FINAL ENVIRONMENTAL IMPACT REPORT (FEIR)

FOR THE

PROPOSED 2nd 400kV LINE FROM ARIADNE TO VENUS SUBSTATION AND UPGRADE OF BOTH SUBSTATIONS

DEA Ref No: 12/12/20/1755

13 February 2012

VOLUME 1 EIR MAIN REPORT & APPENDICES

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DRAFT ENVIRONMENTAL IMPACT REPORT DISTRIBUTED AREAS

The report was also available on the Eskom web page:www.eskom.co.za/eia. Furthermore, soft (electronic) copies of the report were made available at the below-mentioned venues. Finally, electronic copies were taken to Public and Stakeholder Meetings.

Place	Location
Farmers' Association Hall, Estcourt	Phillips Street, Estcourt
The Lodge @ Curry's post	76 Curry's Post Road
WESSA Offices, Umngeni River	1 Karkloof Road, Howick
Nottingham Road Hotel	Nottingham Road
Sakabula Landowners Association	Sakabula Estate
Baynesfield Estate	Baynesfield Country Club
Libraries	
Estcourt Library	C/o Connor &Victorya Streets, Estcourt
Mooi River	1 Church Road, Mooi River
Howick	30 Main Street, Howick
Pietermaritzburg	260 Church Street, Pietermaritzburg
District Municipalities	
uMgungundlovuOffic e	242 Langalibalele Street, Pietermaritzburg
Local Municipalities	
uMtshezi Local Municipal Office	Civic Building, Victoria Street, Estcourt
uMngeni Local Office	C/o Sonne& Brick Street, Howick
MooiMpofana Local Office	10 Clangton Terrace, Mooi River

EXECUTIVE SUMMARY

INTRODUCTION

The growing demand for electricity places increasing pressure on Eskom's existing power generation and transmission capacity. Eskom is committed to implementing a sustainable energy strategy that complements the policies and strategies of National Government. Thus, Eskom wants to expand and upgrade the infrastructure in order to improve the reliability of electricity supply to the country, and in particular, to provide for the growth in electricity demand in the KwaZulu-Natal Province.

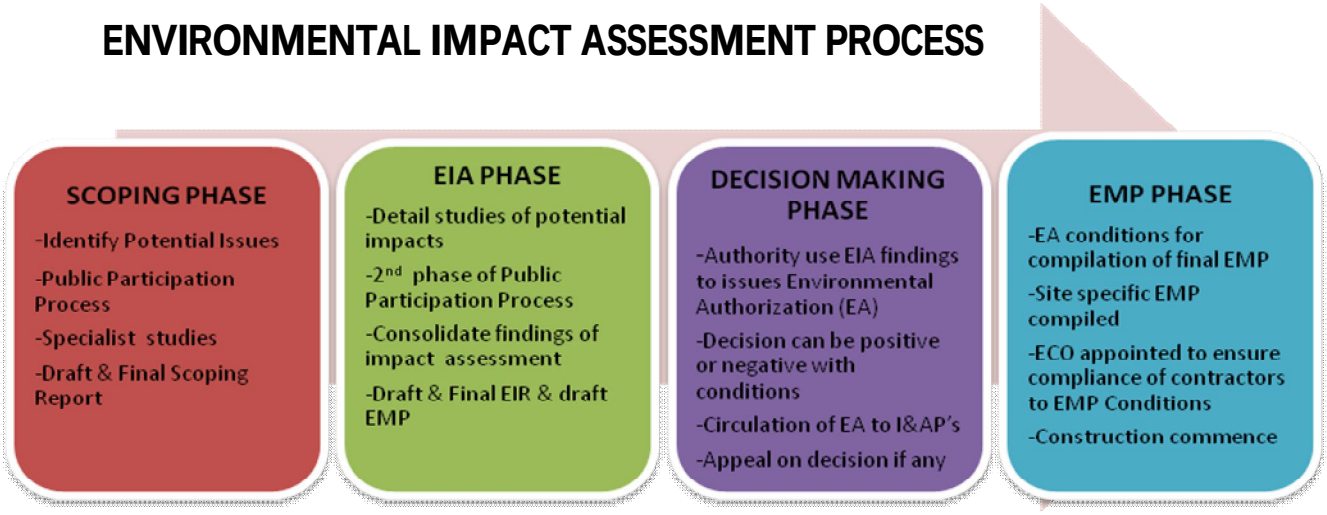
In order to alleviate current and future network constraints under N-1 contingency (loss of one of the Transmission power lines) in KwaZulu-Natal, it is proposed that a 765kV ring must be built. The proposed plan consists of 765kV lines from the generation pool in Mpumalanga, one line going to the Empangeni area and the other to the Pinetown area. It is also proposed to construct a 400kV link between Empangeni and Pinetown 765kV networks.

The proposed second Ariadne-Venus 400kV line project (this study) entails the following activities:

- Construction of one new 400kV power line from Ariadne to Venus Substations;
- Extension of both Ariadne and Venus Substations; and
- Adding 400kV feeder bays at both Ariadne and Venus Substations.

In terms of the National Environmental Management Act (Act 107 of 1998, NEMA) as amended and its EIA Regulation published in July 2008, it is necessary to undertake environmental investigations as an integral part of project planning in order to obtain environmental authorisation for a proposed activity that may have a potentially negative effect on the environment. NEMA regulates a specific multi-phased process for studying these types of proposals – please refer to the figure below:

ENVIRONMENTAL IMPACT ASSESSMENT PROCESS



ALTERNATIVES

It is best practice in environmental management to consider as many alternatives as possible until the most desirable alternative is chosen. During the identification and assessment of alternatives to be considered for proposed project, the project team consisting of the proponent, Environmental Assessment Practitioner (EAP), specialists and members of the public, play a key role in considering and selecting viable alternatives. The following alternatives are considered for this impact assessment phase:

- Alignment Alternative:
  - Alternative 1a (Grey + Purple Corridor);
  - Alternative 1b (Grey + Orange corridor); and
  - Alternative 2 (Green corridor)
- No-Go Alternative.

SPECIALIST FINDINGS AND RECOMMENDATIONS

From the initial scoping process and the distillation of issues and associated potential impacts, the need for the following specialist studies was identified. The following studies were conducted:

- Flora Assessment;
- Fauna Assessment;
- Avi–Fauna Assessment;
- Wetlands Assessment;
- Visual Impact Assessment;
- Heritage Impact Assessment;
- Social Impact Assessment;
- Soil and Agricultural Potential Assessment;
- Economic Assessment; and
- Town and Regional Planning Assessment.

The results of specialist studies were used by the EIA team when undertaking the integrated assessment of the proposed development. The outcomes of the integration and assessment are documented in this Final Environmental Impact Report (this report), which was released to public domain for comment as a Draft EIR.

DRAFT ENVIRONMENTAL MANAGEMENT PLAN

The EMP will outline all activities that have to be undertaken, where they will take place, the responsible persons, all possible environmental or social impacts, mitigation measures, rehabilitation plans, monitoring methods, the frequency of monitoring and performance indicators. The EMP will be a legally binding stand-alone document, which will be used to ensure that Eskom adheres to all conditions of the Environmental Authorization (EA) and Environmental Impact Assessment Report (EIR).

ENVIRONMENTAL IMPACT STATEMENT

The study area is rich in biodiversity in terms of flora, fauna, and Avi-fauna perspective. Many Red Data species were identified across the taxa. The most notable threatened species of high conservation value within the study area were crane species. Most habitats associated with crane species were delineated or marked as highly sensitive areas and all efforts were made that the preferred corridor avoids these sensitive areas. Other sensitive areas that were taken into consideration were based on issues regarding potential agriculture (avoidance of centre pivot points), social (avoid resettlement, school) and other infrastructure impacts.

It is perceived that the construction and operation of a transmission line will have negative effects on the environment. However, when appropriate mitigations are implemented, the intensity of the impacts is reduced. After careful consideration of the key aspects of environment (i.e. biophysical, social and economic aspects), the preferred corridor is Alternative 1b. There was not much distinction between Alternative 1a and Alternative 1b,but Alternative 1b was chosen on the basis that it follows two existing 275kV lines up to the point where it turn in into Ariadne Substation. It therefore makes sense to recycle one of the two existing 275kV lines in its entirety.

UMONGO WESIGUNGU

ISAZISO

Ngenxa yokwentuleka okukhulu kukagesi kufaka ingcindezi enkulu ku-Eskom ekukhiqizeni nokuthumela ugesi. uEskom uzinikele ngakho konke okungamasu asebenzayo nezindlela ezinzulu zikaZwelonke. Kanjalo, u-Eskom uzokwandisa athuthukise izingqalasizinda ukuze kwenyuke izinga lokuphakela ugesi ezweni lonke, ikakhulukazi ngenxa yokwenyuka komthamo kagesi lapha kwi-Province yaKwaZulu-Natal.

Ukuze kunciphe izinkinga ezikhona nezisazokwenzeka zokuxhumana ezingaphansi kuka N1 (ukulahleka kwenye yezintambo zokuthumela amandla kagesi) esifundeni sa KwaZulu-Natal, kuhlongozwa ukuba kwakhiwe isizinda esingu 765kV. Loluhlelo oluhlongozwayo olwezintambo zikagesi ezingu 765kV ezisuka kwisizinda esise Mpumalanga, intambo yamandla eyodwa izobheka Empangeni enye ibheke e-Pinetown. Kuphindwe kuhlongozwe ukwakhiwa kwesizinda esingu 400kV esizo xhumanisa izintambo zikagesi ezingu 765kV zokuxhumana phakathi kweMpangeni ne Pinetown.

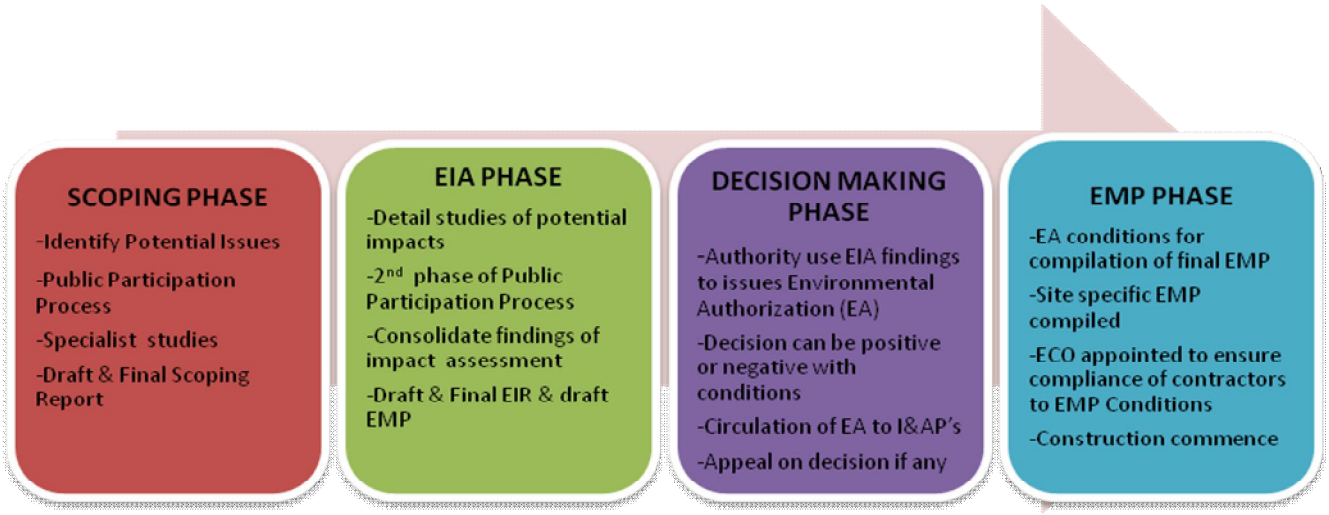
Ukubakhona kwesizinda esingu 765kV kubalulekile ekulahlekeni kwamandla kagesi endaweni yase Pinetown elahlekelwe i-Ariadne – Venus 400kV. Isizathu salokhu ukuthi i-Venus inomsuka onamandla ongu 400kV njengoba i-Majuba neDrakensberg ziphakelwa iyona. Ngenkathi kulahleka i-Ariadne – Venus 400kV, amandla aphuma kuVenus eqhamuka kuMersey – Venus engu 400kV agcina eqisa umthamo. Ukuxazulula lenkinga kuhlongozwa ukuthi umzila iGeorgedale - Venus engu 275kV ikhushulwe amandla abe 400kV noma kwakhiwe umzila omusha ozoba ngu 400kV ube inxenye yase Pinetown yokuqinisa isigaba sokuqala (Phase 1) (koya ngomphumela wocwanigo lwe-EIA).

Amalungiselelo omsebenzi ohlongozwayo we Ariadne – Venus yesibili ahlanganisa lokhu:

- Ukwakhiwa kwentambo entsha ewu 1x400kV esuka e-Ariadne eya e-Venus kusiteshi esincane (substation);
- Ukwandiswa kwezikhungo zombili zeziteshi ezincane i-Ariadne neVenus;
- Ukufakwa kuka 400kV ukuze zombili iziteshi ezincane i-Ariadne neVenus zikwazi ukuthwala ngokweqa

INQUBO YOCWANINGO LWEMVELO

Imigomo efanele yocwaningo (EIA) inezigaba azimbalwa; isigaba esikuso manje yilesi socwaningo lokuqala (Scoping). Amalungiselelo engqala sizinda sokuthuthukisa ahlongozwayo alandela i-Environmental Impact Assessment Regulation, 2006 ye National Environmental Management Act, 1998 (Act No. 107 of 1998). Umthetho wezokuhlolwa kwemvelo uqinisekisa ukuthi imiphumela yocwaningo, ingaba mihle noma ibemibi, inikezwa abaphathi bezemvelo ukuze bona benze isinqumo. Izigaba ezizolandelwa kulolucwaningo lwezemvelo (EIA) yilezi:



AMALUNGISELELO OKUBAMBISANA NOMPHAKATHI

Amalungiselelo okubambisana nomphakathi ayadingeka ku EIA (Environmental Impact Assesment) ngokwesigatshana 6 ka R385 ka National Environmental Management Act, 1998 (Act No. 107 ka 1998). Iqembu labaphathi nabathintekayo linikwa ithuba lokuphawula ngamalungiselelo omsebenzi noku qinisekisa ukuthi yonke imininingwane ephawulwe abathintekayo ngaphansi kwesigaba semvume ishicilelwe. Abaphathi nabathintekayo bayonikwa izinsuku ezingu-30 ukuphawula ngokweziwe ngesigaba semvume. Okulandelayo ngaphansi okokubambisana nomphakathi okwenziwe kwisigaba semvume:

- Ukwethulwa komsebenzi
- Ukuregista kwamalungu abaphathi nabathintekayo
- Umhlangano womphakathi nabathintekayo
- Imihlangano yezigungu zabaholi bendabuko
- Imhlanganisela yezihloko ezahlukene nakanjalo nokuphawula okwahlukene

IZINDLELA EZAHLUKENE

Ubuhlakani bokuphathwa kwemvelo budinga amaqhinga amaningi lapho kugcine sekutholakele indlela ezosebenza kulowo msebenzi ohlongozwayo. Ukubambisana kwethimba elinomhloli onobuhlakani, ongoti (EAP), kanye nomphakathi, kudlala indima ebalulekile ekuqokweni kwezindlela ezisebenzayo. Ngaphansi izindlela eziqokiwe kulomsebenzi ohlongozwayo:

- Ulwazi olunye
  - Izintambo zikagesi ezihamba phezulu
  - Izintambo zikagesi ezihamba ngaphansi komhlabathi
- Enye indlela yokuqondisa
- Amandla kagesi atholakala ngezindlela ezinye
  - amandla agcwaliswayo njalo njalo
- Indlela engahanjwa (alubhadwa)

Kulesigaba sokushicilela imvume, inhloso ukuveza ithuba kubaphathi, abathintekayo nabahlomulayo lokuthola ukuthi kungakanani okungaphazamisa imvelo; kanye nokungenziwa ukulugisa noma ukwelapha lokho ukuze kungabhebhetheki ngokocwaningo. Ukuphawula komphakathi, abathintekayo nabahlomulayo kwisishicilelo semvumo kosetshenziswa kuhlanganiswe nocwaningo imiphumela inikezwe abaphathi (DEA) ukuze kuhlolisiswe bese kuthathwa isinqumo.

Ochwepheshe bazobhekisisa konke okungathinta imvelo kabi noma kahle, nokungavela uma sekubhalwa incwadi yombiko.

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EA:	Environmental Authorisation
ABE:	Affirmative Business Enterprise
ARC:	Agricultural Research Council
DEA:	Department Environmental Affairs
DM:	District Municipality
DWA:	Department of Water Affairs
EA:	Environmental Authorization
EAP:	Environmental Assessment Practitioner
ECO:	Environmental Control Officer
EIA:	Environmental Impact Assessment
EIR:	Environmental Impact Report
EIS:	Environmental Impact Statement
EMF:	Electric Magnetic Field
EMP:	Environmental Management Plan
EWT:	Endangered Wildlife Trust
GIS:	Geographical Information System
GPS:	Geographic Positioning System
IDP:	Integrated Development Plan
I&AP:	Interested and Affected Party
IRR:	Issues and Responses Report
kV:	Kilo Volts
KZN:	KwaZulu-Natal
LM:	Local Municipality
Ma:	Million Years
NEMA:	National Environmental Management Act (Act 107 of 1998)

PES:	Present Ecological Status
P2:	Public Participation
P2P:	Public Participation Process
ROD:	Record of Decision
SDF:	Spatial Development Framework
SIA:	Social Impact Assessment
SMME:	Small, Medium and Micro Enterprise
VIA:	Visual Impact Assessment
WMA:	Water Management Area

1. INTRODUCTION

The growing demand for electricity is resulting in increased pressure on Eskom's existing power generation and transmission capacity. Eskom is committed to implementing a sustainable energy strategy that complements the policies and strategies of National Government. Thus, Eskom wants to expand and upgrade the infrastructure in order to improve the reliability of electricity supply to the country, and in particular to provide for the growth in electricity demand in the KwaZulu-Natal Province.

This EIA is for the proposed construction of a second new 400kV line from Ariadne substation to the Venus substation as well as the extension, upgrade and refurbishment of both substations. An application for Environmental Authorisation was made to the National Department of Environmental Affairs (DEA). Baagi Environmental Consultancy cc as an Independent Environmental Practitioner (EAP), was appointed by Eskom Holdings SOC Limited to manage and undertake the Environmental Impact Assessment (EIA) process for this project

1.1 PROPONENT DETAILS

Table 1: Project Proponent Details

PROPONENT DETAILS	
Company Name	Eskom Holdings SOC Limited
Contact Person	Ms Mamokete Mafumo
Postal Address	P O Box 1091, Johannesburg, 2000
Physical Address	Maxwell Drive, Sunninghill Ext 3, Megawatt Park, Sandton
Telephone	011 800 2621
Fax	086 665 2128
Email	mamokete.mafumo@eskom.co.za

1.2 ENVIRONMENTAL ASSESSMENT PRACTITIONER DETAILS

Table 2: EAP Contact Details

ENVIRONMENTAL ASSESSMENT PRACTITIONER (EAP)	
Company Name	Baagi Environmental Consultancy
Contact person	Mr Lordwick Makhura

Physical Address	88 Rubida Street, Murrayfield x1
Postal Address	P O Box 72847, Lynwood Ridge, Pretoria, 0040
Telephone	012 365 2546
Fax	012 365 3217 x7
Email	baagi@ee-sa.com

Mr. Lordwick Makhura is the Principal member of Baagi Environmental Consultancy. He obtained a degree in Environmental Science and has a BSc (Hons), pending, from the University of Pretoria. He has at least five years' experience in the Environmental Management Industry and is registered with the South African Association of Botanists. For more details about his expertise and experience please refer to Appendix A.

Ms. Marita Oosthuizen has an MA Environmental Management where her mini-dissertation focussed on Public Participation within the South African context. She has more than 10 years of experience with Public Participation. She is a member of the International Association of Impact Assessment (IAIAsa) as well as a Member of and Secretary to the Board of the Southern African Affiliate of the International Association for Public Participation (IAP2 SA).

1.3 ASSUMPTIONS AND LIMITATIONS

The findings of this report are affected by the following factors:

- The level and scale of the information obtained during the reconnaissance site visit;
- The accuracy and relevance (most recent) of the information obtained from literature and desktop resources, and
- The assumption that the information provided by the sub-consultants (specialist) is accurate.

1.4 ENVIRONMENTAL IMPACT ASSESSMENT PROCESS

In terms of the National Environmental Management Act (Act 107 of 1998, NEMA) as amended and its EIA Regulation published in July 2008, it is necessary to undertake environmental investigations as an integral part of project planning in order to obtain environmental authorisation for a proposed activity that may have a potentially negative effect on the environment. NEMA regulates a specific multi-phased process for studying these types of proposals – please refer to the figure below:

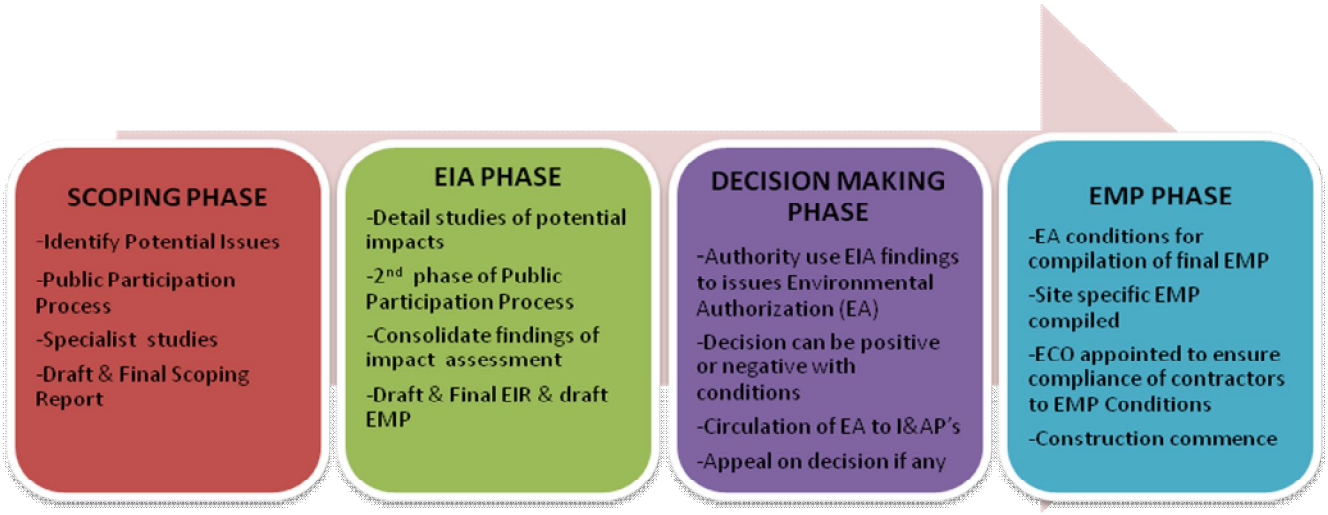


Figure 1:The Process Followed for this Environmental Impact Assessment

1.5 OBJECTIVES OF THIS REPORT

This EIA is being conducted in terms of the EIA Regulations made under the National Environmental Management Act (Act 107 of 1998, NEMA) and published in Government Notices 385, 386 and 387 promulgated on 21st April 2006. The aim of this Draft EIR is to:

- Provide information to the authorities and interested and affected parties on how impacts were assessed and mitigated;
- Provide comments received on draft EIR and how has been incorporated into the final report;
- Show how interested and affected parties were given an opportunity to comment and contribute to the project, verify whether their issues raised during the scoping and EIA process were considered, and comment on the findings of the impact assessment;
- Provide information regarding the alternatives considered;
- Describe the baseline information of the receiving environment;
- Present the findings of specialist during the Impact Assessment phase of this project;
- Incorporate comments made on the acceptance letter of the Scoping report(DEA);
- Provide information on the draft EMP document;

2. LEGAL FRAMEWORK APPLICABLE TO THE PROPOSED PROJECT

2.1 RELEVANT NATIONAL LEGISLATION

2.1.1 National Environmental Management Act, 1998 (Act 107 of 1998)

The proposed project is conducted in terms of the EIA Regulations that were promulgated in terms of Section 24 (5) of the NEMA. NEMA encourages projects that will be socially, economically and environmentally sustainable. Different bodies are competent to authorise different projects depending on their nature. In this case, the identified competent authority is the National Department of Environmental Affairs (DEA) because the applicant is a Parastatal.

