 Impact Overview

Economic Impacts

There is likely to be a short term increase in economic activity as a result of the substation. The construction labour force will not only be earning an income in the area, but consumption will take place this increase the commercial activity and the flow of money in the area.

This may result in short term indirect economic gains, which will be in the form of purchasing construction material and transport.
Through the employment of local labour, skills and knowledge transfer is likely to take place which can increase the employability of these workers. Employment will also increase the income of households and capacity to be more productive.

The strength of the existing power lines will increase given the proposed power lines. Given that Pretoria is expecting to double its electricity demand in the next 20 – 30 years, the project is will secure stable supply of electricity to this region. The economic and social benefits is having a more secure electricity supply are clear and are felt in areas as diverse as education, health, public infrastructure such as street lighting, heating and cooling and uses in the productive economy.

Visual Tourism and Leisure Impacts

The tourism and leisure attractions in the Hartbeespoort area are well established. The mountains and dam provides opportunity for tourism. A large proportion of the study area is used for conservation, nature reserves, and accommodation and tourism facilities. Thus there is a visual appeal to the land which has been used to generate income.

The impact of having a transmission line in such an environment could result in loss of income. The visual appeal of the land will be negatively impacted by having a transmission line. Specifically, in the study area, the Silkaatsnek Nature Reserve, the Magaliesburg Natural Environment area and a portion of the Wonderboom Municipal Nature Reserve may be impacted.

Nature Reserves, when associated with tourism and leisure, derives their economic value from offering a glimpse of the natural wonders of the area, with a focus upon viewing game and the ecological habitat. This value proposition generally targets upper income earners, who place value on a rural sense of place and being in an environment that is as close to natural as possible. When this is not being offered, the value proposition decreases and the affected nature reserves would have to adjust its offering to the market to remain competitive.

Transmission lines impact upon the value proposition by bringing modern development to this natural environment, thereby reducing the rural and undeveloped sense of place.

The construction phase can impact negatively through loss of income or reputation as the natural environment is disturbed. Impacts associated with construction crew actions, resulting in the loss of stock or equipment should also be considered. Hence the final routing, construction and maintenance of the transmission lines should be carried out to have as little impact as possible on the tourism and leisure industries.

Land Value and Servitude

A servitude of fifty five meters or 27.5m on either side of the centre of the power line will need to be purchased. The purpose of the servitude is to ensure public safety, safe construction, maintenance and operation of the line.

Eskom will be entitled to unrestricted access. Negotiation with land owners on access control measures and security issues with regards to locking and unlocking of gates on private properties and damage to fences and gates will need to take place.

The land beneath the overhead lines and within the 55m wide servitude may continue to be used for some activities by the landowners, however, no crops or trees higher than 4m will be allowed along the route, and no structures may be developed underneath the line or within the servitude area.

The proposed power line can negatively impact the development and infrastructure plans for the area. Development within the 55m wide servitude will be restricted. Certain farming and current land use may need to be stopped completely or altered resulting in potential loss of income.

Provisions in South African law allow the establishment of a servitude for the use of the utility, whilst still preserving the ownership of the land with the landowner. The utility thus has rights over the land that exceeds those claimed by the landowner. This trade-off is generally negotiated between the utility and the landowner and involves the payment to the landowner of a sum of money in compensation for the land rights. In the event that agreement cannot be reached, the state does have the right to expropriate the land. This power exists to ensure that landowners who are in the path of proposed public utilities do not have the power to hold the project to unreasonable ransom and to ensure that the public good trumps individual rights.

Thus the emphasis should be on the value of compensation that is to be paid to the landowner for servitude rights. This value depends on the area of servitude, the land use of the servitude area, the impact on productivity and the alterations to land use that will be required.

Comparable sales are traditionally the method used for servitude valuations, where such values exist. This method will best take into account intangible factors such as the visual impacts of transmission lines.
Research suggests that where there are electricity transmission lines, the land value in close proximity to those transmission lines fall. In the study by Elliot and Wadley (2002) a list of various research papers were provided with the estimated value of the fall in property prices. It was found that the percentage decrease in property values ranges from 1 percent to 27 percent. The degree of depreciation depends upon the value, size and location of the property in question.

Larger properties were less affected than small properties, this applies particularly to farmland. It was also found that the higher the value of the land, the larger the impact on land value.

The literature also suggests that the impact on property prices diminishes over time. The impact of transmission lines on property values is initially high. Over time the visual impact decreases as trees and other developments surround the area. Thus the long term impact on property prices will likely be low.

The literature thus suggests that land values do decrease when servitudes are registered over them, and for this the landowner should be compensated. The legal and operational framework for compensation is well established and the channels for negotiation are open for landowners to follow. In this regard an excellent summary of the complexity of the compensation issue has been prepared by Rode and Associates C.C. in October 2007. The study is entitled "Gamma-Grassridge: Compensation Specialist Study" and was conducted for a proposed Eskom transmission line in the Eastern Cape Province.

It is suggested that the guidelines developed for the purposes of this study are used in the payment of compensation during the registering of servitudes over land affected by the routes.

With regards to land values and compensation for the use of a servitude, impacts and mitigation should take into account the following categories of concern:

- the visual impacts on lines;
- maintenance issues during operation;
- multiple lines on a single property;
- larger relative impacts on small properties than on large farms;
- the public relations aspects of Eskom's business; and
- loss of business caused by the servitude.

Loss of Production

The project area is generally rural in nature, with urban and commercial activity increasingly occurring. Land used for agriculture is the most common on the project study area with citrus and maize being farmed. Current farming practices may be disturbed due to the development of the transmission lines. This will be through loss of land available for produce as well as a capital cost on the value of the land. The will be an expected decline in output as agricultural activity in the servitude area will be limited. Thus there is likely to be a loss of potential and existing income.

The biggest lost of productive land is expected to occur during the construction phase of this development. There may an expected removal of all crops within the servitude land for construction and road purposes. Furthermore there is an impact on the way in which agriculture can take place. Transmission lines place a restriction on the types of agriculture that can occur on the land. Thus there is a loss of production capacity.

Agriculture accounts for 36 percent of employment in the area which means that land use has a significant economic impact on production and income generation. Thus the impact on the loss of agricultural land and limitation on agricultural activity is likely to be very significant.

The importance of agriculture for the communities cannot be overstated. In general, these communities are poor, located in geographic areas where the economic is not diversified away from agriculture and are generally able to offer only manual labour to the market. Thus these communities are economically vulnerable and disruption to agricultural production will have disproportionately large impacts on those affected.

Impacts on the Social Environment

The study area has a high population growth rate and is developing rapidly. With the proposed project which is likely to attract workers, this population growth rate may increase and cause further strain on development needs.

When workers come into an area, there is a need to supply municipal services to these workers. The municipality may or may not have the capacity to support a larger number of people. Thus causing strain on social services.

As is common with migrant workers in an area, there may be some social disruption. The relations between locals and new job seekers may not be smooth and lead to conflict in the community.

Workers entering the area will also be competing with locals for employment which may cause tension in the community. Locals and new job seekers will be competing for the same jobs. Thus it is important to deter job seekers and stress on local employment.

Relations between migrant workers and locals can potential cause health problems by rising HIV and AIDS or other sexually transmitted diseases. This is a typically the case when a large number of males enter into an area. Hostel like structures will need to be prevented and awareness campaigns should be conducted.
During construction, the safety and security of labourers around may be at risk when working with transmission lines. Thus effective mitigation measures will need to be in place to avoid loss of life or injury. There safety of farming livestock will also need to be ensured

Employment and Skills Transfer

There is likely to be a positive impact on employment especially during the construction phase. Construction of the power lines will require labour for building the power lines while the operation phase will require labour for maintenance.

Employment can become a sensitive issue, particularly the concern over local labour. There may conflict is migrant workers are given preference to employment opportunities. However the nature of transmission lines requires skilled labour.

Potential secondary employment impacts can result as small business employs more persons to sell goods to labourers.

The project has the potential to positively impact upon household incomes during the construction phase. In the study area, most people are low income earners thus employment of locals will create a positive impact on local communities who can derive some economic benefit from the project.

At least, the contractor should be barred from bringing unskilled labour in from areas outside the immediate area of construction. The contractor should also be encouraged to employ a proportion of their semi-skilled labour requirements from the ranks of the local communities. In addition, the contractor could be obliged to employ labourers on short term contracts of three months, similar to the government sanctioned Expanded Public Works Programme contracts. This would ensure that the project components create as many work opportunities in the affected areas as possible.

The project also has the potential to positively impact upon the skills levels in local communities during the construction phase. Only 19 percent of persons over the age of 20 matriculated. Thus the skill level of the community is not very high. Any local training and skills transfer that results from the project will create a positive impact.

Thus, the impact on skills acquisition would be largest if the transmission line followed the Main Route or Alternative Two, rather than Alternative Three. This conclusion is valid if the contractor implements skills-based training programmers at the site. Unskilled workers could be taught a skill and achieve a certificate to support the skill. This would provide a degree of assistance with the worker's future search for work and allow the project to leave a lasting legacy on the economic wellbeing of the affected community.

Thus if all other aspects are ambivalent about which routing to follow, the employment and skills transfer aspect would dictate which of the routes would most benefit the affected communities. This conclusion is modified by the proviso that the employment and skills impacts are relatively small and short-term in nature and that the populations of all routes would benefit from the employment and skills transfer potential offered by the proposed project.

Roads and Traffic

During the construction phase there may be traffic disruptions in the area. Heavy construction vehicles may cause damage to the roads. There may be temporary and permanent roads that will need to be built in

order to ensure proper maintenance of the power lines. Traffic will be temporary and mitigation can be done well in advance by awareness of the project.