As per the Regulations, a full EIA is required for all projects likely to have significant impacts on the environment because of the nature or extent of the activity, for instance if the effect of the activity is unpredictable, or there is a high risk of environmental degradation. In terms of Government Notice Regulation R387, a number of activities are listed as requiring a full EIA process. Some of these are applicable to this project and is listed below in Table 3.

Table 3: List of Listed Activities Applied for by the Proponent for the Proposed Project (2006 EIA Regulation)

Relevant Notice and Activity Number	Activity Description
R387 Item No 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.
R386 Item No 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 endangered ecosystem listed in terms of section 52 of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004).
R386 Item No 14	The construction of masts of any material or type and of any height, including those used for telecommunications broadcasting and radio transmission, but excluding (a) masts of 15m and lower exclusively used by (i) radio amateurs; or (ii) for lightening purposes (b) flagpoles, and (c) lightening conductor poles.

R386 Item No 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.
R386 Item No 16(a)	The transformation of undeveloped, vacant or derelict land to residential mixed, retail, commercial, industrial or institutional use where such development does not constitute infill and where the total area to be transformed is bigger than 1 hectare.
R386 Item No 7	The above ground storage of dangerous materials, 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.

The current project is being undertaken under the guidelines of 2006 EIA regulations. However, table indicates the listing activities of 2006 EIA regulation that applied into this project but are no longer applicable under 2010 EIA regulation as well as the listed activities of 2010 EIA regulations that are deemed to be affected by the proposed project but have not been applied for environmental authorisation in this project. It is important to highlight these listed activities to assure the authority of the awareness of the changes of legislation with regards to the EIA guidelines and changes on the listed activities.

Table 4: Listed activities of 2006 EIA Regulations that are excluded and 2010 EIA Regulations Listed activities as per the proposed Project

2006 EIA REGULATIONS ACTIVITIES THAT ARE NO LONGER APPLICABLE AS PER 2010 EIA REGULATIONS	2010 EIA REGULATION THAT WERE NOT APPLICABLE TO 2006 EIA REGULATIONS
R387 No.1 (I): The construction of facilities or infrastructure, including associated structures or infrastructure, for the transmission and distribution of above ground electricity with a capacity of 120 kilovolts or more.	**R545 No. 8:** Constructions of facilities or infrastructure for the transmission and distribution of electricity with a capacity of 275kv or more, outside an urban area or industrial complex.

R386 No. 16(a): The transformation of undeveloped, vacant or derelict land to residential mixed, retail, commercial, industrial or institutional use where such development does not constitute infill and where the total area to be transformed is bigger than 1 hectare.	**R545 No. 15:** Physical alteration of undeveloped, vacant or derelict land for residential, retail, commercial, recreational, industrial or institutional use where the total area to be transformed 20 hectares or more; except where such physical alterations take place for: (i)linear development activities; or (ii)agriculture or afforestation where activity 16 in this Schedule will apply.
R 386 No. 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.	**R 546 No. 4:** The construction of a road wider than 4 meters with a reserve less than 13.5 meters. (a) In Eastern Cape, Free State, **KwaZulu-Natal,** Limpopo, Mpumalanga and Northern Cape Provinces: (ii) Outside urban areas, in: (aa) A protected area identified in terms of NEMPAA, excluding conservancies; (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; (ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans; (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.
R 386 No. 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 endangered ecosystem listed in terms of section 52 of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004).	**R546 No. 12:** The clearance of an area of 300 square meters or more of vegetation where 75% or more of the vegetative cover constitute 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.
R387 No. 1(c): The above ground storage of a dangerous good, including petrol, diesel, liquid petroleum gas or paraffin, in containers with a combined capacity of more than 30 cubic metres but less than 1 000 cubic metres at any one location or site.	**R544 No. 20:** Any activity requiring a mining permit in terms of section 27 of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) or renewal thereof.
	R 544 No. 38: The expansion of facilities for the transmission and distribution of electricity where the expanded capacity will exceed 275 kilovolts and the development footprint will increase.
	R 546 No. 16: The construction of: (iii) buildings with a footprint exceeding 10m^2 in size; or (iv) infrastructure covering 10m^2 or more Where such construction occurs within 32m of a watercourse, measured from the edge of the watercourse, excluding where such construction will occur behind the development setback. (a) In Eastern Cape, Free State, KwaZulu-Natal, Limpopo, **Mpumalanga** and Northern Cape. (ii) Outside urban areas, in: (dd) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority; (ff) Critical areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans; (hh) 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 area of a biosphere reserve.
	R544 No. 27: Decommissioning of existing facilities or infrastructure, for (ii) electricity transmission and distribution with a threshold of more than 132kv but excluding any facilities or

	infrastructure that commenced under an environmental authorisation issued in terms of the Environmental Impact Assessment Regulations, 2006 made under section 24(5) of the act and published in government notices No.385 of 2006, or notice no, 543 of 2010

2.1.2 The Constitution of the Republic of South Africa Act, 1996 (Act No. 108 of 1996)

The Constitution of South Africa states that everyone has the right to an environment that is not harmful to his or her health or well-being and to have the environment protected for the benefit of present and future generations.

The Act implies that measures must be implemented to:

1) Prevent pollution and ecological degradation;

2) Promote conservation, and

3) Secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.

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

The Act aims at providing for the protection of water resources, the use of water resources, the treatment and disposal of waste and wastewater. It deals with prevention of pollution of water resources.

It also deals with the regulation of the use of water and the requirements for controlled activities, general authorisations and licences. In general, water use must be licensed unless it is listed in Schedule 1 of the Act, as an existing lawful water use, and is permissible under a general authorisation or if a responsible authority waives the need for a license.

2.1.4 National Heritage Resource Act, 1999 (Act No. 25 of 1999)

The Act aims to promote an integrated system for the identification, assessment, and management of the heritage resources of South Africa. Section 35(4) of this above-mentioned Act states that no person may, without a permit issued by the responsible heritage resources authority; destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or paleontological site or any meteorite.

This Act is concerned with the protection of the archaeological or paleontological sites or meteorites. Furthermore, Section 36(3) of the National Heritage Resources Act states that no person may, without a permit issued by the relevant heritage resources authority handle any human remains. Human remains can only be handled by a registered undertaker or an institution given the authority to do so under the Human Tissues Act (Act 65 of 1983 as amended).

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

The Biodiversity Act provides for the management and conservation of South Africa's biodiversity within the framework of NEMA and the protection of species and ecosystems that warrant national protection. As part of its implementation strategy, the National Spatial Biodiversity Assessment was established. The Biodiversity Act further requires landowners to manage and conserve South Africa's biodiversity for current and future generations. The National Spatial Biodiversity Assessment classifies areas as worthy of protection based on their biophysical characteristics, which are ranked according to priority levels.

2.1.6 National Environmental Management: Air Quality Act, 2005 (Act No. 39 of 2004)

The Act provides for the management of air quality in South Africa.

2.1.7 National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008)

The Act provides for the management of waste in South Africa.

2.1.8 National Environmental Management: Protected Areas Act, 2003 (Act No. 59 of 2003)

The Act provides for the administration and management of protected areas in South Africa.

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

The Act controls the veld, forest and mountain fires as well as the protection of biota and ecosystems; to control the removal/damaging of indigenous forest species.

2.1.10 Conservation of Agricultural Resources Act, 1983 (Act No. 84 of 1983)

The Act provides for control over the utilisation of the natural agricultural resources in the Republic of South Africa in order to promote the conservation of soil, the water resources, vegetation and the combating of weeds and invader plants.

2.1.11 National Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002)

The Act controls land use and infrastructure on mining and prospecting areas. It controls environmental matters in areas to which this Act applies, for example, the removal of trees and bushes.

2.2 RELEVANT PROVINCIAL LEGISLATION

2.2.1 KwaZulu-Natal Heritage Act, 1997 (Act No. 10 of 1997)

The Act promotes an integrated system for the identification, assessment, and management of the heritage resources of KZN. The Act also established a provincial body, Heritage KwaZulu-Natal

(Amafa), as the competent authority for the protection and management of heritage resources in KZN.

2.2.2 KwaZulu-Natal Nature Conservation Management Act, 1997 (Act No. 9 of 1997)

The Act provides for the management of nature conservation within KZN and protected areas. It also provides for the development and promotion of eco-tourism facilities within protected areas.

2.2.3 The Natal Nature Conservation Ordinance, 1974 (Act No. 15 of 1974)

Certain indigenous plant and animal species in KwaZulu-Natal (KZN) are provided with special protection under the KZN nature conservation legislation and permits are required from Ezemvelo KZN Wildlife (EKZNW) for their removal, destruction or translocation. The Natal Nature Conservation Ordinance, No 15 of 1974 specifically exempts Organs of State, from having to apply for such licences. However, this does not exempt Organs of State from applying the purpose of the law i.e. to apply measures to protect protected plant species.

2.3 OTHER RELEVANT LEGISLATION AND POLICIES APPLICABLE TO ESKOM

2.3.1 Eskom Act, 1987 (Act No. 40 of 1987)

The Act sets out the objectives of Eskom, being the provision of a system by which the electricity needs of the consumers may be satisfied in the most cost effective manner, subject to resource constraints and the national interest. The National Energy Regulator of South Africa (NERSA) exercises control over the performance of Eskom's functions and the execution of its powers and duties. Section 12 of the Act sets out the functions, powers, and duties of Eskom.

2.3.2 Eskom Conversion Act, 2001 (Act No. 13 of 2001)

The objective of the Eskom Conversion Act is to convert Eskom into a public company in terms of the Companies Act, and to provide for powers and duties of Eskom.

2.3.3 Electricity Regulation Act, 2006 (Act No. 4 of 2006)

The Act governs the control of the generation and supply of electricity in South Africa and the existence and functions of the Electricity Control Regulator.

2.3.4 White Paper on the Energy Policy of the Republic of South Africa (December 1998)

Policy objectives identified include increasing access to affordable energy services, improving energy governance, stimulating economic development (including the encouragement of cost-effective energy prices which include quantifiable externalities), managing energy related environmental and health impacts, and securing supply through diversity.

3. THE NEED AND DESIRABILITY OF THE PROJECT

Eskom Grid Planning has requested Transmission Land and Rights to conduct an EIA and acquire servitude for the construction of a second 400kV line from Ariadne Substation to Venus Substation. The project forms part of the strengthening plans proposed in the Strategic Grid Planning against the revised load forecast and site locations. According to the Transmission Development Plan, the project was to commence in 2013/14 but it has been brought forward to avoid load shedding as a result of limited Transmission capacity and to comply with Grid code requirements.

In order to alleviate current and future network constraints under N-1 contingency (loss of one of the Transmission power lines) in KwaZulu-Natal, it proposed that a 765kV ring must be built. The proposed plan consists of 765kV lines from the generation pool in Mpumalanga, one line to the Empangeni area and the other line to Pinetown area. It is also proposed to construct 400kV link between Empangeni and Pinetown 765kV networks.

With the 765kV ring in place, the critical contingency (critical loss of a power line) for the Pinetown network is the loss of the Venus – Ariadne 400kV line. The reason for this is because Venus is a strong 400kV source since the Majuba and Drakensberg power stations feed into this substation. During the loss of Ariadne – Venus 400kV line, the power evacuation from Venus is mostly through the single Mersey – Venus 400kV line which ends up overloading. To address this problem it is proposed that the existing Georgedale – Venus 275kV lines be recycled or upgraded to 400kV or a new 400kV line be built (depending on the outcome of this EIA) as part of the Pinetown Strengthening Phase 1 (Figure 8).

The proposed project forms part of the KwaZulu-Natal 765kV strengthening scheme.

3.1 EMPANGENI STRENGTHENING

This project consists of three distinct phases, namely:

- **Phase 1:** Construct 212km Majuba – Umfolozi 765kV line, operated at 400kV.
- **Phase 2:** Establish and construct Theta 400kV switching substation, construct 110km Umfolozi – Theta 765kV line operated at 400kV, construct 20km of 400kV line between Theta and Invubu substations and loop into and out of Theta substation the existing Umfolozi – Athene and Umfolozi – Invubu 400kV lines. An EIA for this phase is underway with construction expected to commence in 2011 and commissioning expected to be around June 2013.
- **Phase 3:** Establish 765/400kV Substation in the vicinity of Majuba Power Station, connect to the new substation the Majuba – Theta and Majuba – Sigma 765kV lines. Also construct about 10km of 2 X 400kV lines between Majuba Power Station and the new 400/765kV substation. This EIA commenced in July 2010 and commissioning is expected in June 2015.

3.2 PINETOWN STRENGTHENING

This project has two phases, namely:

- **Phase 1:** The construction of the 200km Majuba – Venus 765kV line operated at 400kV; establish Sigma 400kV switching substation; construct 80km of Venus – Sigma 765kV line operated at 400kV; construct 60km of 2 X Sigma – Hector 400kV lines. Proposed establishment of 2nd 400kV from Ariadne – Venus Substation and energise the 2nd Hector – Ariadne 400kV line. This phase is at EIA stage and commissioning is expected to be around May 2013.
- **Phase 2:** This is part of Empangeni Strengthening Phase 3 as detailed above.

3.3 LINKING THE EMPANGENI AND PINETOWN 765kV NETWORKS

In this project, two Sigma-Theta 400kV lines will be constructed (±160km). Commissioning is planned for June 2015.

3.4 NEED FOR THIS PROJECT

This project is required to help with the evacuation of power from Venus Substation to the Pinetown area under N-1 contingency. This project is required even after the introduction of 765kV into KZN. Figure 7 below represents the Eastern Grid with four customer load networks; the Pinetown Customer Load Network is coloured yellow.

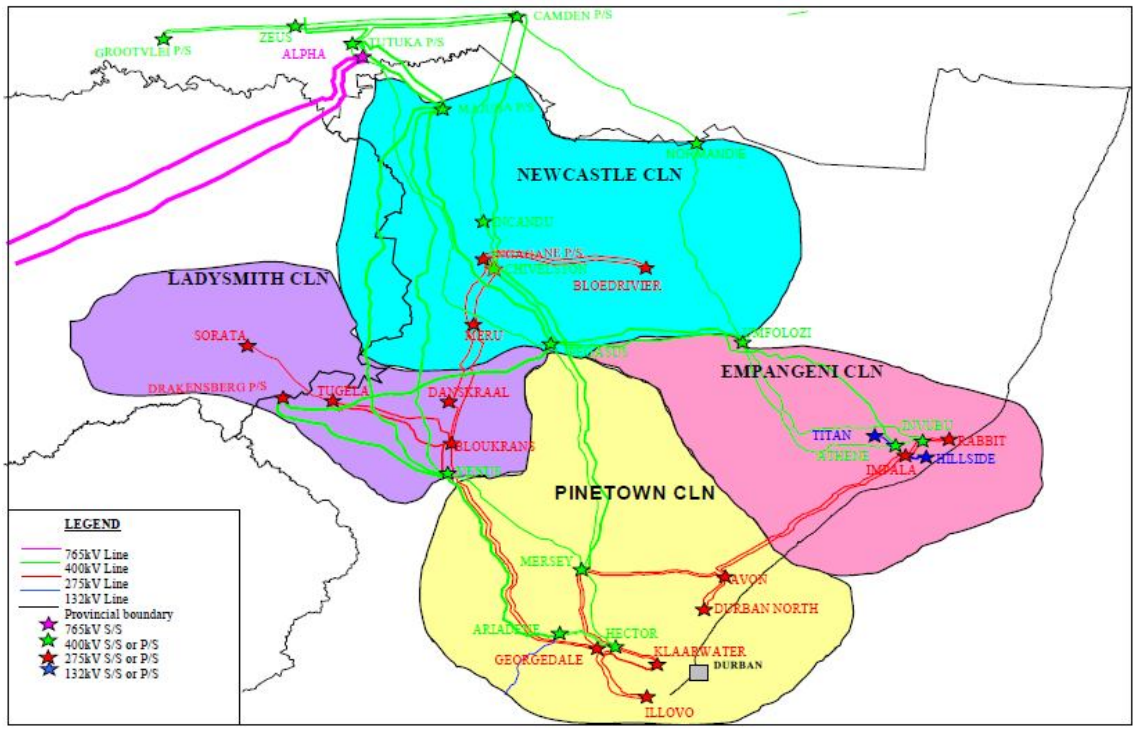


Figure 2: The East Grid consists of four Customer Load Networks (CLN) viz. Newcastle, Ladysmith, Pinetown and Empangeni

The construction of a second 400kV transmission power line between Ariadne and Venus substations will result in the formation of a strong 400kV network out of Venus Substation into the Pinetown network. This will prevent the problems of voltage collapse and it will further create a more flexible network, since it allows evacuation of power out of Venus substation should one of the 400kV lines are lost. This will improve the overall reliability of the system, which will be of benefit to both Eskom and to all electricity users in the area.

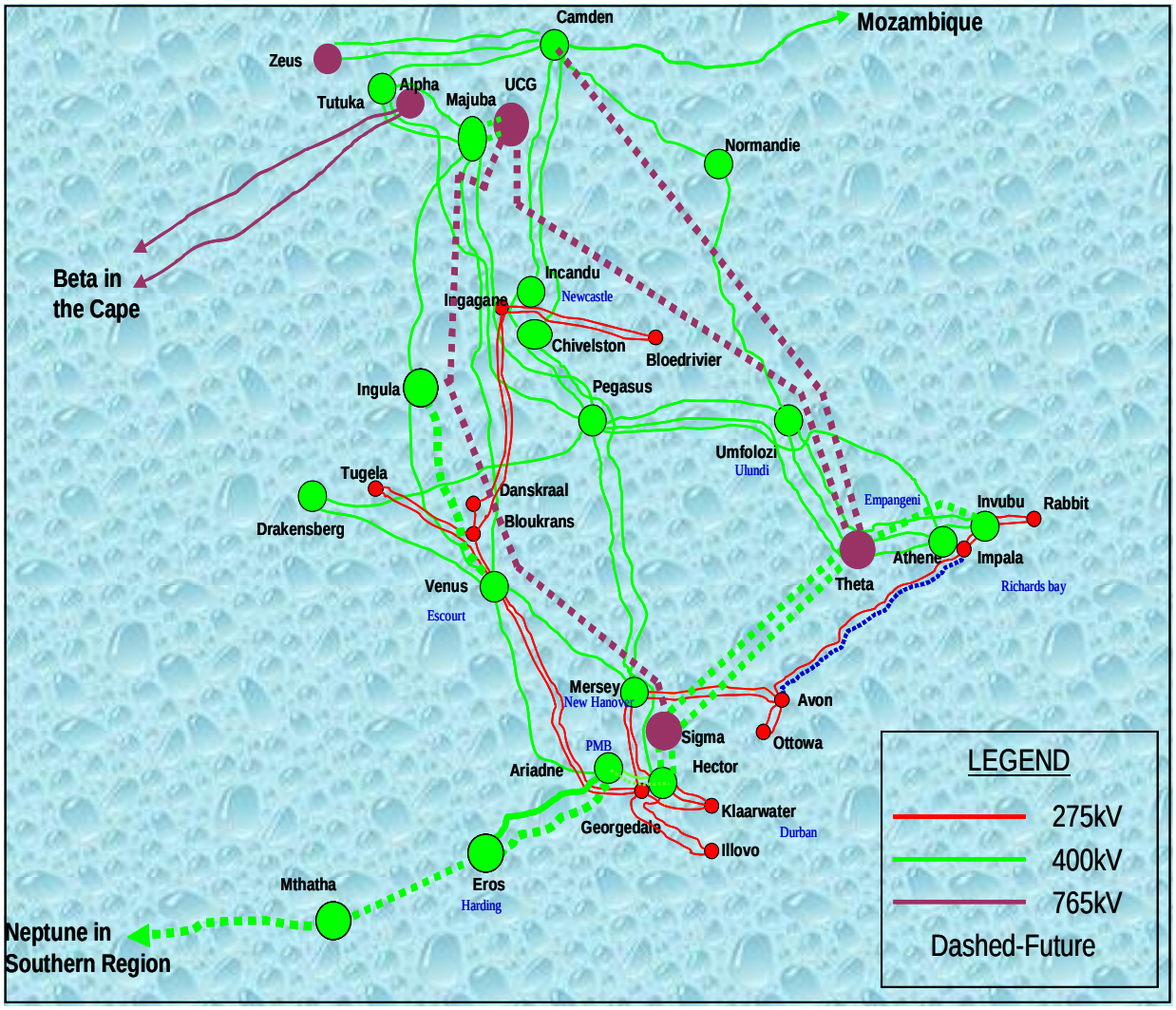


Figure 3: Outline of the Interconnectivity of the Transmission Line Network within KZN and Neighbouring Provinces

4. PROJECT DESCRIPTION

The proposed project entails the following activities:

- Construction of new 1 x 400kV power line from Ariadne to Venus substations;
- Extension, upgrade and refurbishment of both Ariadne and Venus substations; and
- Additional 400kV feeder bays at both Ariadne and Venus substations.