11.9.2 Impact Assessment

The following impact assessment was extracted from the Socio – Economic Impact Assessment) (Nemai, 2011).

Economic Feature	General Economy
Relevant Alternatives & Activities	Eastern and Western Route
Project life-cycle	Pre- Construction and Construction phase
Potential Impact	**Proposed Management Objectives / Mitigation Measures**
• Positive impact on the local economy.	• No mitigation required

	+/- Impacts	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	+	Local	Low	Short	Almost Certain	3
After Mitigation	+	Local	Low	Short	Almost Certain	3

Economic Feature	General Economy
Relevant Alternatives & Activities	Eastern and Western Route
Project life-cycle	Operational Phase
Potential Impact	**Proposed Management Objectives / Mitigation Measures**
• Positive impact of stable electricity supply	• No mitigation required

	+/- Impacts	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	+	Local	Low	Long	Almost Certain	3
After Mitigation	+	Local	Low	Long	Almost Certain	3

Economic Feature	Visual , Tourism And Leisure Impacts
Relevant Alternatives & Activities	Eastern and Western Route
Project life-cycle	Pre- Construction and Construction phase
Potential Impact	**Proposed Management Objectives / Mitigation Measures**
• Route selection that disrupts the visual appearance of tourism and leisure facilities can have a negative impact and result in loss of income. • Pylons placement that disrupts access to facilities.	• Route selection that avoids nature reserves is the most ideal outcome. Thus should Western Route South Alternative take place, it is advised that pylons be placed on the opposite end of the road to the Silkaatsnek Nature Reserve. • Where possible, routing should be selected to traverse low visual impact areas of any farm and areas that have low tourism values. This would mean that main roads such as the R511 are avoided. Care should be taken during route selection not to interrupt access and internal roads within tourism and leisure facilities; • The use of visually appealing pylons, or pylons that reduce the number of structures per kilometres should be used where appropriate.

• Disruption of tourism and leisure facilities due to construction activities which could later the nature of tourism activity. • Poor housekeeping by construction staff. • Stock losses due to poor construction housekeeping.	• Agreement should be reached with each landowner on the construction programme and impacts on the property during construction. Where necessary construction could be scheduled during low tourist season on affected farms. Agreements made prior to construction with respect to property access, the duration of construction and the impacts on the land should be adhered to by both the landowner and the utility. • All local mitigation measures agreed to for each operation should adhered to by Eskom site staff. • Eskom compensates affected landowners at a market-related rate for stock and equipment losses which are directly attributable to construction activities.

	+/- Impacts	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	-	Local	Medium	Medium	Likely	2
After Mitigation	-	Local	Low	Medium	Moderate	1

Economic Feature	**Visual , Tourism And Leisure Impacts**
Relevant Alternatives & Activities	**Eastern and Western Route**
Project life-cycle	**Operational Phase**
Potential Impact	**Proposed Management Objectives / Mitigation Measures**
• Disruption of tourism and leisure facilities due to operations and maintenance activities. • Poor housekeeping by operations and maintenance staff. • Stock losses due to poor operations and maintenance staff housekeeping.	• Operations and maintenance access should be arranged and discussed with the landowner prior to the operation being carried out. • All local mitigation measures agreed to for each operation should adhered to by Eskom site staff. • Eskom compensates affected landowners at a market-related rate for stock losses, directly attributable to operation and maintenance activities.

	+/- Impacts	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	-	Local	Low	Short	Moderate	2
After Mitigation	-	Local	Low	Short	Moderate	1

Economic Feature	**Impact on Land Values**
Relevant Alternatives & Activities	**Main Route; Alternative 2; Alternative 3; Alternative 4**
Project life-cycle	**Pre- Construction and Construction phase**
Potential Impact	**Proposed Management Objectives / Mitigation Measures**
• The negative financial impact of having a servitude, or further servitude, registered over a property. • Access to the land may result in farmland and other property being vulnerable to theft and other security risks.	• Compensation should be paid by the utility for the right of use over the servitude. This value should be set via negotiation with affected landowners and take into account current norms and practice with regards compensation. The use of the power to expropriate land should not be excluded from consideration, given the wider public good that the transmission lines serve. • Mitigation could also take the form of off-sets resulting from the project. Examples include improving access to a series of properties to offset the economic impacts of the transmission line or through improving internal roads as part of access to the pylons. • Where there are existing power lines, the width of the servitude should be widened and the land should be used for the new transmission lines. This will minimise the negative impacts on the land and reduce the use of income generating land. • Land that has a lower economic value should be purchased for use of the power lines. This will minimise the impact on high value land and minimise the fall in property values.

	+/- Impacts	Extent	Magnitude	Duration	Probability	Significance

Before Mitigation	-	Local	Medium	Medium	Likely	2
After Mitigation	-	Local	Low	Short	Moderate	1

Economic Feature	**Impact on Land Values**
Relevant Alternatives & Activities	**Main Route; Alternative 2; Alternative 3; Alternative 4**
Project life-cycle	**Operational Phase**
Potential Impact	**Proposed Management Objectives / Mitigation Measures**
• Access to the land may result in farmland and other property being vulnerable to theft and other security risks.	• Negotiation with farmers around access to land and safety is encouraged. Fencing of properties and the maintenance thereof should also be negotiated. Compensation for loss of stock where negligence on Eskom's behalf can be proved, should take place.

	+/- Impacts	**Extent**	**Magnitude**	**Duration**	**Probability**	**Significance**
Before Mitigation	-	Local	Medium	Long	Likely	2
After Mitigation	-	Local	Low	Long	Moderate	1

Economic Feature	**Loss of Production**
Relevant Alternatives & Activities	**Eastern Route and Western Route**
Project life-cycle	**Pre-Construction and Construction phase**
Potential Impact	**Proposed Management Objectives / Mitigation Measures**
• Route selection which disrupts agricultural production, impacts on irrigation is the most difficult to mitigate.	• Route selection that avoids irrigated agriculture • The use of high pylons to minimize disruption; • Care should be taken during route selection not to interrupt access and internal roads within agricultural production units; • The use of free-standing pylons where necessary to enable farming to proceed without encumbrance from guying. Due regard should be had when implementation • If more than one line crosses agricultural land, then route selection should, as far as possible, use the existing transmission line servitude in the crossing. Using a totally new routing should be avoided where possible this measure to the higher costs of the free-standing pylons. • Purchasing of produce should be negotiated with farmers. If farmer choose to harvest the land before construction that there will be no need for compensation. However, should the land remain un-harvested, there will be need to compensate farmers for produce that is left on the land.
• The cumulative impact of this project's lines adding to the existing lines on agricultural land will be higher as the number of lines increases.	• If more than one line crosses agricultural land, then route selection should as far as possible, use the existing transmission line servitude in the crossing. Using a totally new routing should be avoided where possible.

	+/- Impacts	**Extent**	**Magnitude**	**Duration**	**Probability**	**Significance**
Before Mitigation	-	Local	Medium	Medium	Likely	3
After Mitigation	-	Local	Low	Medium	Moderate	2

Economic Feature	**Loss of Production**
Relevant Alternatives & Activities	**Eastern Route and Western Route**
Project life-cycle	**Operational Phase**
Potential Impact	**Proposed Management Objectives / Mitigation Measures**

• Route selection which disrupts agricultural production, impacts on irrigation is the most difficult to mitigate.	• Where possible, irrigation farming infrastructure should be avoided; • If it cannot be avoided, compensation to reinstate the infrastructure should be paid; • Where possible, the lines should be located so as to minimise the impact on production during the operation phase

	+/- Impacts	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	-	Local	Medium	Long	Likely	2
After Mitigation	-	Local	Low	Long	Moderate	1

Economic Feature	**Impacts on the social environment**
Relevant Alternatives & Activities	**Eastern Route and Western Route**
Project life-cycle	**Pre-Construction and Construction phase**

Potential Impact	Proposed Management Objectives / Mitigation Measures
• Social conflict can be disrupted as a result of the potential job seekers entering the area. • The spread of disease due to hostel like living and relations between locals and job seekers take place. HIV/ AIDS and other STDs may spread as a result. • Safety and security of the workers and the community may be at risk during the construction phase	• Any mitigation to avoid new job seekers from entering the area should be avoided. These can be done through the encouragement of local labour and importing of only necessary skilled labour • Education campaigns on and awareness to on sexually transmitted diseases should take place to avoid health related issues. • Should there be significant imported labour, care should be taken to integrated workers into the local community to avoid any conflict and disturbance to the social structure of the surrounding communities. • In order to mitigate against theft on farmland during construction, there should be effective consultation and fencing where possible to ensure controlled access to farming land to prevent theft and opportunistic behaviour

	+/- Impacts	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	-	Local	Medium	Medium	Likely	3
After Mitigation	-	Local	Low	Medium	Moderate	2

Economic Feature	**Impacts on the social environment**
Relevant Alternatives & Activities	**Eastern Route and Western Route**
Project life-cycle	**Operational Phase**

Potential Impact	Proposed Management Objectives / Mitigation Measures
• Social conflict can be disrupted as a result of the potential job seekers entering the area. • The spread of disease due to hostel like living and relations between locals and job seekers take place. HIV/ AIDS and other STDs may spread as a result.	• Any mitigation to avoid new job seekers from entering the area should be avoided. These can be done through the encouragement of local labour and importing of only necessary skilled labour • Education campaigns on and awareness to on sexually transmitted diseases should take place to avoid health related issues. • Should there be significant imported labour, care should be taken to integrated workers into the local community to avoid any conflict and disturbance to the social structure of the surrounding communities.

	+/- Impacts	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	-	Local	Medium	Long	Likely	2
After Mitigation	-	Local	Low	Long	Moderate	1

Economic Feature	Employment and Skills Transfer
Relevant Alternatives & Activities	Eastern Route and Western Route
Project life-cycle	Pre-Construction and Construction phase
Potential Impact	**Proposed Management Objectives / Mitigation Measures**
• Route selection that runs through or near areas of poverty will greatly enhance opportunities for the use of local labour during construction.	• Route selection to benefit more poverty affected areas, whilst taking into account the larger benefit of choosing the most cost efficient line will outweigh any local poverty alleviation benefits. • Compelling the contractor to use 100% local labour in the unskilled category of employment. • Compelling the contractor to use as much as possible local labour in the semi-skilled category of employment. • The use of three month long employment contracts to ensure that the maximum numbers of work opportunities are created in the area.
• Route selection that runs through or near areas of poverty will greatly enhance opportunities for a formal skills training programme to be implemented for the local labour force.	• Route selection to benefit areas with a higher education deficit, whilst taking into account the larger benefit of choosing the most cost efficient line will outweigh any skills training benefits. • Compelling the contractor to implement a skills training programme for the local labour force.

	+/- Impacts	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	+	Local	Low	Short	Unlikely	0
After Mitigation	+	Local	Low	Short	Likely	1

Economic Feature	Employment and Skills Transfer
Relevant Alternatives & Activities	Eastern Route and Western Route
Project life-cycle	Operational Phase
Potential Impact	**Proposed Management Objectives / Mitigation Measures**
Potential health issues related to the electric and magnetic field	Potential impacts are anticipated to be minimal based on previous studies however the site tower sites must be adequately fenced and danger and warning signs must be appropriately utilised.

	+/- Impacts	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	-	Local	Medium	Long	Likely	2
After Mitigation	-	Local	Low	Long	Moderate	1

Economic Feature	Roads and Traffic
Relevant Alternatives & Activities	Eastern Route and Western Route
Project life-cycle	Pre-Construction and Construction phase
Potential Impact	**Proposed Management Objectives / Mitigation Measures**

• Temporary disruptions to traffic during the construction phase may occur. • New road may be build – both temporary and long term which may impact land use and accessibility during the construction.	• In terms of using road, there should be no reliance on farmers and other landowners for usage of their roads. If there is a need for permanent roads, than land should be bought from the land owners and permanent roads should be built. This road can be built within the servitude. • Access to the roads should be limited to Eskom and farmer and other land owners. There will need to be negotiations with farm owners regarding access. This restriction on road usages is to ensure security for farmers. • Rehabilitation where temporary roads were constructed will need to be ensured

	+/- Impacts	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	-	Local	Low	Short	Likely	2
After Mitigation	-	Local	Low	Short	Likely	1

Economic Feature	**Roads and Traffic**
Relevant Alternatives & Activities	**Eastern Route and Western Route**
Project life-cycle	**Operational Phase**

Potential Impact	Proposed Management Objectives / Mitigation Measures
• Safety and security as a result of access roads.	• Access to the roads should be limited to Eskom and farmer owners. There will need to be negotiations with farm owners regarding access. This restriction on road usages is to ensure security for farmers.

	+/- Impacts	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	-	Local	Low	Long Term	Likely	1
After Mitigation	-	Local	Low	Long Term	Likely	1

11.10 Cumulative Impacts

Box 4:	What is a "Cumulative Impact"?

According to GN No. R. 385 (2006), ***"cumulative impact"***, in relation to an activity, means the impact of an activity that in itself may not be significant but may become significant when added to the existing and potential impacts eventuating from similar or diverse activities or undertakings in the area.

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

These are no known substantial linear projects that are planned within the corridor, which could exacerbate impacts associated with the construction phase of the project (e.g. erosion, vegetation clearing, disruption of farming / mining activities). Heavy vehicle construction traffic for the delivery of material and the

transportation of construction workers will lead to an increase in traffic on the regional transportation network. Due to the scale of the project, the size of the construction crews and the nature of material to be delivered, significant cumulative impacts are not anticipated.

Rehabilitation and eradication of alien and invasive vegetation along the corridor is regarded as a crucial management measure, as other smaller linear of localised projects could compound the proliferation of problematic floral species.

A common method for mitigating impacts related to new power lines is corridor sharing, and thereby increasing the footprints of existing linear developments (e.g. roads, power lines, railway lines). The Western Route and Eastern deviation is mostly situated along the main road and existing powerline.

Corridor sharing with existing facilities is usually encouraged because it minimises impacts by concentrating linear land uses and reducing the number of new corridors and by creating an incremental, rather than a new impact. The adoption of a development corridor aims to lessen the impacts to environmental features such as visual quality, flora, fauna, socio-economic aspects, heritage resources, especially when considered from a macro scale.

Corridor sharing can also have drawbacks. For example, where utility corridors run cross-country for long distances without crossing roadways, additional access roads could be required. If the corridor crosses environmentally sensitive areas, an expanded utility corridor would have additional impacts to the natural resources of the area. On smaller properties, the combined visual and economic impacts of an expanded corridor are also more severe. The corridor would also require a larger area to be cleared of vegetation. Landowners who already have a linear development on their property may feel unfairly burdened by the addition of another facility that further limits their rights and use of their property, or increases the impact of the existing facility (e.g. farms).

In general, the soils in the project areas are highly erodible due to the. Any previous disturbance (including grazing) will be aggravated by the construction activities if this impact is not properly managed.

The project was initiated due to increasing demands being placed on electricity supply. These demands will result in the respective Grid becoming increasingly unstable which, in turn is likely to have both a regional and macro-economic impact. It is intended for the Anderson-Dinaledi project to improve the reliability of supply of electricity in the Pretoria area. In turn, this will have a positive impact on the macro economy.

12 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. This section explores the evolution in the identification and refinement of alternatives that occurred during the execution of the EIA process,

The section is concluded with the 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). Münster (2005) defines the 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*".

12.1 Overview of Alternatives

Of the various alternatives considered and discussed below, note that only the options pertaining to the alignments and tower structures were deemed feasible. In order to provide a point of reference for assessing the other alternatives, the "no go" option was also considered in the EIA.

12.1.1 Alignment Options

Through the EIA process, the following alignment alternatives were identified (refer to **Section 8.1**):

- **Western Alternative:** The Western Route Alternative is approximately 30km in length and runs between the proposed new Anderson Substation which is earmarked for development north of Pelindaba and the existing Dinaledi Substation which is located approximately 8km north east of Brits.
- **Western Alternative – Western Deviation:** This deviation originates on Portion 104 of the Farm Zilkaatsnek 439 JQ from where it links from the Western Route Alternative Deviation 3 (Southern Deviation). This deviation is approximately 8km's.
- **Western Alternative Eastern Deviation:** This deviation originates on Portion 14 of the Farm Zilkaatsnek 439 JQ where it links from the original Western Route Alternative. This deviation is approximately 6km's in length.
- **Western Deviation – Southern Deviation:** This deviation originates on Portion 70 of the Farm Rietfontein 485 JQ where it links from the original Western Route Alternative and is approximately 8km's in length.

- **Eastern Route Alternative:** The Eastern Route alternative is approximately 30km in length and runs between the existing Dinaledi Substation and the proposed new Anderson Substation.
- **Eastern Route Alternative Deviation:** The deviation to the eastern route originates on Portion 16 of the Farm Schietfontein 437 JQ where it turns from the original eastern route alternative in a north eastern direction, and then in a northern direction from where it traverses Portion 13 of the Farm Schietfontein 437 JQ. The route runs along the eastern boundary of Portion 13 for approximately 1.4km before it turns in a north western direction where it joins the original eastern route alternative on Portion 13. The deviation is approximately 4km's.
- **Central Route:** The Central Route Alternative originates on Portion 843 of the Farm Roodekopjes of Zwartkopjes 427 JQ where the Dinaledi Substation is located and is approximately 5km's.

Should authorisation for the final alignment be granted by DEA, and following the negotiations with landowners, the final positions of the towers and the centre line for the Anderson-Dinaledi 400kV Transmission line and coordinates of each bend in the line will be determined through a walk-down survey to be conducted by surveyors and the relevant environmental specialists.

12.1.2 Tower Structures

The various tower types for a 400kV transmission line are discussed in **Section 8.5**.

Should authorisation for the final alignment be granted by DEA, and following the negotiations with landowners, optimal tower sizes and positions will be identified and verified using a ground survey in terms of the EMPr requirements.

Due to the constant endeavour to enhance tower design to minimise adverse environmental impacts in a technical and economically viable manner, the tower types available at the actual time of construction may differ from those currently available.

12.1.3 Placing the Transmission Line Underground

There are currently no underground transmission lines of this capacity in South Africa and currently there are no plans to consider this option by Eskom Transmission.

It currently costs in the region of R1 million/km to construct an overhead 400kV transmission line, whilst placing the equivalent line underground costs approximately 10 times more (i.e. R10 million/km). It is thus not economically viable to place a transmission line of this voltage underground.

In addition to financial considerations, the environmental impact of placing such a line underground is high. This is mainly due to the large area needed for installation to ensure sufficient spacing of the conductors, as

they generate high heat and are not naturally cooled. Apart from certain grass types, no vegetation is allowed to grow on top of these underground lines. There are also severe restrictions in terms of land use, to allow for maintenance of the lines.

This option was not considered to be feasible and was disregarded following the Scoping phase.

12.1.4 "No Go" Option

As standard practice, the "no-go" option was included in the evaluation of the project alternatives.

The implications of the "no go" option are as follows:

- Inability to supply additional Transmission load;
- Poor Transmission reliability and Distribution quality of supply; and
- Possible shedding of Distribution load in the Tshwane area.

This alternative is not supported, as failure to provide the necessary electrical infrastructure could potentially hamper economic activity in this area.