Venus Substation will be equipped with a 400kV feeder bay on an existing terrace and an extension of the 275kV line to the new 400kV Feeder bay (within the existing High Voltage Yard). At Ariadne Substation, there will be an extension of the 400kV Busbar within the existing substation parameter. Ariadne Substation will be equipped with 400kV feeder bay whereby power lines will connect to the new feeder bay. Below are photos showing examples of Busbars and Feeder bays within a substation.

Photo1: An Example of Busbars within a Substation

Photo 2: An Example of a Feeder Bay within a Substation

4.1 TECHNICAL AND ENVIRONMENTAL SPECIFICATIONS DURING DESIGN AND CONSTRUCTION

4.1.1 Servitude

The proposed 400kV transmission power line will require a servitude of 55m in width, i.e. 27.5 m both sides of the centre line. No permanent residents are allowed within the servitude. The servitude is required for the safe operation of the power line and reliability of electricity supply to consumers.

During construction, five teams are responsible for the excavation of foundations, concrete works, erection of steel structures, stringing of transmission cables, and rehabilitation respectively. All these activities, including vehicular access and the pylon anchors, are required to take place within the negotiated servitude.

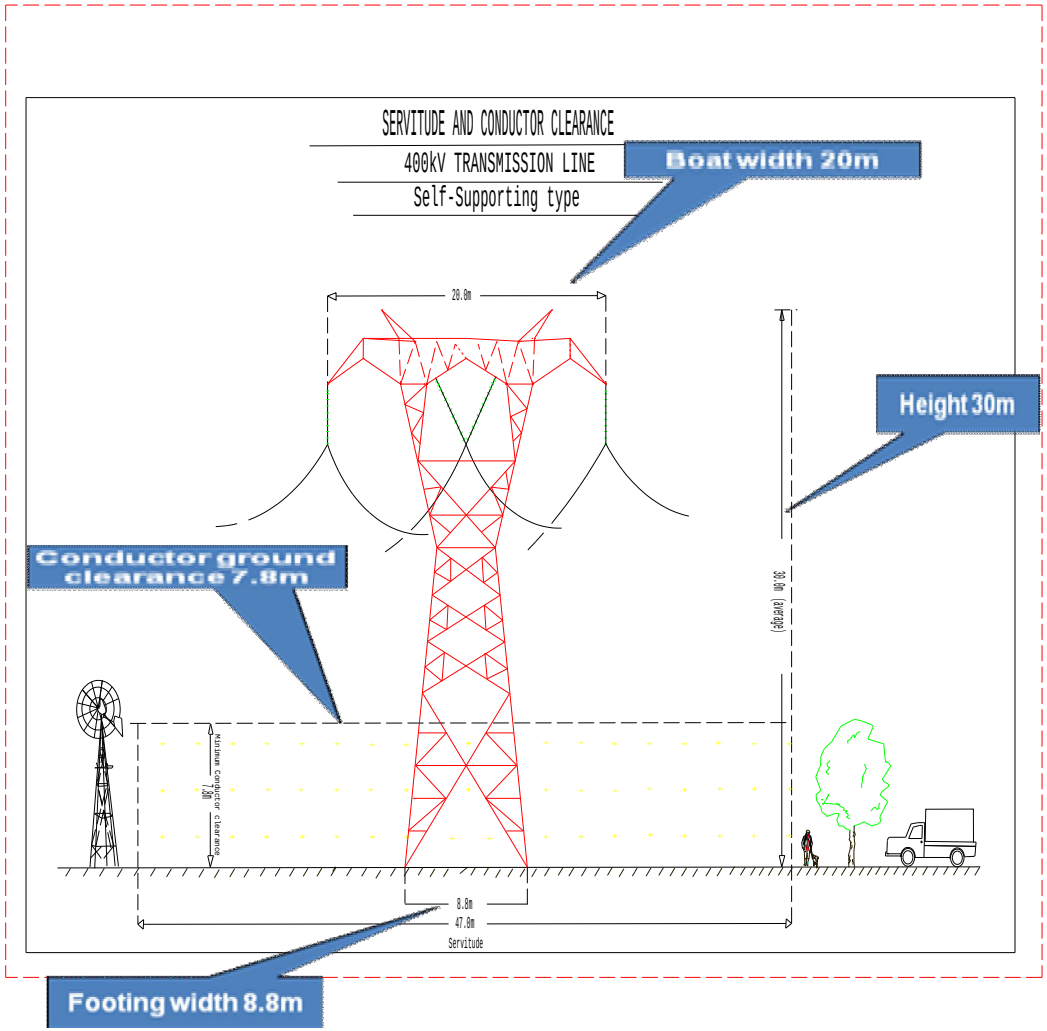
4.1.2 Towers

Transmission line towers will be constructed in accordance with the latest designs available. Different towers are utilised under different circumstances. In the case of this project, it is envisaged that following tower types will be used:

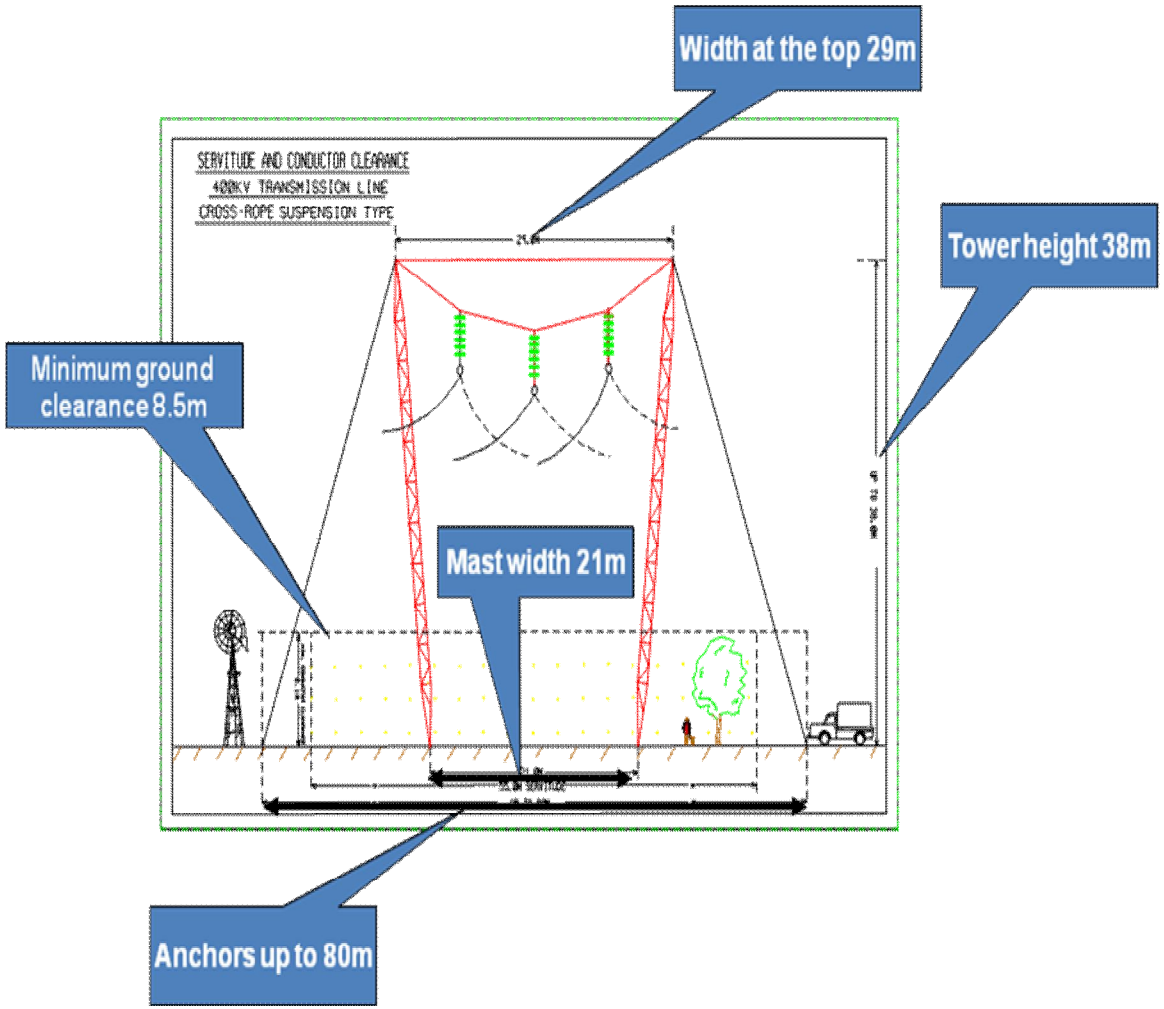
- Self-supporting Suspension Towers – These towers are used in instances where the power line bends (i.e. make an angle). These towers are designed to carry the strain of the bend.
- Cross Rope Suspension Towers – These are used where the power line runs straight. This type of tower is designed to hold the power line up, but it cannot withstand any strain (e.g. where the power line makes a bend).
- Compact Cross Rope Suspension Towers – These towers are basically the same as the Cross Rope Suspension Tower, but the two masts are placed very close to each other. This is done to minimise the space utilised for the tower.

Please refer to the photos and graphics below for more information on these tower types.

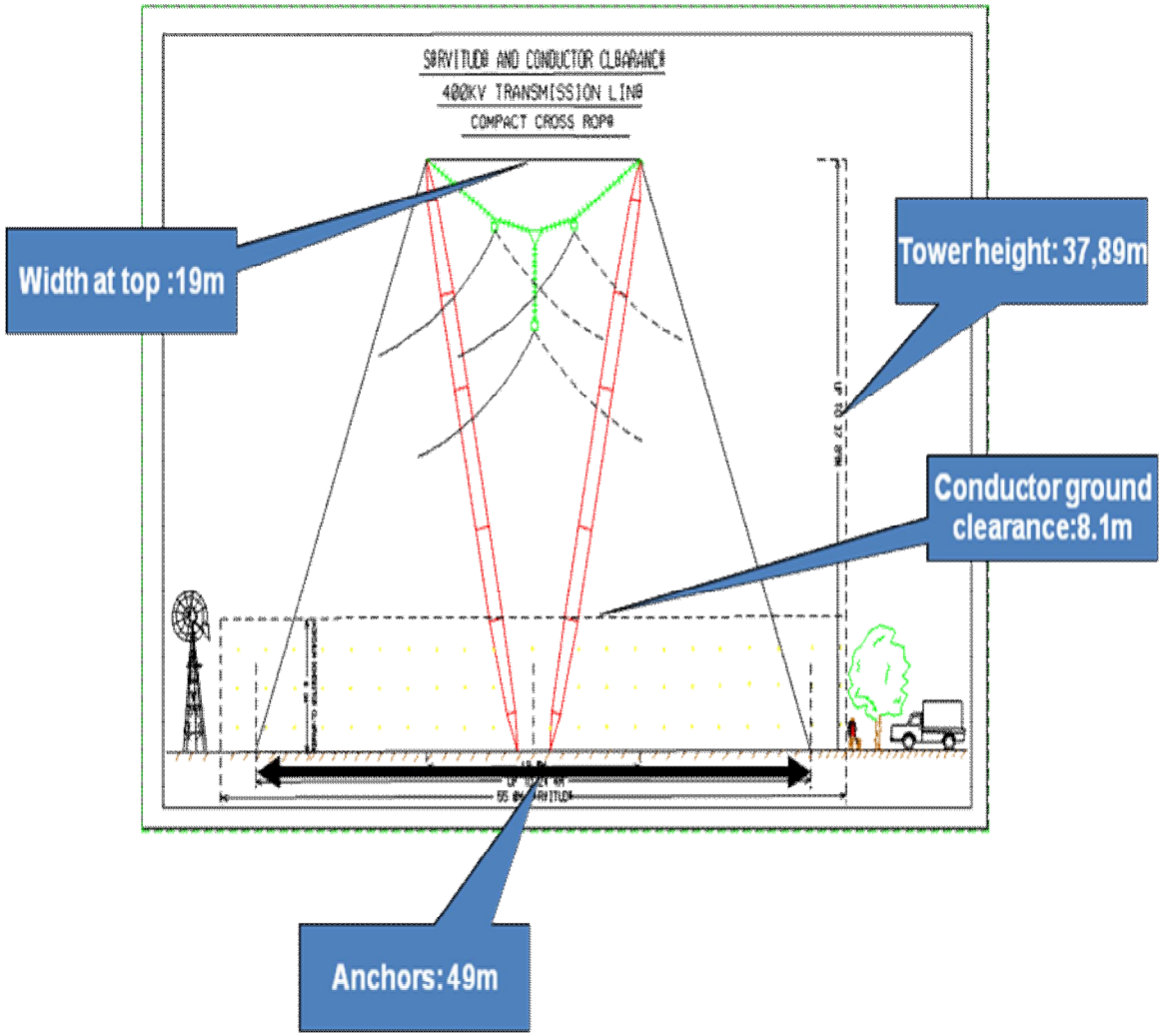
4.1.2.1 Self-supporting Suspension Tower

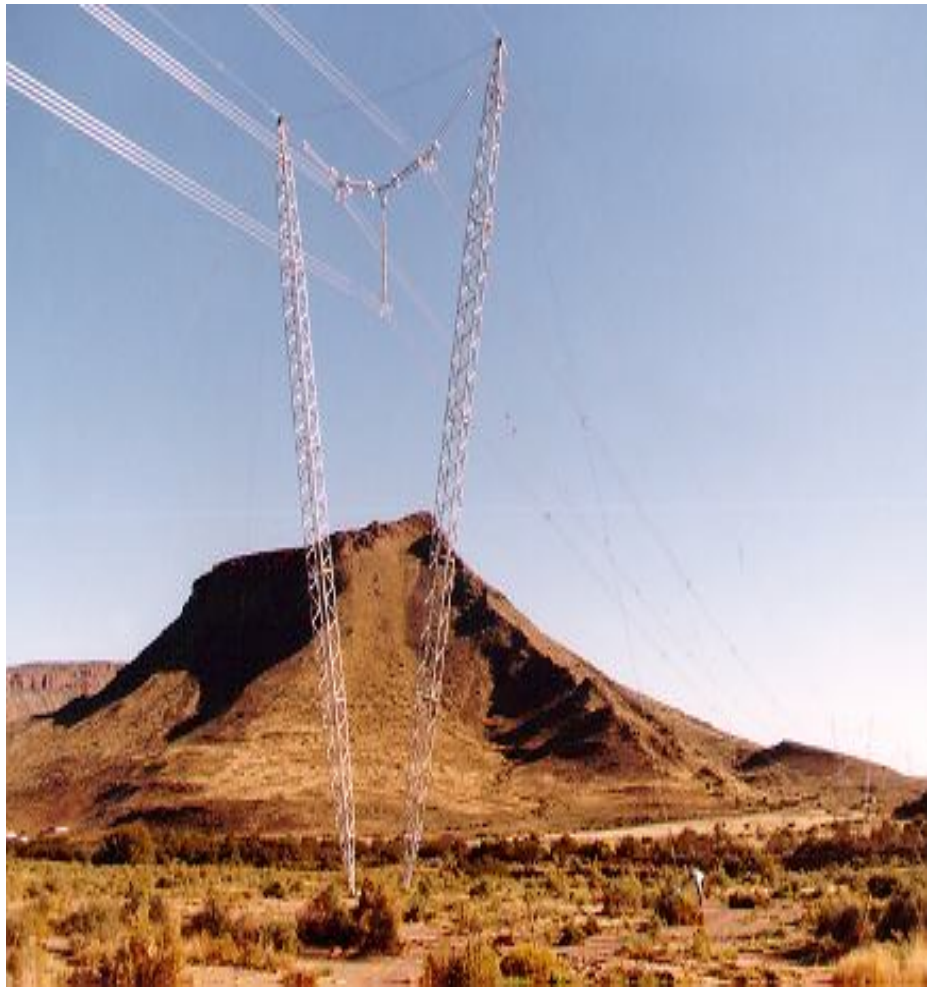


4.1.2.2 Cross Rope Suspension Tower



4.1.2.3 Compact Cross Rope Suspension Tower





4.1.3 Access Roads

New roads may be needed (depending on which route is selected) in order to access the transmission lines for construction and subsequent maintenance activities. Particular attention will be paid to storm water and the management thereof, with erosion protection measures being put in place where indicated by the terrain (geology, soils and topography) and climate (for instance, typical rainfall patterns). Furthermore, access roads will be aligned and constructed within the provisions and to the specifications of private landowners. This is considered important for two primary reasons:

- The access road should fulfil multi-purpose functions serving the needs of Eskom and the landowners.
- Landowners are acutely aware of sensitivities on their land and will be in an excellent position to inform Eskom of optimum alignments.

The specifications for the access road will be contained within the Environmental Management Plan (EMP) that will be prepared for construction and which will become legally binding on Eskom and contractually binding on the Eskom-appointed contractors (with special care being taken with river/stream crossings, where potential environmental impacts are greatest, with due consideration for licences that must be obtained from the Department of Water Affairs - DWA).

4.1.4 Hazardous Substances

Hazardous substances comprise fuels, oils and lubricants that will be stored and dispensed at the construction camps. Specifications for the storage and dispensing of fuels, oils and lubricants include, but are not limited to, the following:

- Storage in specifically designated areas;
- All fuels, oils and lubricants shall be stored above ground and under cover;
- Each designated area will be equipped with adequate fire protection equipment appropriate for the nature of the fuels, oils and lubricants that are stored and dispensed;
- All areas shall be properly signed in all applicable languages;
- All employees will be properly trained in the storage and dispensing of specific fuels, oils and lubricants; and
- A specific procedure for emergency situations, including accidental spills, will be formulated and must be available on site at all times.

These and other specifications will be contained within the EMP that will be prepared for construction. This EMP will become legally binding on Eskom and contractually binding on Eskom's appointed contractors.

4.1.5 Bulk Services and Infrastructure

During construction, there will be a need for bulk services and infrastructure. These include:

- **Water** – Water for potable and construction use as well as sewerage (it is anticipated that on-site treatment of sewerage will be done through the use of chemical toilets and/or septic tanks;
- **Access Roads** - Existing roads will be utilised as far as possible during the construction and operational periods. The use of roads on private property is subject to the provisions of the EMP that will be prepared for the project (with individual landowner specifications being determined during discussions with landowners during the servitude negotiation process). The flow of traffic to the site during the construction period will be relatively light and during operations there will be virtually no traffic.
- **Storm Water** - Great care will be taken in making sure that storm water drainage is carefully designed on all access roads. Storm water will have to be diverted into the surrounding fields at low energy levels, to make sure that significant erosion problems are avoided. Storm water will be managed according to the Eskom Guidelines for Erosion Control and Vegetation Management, as well as the provisions of the EMP.
- **Solid Waste** - All solid waste will be collected at a central location at the construction site and will be stored temporarily until removal to an appropriately permitted landfill site. Recyclable materials will be stored and removed to appropriate recycling facilities.
- **Generators** - Diesel generators will be utilised for the provision of electricity where there is no electricity connection nearby.

4.1.6 Contractors

Most contractors have teams of between 40 and 50 people. The construction of transmission lines is a fairly technical activity and therefore the majority of contractors use their own teams of skilled and trained personnel for construction purposes. The opportunities for new/additional people are, therefore, fairly limited although there will be a number of activities such as bush clearing and fencing with which local contractors can be involved.

4.2 EXTENSION AND UPGRADE OF ARIADNE AND VENUS SUBSTATION

A substation is an important element of electricity generation, transmission and distribution system. Its function is to transform voltages from high to low or the reverse, using transformers and other heavy-duty electric switchgear. The proposed second 400kV line will require 400kV feeder bay on both substation for connection purposes. The extension of the substation will entail the expansion of the substation terraces within both substations HV yards. It must also be indicated that the extension of the substations terraces will occur within Eskom property.

Figure 4 and 5 indicates the positions where the feeder's bay will be located within the respective substations.

Figure 4: Representing Ariadne 400kV Transmission substation showing location for new feeder bay

Figure 5: Representing Venus 400kV Transmission Substation Showing Location for New Feeder Bay

4.3 NEGOTIATIONS AND REGISTRATION OF SERVITUDES

Before any construction can start on a Transmission Line, Eskom Transmission needs to secure servitude rights through negotiations with affected landowners. Even where existing servitudes exist, these need to be confirmed with the affected landowners, especially since the new servitude will be wider than the existing servitude.

The proposed Ariadne-Venus Transmission Line will require the registration of a 55m wide servitude across all land traversed by the proposed power line. It is important to note that the registration of servitude does not mean that the holder of the servitude, (Eskom in this instance) becomes the owner of the land. It merely means that Eskom has the right to convey electricity and communications over the land, subject to conditions agreed between the Eskom Transmission and the affected landowners .A registered servitude gives Eskom certain defined rights for the use of that land. These 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 tree and vegetation that will interfere with the operations of the lines.

The registration of servitudes can be a lengthy process, as it requires contractual negotiations with each affected landowner. Once the negotiations are complete, an application for the registration of servitude is lodged with the Provincial Deeds Office against the property deed. Eskom has appointed Negotiators that will take this process forward should the application for the construction of the Transmission Line be granted.

4.4 CONSTRUCTION, OPERATION AND DECOMMISSIONING ACTIVITIES IN SEQUENCE

The actual construction phase for this Transmission Line will require approximately 14 months to complete. As mentioned before, there are five main teams responsible for construction (namely teams for the excavation of the foundations, concrete works, erection of steel structures, stringing of transmission cables and rehabilitation).

It should be noted that construction activities are not continuous and people will be employed throughout the process for long, but intermittent, periods of time. Therefore, it is anticipated that any impacts associated with construction workers are likely to be minimized as the low number of people employed over a large area.

Specification necessary for the construction camps will be contained within the EMP, with specialist input where required.

A summary of the different construction phases is outlined below:

4.4.1 Access Negotiations

Negotiations between landowner, contractor and Eskom Transmission are undertaken in order to determine access routes.

Access routes are established through recurring use of the route(s)(i.e. they are not specially constructed roads) and are only constructed or upgraded under special circumstances.

4.4.2 Tower Pegging

The contractor appoints a surveyor to undertake this process. Once central line pegging has taken place, the surveyor sets out the footprint of the transmission line and towers. The centre points of the proposed route and pylons are marked as well as the position positioning of the tower peg is marked. The surveying team then makes the first basic track to the proposed site and pegs the position of the tower.

4.4.3 Gate Installation

Gates are installed where it is necessary to breach existing fence lines. This is required to help with the access of roads that is utilized for operational and maintenance purpose of the powerline. The EMP will specify criteria used for installation of the farm gates that will provide the access to the Eskom servitude.

Photo 3 - Example of Gate within a Farm

4.4.4 Excavation of Foundation

Holes for the towers are now excavated, with the size depending on the tower type and soil conditions. The holes are filled with concrete. During construction, fences will be temporarily erected around the holes as a safety precaution. The anchor holes will be covered with a safety plate.

4.4.5 Foundation for Steelwork

The foundation structures are positioned into the excavated holes, which are tied together for support. This is dependent to the excavation of the foundation and vice versa.