In contrast, should the Anderson-Dinaledi 400kV project not go ahead, the negative impacts associated with the project highlighted in **Section 11** would be irrelevant and the environmental status quo would not be affected.

12.2 Specialist Studies

In the sub-sections to follow the findings of the various specialists in terms of their respective preferences to the alternative routes are provided.

12.2.1 Fauna and Flora Impact Assessment

According to the Fauna and Flora specialist, the Eastern route is regarded as the route alternative that would pose the greatest threat to the overall biodiversity of the area during construction of the proposed transmission line as it traverses through the sensitive areas such as MPNE, and the number of Orange Listed plant species recorded on this route were higher than the other route alternatives. **The preferred route in terms of flora and fauna sensitivity would be the Western Route-Western deviation**, as most parts of the route are along the main road and existing powerline and are considered less sensitive than the alternative routes in terms of biodiversity. The use of existing degraded habitat is preferable and habitat units known to be highly productive in supporting breeding, foraging and roosting sites, such as wetlands and ridges should be avoided.

12.2.2 Invertebrate Impact Assessment

According to the invertebrate specialist, **it is recommended that the transmission line follow the Western route.** The possible southern, eastern or western deviations do not need to be followed. The main reason for the recommendation is that there are existing powerlines along much of the western route. The establishment of a transmission line along a formerly undisturbed route will have greater impact on invertebrate diversity than its establishment along a route that already has been impacted by development. Additionally, the western route will traverse areas impacted considerably more by the development of roads and other anthropogenic activities than along the eastern route. From an environmental point of view, this route is considerably more degraded than the eastern route. The western route also traverses less natural Marikana Thornveld, the most threatened vegetation type transverse by the alternative routes.

12.2.3 Herpetological Study

During the preliminary herpetological habitat assessment or sensitivity scan the majority of habitats and vegetation along the proposed western alignment; except for the Magaliesburg Natural Protected Environment (MNE) and a few scattered granitic hills and outcrops; has been transformed through agriculture, formal settlements and other forms of infrastructure development, such as powerlines, roads (R511) and Telkom lines. The Eastern route is regarded as the route alternative that would pose the great threat to the overall biodiversity of the area during construction of the proposed transmission line as it traverses through the sensitive areas (rocky cliffs) of the Magaliesburg Natural Protected Environment, Wonderboom Municipal Nature reserve**. It is recommended that the transmission line follow the Western route. The southern, eastern or western deviations will not ameliorate any potential impacts on the herpetofuana.** The main reason for the recommendation of the western alignment is that there are existing powerlines along the majority of the proposed alignment and higher levels of anthropogenic disturbances along this route. The establishment of new transmission line servitudes along a formerly undisturbed area will have greater impact on herpetofauna diversity than if following adjacent to existing servitudes. From an ecological perspective the western route is considerably more degraded than the eastern route. The western route also traverses less natural Marikana Thornveld, the most threatened vegetation type transverse than the alternative alignments.

12.2.4 Heritage Impact Assessment

Based on the Heritage Impact Assessment, the specialist has stated that from a heritage perspective **the Eastern Route is the recommended** route adue to the increased number of heritage sites identified along the Western Rotue. The potential impacts will be of low significance if all recommended mitigation measures are adhered to.

12.2.5 Agricultural Potential Assessment

The agricultural specialist has **recommended that the Eastern route** be followed from an agricultural land use perspective.

12.2.6 Visual Impact Assessment

According to the Visual Impact Assessment, the **Eastern route is regarded as the most preferred alternative**. Its location and position in the landscape is considered to cause the least impact on the landscape character due to the reduced sensitivity of the landscape along the servitudes and the local roads.

The impact of the Eastern Route on visual receptors varies between residents, tourists and motorists. The Eastern Route's great advantage lies in the less significant landscape and visual impact on motorists and residents as compared to the other alternatives.

12.2.7 Socio-Economic Study

According to the socio-economic specialist, the preferred choice between the alternatives will be the alternative that has the lowest social and economic impacts.

The determination has been carried out with reference to the following impacts:

- Economic benefits of improved electricity supply at the lowest cost
- Visual, Tourism and Leisure Impacts
- Land Value and Servitude Impacts;
- Loss of Production;
- Impacts on the Social Environment;
- Employment and skills transfer during the construction phase; and
- Roads and Traffic Impacts.

These impacts were identified earlier in the study and do not include the positive impact of increased and more reliable electricity supply to the region. This impact is common, and equal, for all routes and can therefore be removed from consideration.

The economic requirement of lowest cost for the same quality of product is included in the evaluation criteria. The impact of damage to property has been excluded from the evaluation criteria owing to it being common to all routes. Although the costs to repair damage may be higher on higher value land, this is not certain, and may indeed be equal to the costs on lower value land.

The impacts of the cost of servitude acquisition, the potential disruption to economic and social activity along the Western Route are estimated to be higher than that posed by the Eastern Route. It is therefore concluded that **the preferred route is the Eastern route**.

12.2.8 Summary

For comparative purposes, the project areas was divided into a western, central and eastern routes, as shown in the figure below.

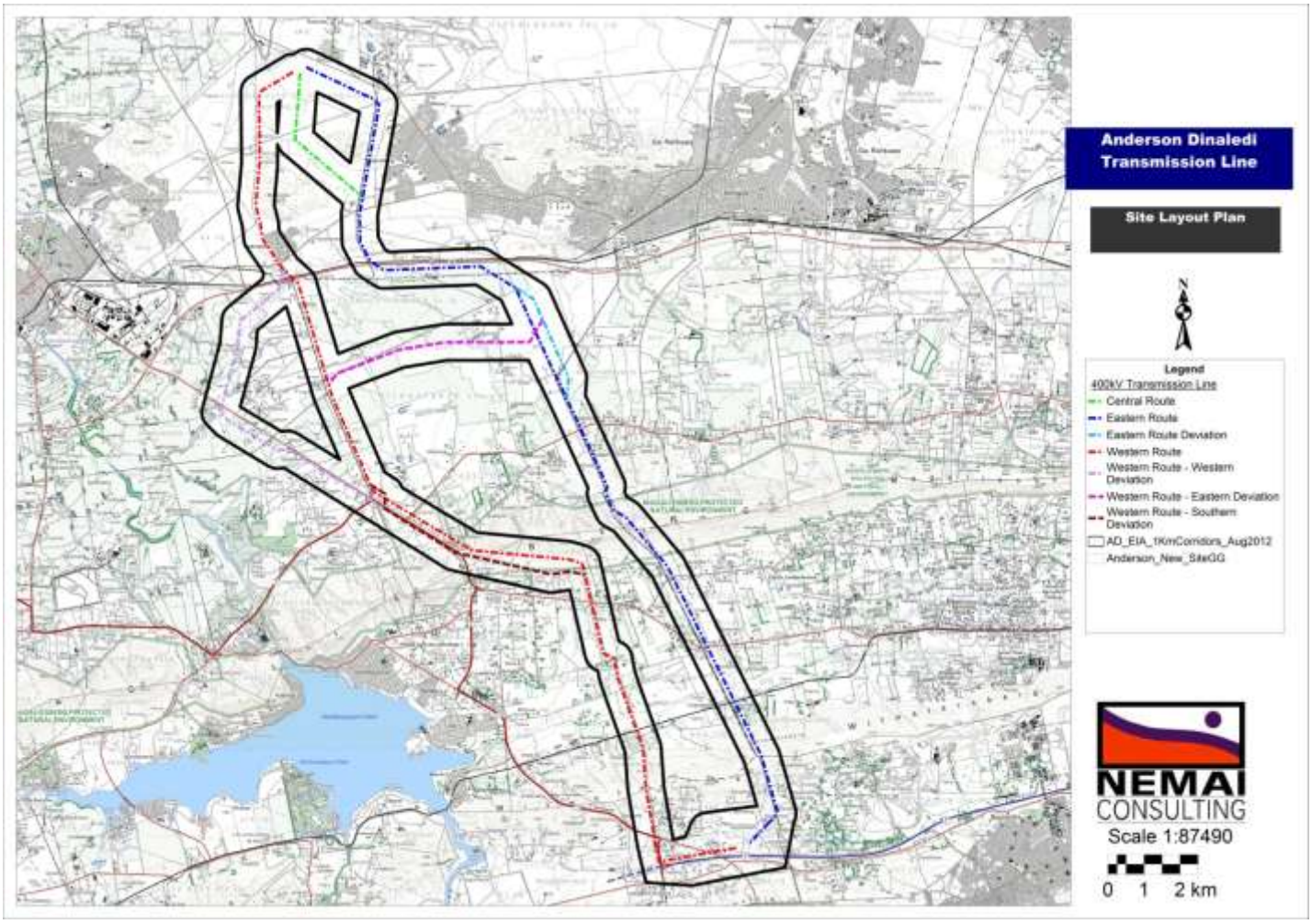

Figure 64: Layout of Anderson-Dinaledi 400kV alignment alternatives

A summary of the preferred alternatives, as recommended by the respective specialists, is tabulated below.

Table 38: Summary of Preferred Options recommended by Specialists

Specialist Study	Western Route	Western Route – Western Deviation	Western Route – Eastern Deviation	Western Route – Southern Deviation	Central Route	Eastern Route	Eastern Route – Eastern Deviation
Fauna and Flora Assessment		X					
Invertebrate Impact Assessment	X						
Herpetological Study	X						
Heritage Impact Assessment						X	
Socio-Economic Assessment						X	
Agricultural Potential Study						X	
Visual Impact Assessment						X	

12.3 Comparative Impacts of Alternative Routes

The table to follow compares the various route alternatives based on the receiving environment and the outcome of the impact assessment (**Section 11**).

Table 39: Comparative Impacts of Alternative Routes

(Note: Blocks highlighted in orange indicate the preferred option for each environmental feature; where no blocks are highlighted, no obvious preference exists)

Environmental Feature / Attribute	Western Route	Western Route – Eastern Deviation	Western Route – Western Deviation	Western Route Southern Deviation	Central Route	Eastern Route	Eastern Route – Eastern Deviation	No-Go Option
Topography	The transmission lines traverse mountainous and areas characterised by undulating plains. The potential impact on topography / landscape is considered to be greater for this alternative based on the specialist assessment.	The transmission lines traverse mountainous and areas characterised by undulating plains. The potential impact on topography / landscape is considered to be greater for this alternative based on the specialist assessment.	The transmission lines traverse mountainous and areas characterised by undulating plains. The potential impact on topography / landscape is considered to be greater for this alternative based on the specialist assessment.	The transmission lines traverse mountainous and areas characterised by undulating plains. The potential impact on topography / landscape is considered to be greater for this alternative based on the specialist assessment.	The transmission lines traverse mountainous and areas characterised by undulating plains. The potential impact on topography / landscape is considered to be greater for this alternative based on the specialist assessment.	The southern portion of the Eastern Route traverses the rugged landscape and the slopes of Magaliesberg and the Witwatersberg. The location and position of the landscape associated with this alternative is considered to cause the least impact on the landscape character due to the reduced sensitivity of the landscape along the servitudes and the local roads.	The southern portion of the Eastern Route traverses the rugged landscape and the slopes of Magaliesberg and the Witwatersberg. The location and position of the landscape associated with this alternative is considered to cause a lesser impact on the landscape character due to the reduced sensitivity of the landscape along the servitudes and the local roads.	No impact
Watercourses	Major river crossing includes Swartspruit,	Major river crossing includes Swartspruit,	Major river crossing includes Swartspruit,	Major river crossing includes	Major river crossing includes	Major river crossing includes	Major river crossing includes	No impact

Environmental Feature / Attribute	Western Route	Western Route – Eastern Deviation	Western Route – Western Deviation	Western Route Southern Deviation	Central Route	Eastern Route	Eastern Route – Eastern Deviation	No-Go Option
	Crocodile and Moganwe Rivers. The Western route crosses more watercourses than the Eastern route. The potential impact is therefore anticipated to be greater on the Western route or any of the deviations in comparison to the Eastern route.	Crocodile and Moganwe Rivers. The Western route crosses more watercourses than the Eastern route. The potential impact is therefore anticipated to be greater on the Western route or any of the deviations in comparison to the Eastern route.	Crocodile and Moganwe Rivers. The Western route crosses more watercourses than the Eastern route. The potential impact is therefore anticipated to be greater on the Western route or any of the deviations in comparison to the Eastern route.	Swartspruit, Crocodile and Moganwe Rivers. The Western route crosses more watercourses than the Eastern route. The potential impact is therefore anticipated to be greater on the Western route or any of the deviations in comparison to the Eastern route.	Swartspruit, Crocodile and Moganwe Rivers. The Western route crosses more watercourses than the Eastern route. The potential impact is therefore anticipated to be greater on the Western route or any of the deviations in comparison to the Eastern route.	Swartspruit, Crocodile and Moganwe Rivers. The potential impact on the watercourses is anticipated to be less as the Western route crosses more watercourses than the Eastern route and there is exisintg infrastructure already in place to access the Eastern Route provided the Le-Mondt servitude is used.	Swartspruit, Crocodile and Moganwe Rivers. The potential impact on the watercourses is anticipated to be less as the Western route crosses more watercourses than the Eastern route and there is exisintg infrastructure already in place to access the Eastern Route provided the Le-Mondt servitude is used.	
Soil and agriculture	The central western portion of the study area, just north of the Magaliesberg consists of deep, reddish and vertic soils that is high potential if they can be irrigated. In terms of soil potential, this	The central western portion of the study area, just north of the Magaliesberg consists of deep, reddish and vertic soils that is high potential if they can be irrigated. In terms of soil potential, this alternative is	The central western portion of the study area, just north of the Magaliesberg consists of deep, reddish and vertic soils that is high potential if they can be irrigated. In terms of soil potential, this alternative is	The central western portion of the study area, just north of the Magaliesberg consists of deep, reddish and vertic soils that is high potential if they can be irrigated.	The central western portion of the study area, just north of the Magaliesberg consists of deep, reddish and vertic soils that is high potential	The land is either too shallow or rocky to cultivate and only suitable as grazing. The potential impact on the soil is anticipated to be the minimal	The land is either too shallow or rocky to cultivate and only suitable as grazing. The potential impact on soil is anticipated to be low due to the low	No impact

Environmental Feature / Attribute	Western Route	Western Route – Eastern Deviation	Western Route – Western Deviation	Western Route Southern Deviation	Central Route	Eastern Route	Eastern Route – Eastern Deviation	No-Go Option
	alternative is anticipated to have a greater impact than all other alternatives due to the high irrigation potential. It is important to note that the potential impact on irrigated land can be significantly, by locating the towers out of those areas.	anticipated to have a greater impact due to the high irrigation potential.	anticipated to have a greater impact due to the high irrigation potential.		if they can be irrigated.	with the route alternative.	irrigation potential.	
Flora	The vegetation on this route is highly disturbed due to previous construction of the transmission lines and is dominated by weeds and alien invasive species such as *Melia azedarach, Opuntia ficus-indica, Campuloclinium macrocephalum,* and *Solanum mauritianum.* The sensitive areas that the proposed route will traverse are the Magaliesberg Natural Area, MPNE, and Magaliesberg & Witwatersberg IBA.	The vegetation on this route is highly disturbed due to previous construction of the transmission lines and is dominated by weeds and alien invasive species such as *Melia azedarach, Opuntia ficus-indica, Campuloclinium macrocephalum,* and *Solanum mauritianum.* The sensitive areas that the proposed route will traverse are the Magaliesberg Natural Area, MPNE, and Magaliesberg & Witwatersberg IBA.	The vegetation on this route is highly disturbed due to previous construction of the transmission lines and is dominated by weeds and alien invasive species such as *Melia azedarach, Opuntia ficus-indica, Campuloclinium macrocephalum,* and *Solanum mauritianum.* The sensitive areas that the proposed route will traverse are the Magaliesberg Natural Area, MPNE, and Magaliesberg & Witwatersberg IBA.	The vegetation on this route is highly disturbed due to previous construction of the transmission lines and is dominated by weeds and alien invasive species such as *Melia azedarach, Opuntia ficus-indica, Campuloclinium macrocephalum,* and *Solanum mauritianum.* The sensitive areas that the proposed route will traverse are the Magaliesberg	The koppie/ridge, through which the proposed transmission will traverse, provides a suitable habitats for Red Data listed species.	These route alternatives will traverse through sensitive areas such as the MPNE, Wonderboom Municipal Nature Reserve, and Magaliesberg & Witwatersberg IBA and the number of orange listed species is greater along this route in comparison to other alternative routes. The	These route alternatives will traverse through sensitive areas such as the MPNE, Wonderboom Municipal Nature Reserve, and Magaliesberg & Witwatersberg IBA.	No impact

Environmental Feature / Attribute	Western Route	Western Route – Eastern Deviation	Western Route – Western Deviation	Western Route Southern Deviation	Central Route	Eastern Route	Eastern Route – Eastern Deviation	No-Go Option
	The western route alternative incorporates the existing powerlines, mostly along the R511 to Brits and passes through the Xstrata Eland Platinum Mine	The western route alternative incorporates the existing powerlines, mostly along the R511 to Brits and passes through the Xstrata Eland Platinum Mine	The western route alternative incorporates the existing powerlines, mostly along the R511 to Brits and passes through the Xstrata Eland Platinum Mine. This alternative poses the least significant impact in comparison to all other alternative routes as most parts of the route are along the main road and existing powerline.	Natural Area, MPNE, and Magaliesberg & Witwatersberg IBA. The western route alternative incorporates the existing powerlines, mostly along the R511 to Brits and passes through the Xstrata Eland Platinum Mine		potential impact to overall biodiversity is the greatest with this route.		
Fauna – Avifauna and Mammals	Mammal species diversity was low across the alternative sites. No sensitive or endangered mammals were visually recorded during the site visits.	Mammal species diversity was low across the alternative sites. No sensitive or endangered mammals were visually recorded during the site visits. .	Mammal species diversity was low across the alternative sites. No sensitive or endangered mammals were visually recorded during the site visits. The potential impact to fauna as a result of the proposed powerline is anticipated to be the least significant in comparison to the other alternatives due to	Mammal species diversity was low across the alternative sites. No sensitive or endangered mammals were visually recorded during the site visits.	Mammal species diversity was low across the alternative sites. No sensitive or endangered mammals were visually recorded during the site visits.	Mammal species diversity was low across the alternative sites. No sensitive or endangered mammals were visually recorded during the site visits. This alternative is anticipated to pose the	Mammal species diversity was low across the alternative sites. No sensitive or endangered mammals were visually recorded during the site visits.	No impact