Photo 4 - Example of a Foundation for Steelwork

4.4.6 Foundation Pouring

A "ready-mix" truck, which contains 6 m3 of concrete, now moves onto site and concrete is poured into the foundation holes. If there are difficulties in gaining access for the truck, concrete will be mixed on site.

4.4.7 Delivery of Steel to Tower Site

The steelwork is usually delivered to the site approximately one month after the foundation has been poured. Where possible, the steel is transported to the site by a truck. Access roads are clearly marked to facilitate this process.

4.4.8 Assembly Team, Punch and Paint

A team will assemble the galvanized steel towers. The tower is assembled whilst it is lying on the ground. Every nut is screwed into the framework and painted with a non-corrosive paint ("punch and paint") first. This team also does the stringing of the conductors.

4.4.9 Operation and Maintenance

During operation, Eskom transmission requires access to the servitude to enable maintenance of the transmission line. This is likely to require access to the private properties. Maintenance is carried out at regular intervals, and is often done by helicopter so that supply is not disrupted.

Maintenance activities are high specialized and are therefore carried out by Eskom Transmission employees/contractors.

It is important that the servitude is cleared of vegetation occasionally to ensure that the vegetation does not interfere with the operation of the line.

4.4.10 Decommissioning

The process of decommissioning any transmission line will contain the following:

- The physical removal of the transmission line and towers would entail the reversal of the construction process.
- A rehabilitation programme would have to be agreed upon with the landowner before being implemented.
- The disposal of materials from decommissioned transmission line (steel, cabling, concrete, etc.) would be at an approved waste disposal facility. Alternatively, recycling opportunities could be investigated and implemented.
- Specific considerations regarding servitude and landowner rights would need to be negotiated with the landowner at the time of decommissioning, and fall outside the scope of this EIA.

The detail sequence of the activities for decommissioning process can be accessed under Final Decommissioning Report in Appendix G.

4.5 USE OF SERVICES AND RESOURCING DURING CONSTRUCTION

4.5.1 Water

Water will be required for potable use and in the construction of the foundation for the towers. The water will be sourced from approved water use points at locations closest to the area of construction.

4.5.2 Sewerage

A negligible sewage flow is anticipated for the duration of the construction period. Onsite treatment will be undertaken, through the use of chemical toilets. The supplier will service the toilets periodically. A clear plan to control those temporary toilets will be outlined.

4.5.3 Roads

Existing roads will be utilized as far as possible during the construction and operational periods. The use of roads on landowner property is subject to the provisions of EMP that will be prepared for the project with individual landowner specifications being determined during discussions with landowners as part of the negotiation process.

Photo 5: Normal Access Roads

Photo 6: Special Access Road

4.5.4 Storm Water Control

Storm water will be managed according to the Eskom Guidelines for Erosion Control and Vegetation Management, as well as the provisions of the project specific EMP.

4.5.5 Solid Waste Disposal

Eskom has a strong commitment to waste minimisation and recycling. All solid waste will be collected at a central location at each construction site and will be stored temporarily until removal for recycling or disposal at an appropriately permitted landfill site in the vicinity of the construction site. Where waste categorised or listed within the National Environmental Management Waste Act (Act 59 or 2008) are generated, specific requirements to deal with such waste will be included in the EMP.

4.5.6 Electricity

Given that Eskom is the main supplier of electricity in South Africa, it is well placed to provide electricity for use during the construction period. In addition, diesel generators will be utilised during the construction period.

Diesel generators will be utilized for provision of electricity during the construction phase.

4.5.7 Economics and Job Creation

Eskom will make use of a contractor or sub-contractors to do the construction. These will include Small, Medium and Micro Enterprises (SMMEs) as well as Affirmative Business Enterprises (ABEs). There will be an emphasis on job creation during the construction period of this proposed power line.

It is important to note that the construction of transmission lines is a specialized undertaking and requires skilled people. It is therefore probable that the appointed contractors will bring in skilled labour from other areas. By implication, job opportunities for local people will be limited to unskilled jobs on site and in construction camps. Apart from direct employment however, local people and businesses will benefit through supply of goods and services to the appointed contractors.

4.6 ENVIRONMENTAL MANAGEMENT

Environmental management of the project will take place through a project-specific Environmental Management Plan (EMP). This document will detail the specific environmental controls, which must be in place during the construction and operational phases. An Environmental Control Officer (ECO) will also be appointed. The ECO will:

- Act as an intermediary between individual landowners, Eskom and the contractors, and
- Ensure compliance with the EMP.

The EMP will outline all activities that have to be undertaken, where they will take place, the responsible persons, all possible environmental or social impacts, mitigation measures, rehabilitation plans, monitoring methods, the frequency of monitoring and performance indicators. The EMP will be legally binding document and stand-alone document, which will be used to ensure that Eskom adheres to all conditions of the Environmental Authorization (EA) and Environmental Impact Assessment Report (EIR). Only once this document has been approved by DEA, the appointed contractor can commence with construction.

4.7 PROJECTED TIME FRAMES

In order to stabilize the current situation and meet projected demand, the proposed Ariadne-Venus Transmission line should be operational by 2014. Therefore, Eskom wishes to commence with construction early in 2013. With this in mind, this EIA is managed with the target date for the issuing of the EA by DEA in March 2012.

5. DESCRIPTION OF THE RECEIVING ENVIRONMENT

5.1 THE STUDY AREA

The study area is located within the KwaZulu-Natal Province. The area stretches from north of the town of Estcourt to the south of the city of Pietermaritzburg in the form of a bean or boomerang. The proposed powerline will run between Ariadne substation situated south of Pietermaritzburg and Venus substation north of Estcourt – a length of approximately 103 km. There are existing transmission power lines between these two substations (i.e. two 275kV lines and one 400kV line). In terms of hectares, the study area covers approximately 322,543.01 ha.

The study area affects the following Municipalities' jurisdictions (see Figure 6and Figure 7):

- uMgungundlovu District Municipality, which includes the:
    - uMsunduzi Local Municipality;
    - uMngeni Local Municipality;
    - Mpofana Local Municipality;
    - uMshwathi Local Municipality; and
    - Richmond Local Municipality.
- uThukela District Municipality, which includes the:
    - uMtshezi Estcourt Local Municipality.

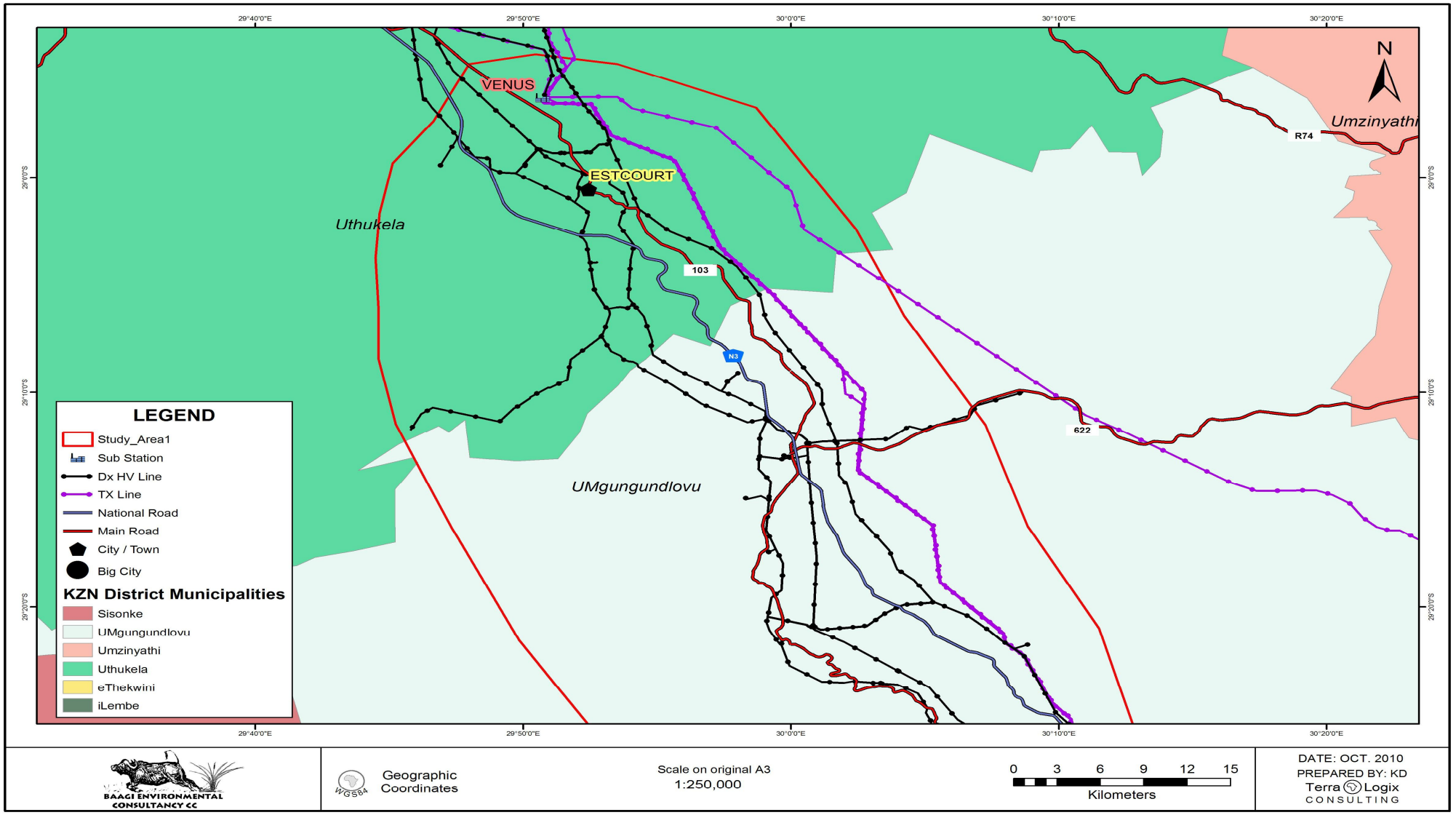


Figure 6: Affected Municipalities (Northern Section) within the study area

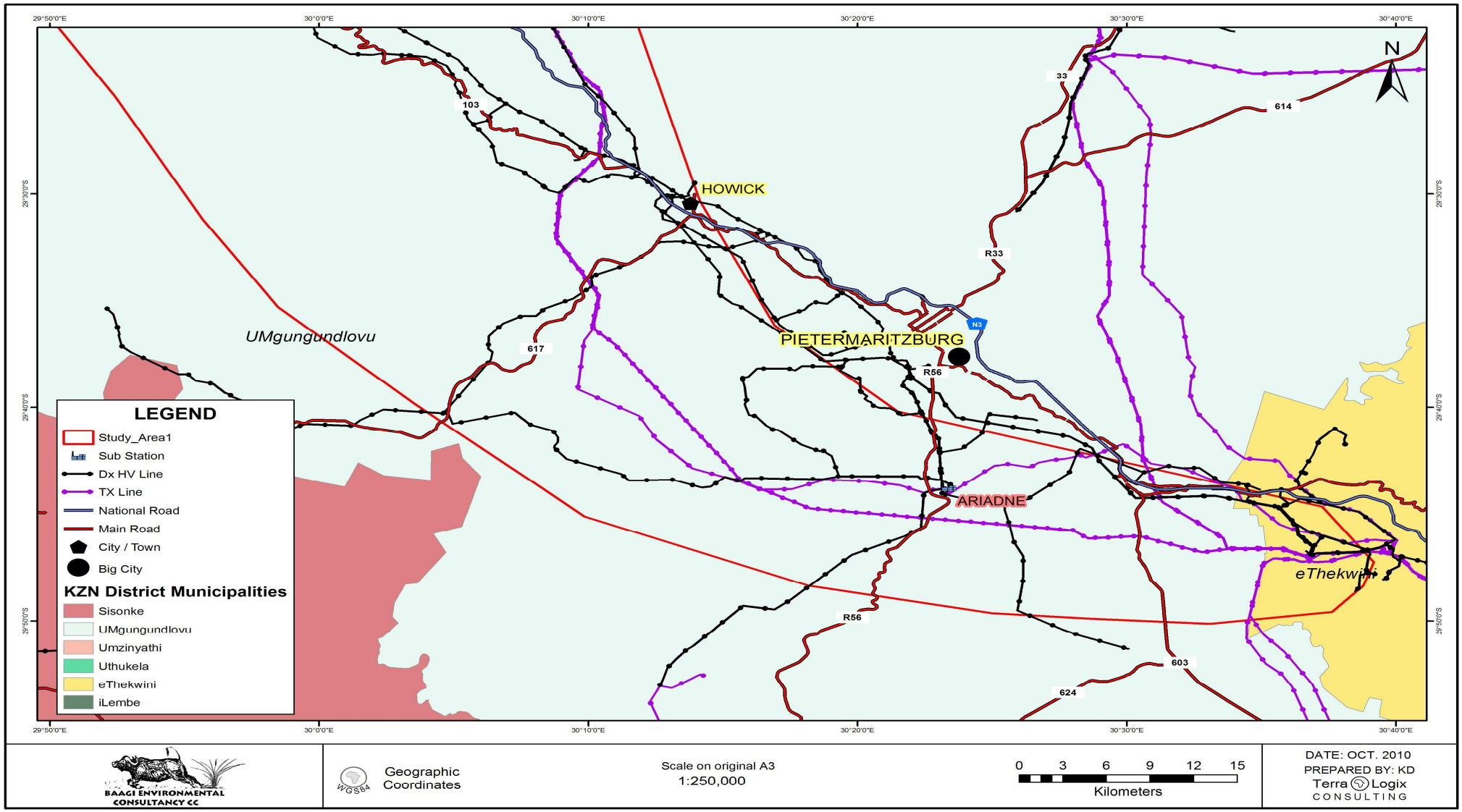


Figure 7: Affected Municipalities (Southern Section) within the study area

5.2 DESCRIPTION OF THE SOCIAL ENVIRONMENT

5.2.1 Affected Municipalities

5.2.1.1 uMtshezi Local Municipality

The uMtshezi Local Municipality (LM) is one of five local municipalities falling under the uThukela District Municipality. The population within this municipality is spread between urban centres, farming areas and high-density settlements with the largest being Wembezi situated in close proximity to the town of Estcourt. The tribal areas make up approximately 16% of the residents in the municipal area.

The main sectors within this LM include agriculture, manufacturing and trade. The main towns within this municipality include Estcourt, Wembezi and Weenen.

5.2.1.2 uMngeni Local Municipality

The municipal seat of the uMngeni LM is situated in Howick, which is characterised by various manufacturing enterprises, leisure facilities and a growing agricultural sector. The area hosts the well-known Cedara Agricultural College and lends itself to beef and dairy farming as well as timber production and the cultivation of vegetables.

The larger section of the Midlands Meander is situated within the uMngeni LM area. The Howick Falls and the Karkloof Falls as well as the Midmar Dam resort with its game reserve are some of the main tourist attractions in the area.

5.2.1.3 Mooi Mpofana Local Municipality

The administrative centre of the Mooi Mpofana LM is in the Town of Mooi River. The area has a low population profile because of the large rural and agricultural section surrounding the town. Crops cultivated in the area include maize, wheat, beans, peas and potatoes. It also has a large fabric manufacturing sector run by SMMEs. Sheep and cattle farming are also found in the area together with various racehorse stud farms. The rural areas within this municipality are thus not homogenous and ranges from commercial farmlands, subsistence farming, villages and nature reserves. All of these have different development needs.

5.2.1.4 uMsunduzi Local Municipality

The uMsunduzi LM is centred on Pietermaritzburg, which is also the provincial capital. The processing of timber and the manufacturing of aluminium and leather take place in the area. Tourism is promoted by the architectural features of the historical buildings in the town, the various international sporting events and the educational centre of the University of KwaZulu-Natal.

5.2.1.5 Richmond Local Municipality

The Richmond LM is situated to the south of the uMsunduzi LM (Pietermaritzburg area). The main activities in this area include timber and the manufacturing of wood products. Agricultural

activities are based on citrus, dairy, vegetable and sugar cane production. Tea is cultivated at the Sapekoe Estate and coffee at Shongweni and Assegaai.

5.2.2 Social Profile

5.2.2.1 Population Figures

The population figures for the uMgungundlovu District Municipality and relevant local municipalities are indicated in the table below:

Table 5: Population Figures of uMgungundlovu District Municipality

Area	Population – Census 2001	Population – Community Survey 2007
uMgungundlovu DM	927 846	988 837
uMngeni LM	73 896	84 781
Mooi Mpofana LM	36 820	31 518
uMsunduzi LM	552 837	616 730
Richmond LM	63 223	56 772

From the above it is clear that the more densely populated rural settlements are situated within the uMsunduzi (highest rate of urbanisation) LM area. The uMsunduzi area attracts a number of people to the area every year because the University of KwaZulu-Natal is situated within Pietermaritzburg and also because of the area's economic dominance.

The Mooi Mpofana Local Municipality experienced a population decline mainly due to the closing of various textile factories within Mooi River during the late 1990s. Other contributing factors are people moving to other economically active nodes, and possibly also the prevalence of HIV/Aids.

The population figures for the uThukela District Municipality and the uMtshezi local municipality which fall within the study area are indicated in the table below:

Table 6: Population Figures of uThukela District Municipality

Area	Population – Census 2001	Population – Community Survey 2007
uThukela DM	656 986	714 908
uMtshezi LM	59 921	83 906

These figures indicate that the uThukela DM and uMtshezi LM have both experienced a slight population increase.

5.2.2.2 Education and Skills Levels

Various renowned public and private schools including sixteen tertiary institutions such as the University of KwaZulu-Natal are situated throughout the uMsunduzi LM area. Although the Midlands is home to a number of the most prestigious private schools in the country such as Michael House, Hilton, and St Anne's, the majority of schools in the larger study area lack basic infrastructure and facilities. The uMgungundlovu District furthermore has a large labour pool of semi-skilled workers.

Future growth in the district, however, is anticipated to require skilled labour, as the primary and secondary sectors of the economy that absorb semi-skilled labour are not growing fast enough. The demand for semi-skilled labour is therefore exceeded by the growing number of job seekers.

As indicated in the uMgungundlovu IDP, only 24% of the population within the uMgungundlovu DM had matriculated, 15% had no schooling and only 9% had a post Grade 12 qualification.

Low levels of education are also prevalent throughout the uThukela District. Overall skills levels in the uMtshezi LM are low and the municipality should thus embark on a programme to ensure a suitable environment for education and training.

5.2.3 Infrastructure

The area has a well-developed road network, especially the N3 that stimulates development between the various economic hubs of Gauteng, Durban and Pietermaritzburg. Other important secondary corridors include the Howick- Mooi River Road (R103), the Mooi River- Greytown Road (R622), the Albert Falls–Wartburg-North Coast Road (R641) and the R33 corridor that links Greytown to Pietermaritzburg via New Hanover.

The main railway line between Durban and Johannesburg also traverses sections of the study area. A number of small airfields are also found throughout the study area. Table 6 indicates the list of airfields within the study area and some which are just outside the study area.

The construction of the Transnet new multi-products pipeline (NMPP) is currently underway. The Transnet pipeline cuts through the study area and also forms a link between Durban and Johannesburg.

Table 7: Airfields within the Study Area and Surrounds

Kind	City	Name	Latitude	Longitude
Small	Estcourt	Estcourt Airport	-29.047(S)	29.911(E)
Small	Durnacol	Durnacol Airport	-28.046(S)	30.006(E)
Small	Siteka	Siteka Airport	-29.325(S)	30.149(E)
Small	Howick	Howick Airport	-29.553(S)	30.211(E)
Small	Howick	Shafton Airfield	-29.24.3(S)	30.14.1.(E)

Small	Atherstone	Baynesfield Estate Airport	-29.762(S)	30.340(E)
Medium	Pietermaritzburg	Pietermaritzburg	-29.649(S)	30.399(E)
Small	York	Clan Airport	-29.355(S)	30.428(E)

5.2.4 Tourism Industry

The KwaZulu-Natal Tourism Authority recognises the uMgungundlovu District as an area with significant tourism potential. The area is ideally situated for tourism (along the N3 corridor and between Gauteng and the South Coast) and possesses a variety of natural resources to benefit its tourism potential.

The tourism industry revolves around leisure-based tourism including adventure sports and cultural tourism, business tourism (e.g. conferences and exhibitions) and specific annual events (e.g. the Comrades Marathon an Midmar Mile). Tourism related industries include game reserves, cultural centres, adventure sports, Bed and Breakfast and other accommodation facilities, arts and crafts, and restaurants. Much of the successful Midlands Meander (artist retreats, cottage industries, antiques and eateries) are situated in the uMngeni Municipal area and sets the tone for further development and joint-ventures in this regard. Nottingham Road is known as the "heart" of the KwaZulu-Natal Midlands Meander because of its beautiful surroundings, accommodation and function facilities, sports opportunities and calendar of events (Appendix G).

Planning for the future development of the proposed Rosetta and Nottingham Road Tourism Node in relation to the proposed Spring Grove Dam would be undertaken by the uMgungundlovu DM.

Key tourism areas / sectors in the area include the following:

- Regional Museums and historical buildings especially in the town of Pietermaritzburg;
- The recently opened Freedom Route which recognises political heroes of the past including the Nelson Mandela Capture Site near Estcourt;
- The Midlands Meander, which is the second largest tourist attraction in the province after the various coastal destinations;
- The villages of Nottingham Road and Rosetta;
- Howick falls (national heritage site);
- Albert Falls Dam;
- Karkloof Falls;
- The Zulu Mpophomeni Tourism Experience;
- Various nature trails; and
- World's View.

Well known events held in the area are the:

- Comrades Marathon;

- Midmar Mile Swimming Race;
- Wildfly Corporate Fly Fishing Challenge; and
- Duzi Canoe Marathon.

5.3 DESCRIPTION OF THE BIOPHYSICAL ENVIRONMENT

5.3.1 Geology

The northern and central parts of the study area are covered mostly by sedimentary and igneous rocks of the Karoo Supergroup. The sedimentary rocks started to form in a depositional basin around 270 Ma (Ma - million years) ago. The main stratigraphic unit, according to surface area, is the Normandien Formation (± 36%) consisting of sedimentary rocks (mudstone, siltstone, shale and sandstone). There are some other stratigraphic units consisting also of sedimentary rocks that cover minor portions of the study area (Tarkastad Subgroup, Vryheid and Volksrust Formations).

The second most widespread is the dolerite (igneous rock) of the Karoo Supergroup, which covers approximately 27% of the study area. Towards the southern part of the study area the most prevalent stratigraphic units are (in order of decreasing coverage) the Pietermaritzburg Formation (shale with siltstone and sandstone), Dwyka Group (diamictite) and Natal Group (sandstone with some sandstone, granulestone and conglomerate). Figure 8 represents the overall geology underlying the study area in general (Appendix H).

5.3.2 Climate

The study area experiences summer rainfall and winter frost. Morning fog and mist and even snow are common. Two climatic zones occur within the study area, namely Drakensberg escarpment and Eastern Coastal Belt and Zululand. The Drakensberg escarpment is the most prominent. The Drakensberg escarpment is associated with the interior of Natal and Transkei (Eastern Cape). It has a warm temperature with summer rainfall and the dry season in the winter and the warmest month mean temperature average at 22°C.

The overall rainfall ranges between 500 mm and 1,000 mm; which implies that it belongs to the sub-humid level of the five annual precipitation levels (de Frey 1999). An area with above 1,000mm annual rainfall occurs almost as an east to west band across the centre of the study area.

5.3.3 Topography

The altitudinal range within the study area is between 1,000 and 1,500 m above sea level. Three major landforms occur within the study area, namely plains, hills/ridges and mountains. Of these three major landforms, the most dominant are those associated with plains and ridges, namely tablelands, hills and plains.

5.3.4 Soil and Agricultural Potential Component

The dominant soil texture within the study area is sandy, with pockets of clayey and loamy soils. The dominant sandy texture implies high infiltration rates and a higher probability for wetland development on slopes and in close proximity to drainage lines. Rockiness is mainly associated with ridges or areas close to drainage lines where active weathering and erosion takes place (Appendix H).

The following land types (Figure 9) are associated with the line transects:

- Ab – red, dystrophic and/or mesotrophic soils of variable depth, low to high agricultural potential;
- Ac – red and yellow dystrophic and/or mesotrophic soils of variable depth, low to high agricultural potential;
- Ah – red and yellow high base status soils of variable depth, low to high agricultural potential;
- Bb – Dystrophic and/or mesotrophic, red soils not widespread, low to high agricultural potential;
- Bd - Eutrophic, red soils not widespread, low to high agricultural potential.
- Ca – Upland duplex and margalitic soils common, low to medium agriculture potential;
- Db – duplex soils with non-red B-horizons dominant, low agriculture potential;
- Dc – duplex soils including soils with vertic, melanic and red structured horizons, low agriculture potential;
- Fa – shallow and rocky soils without lime in the profile, low agriculture potential.
- Fb – shallow and rocky soils with lowland lime occurrences in the profile, low agriculture potential;
- Ia – pedologically youthful soils and unconsolidated deposits – often transported, low agriculture potential; and
- Wa – water bodies.

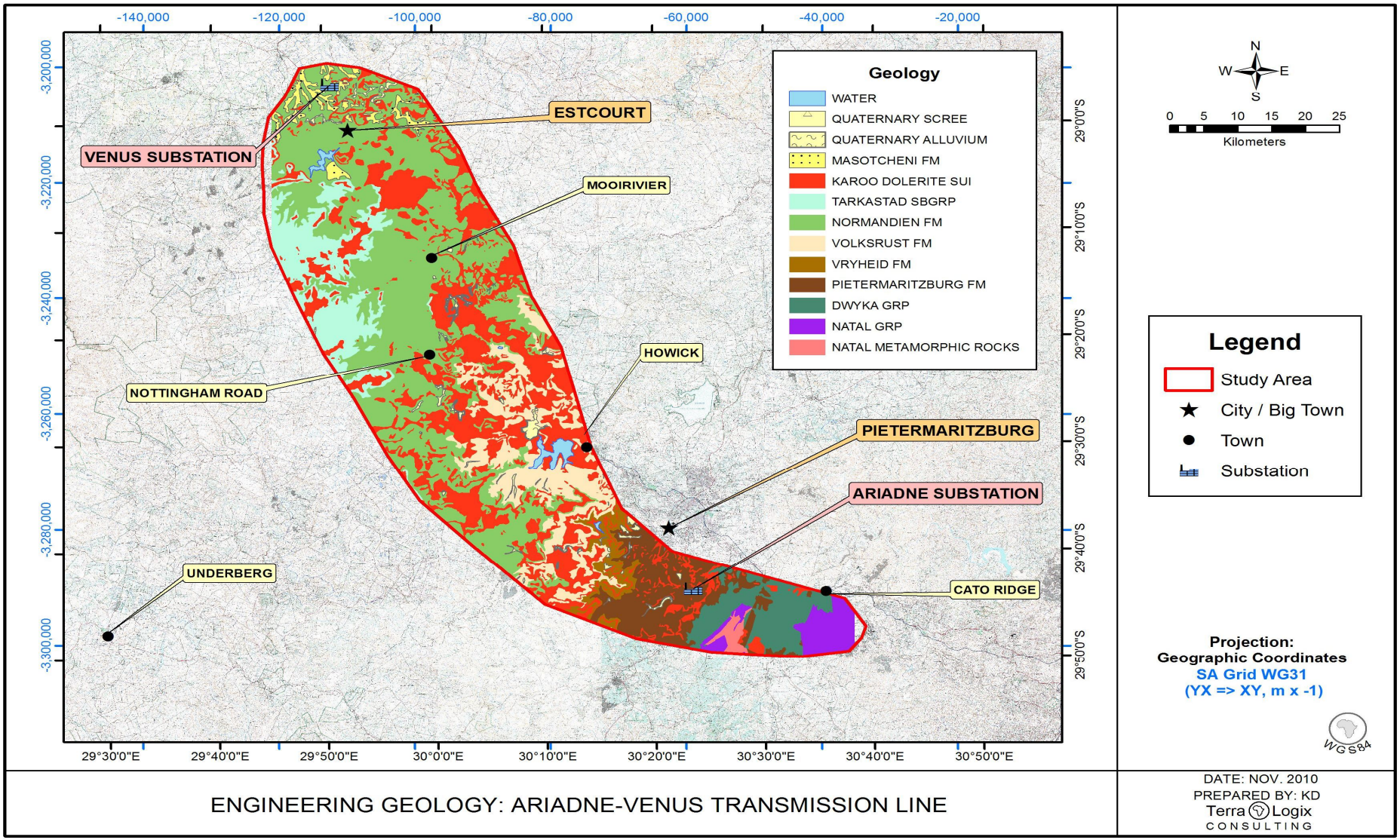


Figure 8: Geology Underlying the Study Area

5.3.5 Vegetation

The study area comprises various vegetation units due to the nature of the topography. Fourteen regional vegetation units occur within the study area (Figure 10), 80% of which is covered by regional vegetation units related to grasslands. More than 37% of the regional vegetation units present within the study area are classified as threatened because their conservation status is either vulnerable or endangered. One regional vegetation unit belonging to the grassland biome, namely Midlands Mistbelt Grassland is considered to be endangered. The Midlands Mistbelt Grassland covers 27% of the study area (Appendix H).

The Midlands Mistbelt Grassland is described as belonging to a: "Hilly and rolling landscape mainly associated with a discontinuous east-facing scarp formed by dolerite intrusions (south of the Thukela River). Dominated by forb-rich, tall, sour *Themeda triandra* grassland transformed by the invasion of native 'Ngongoni grass' (*Aristida junciformis*). Only a few patches of the original species-rich grassland remain." (Rutherford & Mucina 2006). Both bio-geographically important taxa and endemic taxa occur within this vegetation unit.

Only a small fraction (about 0.5%) is statutorily conserved, its conservation target is 23%. Plantations, cultivated land and urban sprawl already transform more than half of this biome. Uncontrolled fires and poorly regulated grazing by livestock add to the threats to this unique grassland. Some aliens (including Solanum mauritianum, species of Rubus, Acacia, Pinus and Eucalyptus) are of concern in certain places.

Overall the number of regional vegetation units within the study area reflects the influence of the geology, climate, topography and soils within the landscape at a regional scale. On a local scale, the presence of various soil forms, soil depth, soil texture, rockiness, changes in altitude and human influences will define various vegetation communities.

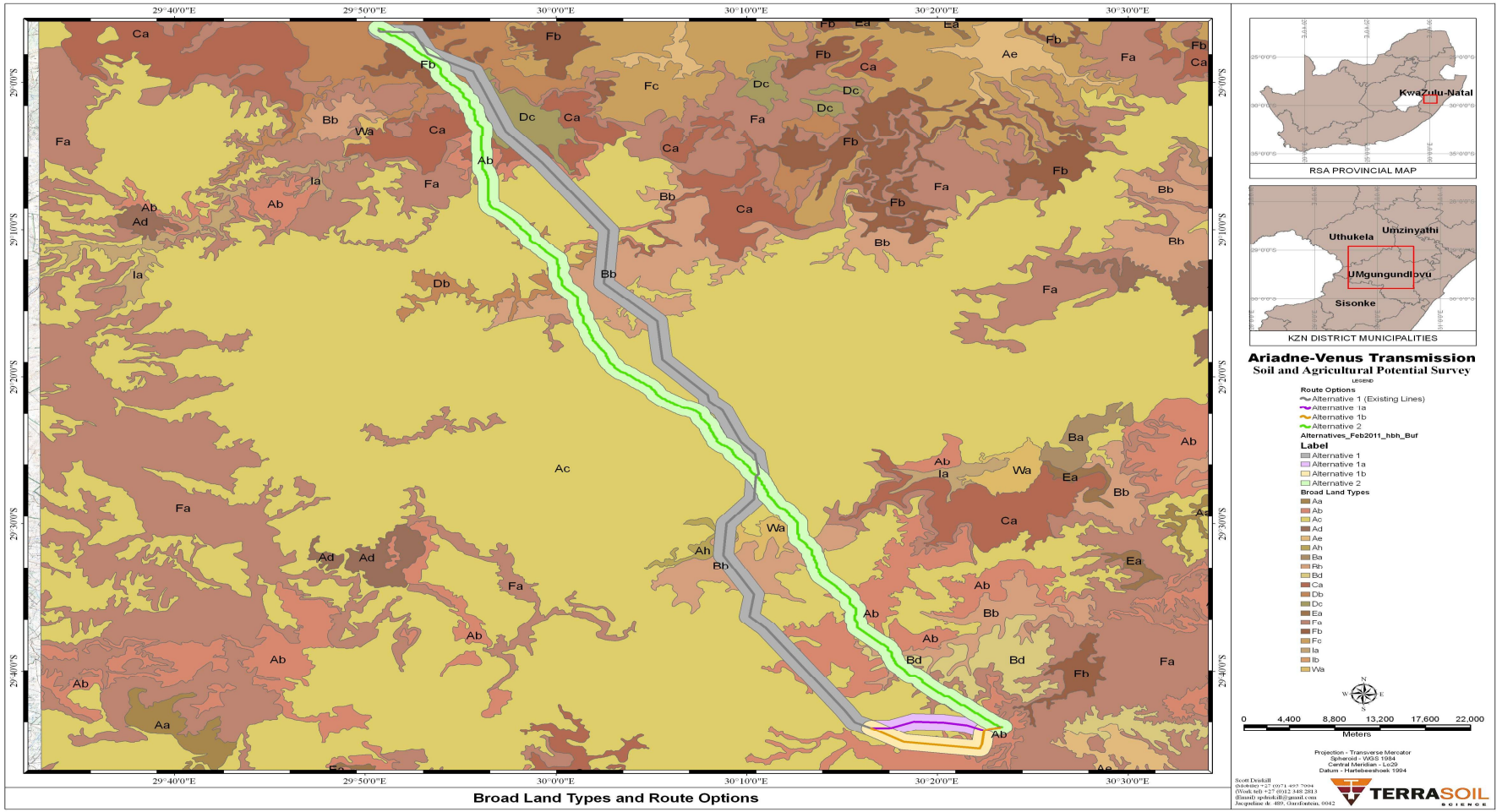


Figure 9: Land Types of the Study Area

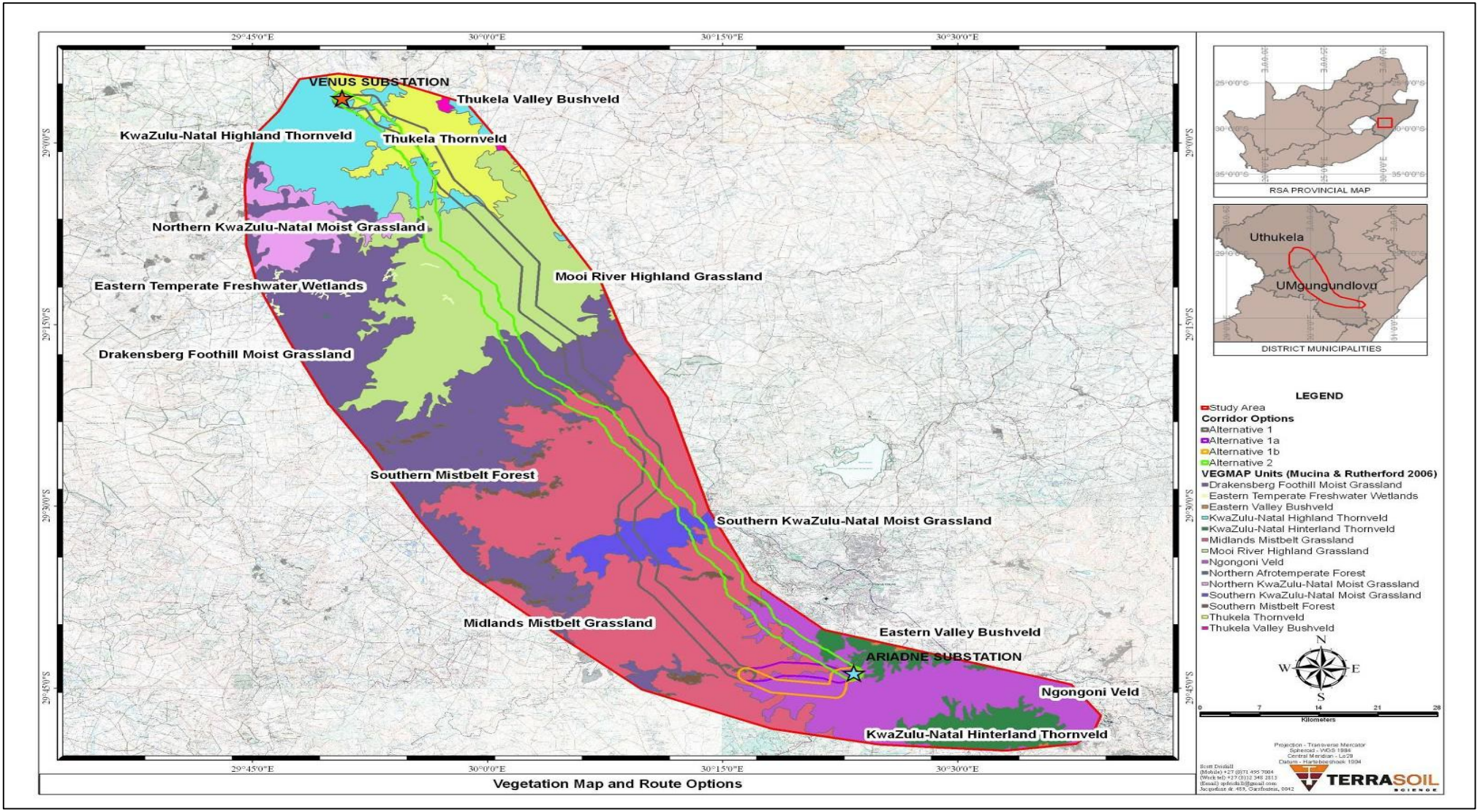


Figure 10: **Vegetation Units Associated with the Study Area**

5.3.6 Fauna and Avi-Fauna

The Province of KwaZulu-Natal is exceptionally rich in mammal taxa as a result of the number of different biotypes created by the varied toposcape, vegetation types and climate. Sixty-five (65) larger and 103 smaller mammal species are represented, including more than 50% of all mammals species recorded from the Southern African sub-region. The diversity is further enhanced through the northwards expansion of many temperate species (Cape derived species) along the Drakensberg escarpment (Appendix H).

From an avi-faunal perspective, the Province boasts an impressive list of approximately 690 species. The study area is rich in bird species, which is easily explained by the high spatial heterogeneity in habitat and vegetation types. The number of bird species recorded for each quarter degree square ranges from 249 species at New Hanover to as many as 349 species at Pietermaritzburg.

The study area is part of BirdLife's Midlands Birding Route (part of the southern KZN birding route) with a number of 'birder-friendly' establishments (as part of the Midlands Meander) located near Curry's Post, Howick and Nottingham Road. Many of these farms provide a secure breeding habitat for a variety of Red Listed and range-restricted bird species.

Listed Red-Data Species

The high diversity of habitat types is responsible for a diverse array of Red Listed bird species (according to Barnes, 2000) with 34% (42 spp) of all national threatened and near-threatened species represent in the study area.

It is evident that the highest reporting rates (according to Harrison et al., 1997) were recorded from the peripheral parts of the study area corresponding to 2930AB (Mount Alida), 2929BD (Nottingham Road) and 2930CC (Byrne). Other parts of the study area with moderate-high reporting rates correspond to 2829DD (Frere), 2830CC (Weenen), 2929DB (Impendle) and 2930CA (Merrivale). In contrast, areas subjected to high urban sprawl and rural densification had the lowest reporting rates of Red Listed species (e.g. 2930CB Pietermaritzburg and 2930DA Cato Ridge). The latter two areas correspond to Ngongoni Veld, a species-poor grassland subjected to intense overgrazing.

Those areas with high reporting rates were well-utilised by species such as Southern Bald Ibis (*G. calvus*), Grey Crowned Crane (*B. regulorum*), Blue Crane (*Anthropoides paradiseus*), African Crowned Eagle (*Stephanoaetus coronatus*) and Blue Swallow (*H. atrocaerulea*).

Figure 11, shows a spatial representation of the KZN Conservation Plan on the study area. Note that areas classified as totally irreplaceable (red) refer to areas with a high suitability for Wattled Cranes (*Bugeranus carunculatus*) and Blue Swallows (*Hirundo atrocaerulea*).

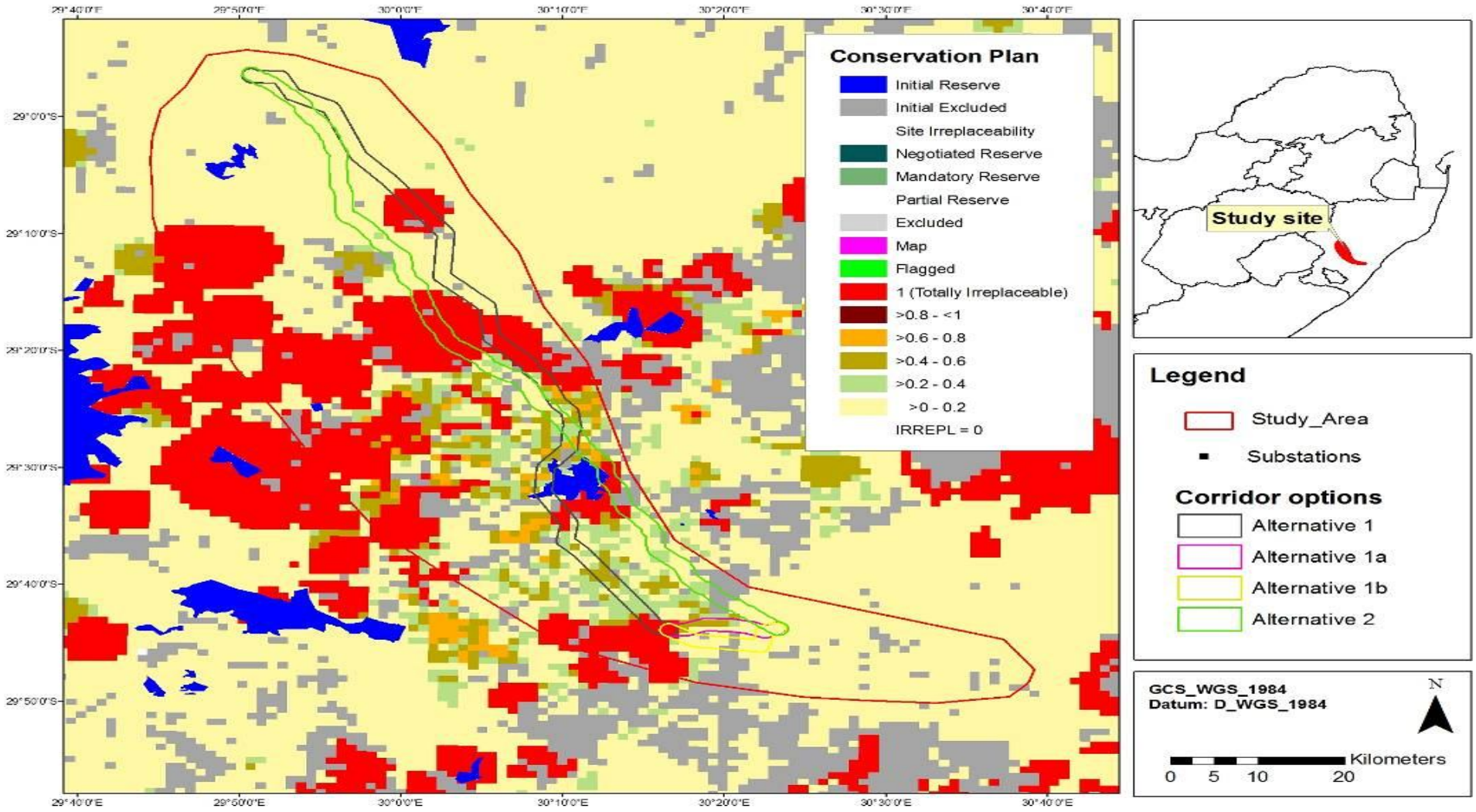


Figure 11: Spatial Representation of the KZN Conservation Plan of the Study Area

5.3.7 Wetland

Figure 10 represent the overall 23 Quaternary Catchments within the study area. It is basically found in the primary catchment area of the Tugela and Mkomazi rivers and includes the following rivers: Boesmans, Klein-Boesmans, Roodepoortspruit, Rensburgspruit, Katspruit, Hlatikulu, Mooi, Klein-Mooi, Karkloof, Kusane, Ngqishi, Mlazi, uMsunduze, uMngeni, Lions, and Manzimyama. It also includes the Midmar, Wagendrift and Henley Dams (manmade) and the natural wetlands Mgeni at Howick Falls and Lions River flats. The terrain morphology of the study area includes escarpments, low mountains, irregularly undulating lowlands with hills, mountains and lowlands and undulating hills and lowlands (Appendix H).

5.3.8 Cultural Heritage Resources Component

The study area has a fairly large number of cultural (archaeological and historical) sites, ranging from the Stone Age to the more recent historical period of the study area. The sites include graveyards, historical farmsteads and other features, Anglo-Boer War (1899-1902) sites, possible rock art sites, Iron Age stone walled sites, railway stations and bridges. The proposed corridors may affect all these cultural and heritage resources and this will be taken into consideration during the assessments of impact in an attempt to identify the preferred best corridor.