Environmental Feature / Attribute	Western Route	Western Route – Eastern Deviation	Western Route – Western Deviation	Western Route Southern Deviation	Central Route	Eastern Route	Eastern Route – Eastern Deviation	No-Go Option
			existing disturbances			greatest risk to fauna as the areas along the route is not highly disturbed.		
Fauna – Invertebrates and Herpetofauna	It is anticipated that the potential impacts to invertebrates and herpetofauna that may occur as a result of the proposed powerline will be the least significant for this alternative route as there are existing powerlines along the majority of the proposed alignment and higher levels of anthropogenic disturbances along this route. No major breeding habitats of Giant Bullfrogs were observed along the proposed Anderson-Dinaledi 400kV Transmission Line alternatives, however there are records of the giant bullfrog around the	No major breeding habitats of Giant Bullfrogs were observed along the proposed Anderson-Dinaledi 400kV Transmission Line alternatives, however there are records of the giant bullfrog around the Magaliesburg-Brits area. Southern African Pythons have been recorded from the Magaliesburg Protected Natural Environment (MPNE).	No major breeding habitats of Giant Bullfrogs were observed along the proposed Anderson-Dinaledi 400kV Transmission Line alternatives, however there are records of the giant bullfrog around the Magaliesburg-Brits area. Southern African Pythons have been recorded from the Magaliesburg Protected Natural Environment (MPNE).	No major breeding habitats of Giant Bullfrogs were observed along the proposed Anderson-Dinaledi 400kV Transmission Line alternatives, however there are records of the giant bullfrog around the Magaliesburg-Brits area. Southern African Pythons have been recorded from the Magaliesburg Protected Natural Environment (MPNE).	No major breeding habitats of Giant Bullfrogs were observed along the proposed Anderson-Dinaledi 400kV Transmission Line alternatives, however there are records of the giant bullfrog around the Magaliesburg-Brits area. Southern African Pythons have been recorded from the Magaliesburg Protected Natural Environment	Most of the eastern route is undisturbed and as such the proposed powerline is anticipated to have the greatest impact along this route in comparison to the other alternative routes. No major breeding habitats of Giant Bullfrogs were observed along the proposed Anderson-Dinaledi 400kV Transmission Line alternatives, however there are records of the giant bullfrog around the	No major breeding habitats of Giant Bullfrogs were observed along the proposed Anderson-Dinaledi 400kV Transmission Line alternatives, however there are records of the giant bullfrog around the Magaliesburg-Brits area. Southern African Pythons have been recorded from the Magaliesburg Protected Natural Environment (MPNE).	There will be no impact on the fauna in these areas. No major breeding habitats of Giant Bullfrogs were observed along the proposed Anderson-Dinaledi 400kV Transmission Line alternatives, however there are records of the giant bullfrog around the Magaliesburg-Brits area. Southern African Pythons have been recorded from

Environmental Feature / Attribute	Western Route	Western Route – Eastern Deviation	Western Route – Western Deviation	Western Route Southern Deviation	Central Route	Eastern Route	Eastern Route – Eastern Deviation	No-Go Option
	Magaliesburg-Brits area. Southern African Pythons have been recorded from the Magaliesburg Protected Natural Environment (MPNE).				(MPNE).	Magaliesburg-Brits area. Southern African Pythons have been recorded from the Magaliesburg Protected Natural Environment (MPNE).		the Magaliesburg Protected Natural Environment (MPNE).
Heritage resources	A greater number of heritage sites were identified along the western route and the potential impacts are therefore considered to be of greater significance.	A greater number of heritage sites were identified along the western route and the potential impacts are therefore considered to be of greater significance.	A greater number of heritage sites were identified along the western route and the potential impacts are therefore considered to be of greater significance.	A greater number of heritage sites were identified along the western route and the potential impacts are therefore considered to be of greater significance.	No heritage resources were identified along the corridor route.	Fewer heritage sites were identified along the Eastern route and this route is therefore preferred in terms of heritage signifance.	Fewer heritage sites were identified along this route in comparison to the Western route.	No impact
Social - Economic aspects	The impacts of the cost of servitude acquisition, the potential disruption to economic and social activity along the Western Route are estimated to be higher than that posed by the Eastern Route.	The impacts of the cost of servitude acquisition, the potential disruption to economic and social activity along the Western Route are estimated to be higher than that posed by the Eastern Route.	The impacts of the cost of servitude acquisition, the potential disruption to economic and social activity along the Western Route are estimated to be higher than that posed by the Eastern Route.	The impacts of the cost of servitude acquisition, the potential disruption to economic and social activity along the Western Route are estimated to be higher than	The impacts of the cost of servitude acquisition, the potential disruption to economic and social activity along the Western Route are estimated to	The impacts of the cost of servitude acquisition, the potential disruption to economic and social activity along the Western Route are estimated to be higher	The impacts of the cost of servitude acquisition, the potential disruption to economic and social activity along the Western Route are estimated to be higher	Future development may be compromised if electricity Grid is not strengthened.

Environmental Feature / Attribute	Western Route	Western Route – Eastern Deviation	Western Route – Western Deviation	Western Route Southern Deviation	Central Route	Eastern Route	Eastern Route – Eastern Deviation	No-Go Option
				that posed by the Eastern Route.	be higher than that posed by the Eastern Route.	than that posed by the Eastern Route.	than that posed by the Eastern Route.	
Transportation - Roads	The proposed powerline is anticipated to cross the following major routes N4, R566, R513, R511, R514 and the R104. Access roads may be required across streams and watercourses.	The proposed powerline is anticipated to cross the following major routes N4, R566, R513, R511, R514 and the R104. Access roads may be required across streams and watercourses.	The proposed powerline is anticipated to cross the following major routes N4, R566, R513, R511, R514 and the R104. Access roads may be required across streams and watercourses.	The proposed powerline is anticipated to cross the following major routes N4, R566, R513, R511, R514 and the R104. Access roads may be required across streams and watercourses.	The proposed powerline is anticipated to cross the following major routes N4, R566, R513, R511, R514 and the R104. Access roads may be required across streams and watercourses.	The proposed powerline is anticipated to cross the following major routes N4, R566, R513, R511 and the R514. Access roads may be required across streams and watercourses.	The proposed powerline is anticipated to cross the following major routes N4, R566, R513, R511 and the R514. Access roads may be required across streams and watercourses.	No impact
Visual quality	This route is anticipated to have a lesser impact that the eastern alternatives due to the location and position of the powerlines and towers; however it is important to note that the landscape and visual impacts occurring during the construction phase can be mitigated relatively effectively.	This route is the least preferred in terms of the visual impacts that may result due to the location and position of the powerlines and towers; however it is important to note that the landscape and visual impacts occurring during the construction phase can be mitigated relatively effectively.	This route is anticipated to have a lesser impact that the eastern alternatives due to the location and position of the powerlines and towers; however it is important to note that the landscape and visual impacts occurring during the construction phase can be mitigated relatively effectively.	This route is anticipated to have a lesser impact that the eastern alternatives due to the location and position of the powerlines and towers; however it is important to note that the landscape and visual impacts occurring during the construction phase can be	This route is anticipated to have a lesser impact that the eastern alternatives due to the location and position of the powerlines and towers; however it is important to note that the landscape and visual impacts occurring	The Eastern Route is regarded as the most preferred alternative. Its location and position in the landscape is considered to cause the least impact on the landscape character due to the reduced sensitivity of the landscape	The Eastern Route – Eastern Deviation is regarded as the second preferred alternative. Its location and position in the landscape is considered to cause the least impact on the landscape character due to the reduced	No impact

Environmental Feature / Attribute	Western Route	Western Route – Eastern Deviation	Western Route – Western Deviation	Western Route Southern Deviation	Central Route	Eastern Route	Eastern Route – Eastern Deviation	No-Go Option
				mitigated relatively effectively.	during the construction phase can be mitigated relatively effectively.	along the servitudes and the local roads.	sensitivity of the landscape along the servitudes and the local roads.	

12.4 BPEO Selection

Based on the recommendations of the specialists and the comparison of the impacts associated with the various alignments, the following options are considered to be the preferred alternatives:

Western Route: The invertebrate and herpetological specialist recommends that the western route be recommended as the preferred route, the southern, eastern and western deviations will not ameliorate any potential impact.

Western Route – Western Deviation: The flora and fauna specialist recommends that this route be recommended in terms of flora and fauna sensitivity as most parts of the route are along the main road and existing powerline and are considered less sensitive than the alternative routes in terms of biodiversity.

Eastern Route: This route option is recommended by the Heritage, Visual, Agricultural and Socio-Economic specialists.

Based on the recommendations by the specialists and the impact assessment, **the Best Practicable Environmental Option (BPEO) is the Eastern Route**. There are a number of reasons for this recommendation highlighted in the text below:

- According to the the flora and fauna study, the Eastern route is regarded as the route alternative that would pose the greatest threat to the overall biodiversity of the area **during construction of the proposed transmission line** as it traverses through the sensitive areas such as MPNE, and the number of Orange Listed plant species recorded on this route were higher than the other route alternatives. However it must be noted that the line and the pylons can be relocated within the corridor to avoid these listed species and where these species cannot be avoided then the relevant permit must be obtained. It is therefore in the opinion of the EAP that the potential impact on the Eastern route can be mitigated against in terms of flora and fauna.
- In terms of the invertebrate and herpetological assessments, there were no species of conservation identified along any of the routes and as such the potential impact on the Eastern route can be mitigated against.
- Both the Eastern and Western routes cross the MPNE and as such irrespective of the route chosen, the powerline will cross the MPNE, However the existing Le-Mondt line which follows part of the Eastern route has a servitude of 22m that is already disturbed and will be decommissioned in early 2014 and it is therefore anticipated that if the powerline follows the Eastern Route, the potential impacts can be mitigated against as the existing Le-Mondt 22m servitude can be used for a portion of the Eastern route. Where there is already existing disturbance from the exisintg infrastructure.