A heritage study will be undertaken in accordance with the National Heritage Act, 1999 (Act No. 25 of 1999) in order to assess if there are any areas of heritage concern within or close to the study area. The Heritage authority of the KwaZulu-Natal Province, known as Amafa, has been notified and will play an integral part in the study. It will be asked to comment on issues related to cultural and heritage resources within the study area.

5.3.9 Visual and Aesthetic Value

It is generally accepted that transmission lines reduce visual amenity and that visual amenity has a value to local residents and visitors to an area. The visual impact of transmission lines is much greater per kilometre than distribution lines because of the size of transmission pylons. The introduction of the new power lines on the landscape affects the natural view of the area, which leads to a change in the sense of place. Tourism areas are significant for local economic development and in many cases are earmarked to contribute to profitability and the mitigation of poverty by their aesthetic and recreational value. The optimal utilisation of these areas is important and fragmentation/sterilisation of and damage to the aesthetic value should be avoided. Figure 11 indicates the visual sensitivity based on the GIS run model (Appendix H).

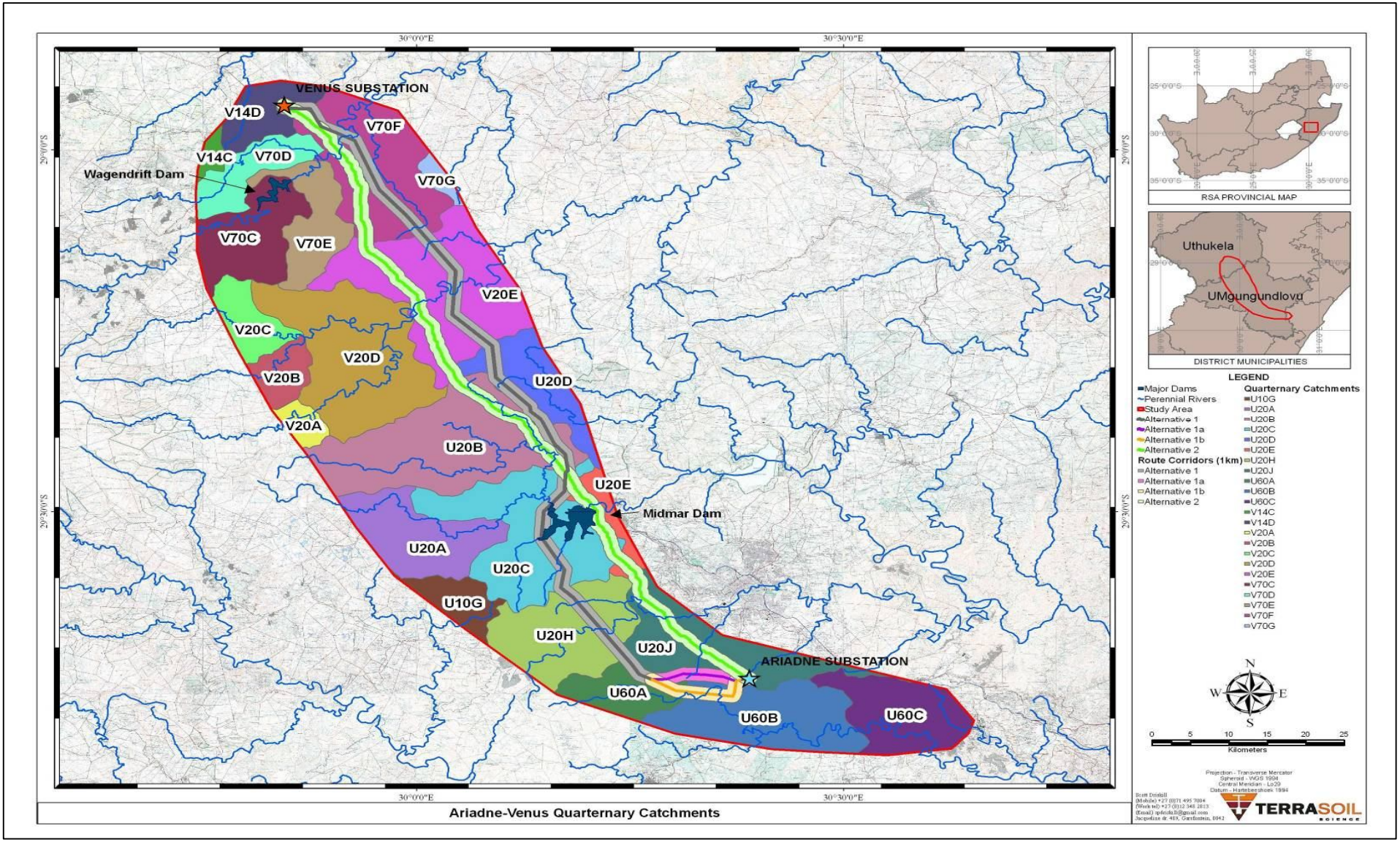


Figure 12: Overall Quaternary Catchments that Overlap the Study Area

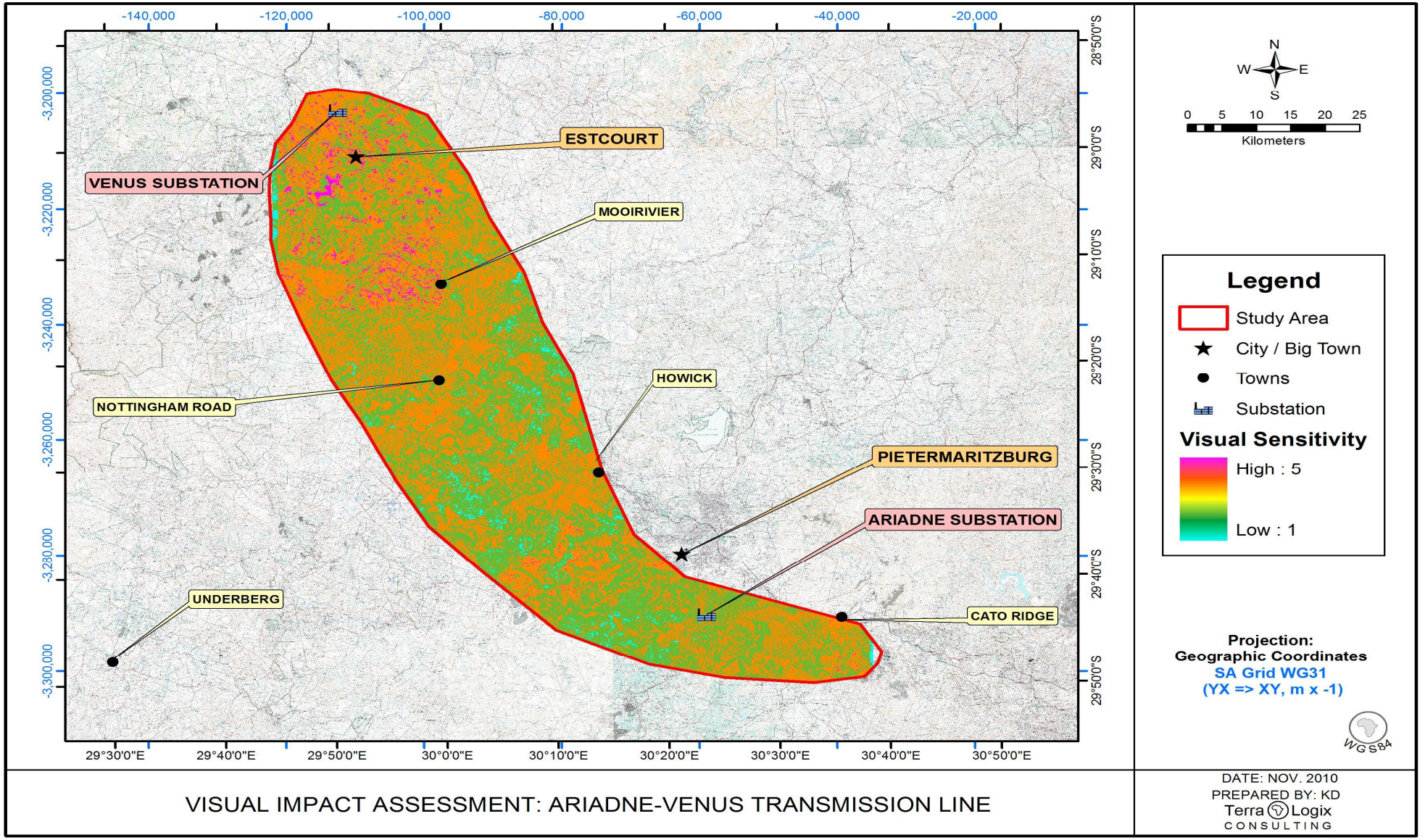


Figure 13: Overall Visual Sensitivity within the Study Area Based on GIS Modelling

6. ALTERNATIVES

It is best practice in environmental management to consider as many alternatives as possible until a feasible alternative is chosen. During the identification and assessment of alternatives to be considered for the proposed project, the project team comprised a proponent, an Environmental Assessment Practitioner (EAP), specialists and members of the public all playing important roles in considering and selecting the viable alternatives.

Taking into consideration the nature, type and extent of the project, the following alternatives were identified: alignment alternatives and micro alternatives. Based on the nature and extent of the project, alignment alternatives and the No-Go alternative need to be assessed during EIA phase as per the requirements of the Environmental Impact Assessment Regulation, 2006.

The criteria for selecting a suitable or viable alternative will take into consideration environmental constraints and social and economic factors.

6.1 ALIGNMENT ALTERNATIVES

During the scoping phase three corridors were investigated (namely a Grey Corridor (Alternative 1), Green Corridor (Alternative 2) and Orange Corridor (Alternative 3)). Each corridor is 2km wide to ensure that there was space to move the alignment within the corridor.

The Scoping Phase specialist studies and public participation (P2) concluded that the largest part of the Orange Corridor (Alternative 3) had more potential significant impact and was therefore discarded from the EIA Phase. This omission was because of the social, economic and social issues that were tabled by specialists and the public alike and were found to be significant. The Final Scoping Report subsequently recommended the omission of part of the Orange Corridor from the Impact Assessment Phase.

6.1.1 Alternative 1 (Grey Corridor)

This corridor encompass the two existing 275kV and one 400kV power line between Ariadne and Venus substations that runs parallel to each other. Eskom is investigating the option of using one of the existing 275kV line servitudes for the purpose of constructing a new second 400kV line between Ariadne and Venus substations. Feasibility studies are still ongoing with regard to the possibility of upgrading one 275kV line to 400kV line. Some findings from the feasibility studies indicate that the existing tower structures are not strong enough to carry the 400kV conductors and it is therefore suggested that one of the 275kV lines would be rebuilt on the same alignment (i.e. the 275kV line will be taken down and a 400kV line would be erected in the same place). It would, however, mean that the existing towers would be demolished and new tower structures erected.

Furthermore, a 400kV line servitude requirement is 55m (measured 22,5m from the mid-line), while the servitude requirement for a 275kV line is only 46m. This means that the servitude would have to be extended (via negotiations) in order to meet the requirement of a 55m servitude. The length of Alternative 1 (Grey Route) is approximately 117,5km and runs from the

Venus Substation to the east of the N3 highway in a southerly direction. Just north of Howick this alternative crosses the N3 highway and passes the Midmar Dam to the west to continue in a southerly direction to the Ariadne Substation.

It is possible that the local bird communities on the study area have become accustomed to the existing powerlines and has "learned" to avoid colliding with these lines. Thus, Alternative 1 would be "more" visible to passing birds and would have the least possible impact on crane movements. The existing 275kV power line has already impacted on the ecology of the area and on various social and economic aspects as well. Increasing the voltage to 400kV by upgrading the existing line would have further consequences.

The challenges of recycling one of the existing 275kV technically faced with where the lines cross amongst each other. The crossing of lines involves existing Ariadne-Venus 400kV line 1 cross over existing 275kV line 1 and line 2 which are both goes to Venus to Georgedale substation. One of the existing lines is proposed to be replaced by new second 400kV line from Ariadne-Venus substation. Technically, 400kV line are not allowed to cross over each other, the challenges when the existing 400kV line crosses with one of the 275kV line that will be replaced with new 400kV line.

6.1.1.1 Technical Challenges Associated with Alternative 1

One of the challenges of this alternative is that there is more than one instance where power lines will cross over each other. Technically, 400kV line is not allowed to cross over each other. The crossings of the lines were mapped and the geographic coordinates of each point were recorded. Figure 14 to 20 represents the crossings where they will pose potential difficulties to recycle one of the 275kV line.

Table 8: Power Line Crossings on Alternative 1 (Grey Corridor)

Name	Geographic Coordinates	Altitude
Ariadne/Eros 1 132(400)kV Line	S29 45.192 E30 22.387	887 m
Ariadne/Riverdale 132kv Double Circuit Line	S29 45.190 E30 22.382	887 m
Ariadne/Venus 1 400kv Line	S29 43.893 E30 16.515	1220 m
Swapping 1	S29 43.892 E30 16.536	1219 m
Ariadne/Venus 1 400kv Line1	S29 36.311 E30 10.174	1315 m
Swapping 2	S29 36.299 E30 10.176	1311 m
Ariadne/Venus 1 400kv Line2	S29 23.242 E30 09.171	1315 m
Swapping3	S29 23.212 E30 09.143	1324 m
Ariadne/Venus 1 400kv Line3	S29 08.931 E30 01.924	1505 m

Swapping 4	S29 08.913 E30 01.922	1504 m

Figure 14: Ariadne-Eros Crossing the Existing Georgedale-Venus 275kV Line

Figure 15: 400kV Ariadne-Venus 1 Crossing Over Two Existing 275kV Lines (Crossing 1)

Figure 16: Google Image of the Ariadne-Venus 1 CrossingOver Two Existing 275kV Lines (Crossing 1)

Figure 17: Ariadne-Venus 1 CrossingOver Two Existing 275kV Lines (Crossing 2)

Figure 18: Google Image of the Ariadne-Venus 1 Crossing Over Two Existing 275kV Lines (Crossing 2)

Figure 19: Ariadne-Venus 1 Crossing Over Two Existing 275kV Lines (Crossing 3)

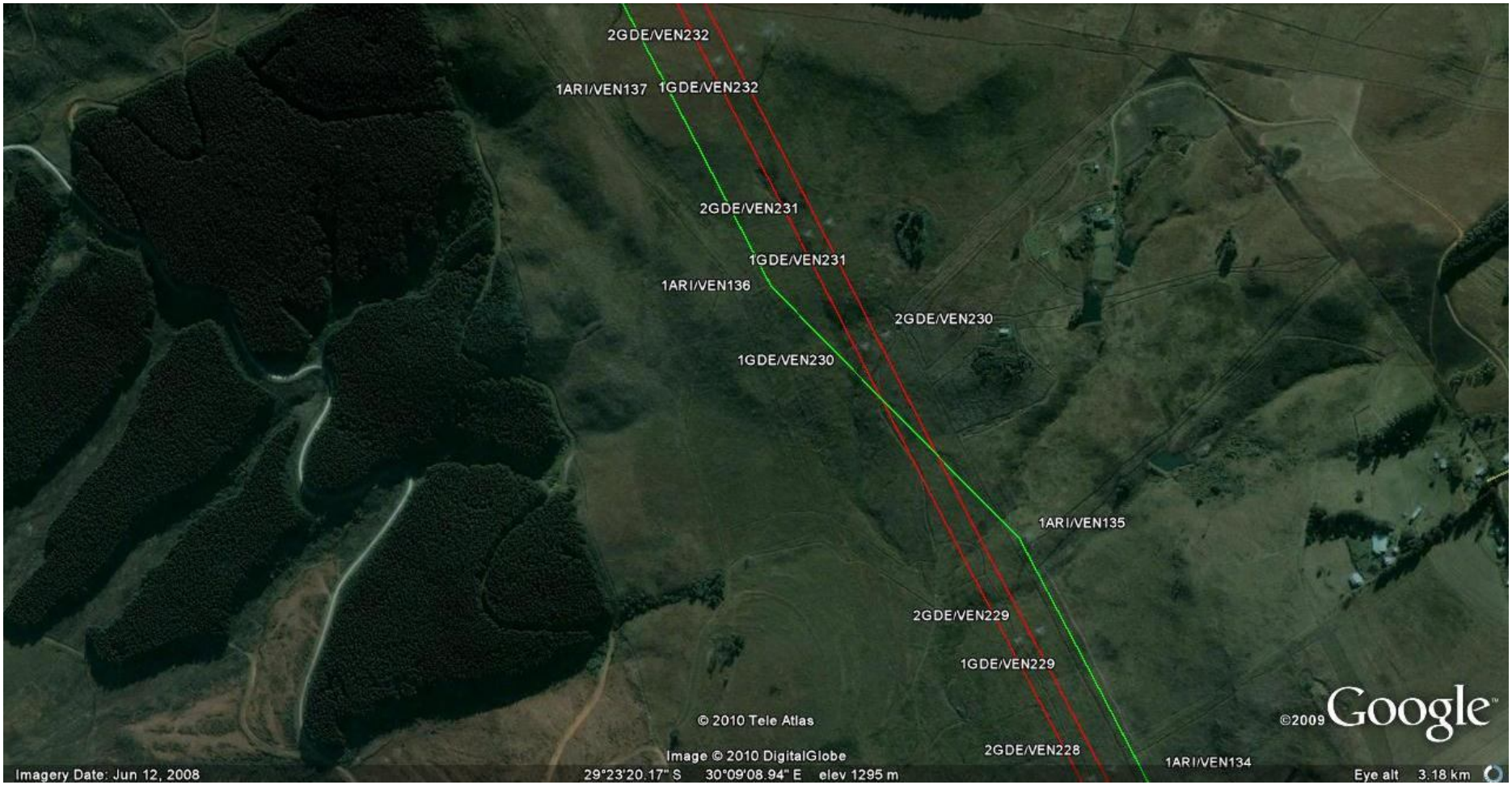


Figure 20: Google Image of the Ariadne-Venus 1 Crossing Over Two Existing 275kV Lines (Crossing 3)

Figure 21: Ariadne-Venus 1 Crossing Over Two Existing 275kV Lines (Crossing 4)

Figure 22:Google Image of the Ariadne-Venus 1 Crossing Over Two Existing 275kV Lines (Crossing 4)

During the consultation with the public and stakeholders on the Draft Scoping Report (DSR) **Alternative 1 at the southernmost section of the study area was split into two new two sub-alternatives namely Alternative 1a (Purple Corridor) and Alternative 1b (Orange Corridor)**. This was due to the difficulties experienced in trying to connect to Ariadne Substation as both the existing 275kV lines go to the Georgedale Substation - bypassing the Ariadne Substation. As it is, Ariadne Substation is congested with both Transmission and Distribution lines coming in and out of it. It was therefore important to split Alternative 1 into two alternatives (1a and 1b) in an attempt to have a few options to connect to the Ariadne Substation.

6.1.1.2 Alternative 1a (Purple Corridor)

This alternative was derived during the period of consultation with the public and stakeholders on Draft Scoping Report. Alternative 1a (Purple Corridor) used to be the original Grey Corridor that connected to Ariadne Substation. In this case, the Purple Corridor cut across greenfield areas (i.e. areas where there are no existing power lines). On this corridor an entire new 55m servitude will be required as part of the requirements of the proposed 400kV power line. It must be noted that the corridor width will remain 2km width to be in line with the other corridors. Figure 23 represents the amendment of the Alternative 1 while excluding Alternative 3 from the EIA process.

6.1.1.3 Alternative 1b (Orange Corridor)

This alternative came to the fore during the period of consultation with the public and stakeholders on DSR. Alternative 1b (Orange) was part of the Alternative 3 that was considered to have significant issues on Social, Economic and Environmental level that led for Alternative 3 to be recommended to be discarded from the EIA investigation process (Figure 21). In this instance, though, part of Alternative 3 at the southern section of the study area, it merges with Alternative 1 and from there it runs on the existing two 275kV lines of which one (of these two 275kV lines) is proposed to be rebuilt to accommodate the 400kV line.

It is important to have various options that will turn into Ariadne Substation as currently there is several transmission and distribution power lines that are coming in and out of Ariadne Substation. This suggests potential difficulties to connect to Ariadne Substation. Most of the Alternative 1b is on the existing servitude of 275kV line that goes to Georgedale Substation however new servitude will required where it turns to Ariadne Substation since both the 275kV do not connect to Ariadne Substation.

6.1.2 Alternative 2 (Green Corridor)

Alternative 2 is the product of using a combination of a landscape model and the least cost approach. This alternative has been derived from technical construction specifications combined with perceived environmental sensitivities.

Using commercially available raster based GIS software; the least cost approach was applied to determine the location of a least environmentally sensitive but still socio-economically viable alignment. This approach makes use of a model consisting of landscape features such as geology, topography, soils, vegetation, land use and known infrastructure. Attributes within each landscape feature were ranked from one (1 – very low) to five (5 – very high) in terms of

how a specific attribute within a landscape feature contributes to a specific environmental issue (for example threatened ecosystem and species and visual aesthetics) or cost. Slopes, for instance, were classified into five classes ranging from 0 – 5°, 5 – 10°, 10 – 15°, 15 – 20° and 20° or more. Slopes of more than five degrees (5°) are associated with ridges and habitat diversity and potential threatened species and would be assigned a value of five (5).

Engineers would also rate the steeper slopes high because it would be technically more difficult and costly to construct infrastructure on steep slopes. The model is data-dependent and therefore the amount of data used determines the accuracy of the result. For this study, the input data ranged in scale from 1: 250 000 (small scale) to 1: 50 000 (large scale), at a 100 m pixel resolution, thus each pixel representing one hectare (1 ha). The least cost approach algorithm searches through the landscape model from pixel to pixel to find the next pixel/area with a lower cost, whether environmentally or technically, than the surrounding pixels/areas. It continues with this process from the starting point, for example Venus, until it reaches the end point – Ariadne Substation in this instance.

Both the environmental and technical specialists were asked to rate the environmental attributes per landscape feature for their respective fields of expertise. This approach was not limited to the biophysical and technical specialists, but included the social specialists. The social specialist were asked to rate/assign a five (5) to human related infrastructure such as a school, crèche, hospital or human settlement, while assigning/rating open spaces or natural environment where there are no structures, a one (1). Similarly with regard to vegetation, the model determines where in the landscape a proposed development will have the least impact on vegetation. Thus a vegetation specialist will rate natural vegetation associated with protected areas a five (5), while rating areas associated with infrastructures such as roads and buildings a one (1) because such infrastructure has already had a major impact on the environment.

Once all the landscape features had been rated by the specialists in terms of their field of expertise, the model executed and created lines/pathways per field of expertise. These results were verified during the site visit in order to assess the model for future alterations or amendments. The specialists' input resulting from this rating methodology was used to create various GIS layers based on the respective fields of expertise. These layers were combined and a line/pathway was generated, buffered to accommodate a 2km wide corridor. The corridor obtained from the least cost approach was named the environmental and technical least impact line and is depicted as Alternative 2 (Green Corridor).