- As with the Western route, there are also existing powerlines that span most of the length of both routes and therefore irrespective of which route is chosen, the new Anderson-Dinaledi line will be located along exisintg powerline.
- Should the western route be used, the potential impacts from a Heritage, Socio-Economic, Visual and Agricultural perspective will be of higher / of greater significance than the Eastern route. The potential impacts as a result of the Eastern route are anticipated to be much less significant than the Western route.
- In addition to this, the Hartbeespoort Environment Heritage Association (HEHA) stated in the comments submitted on the 09/11/2012, that the Western route is more sensitive in terms of avifauna, reptiles and amphibians and heritage and as such the western route should not be the preferable route for the Anderson-Dinaledi Transmission line. It is therefore in the opinion of the EAP that the Eastern route therefore be used as the preferred route.

It is imprtoant at this point to note that according to NEMA (1998) the environment is defined as the natural environment and the physical chemical, aesthetic and cultural properties of it that influence human health and well-being. **It is therefore recommended that the Eastern route be chosen as the preferred route as it is considered to be the BPEO.**

12.5 Route Refinement

Within the 1km corridor and through the spanning of the line the following sensitive features and areas need to be avoided as far as possible:

- Human settlements;
- Any conservation or protected areas;
- Active clay soil, marshy or flooding areas;
- Aerodrome statutory safety zones;
- Sugar cane fields, plantations;
- Irrigated land, windmills, boreholes;
- Open cast mining;
- Rugged terrain, extensive rock outcrops;
- Potential unstable side-slope terrain;
- Eroded and unstable areas;
- Railway lines/major roads angle of crossing (60º to 90º) because of interference to telecommunication system; and
- Railway lines telecommunication safety zone (when running parallel to them).

Taking into consideration the above-mentioned features as well as the environmental context of the project area, potentially significant environmental issues and suggestions made by the I&APs and EIA team, the

route of the BPEO can be refined. The majority of the route refinement will take place during the walk-down survey, as well as through the negotiation process for the servitude registration.

13 PUBLIC PARTICIPATION – EIA PHASE

The purpose of public participation includes:

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

Box 3:	What is an "I&AP"?
According to Government Notice GN No. R. 385 (2006), "*Interested and Affected Party*" (I&AP) means an party contemplated in section 24(4)(d) of the NEMA, and which in terms of that section includes – (a) any person, group of persons or organisation interested in or affected by an activity; and (b) any organ of state that may have jurisdiction over any aspect of the activity.	

The public participation process that was followed for Anderson-Dinaledi Project is governed by NEMA and GN No. R. 385. The Plan of Study for the EIA stipulates the activities to be undertaken as part of the public participation for the Anderson-Dinaeldi Project, in accordance with regulatory requirements, which forms the basis of the discussions 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.

Figure 65 outlines the key milestones in the public participation process undertaken for the Scoping and EIA phases for the proposed Anderson-Dinaledi 400kV transmission line.

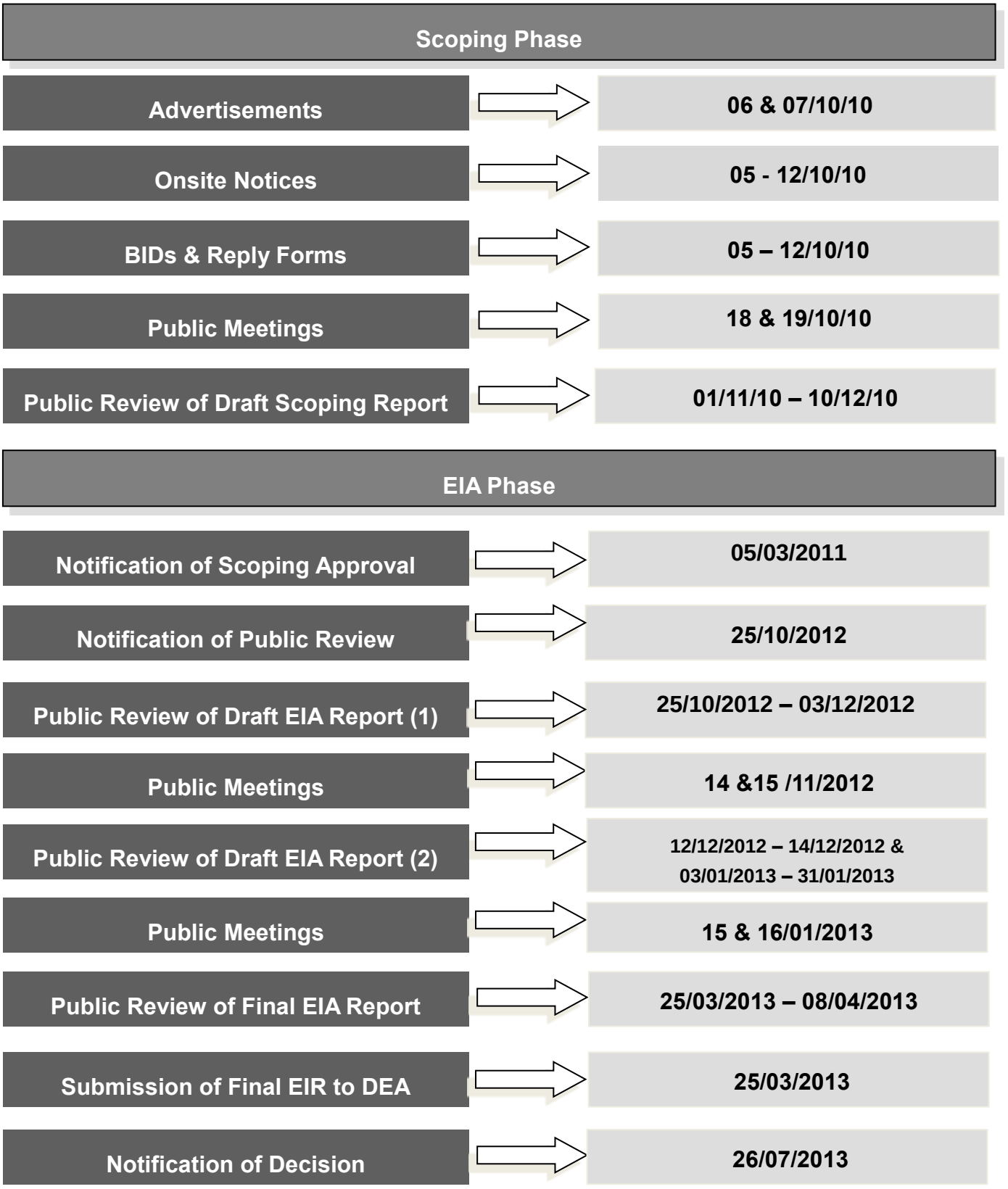

Figure 65: Public Participation Process for Anderson-Dinaledi 400 kV transmission line

13.1 Maintenance of the I&AP Database

The database of I&APs, which contains particulars of *inter alia* authorities, stakeholders, landowners and members of the general public, was maintained during the EIA phase.

Directly affected landowners along the route were identified *inter alia* by using the information provided by Eskom for their existing servitude. The remainder of the details for directly affected landowners along all alternative routes were identified through a deed search on affected properties within the 1 km corridor (i.e. 500 m on either side of the servitude centre line), and through discussions held with the Agricultural Sector, Municipal Planning departments, Department of Land Affairs: Deeds Registration and known landowners.

13.2 Notification – Approval of Scoping Report

Advertisements were placed in the following newspapers as notification that the Scoping Report had been approved by DEA (refer to copies of the newspaper advertisements contained in ***Appendix I***):

- The Star: 06/10/2010
- The Beeld: 07/10/2010; and
- The Kormoront: 07/10/2010.

In addition, all I&APs on the database were notified of the approval of the Scoping Report and commencement of the EIA phase via fax, email or registered mail.

13.3 Comments and Response Report

The correspondence received from I&APs during the EIA phase is included in ***Appendix H.*** This Report also attempts to addresses the comments through input from the project team. Note that all comments received following the public review of the Draft EIA Report will be included in the final EIA Comments and Response Report.

13.4 Review of Draft EIA Report

13.4.1 Notification

I&APs will be notified as follows of the opportunity to review the Draft EIA Report:

- A notification letter of the Draft EIA Reports were forwarded to I & APs; and
- Newspaper advertisements were placed as notification on 25 and 26 October 2012 and on 10 and 13 December 2012 in the following newspapers:
    - The Star;

- The Beeld; and
- The Kormoront.

13.4.2 Lodging and Distribution of Draft EIA Report

The Draft EIA Report (version 1) was placed at the locations provided in the table below to allow the I&APs to review the document. A fourty-day review period (from 25th October 2012 until 03rd December 2012) was granted.

Table 36: Locations for review of Draft EIA Report

Location	Address	Tel. No.
Hoërskool Brits	1 Johan Street Brits	Adolf Gouws 012 252 3228
Laerskool Broederstroom	Plot 33, Primula Street, Flora Park	087 940 9167
Madibeng Community Library	51 Van Velden Street, Brits Office Hours: Mon-Fri: 09:00-17:00 Saturdays: 09:00-12:00	012 318 9318
Schoemansville Library	Marais Street, Schoemansville	012 253 1177

The Draft EIA Report (version 2) was placed at the locations provided in the table below to allow the I&APs to review the document. A thirty-day review period (from 12-14 December 2012 and 03-31 January 2013) will be granted.

Table 37: Locations for review of Draft EIA Report

Location	Address	Tel. No.
Madibeng Community Library	51 Van Velden Street, Brits Office Hours: Mon-Fri: 09:00-17:00 Saturdays: 09:00-12:00	012 318 9318
Schoemansville Library	Marais Street, Schoemansville	012 253 1177

Copies of the Draft EIA Report will be provided to the following Authorities for review:

- Department of Environmental Affairs (DEA);
- Gauteng Department of Agriculture and Rural Development (GDARD);
- North West Department of Agriculture, Conservation and Environment;
- Madibeng Local Municipality;
- City of Tshwane Metropolitan Municipality;
- South African National Roads Agency (SANRAL);
- North West Province Roads Department and Public Works;

- North West Department of Housing;
- Department of Mineral Resources (DMR);
- Department of Water Affairs (DWA);
- National Department of Agriculture (NDA);
- Provincial Heritage Resources Authority, Gauteng; and
- South African Heritage Resources Authority.