Alternative 2 runs almost parallel to Alternative 1 from the Venus Substation on the eastern side of the N3 highway. Between Estcourt and Mooi Rivier this alternative crosses the N3 highway and runs parallel to the highway (on its western side) until it reaches the town of Mooi Rivier. There it again crosses the N3 highway to run parallel to Alternative 1 to the east of the N3. It passes the Midmar Dam on the eastern side, traverses some areas of Howick or in close proximity thereto (e.g. Howick West, Tweedie and Merrivale) until it reaches the Ariadne Substation. The length of Alternative 2 is approximately 108.27km.

This alternative crosses over less biologically sensitive areas than those affected by Alternatives 1 and 3. This is because the alignment is located alongside or running mostly parallel to the N3

highway where the ecologically sensitive areas are less significant and historically influenced. However, this alternative will have more social issues as it often traverses built-up areas such as residential, touristic and institutional areas.

Figures 24 to 26 provide better views of the Alternatives as well as providing geographic points for better orientation.

6.2 THE NO-GO ALTERNATIVE

As a norm, the No-Go alternative should be considered as an option alongside the other project alternatives. To maintain the status quo is an attractive option for the reasons outlined below, but by not taking any action, Eskom Transmission would not be able to ensure consistent supply into KZN and therefore would be in contravention of the Grid Code (Transmission Licence). This would result in load shedding to protect the network from collapsing completely when one of the 400kV lines into KZN is out of service. Doing nothing would have a major impact on the economics of the region, as no new customers or load increase would be able to be accommodated by the network.

On a positive note this would reduce the impact on the aesthetic value of the natural environment, because the introduction of power lines into the landscape changes the sense of place (tourism impacts). It would also benefit the current status quo of the biophysical environment. However, the need for electricity is a national concern and not increasing the capacity to generate electricity within KZN could potentially stunt economic growth both in KZN and in South Africa in general. Considering the need for a steady supply of electricity in the province and country in general, this option based on EAP opinion is considered unrealistic.

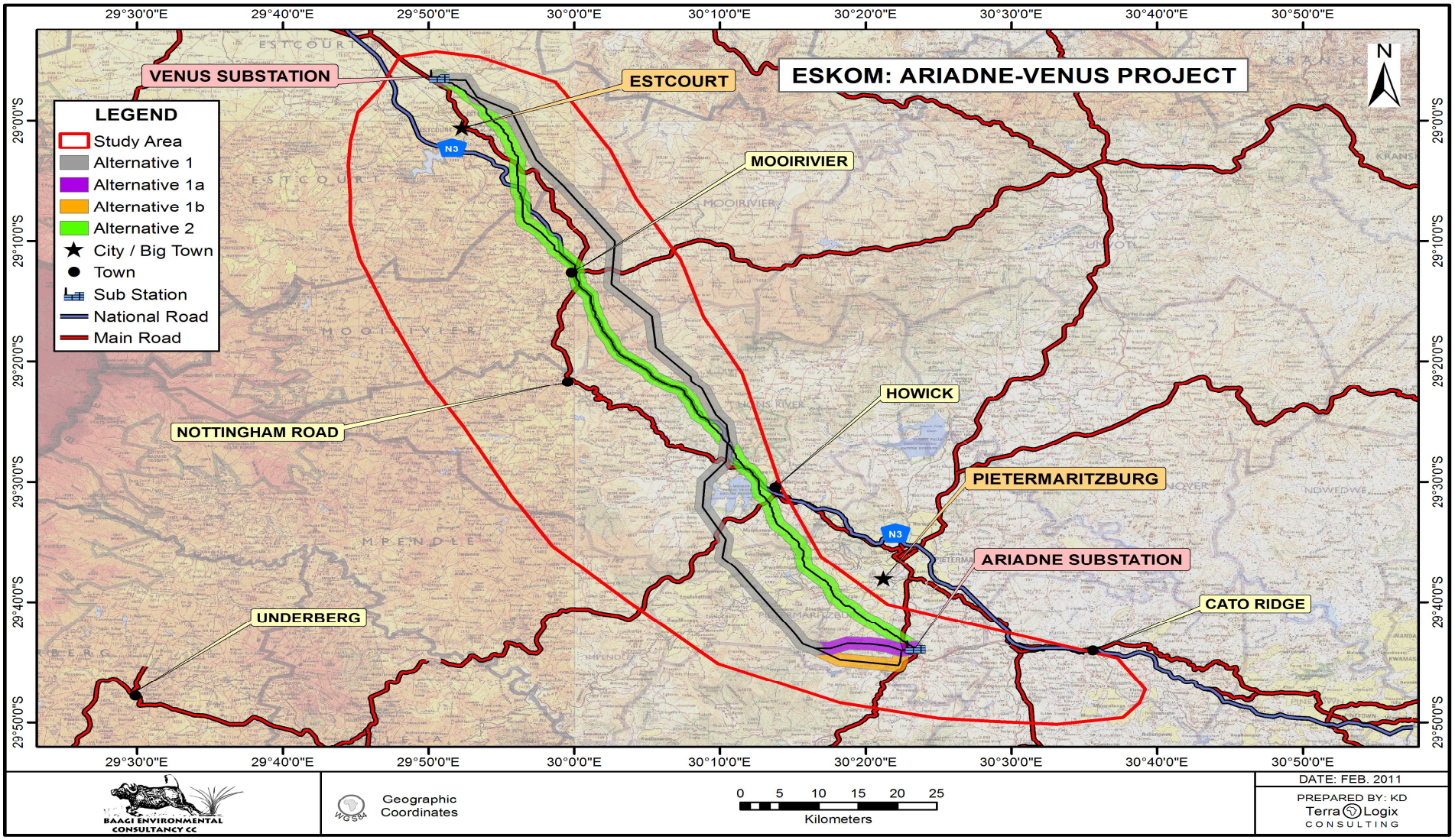


Figure 23: Alternative Alignments Investigated During the EIA Phase

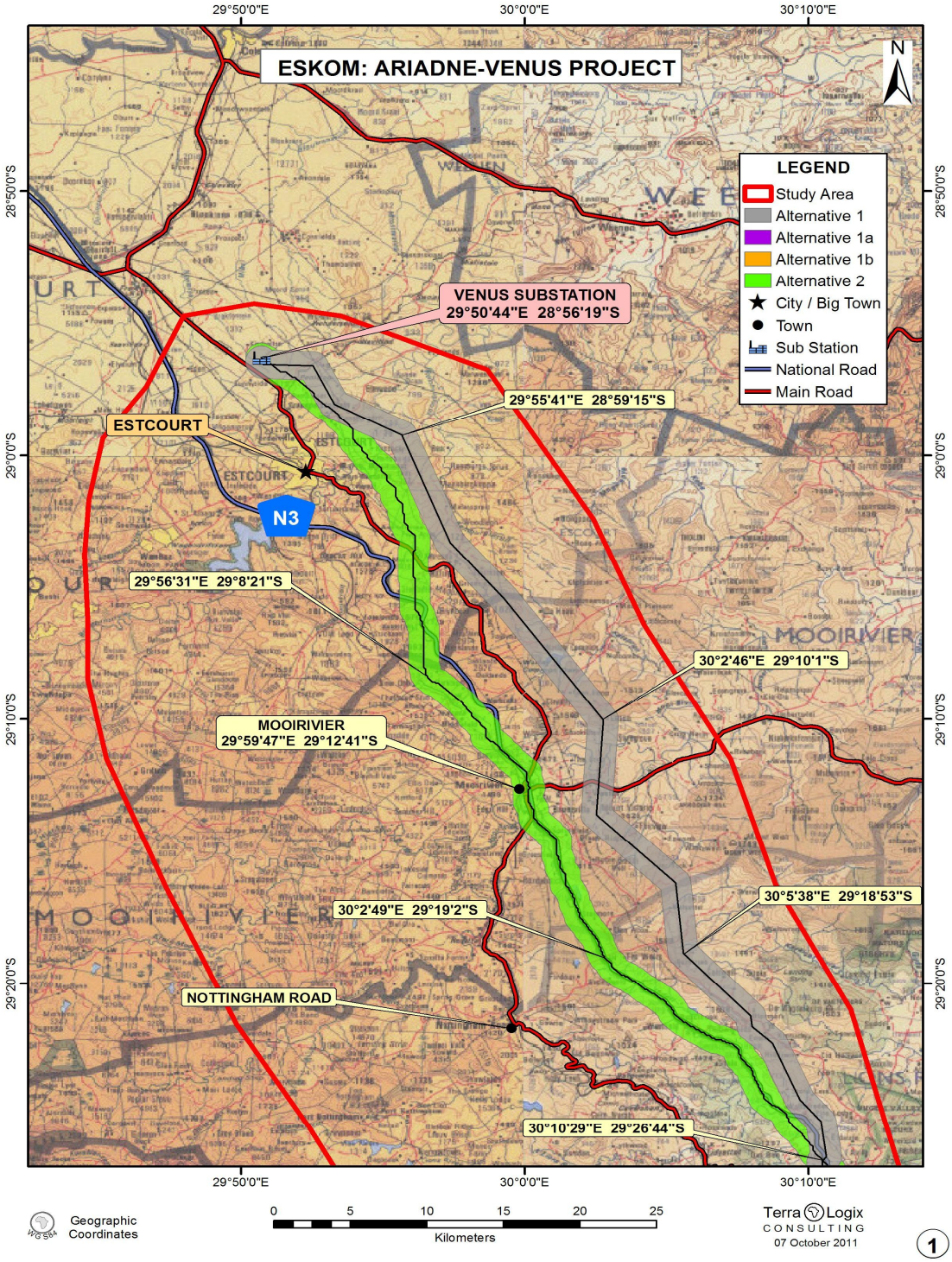


Figure 24: Corridors with Geographic Coordinates (Part 1)

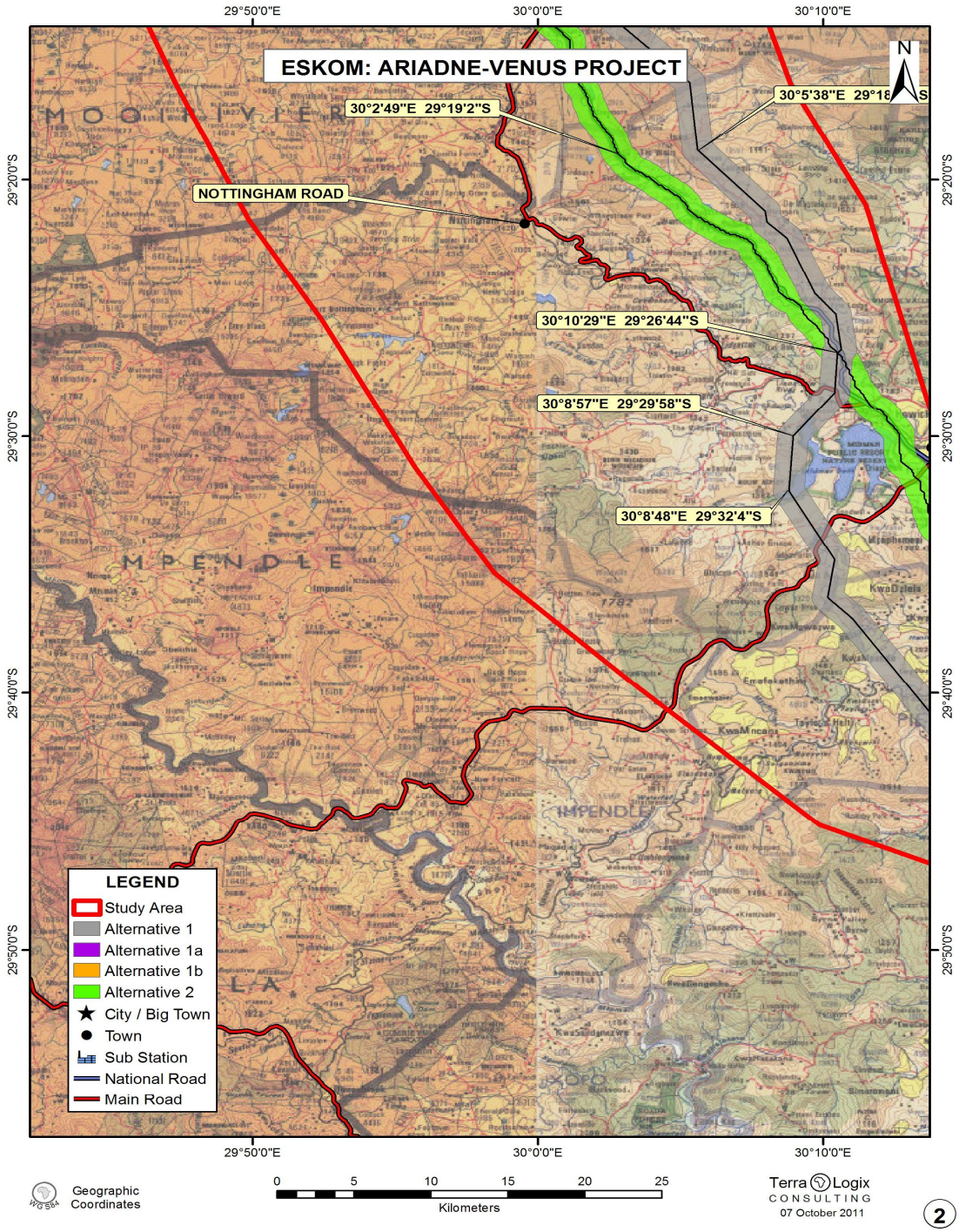


Figure 25: Corridors with Geographic Coordinates (Part 2)

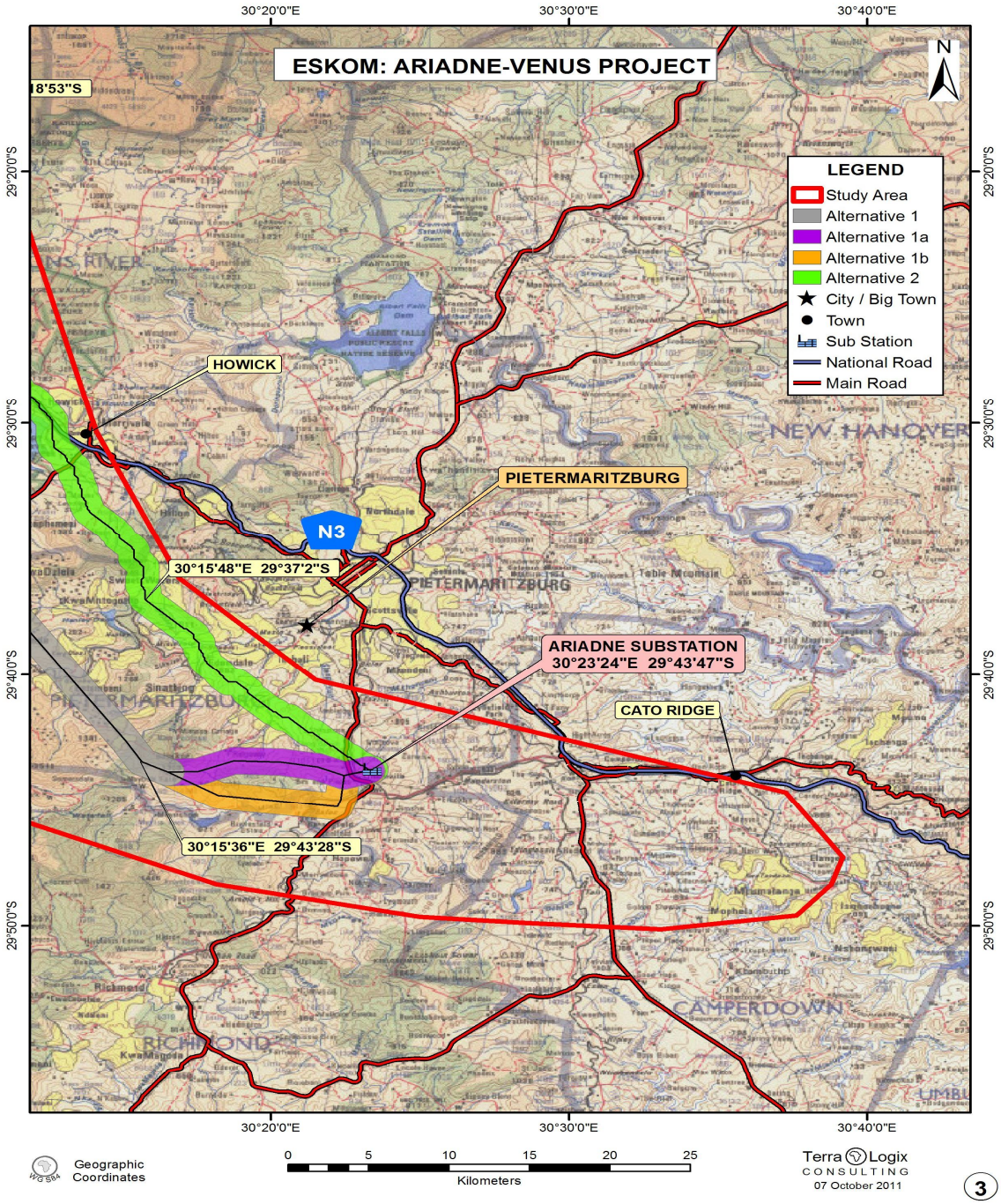


Figure 26: Corridors with Geographic Coordinates (Part 3)

7. PUBLIC PARTICIPATION PROCESS: EIA PHASE

Public participation forms an integral part of the full EIA process and the EAP is totally reliant on the Interested and Affected parties (I&AP's) participation to ensure adherence to the legal requirements as set out in NEMA.

Sections 56 to 59 of Regulation R385 of the National Environmental Management Act No 107 of 1998 are applicable. The important elements relating to the public participation process that are required by the Regulations are the following:

- The manner in which potential Interested and Affected Parties (I&APs) were notified of the application for authorisation, and that a public participation process was mandatory.
- This includes notice boards, giving written notice to land owners, letters, information documents and advertisements in the media (Section 56).
- Opening and maintaining a register of the names and addresses of I&APs. These include all persons who have attended meetings, submitted comments, organs of State who have some form of jurisdiction in the assessment process, and all those who have requested that they be placed on the register as registered I&APs (Section 57).
- Registered I&APs are entitled to comment, in writing, on all written submissions made to the competent authority by the applicant or the EAP managing the application, and to bring to the attention of the competent authority any issues which that party believes may be of significance when the application is considered for authorisation (Section 58). The comments of registered I&APs must be recorded and included in the reports submitted to the competent authority (Section 59).

The Public Participation (PP) team set out an information program during the Scoping Phase of the process to ensure that as many I&APs as possible were well informed about the proposed project as possible in order to form part of the EIA from inception to completion.

During the EIA Phase, the focus was on keeping registered I&APs up to speed with the project and to ensure that they (and other stakeholders) have ample opportunity to comment and give input, especially with regard to the preferred alignment. As with the Scoping Phase, there was no cut-off date for registering as I&APs and new stakeholders were welcomed into the process.

7.1 Updating the I&AP Database

The Public Participation Process in the EIA Phase kicked off with an exercise to ensure that the team had the most up-to-date contact details of parties. The initial stages of the process were already in June/July 2010 and many of the contact details have changed since. This was no easy task, but every endeavour was made to create an up to date database of I&APs. During these conversations (and the e-mails sent) I&APs were invited to send their comments and concerns and to communicate with the P2 Team should they have any questions, etc.

7.2 Informing I&APs of Public Meetings to Discuss the Findings of the DEIR as well as the Availability of the DEIR for Comment

Public meetings and Focus Group Meetings were held during the week of Monday 24 to Friday 28 October 2011. The following ways were used to notify people of the Public Meetings and the availability of the DEIR for public perusal and comment:

- Newspaper advertisements;
- Site Notices; and
- Notifications to existing registered I&APs.

Newspaper Advertisements

The table below indicates the newspapers and the publication dates used to inform I&APs of the proposed activities:

Table 9 Newspapers and publication dates

Newspaper	Publication Date
Natal Mercury	18 October 2011
Isolezwe	18 October 2011
Village Talk	19 October 2011
Ilanga	20 October 2011
Natal Witness	20 October 2011
Estcourt& Midlands News	21 October 2011

The proof of the advertisements can be seen under **Appendix C**.

Site Notices

In excess of 100 site notices (in isiZulu and English) were placed along the proposed corridors and in the following towns:

- Estcourt;
- Mooi River;
- Curry's Post;
- Nottingham Road;
- Howick;
- Thornville and Bayenesfield area near Pietermaritzburg; and
- Edendale.

Mailing and Faxing

After the Database of registered I&APs was updated, notices of the Public Meetings were sent to the entire database. The current I&AP database appears in **Appendix C** of the Public Participation Specialist Report.

7.3 Public and Focus Group Meetings

The Table below shows the places where Stakeholder and Public Information Meetings were held.

Table 10: Schedule of Stakeholder and Public Information Meetings

Stakeholder Meeting	Type of Meeting	Venue	Date & Time
KZN Provincial House of Traditional Leaders, Pietermaritzburg	Site Visit	Pietermaritzburg &Ennerdale Area	21 September 2011 @ 10:00
Estcourt Farmers' Ass & Local Municipality	Focus Group Meeting	Estcourt Dutch Reformed Church	24 October 2011 @ 15:30
Estcourt	Public Meeting	Estcourt Dutch Reformed Church	24 October 2011 @ 18:00
Mooi Mpofana Local Municipality	Focus Group Meeting	Mooi Mpofana Council Chambers	25 October @ 08:30
Midlands Meander Tourism Association and Conservation Groups	Focus Group Meeting	Yellow Wood Café, Howick	25 October 2011 @ 10:30
Howick Local Municipality & Rate Payers' Associations	Focus Group Meeting	Yellow Wood Café, Howick	25 October 2011 @ 12:00
Howick	Specialist Open Day and Public Meeting	Yellow Wood Café, Howick	25 October 2011 @ 14:00 (OD) 25 October 2011 @ 18:00 (PM)
Conservation Groups and Fire Protection Agencies	Focus Group Meeting	Nottingham Road Hotel	26 October 2011 @ 12:00
Nottingham Road	Public Meeting	Nottingham Road Hotel	26 October 2011 @ 16:00
Curry's Post	Public Meeting	The Lodge @ Curry's Post	26 October 2011 @ 18:30
Msunduzi Municipality and AMAFA	Focus Group Meeting	Msunduzi Offices	27 October 2011 @ 08:30
Bayenesfield / Thornville	Public Meeting	Bayensfield Country Club	27 October @ 18:00
KZN Provincial House of Traditional Leaders, Estcourt	Focus Group Meeting	Estcourt Library	10 November 2011 @ 10:00
Greater Edendale Development Initiative (GEDI)	Focus Group Meeting	GEDI Offices	11 November @ 10:00
KZN Provincial House of Traditional Leaders, Estcourt	Focus Group Meeting	Estcourt Library	09 December 2011 @ 12:00
Estcourt Affected Farmers	Focus Group Meeting	Estcourt Farmers'	09 December 2011 @ 14:30

		Association Board Room	

The minutes of these meetings can be seen in **Appendix C**.