The Draft EIA Report was also placed on the Eskom website (http://www.eskom.co.za/c/44/environmental-impact-assessment/) for all I&APs to review.

13.4.3 Public Meetings

Public meetings were held on the 14 and 15 November 2012 to present the Anderson substation Draft EIA Report (version 1). Public meetings were also held on the 15 and 16 January 2013 to review the Draft EIA Report (version 2).

Table 38: Details of public meetings held to present the Draft EIA Report (version 2)

15 January 2013	**Venue:**	Motozi Lodge, R104 Hartbeespoort
	Time:	17:30-19:30
16 January 2013	**Venue:**	Dassie Paleis, Spoorweg St, Brits
	Time:	17:30-19:30

I&APs were notified via email, fax or post regarding the details of the meetings. The advertisements discussed in **Section 13.4.1** also contains the particulars of the abovementioned public meetings.

The aims of the public meetings include the following:

- To present the project details (i.e. alternative routes considered);
- To present the findings of the specialist studies;
- To address key issues raised during the EIA Process;
- To elaborate on the potential environmental impacts (qualitative and quantitative), and the proposed mitigation of these impacts;
- To present the findings of the comparative analysis of the alternatives;
- To explain the EIA process; and
- To allow for queries and concerns to be raised, and for the project team to respond.

13.5 Review of Final EIA Report

The Final EIA Report will be lodged in the public domain from the 25 March 2013 – 08 April 2013 to grant I&APs and opportunity to review the document. Copies of the document will be lodged at the same places listed in **Table 37** and it will be placed on the Eskom website (http://www.eskom.co.za/c/44/environmental-impact-assessment/). All attendees of the public meetings will be notified of the review process.

13.6 Notification of DEA Decision

All I&APs will be notified via email, fax or post within 10 days after having received written notice from DEA on the final decision for the Anderson-Dinaledi EIA Report. 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 and key reasons for the decision. A copy of the decision would be provided to I&APs on request.

13.7 Landowner Notification

In terms of regulation 16(1) of GN No. R. 385 of 21 April 2006, landowner consent is required if the applicant (i.e. ESKOM) is not the owner of the land on which the proposed activity is to be undertaken. According to regulation 16(3), this stipulation does not apply to a linear activity provided the applicant "has given notice of the proposed activity to the owners of the land on which the activity is to be undertaken as soon as the proposed route or route alternatives have been identified". The last mentioned provision was attended to during public participation. Landowner consent will thus not be sought for the linear components of the Anderson-Dinaledi Project.

14 EIA CONCLUSIONS AND RECOMMENDATIONS

14.1 Sensitive Environmental Features

Should authorisation for the final alignment be granted by DEA, and following the negotiations with landowners, the final position of the towers and the centre line for the Anderson-Dinaledi 400 kV transmission line and coordinates of each bend in the line will be determined by the surveyors, line design engineers and environmental specialists.

Within the context of the project area, cognisance must be taken of the following sensitive environmental features, attributes and aspects, for which mitigation measures are included in the EIA Report and draft EMPr:

- Erosion control measures are deemed to be crucial especially once the surface soil, vegetation and plant cover has been compromised.
- The encroachment of the construction activities (transmission line, access roads and construction camp) into the regulated areas of watercourses (i.e. 1:100 year floodline or delineated riparian / wetland habitats, whichever is greatest) could adversely affect resource quality by altering flow, reducing water quality, altering habitat and impacting on aquatic biota. These impacts could be exacerbated during the rainy season, if suitable mitigation measures are not in place. Accepting that the objectives and measures included in the draft EMPr pertaining to reinstatement and rehabilitation of the watercourses are adopted and implemented and that the regulated areas of watercourses will be avoided, the potential impacts should be temporary and restricted to the construction phase. Specific management requirements and measures are listed in the EMPr to address the construction-related impacts to the resource quality of the affected watercourses.
- Although much of the project area is utilised for farming and mining and other land uses that has caused land degradation, all route alternatives incorporate habitat units that would support a variety of faunal and floral species biodiversity to a greater or lesser extent – many of which are RDL and ODL. The proposed transmission lines will traverse the Magaliesberg mountain range, which is a unique mountain range of great ecological, geological and cultural importance and value.

  Sensitive ecological features include:
  - All protected areas;
  - Rocky ridges;
  - Wetlands, aquatic habitat and riparian areas;
  - Areas that have retained natural ecological features and are not suffering degradation are considered ecologically sensitive.
  - Impacts to avifauna from collision with the power line require specific attention, and the recommendations included in this report need to be implemented.

- Special care should be exercised to minimise traffic disruptions along the national, arterial, main and secondary roads.
- The project area consists of high topographic variation. This affords a high visual quality to the region, which needs to be taken into consideration during the final placement of the towers. The draft EMPr includes measures to impacts to the aesthetic value of the project area.
- From a socio-economic perspective, the management of impacts to landowners during the construction and operation phases need to be strictly controlled through the mitigation measures recommended by the specialist studies and the draft EMPr.
- Human and animal health risks associated with EMFs need to be closely monitored.

14.2 Environmental Impact Statement

With the selection of the BPEO for the transmission line route, the adoption of the mitigation measures included in the EIA Report and the dedicated implementation of the draft EMPr, it is believed that the significant environmental aspects and impact 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.

14.3 Key Recommendations

The following key recommendations accompany the EIA for the Anderson-Dinaledi 400kV transmission line:

- From the comparative analysis, the western route, western route – western deviation and the eastern route are preferred options to minimise impacts to the environment.
- It is recommended that Eastern route be chosen as the preferred alternative as the potential impacts that may rise can be mitigated against.

14.4 Conditions for Authorisation

The following conditions are regarded as critical mitigation measures emanating from the EIA:

- On-going communication with the affected landowners and during the implementation of the project.
- Prior to any construction, undertake necessary negotiations with directly affected landowners and establish requirements for access, fencing, game requirements, existing services, etc.
- Diligent compliance monitoring of the EMPr, environmental authorisation and other relevant environmental legislation by an Independent Environmental Control Officer (ECO) is crucial to ensure compliance with the stipulated management measures.

- Areas affected by construction activities need to be suitably stabilised due to the varying topography and watercourses within the project area. Suitable stormwater management measures are also required for access roads to manage erosion.
- Protected flora species are to be relocated prior to vegetation clearance, should avoidance not be possible. Permits need to be obtained under National Forests Act (Act No. 84 of 1998) if protected trees are to be cut, disturbed, damaged, destroyed or removed.
- A walk-down survey is to be undertaken, which includes the relevant environmental specialists, to determine the exact locations of the towers to ensure the safeguarding of sensitive environmental features within the corridor.
- The Construction EMPr must be updated to include the findings of the walk-down survey and should be submitted to DEA for approval.
- All access roads and construction camps need to be identified prior to construction and the final EMPr should make provision for suitable mitigation measures to manage these project components.
- Suitable fencing and access control required to protect farms.
- Strict security measures to be implemented.
- All relevant permits must be obtained prior to the commencement of construction activities or as deemed necessary.
- All recommendations and / mitigation measures made by the specialists must be adhered to for the preferred route chosen.

15 REFERENCES

Cook, C. (2012) Herpetological habitat sensitivity scan for the proposed establishment of the Anderson-Dinaledi 400kV transmission line between the proposed ne Anderson substation and the existing Dinaledi substation (Brits); North West and Gauteng Provinces.

Gauteng Conservation Plan Version 3.3 (C-Plan 3.3). Gauteng Department of Agriculture and Rural Development. Directorate Nature Conservation. Technological Services.

Gouws, A. (2012) Soil Survey and Agricultural Potential Study.

Keatimilwe K. and Ashton P. (2005) Guidline for the review of specialist input in the EIA Process. Accessed via: http://www.westerncape.gov.za/Text/2005/10/2b_deadp_specialist_review_guideline_june05.pdf)

Marais-Botes, (2011). Phase 1 Heritage impact assessment for the proposed Dinaledi substation to Anderson – Substation 400kV Transmisison line.

Phampe, R. (2011) Fauna and Flora Assessment: Proposed establishment of the Anderson 400kV Substation in Broederstroom, North West Province.

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Van de Merwe, V. (2012). Invertebrate sensitivity scan for the proposed Anderson – Dinaledi Transmission Line.

APPENDIX A: MAPS

1. LOCALITY MAP

2. GOOGLE EARTH MAP

APPENDIX B: DEA APPROVAL OF SCOPING REPORT

APPENDIX C: MINUTES OF MEETING HELD WITH DEA

APPENDIX D: SPECIALIST REPORTS

1. FAUNA, FLORA AND AVIFAUNAL IMPACT ASSESSMENT

2. INVERTEBRATE IMPACT ASSESSMENT

3. HERPETOLOGICAL IMPACT ASSESSMENT

4. VISUAL IMPACT ASSESSMENT

5. SOCIO-ECONOMIC IMPACT ASSESSMENT

6. HERITAGE IMPACT ASSESSMENT

7. AGRICULTURAL AND LAND CAPABILITY IMPACT ASSESSMENT

8. ELECTROMAGNETIC SURVEY

APPENDIX E: ENVIRONMENTAL MANAGEMENT PROGRAMME (EMPr)

APPENDIX F: SERVITUDE NEGOTIATION PROCESS

APPENDIX G: CURRICULA VITAE

APPENDIX H: COMMENTS RAISED BY I & APS

APPENDIX I: PROOF OF PUBLIC PARTICIPATION