7.4 Draft Environmental Impact Report Public Comment Period

The public comment period for the DEIR initially ran for a 30-day period until 14 November 2011 (to ensure that the people had the opportunity to study the DEIR before and after the Public and Focus Group Meetings). On 25 October 2011, we were informed by two I&APs that the report was not yet loaded onto the Eskom website (one of the places where the report could be obtained). Subsequently a notice was sent out to all registered I&APs to inform them that the DEIR would be available for comment until 21 November 2011 to make up for the lost time. However, many I&APs made arrangements with the P2 Team and only submitted their comments later (the last was received on 19 December 2011). These comments were taken up into the Issues and Responses Register that can be viewed in this report.

7.5 Summary of concerns raised during the EIA Phase

- **Agriculture**
  - Problems with crop dusting.
  - Loss of income during construction and operational phase.
- **Air Quality**
  - No issues recorded.
- **Alternatives (including Alignment)**
  - People were pleased that the orange corridor had been dropped.
  - The fact that the grey corridor were regarded as the preferred alternative was understood by I&APs, however, many pointed out that it was not without its challenges.
- **Archaeology and Heritage**
  - The AMAFA application had to be lodged at their offices.
- **Compensation**
  - Will landowners be compensated?
  - How will compensation work?
- **Construction and Rehabilitation**
  - Suggestions for the EMP.
  - Environmental Awareness Training for contractors.
  - Legality and chances of the EMP being implemented, especially after the experience with the NMPP.
  - Location, use and rehabilitation of access roads.
  - Disruption of normal activities and loss of agricultural potential during construction.
  - The timing and duration of rehabilitation efforts.
- **Cumulative Impact**
  - There are numerous Eskom projects in the area and countrywide.

What is the impact of the projects together on the environment?
    - Nett loss of biodiversity, especially forests and grassland.
    - Eskom's plans to provide for the above.
- **Ecology, Fauna and Flora**
    - Rare, vulnerable and endangered species (e.g. Oribi and Hilton Daisies) and large bird species e.g. the Wattled Crane, Blue Crane, Wooly-Necked Crane, Grey-Crowned Crane, Storks, Herons and vultures.
    - Loss of habitat.
    - Loss of biodiversity (especially the Midlands Mistbelt Grassland).
- **Economy**
    - Loss of income during construction.
- **Employment**
    -
- **Eskom Specific Issues**
    - Maintenance of servitude areas.
    - Training of maintenance and contractor staff.
    - The cumulative effect of the many power lines.
    - Ensuring that recommendations during the EIA phase are adhered to during construction.
- **General**
    - How much deviation may be allowed within a corridor?
- **Geology**
    - No issues were recorded.
- **Ground Water**
    - No issues were recorded
- **Health (Human and Animal, including electro-magnetic fields)**
    - No issues were recorded.
- **Infrastructure**
    - Questions about the types of towers to be used.
- **Land-Use and Planning**
    - Mostly issues around the alignment.
- **Legal**
    - No issues were recorded.
- **Need for the Project**
    - No issues were recorded.
- **Nuisance (including Noise)**
    - No issues were recorded.
- **Offers to assist and requests of Baagi**
    - Various issues ranging from thanking Baagi for a job well done to explaining that there were gaps in the report.
- **Process**
    - Mostly issues around the timing of the construction.
    - Few questions regarding the actual EIA and P2P were recorded.
- **Property Values**
    - No issues were recorded.

- **Quality of Life / Sense of Place (including Visual Impact)**
  - A question about the difference in aesthetic value of the different towers was asked.
- **Safety**
  - Aerial fire fighting will be hampered.
  - Power lines near dwellings are not safe.
- **Security**
  - The fact that Eskom has keys to the locks to farm gates is a security issue.
  - The three lines and NMPP in close proximity may be a national security issue.
- **Surface Water**
  - Wetlands need to be studied.
  - Wetlands need to be spanned.
- **Technical Questions**
  - No issues were recorded.
- **Waste Management**
  - No issues were recorded.

The public participation followed to date has culminated in the current Issues and Response Report, see **Appendix D**. The issues raised by all I&APs have been included in this report and have been taken into consideration by the Technical Team.

8. ENVIRONMENTAL IMPACT ASSESSMENT PROCESS

8.1. BACKGROUND

The EIA Team adopted a robust framework within environmental aspects arising from the influences of the proposed Ariadne-Venus Transmission line that will be considered.

The key elements of the framework took the following into consideration:

- The concept of the sustainability, which considers the inter-related dimensions of the environment, viz. the social, economic, and biophysical dimensions, underpinned by a system of sound governance.
- Integrated planning in terms of Government strategies, Integrated Development Plans, Provincial Development strategies and the principles and practice of the cooperative governance.
- Legal/statutory requirements of South Africa (specifically, the National Environmental Management Act (Act 107 of 1998). The National Heritage Act (Act no 25 of 1999) and obligations that is associated with ratification of important international treaties, accords and agreements, for example, the United Nations Convention on Biodiversity.

8.2. SCOPING

Scoping was undertaken between January 2009 and May 2010. Primary activities and/or products of scoping are outlined in Table 11.

Table 11: Key Activities and Deliverables of the Scoping Phase

Activities of Scoping Phase
Project Announcement
Public Participation
I&AP Identification
I&AP Engagement
Public and Focus Group Meetings
Technical Investigations
Identification of Issues
Draft Scoping Report Review
Compilation of Comments Report

Finalising Report
Submission of Report to DEA

8.3 PLAN OF STUDY FOR ENVIRONMENTAL IMPACT ASSESSMENT

The primary product of the Scoping Phase was the Final Scoping Report that was accepted by DEA on 05 July 2011. An important Section of the Final Scoping Report was the Plan of Study for the Environmental Impact Assessment (PoS for EIA), which provided information on the following:

- Which Specialist Studies would be undertaken;
- What would be investigated within each specialist study;
- How the investigation would be conducted;
- How potential impacts would be assessed;
- How the impact significance will be determined;
- The public participation activities; and
- The applicable times lines.

Thus, this Plan set the parameters for the Environmental Impact Assessment, the findings of which are contained in this Report.

8.4 ENVIRONMENTAL IMPACT ASSESSMENT PHASE

The aim of the Environmental Impact Assessment Phase is to investigate the environmental issues and concerns that were identified during scoping. The technical and public participation processes continue to interact at important stages to ensure that both processes build towards a comprehensive investigation of the issues identified. The main activities during the EIA Phase include:

- Undertake focused scientific studies to assess the issues of concerns;
- Maintain ongoing communication and participation with stakeholders;
- Integrate the findings into an Environmental Impact Assessment Report, inclusive of mitigation measures to ameliorate the effects of negative impacts and optimize positive ones; and
- Prepare an Environmental Management Plan.

For the purposes of assessing impacts, the project was divided into three phases, namely:

- **Construction Phase**

This phase involves the actual construction and all construction related activities on site until the contractor leaves the site. Therefore, the main activities will be the establishment of construction camp sites, access routes, clearance of servitude to facilitate access, excavation

of pits for tower foundation, erection of towers, movement of the construction workforce, equipment, construction vehicles and materials, etc. The above-mentioned activities will result in different types of impacts, some contributing to cumulative impacts.

- **Operational Phase**

This phase involves post construction activities, in particular, the transmission of power from one substation to the other. This phase includes the rehabilitation plan and monitoring system that will ensure that the impacts from the Construction Phase such as vegetation pruning, erosion control and the colonisation of area by alien species are continuously monitored and inspected. This phase also involves the maintenance of the facilities / towers to ensure continuous proper functioning of the equipment.

- **Decommissioning Phase**

One of the alternatives investigated will involve the decommissioning of the existing powerline structure before construction can take place. This phase involves the dismantling of the power lines. In such a case, environmental rehabilitation is crucial in ensuring that this phase is carried out properly as this phase has to do with the residual impacts. The activities in Decommissioning Phase include the demolition of infrastructure and removal of foundations of the towers. This phase also includes the creation of access routes to facilitate demolition, the transport of waste materials and disposal of waste materials, which might require a waste permit based on the National Environmental Management Waste Act 2008 (Act No 59 of 2008).

8.4.1 Technical Process Followed

In order to provide scientifically sound information with regard to the various issues identified, a number of specialist studies were commissioned. Specialists were tasked with assessing the possible impact of a 400kV power line on the receiving environment for each phase of the life cycle of the project (namely construction, operation and decommissioning as described above). The terms of reference guided each specialist to provide input that would ensure that issues and associated impacts were correctly understood and addressed, thereby enabling an integration assessment of the development proposal. The following specialist studies were commissioned:

- Flora Assessment;
- Fauna Assessment;
- Avi–Fauna (birds) Assessment;
- Wetlands Assessment;
- Visual and Aesthetics Assessment;
- Heritage Impact Assessment;
- Social Impact Assessment;
- Soil and Agricultural Potential Assessment;
- Economic Assessment; and

- Town and Regional Planning Assessment.
- In addition to these specialist studies, information was also sourced on electromagnetic fields (based on specialist input obtained for other Eskom projects).

Specialists did not work in isolation, but were continuously communicating to discuss various aspects of the project during their investigations. An integrated approach was adopted to consider direct, secondary and cumulative impacts wherever possible.

Following the specialist studies, the EIA Team integrated the respective findings to provide a comprehensive understanding of the potential positive and negative impacts of the project. Information on certain project components and activities were fed into the EIA Process from other project team members that did not necessarily form part of the EIA specialist group.

The EIA Team used these results when they assessed the various alternatives during the integration process. The outcomes of the integration and assessment were documented in the report, released to the public domain for comment as a Draft Environmental Impact Report (DEIR).

8.4.2 Key Aspects Pertaining to Each Specialist Study

The key aspects of each specialist study will now be outlined.

8.4.2.1 Flora Assessment

The following aspects were addressed:

- A description of the current state of the flora in the areas traversed by the corridors, outlining important characteristics and components thereof, which may be influenced by the implementation of the proposed project or which may influence the proposed project during construction and operation.
- The identification of existing and future planned conservation areas.
- The identification and categorisation of Red Data species potentially affected by the proposed project.
- The identification of potential impacts (positive and negative, including cumulative impacts) of the proposed project on vegetation, and vice versa, during construction and operation.
- Map all sensitive features (including wetlands, drainage lines, habitats for threatened species and other areas of conservation significance) - superimposed on the proposed corridors.
- The identification of mitigatory measures that will enhance benefits and aid in avoiding or mitigating negative impacts and risks (to be implemented during design (i.e. pre-construction), construction and operation of the proposed project).
- The provision of clear guidelines to reduce damage to and loss of vegetation, to assist with rehabilitation where damage and loss are unavoidable and to reduce the risk of the spread of alien vegetation.
- The formulation of a clear and simple system to monitor impacts and their management, based on key indicators.

- Adherence to and compliance with the NEMA Regulations as well as provincial and national authorities' policies.

8.4.2.2 Faunal Assessment

The following aspects were addressed:

- A description of the current state of fauna in the areas traversed by the corridors, outlining important characteristics and components thereof - including species-specific habitats -which may be influenced by the proposed project or which may influence the proposed project during construction and operation.
- The identification of Red Data species potentially affected by the proposed project.
- The identification of potential impacts (positive and negative, including cumulative impacts) of the proposed project on fauna during construction and operation.
- The identification of mitigatory measures for enhancing benefits and avoiding or mitigating negative impacts and risks (to be implemented during design (i.e. pre-construction), construction and operation of the proposed project).
- The formulation of a clear and simple system to monitor impacts and their management, based on key indicators.

8.4.2.3 Avi-Faunal (Bird) Assessment

The following aspects were addressed:

- A description of the current state of avi-fauna in the areas traversed by the corridors, outlining important characteristics and components thereof - including species-specific habitats and roosting/nesting sites - which may be influenced by the proposed project or which may influence the proposed project during construction and operation.
- The identification of Red Data and vulnerable species potentially affected by the proposed project.
- The identification of potential impacts (positive and negative, including cumulative impacts) of the proposed project on avi-fauna during construction and operation.
- The identification of mitigatory measures for enhancing benefits and avoiding or mitigating negative impacts and risks (to be implemented during design (i.e. pre-construction), construction and operation of the proposed project).
- The formulation of a clear and simple system to monitor impacts and their management, based on key indicators.

8.4.2.4 Soil and Agricultural Potential Assessment

The following aspects were addressed:

- Description of current state of soil and agricultural potential within the study area. This outlined important characteristics and components thereof, which may be influenced by the proposed transmission line, or which may influence the proposed transmission line during construction and operation. Collaboration with the Geotechnical and Wetland specialists will be required in this regard.
- Description of the agricultural potential and soil types within the study area.
- The identification of the potential impacts (positive or negative, including cumulative impacts, if relevant) of the proposed transmission line on soil and agricultural potential

during construction and operation. This aspect of study identifies sensitive "no-go" areas and also includes an analysis of construction constraints associated with the areas with high agricultural potential.

- The identification of mitigatory measures for enhancing benefits and avoiding or mitigating negative impact and risks (to be implemented during design (i.e. pre-construction), construction and operation of the transmission line).
- The formulation of a simple system to monitor impacts and their management based on key indicators.
- Adherence to and compliance with the NEMA Regulations as well as provincial and national authorities' policies.

8.4.2.5 Wetland Assessment

The following aspects were addressed:

- Description of the current state of wetland and surface water resources and key ground water resources (including geo-hydrological aspects) within the study area. This outlines important characteristics and components thereof, which may be influenced by the proposed transmission line, or which may influence the proposed transmission line during construction and operation.
- Description of the functionality of the wetlands within the study area.
- The identification of the potential impacts (positive or negative, including cumulative impacts, if relevant) of the proposed transmission line on wetlands during construction and operation. This aspect of study identifies the sensitive "no-go" areas and includes an analysis of construction constraints associated with wetlands.
- The identification of mitigatory measures for enhancing benefits and avoiding or mitigating negative impact and risks (to be implemented during design (i.e. pre-construction), construction and operation of the transmission line).
- The formulation of a simple system to monitor impacts and their management based on key indicators.
- Adherence to and compliance with the NEMA Regulations as well as provincial and national authorities' policies.

8.4.2.6 Visual and Aesthetics Assessment

The following aspects were addressed:

- Description of the visual landscape of the study area, with specific focus on topographical features that offer impact mitigation opportunities and constraints.
- Description of the area from which the project can be seen (the view shed), as well as the viewing distance.
- An assessment of the visual absorption capacity of the landscape (i.e. the capacity of the landscape to visually absorb structures and form placed upon it).
- The appearance of a transmission line from important or critical viewpoints within established and existing planned land uses/activities (e.g. nature reserve birds hide). Particular attention was paid to where the transmission line will traverse the Drakensberg escarpment.

- The identification of potential impacts (positive or negative, including cumulative impacts, if relevant) of the proposed development on the visual landscape during construction and operation.
- The identification of mitigatory measures for enhancing benefits and avoiding, reducing or mitigating negative impact and risks (to be implemented during design (i.e. pre-construction), construction and operation of the transmission line).
- The formulation of a simple system to monitor impacts and their management, based on key indicators.
- Adherence to and compliance with the NEMA Regulations as well as provincial and National Authorities policies.

8.4.2.7 Social and Socio-Economic Assessment

The following aspects were addressed:

- Description of the current socio-economic environment within the study area, outlining important characteristics and components thereof, which may be influenced by the proposed infrastructure or which may influence the proposed infrastructure during construction or operation.
- The identification of potential impacts (positive or negative, regional and local, including cumulative impacts, if relevant) of the proposed development on the social and socio-economic environment during construction and operation. This aspect of the study considers potential impacts on the existing infrastructure, nuisance impacts, possible traffic effects (in collaboration with the transport specialist), the transmission of diseases, in particular HIV/AIDS and health and safety impacts (including poaching and stock theft).
- The identification of mitigatory measures for enhancing benefits and avoiding or mitigating negative impacts and the risks (to be implemented during design (i.e. pre-construction), construction and operation of the proposed transmission line).
- The formulation of a simple system to monitor impacts and their management based on key indicators.
- Adherence to and compliance with the NEMA Regulations as well as provincial and national authorities' policies.

8.4.2.8 Economic Assessment

The following aspects were addressed:

- Provision of a broad understanding of the economic profile of the areas traversed by the corridors, outlining the key components, characteristics and drivers thereof, which may be influenced by the proposed project or which may influence the proposed project during construction and operation.
- The identification and mapping of geographic areas of economic importance (such as areas of important tourism, areas of recreational value and areas of important agriculture). Identify those geographic areas where the proposed project would be incompatible with existing and future planned developments. Where possible, quantification of impacts on the various sectors for comparison between corridor alternatives will be important.

- The identification of potential impacts (positive and negative, local and regional, including cumulative impacts) of the proposed project on the economic environment during construction and operation.

8.4.2.9 Heritage Assessment

The following aspects were addressed:

- The consideration of the impacts on Cultural Heritage resources arising from the construction and operation of the proposed transmission line and the infrastructure.
- Information were provided regarding the following:
    - Results of the survey of the construction footprint and the identification of cultural heritage resources that may be affected by the proposed infrastructure, or which may affect the proposed infrastructure during construction and operation.
    - Recommended mitigation measures for enhancing positive impacts and avoiding or minimizing negative impacts and risks (to be implemented during design, construction and operation).
- Formulation of protocol to be followed by Eskom for the identification, protection and recovery of cultural heritage resources during construction and operation.
- Liaison with SAHRA / AMAFA.
- Adherence to and compliance with the NEMA Regulations as well as provincial and national authorities' policies.
- The identification of known heritage resources that will be adversely affected by the proposed development.

8.4.2.10 Town and Regional Planning Assessment

The following aspects were addressed:

- The identification, description and mapping of all relevant existing and future planned developments within the areas traversed by corridors.
- The identification and mapping of land claims and land reform initiatives in the areas traversed by the corridors (where possible).
- The identification of geographic areas where the proposed project would be incompatible with existing and future planned developments and the land reform programme.

8.4.2.11 Electro-Magnetic Fields Assessment

No separate Electro-Magnetic Field (EMF) Assessment was commissioned as part of this EIA. This was because Eskom had recently completed a detailed study of effects of EMFs, which was externally reviewed by international specialists. The EIA Team used findings of this study to incorporate into this report in attempt to show the effect of the EMFs on people, plants and animals(Appendix F).

8.4.3 Assessment Criteria

An impact can be defined as any change in the physical-chemical, biological, cultural and/or socio-economic environmental system that can be attributed to human activities related to alternatives under study for meeting a project need.

The significance of the aspects/impacts of the process were rated by using a matrix derived from Plomp (2004) and adapted to some extent to fit this process. These matrixes use the consequence and the likelihood of the different aspects and associated impacts to determine the significance of the impacts.

The significance of the impacts were determined through a synthesis of the criteria below:

Probability: This describes the likelihood of the impact actually occurring

Improbable: The possibility of the impact occurring is very low, due to the circumstances, design or experience.

Probable: There is a probability that the impact will occur to the extent that provision must be made therefore.

Highly Probable: It is most likely that the impact will occur at some stage of the development.

Definite: The impact will take place regardless of any prevention plans and there can only be relied on mitigatory measures or contingency plans to contain the effect.

Duration: The lifetime of the impact

Short Term: The impact will either disappear with mitigation or will be mitigated through natural processes in a time span shorter than any of the phases.

Medium Term: The impact will last up to the end of the phases, where after it will be negated.

Long Term: The impact will last for the entire operational phase of the project but will be mitigated by direct human action or by natural processes thereafter.

Permanent: The impact is non-transitory. Mitigation either by man or natural processes will not occur in such a way or in such a time span that the impact can be considered transient.

Scale: The physical and spatial size of the impact

Local: The impacted area extends only as far as the activity, e.g. footprint

Site: The impact could affect the whole, or a measurable portion of the above mentioned properties.

Regional: The impact could affect the area including the neighbouring residential areas.

Magnitude/ Severity: Does the impact destroy the environment, or alter its function

Low: The impact alters the affected environment in such a way that natural processes are not affected.

Medium: The affected environment is altered, but functions and processes continue in a modified way.

High: Function or process of the affected environment is disturbed to the extent where it temporarily or permanently ceases.

Significance: This is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required.

Negligible: The impact is non-existent or unsubstantial and is of no or little importance to any stakeholder and can be ignored.

Low: The impact is limited in extent, has low to medium intensity; whatever its probability of occurrence is, the impact will not have a material effect on the decision and is likely to require management intervention with increased costs.

Moderate: The impact is of importance to one or more stakeholders, and its intensity will be medium or high; therefore, the impact may materially affect the decision, and management intervention will be required.

High: The impact could render development options controversial or the project unacceptable if it cannot be reduced to acceptable levels; and/or the cost of management intervention will be a significant factor in mitigation.

The following weights were assigned to each attribute:

Aspect	Description	Weight
Probability	**Improbable**	**1**
	Probable	**2**
	Highly Probable	**4**
	Definite	**5**
Duration	**Short term**	**1**
	Medium term	**3**
	Long term	**4**
	Permanent	**5**
Scale	**Local**	**1**
	Site	**2**
	Regional	**3**
Magnitude/Severity	**Low**	**2**
	Medium	**6**
	High	**8**
Significance	**Sum (Duration, Scale, Magnitude) x Probability**	
	Negligible	**≤20**
	Low	**>20 ≤40**
	Moderate	**>40 ≤60**
	High	**>60**

The significance of each activity was rated without mitigation measures (WOM) and with mitigation (WM) measures for both construction, operational and closure phases of the proposed development

9. SPECIALIST FINDINGS AND RECOMMENDATIONS OF SPECIALIST REPORTS

This chapter provides a brief outline of the findings and recommendations by specialists. Eleven specialist studies were undertaken and peer-reviewed by independent specialists (Table 10), the results of which are summarized in this chapter. Copies of the specialist reports are provided in Appendix H.

With respect to Electro-Magnetic Fields (EMFs), no separate EMF Specialist Study was undertaken as part of this EIA. This is because Eskom had previously commissioned such a study (Appendix F), which was externally peer-reviewed. The findings of this study are used to inform this EIA in addressing EMF-related matters.

Table 12: Details of Specialist Studies and Specialists

Specialist Field of Study	Specialist	Independent Peer Reviewer
Wetland	Mr. Retief Grobler	n/a
HIA	Mr. Anton Pelser	Mr. Schalk van Wyk
Avifauna	Mr. Lukas Niemand	Chris van Rooyen and EWT
Flora	Mr. Willem de Frey	Elsa Pooley
Soil and Agricultural Potential	Dr. Johan van der Waal	n/a
Visual Impact Assessment	Mr Karsten Drescher	Mr. Menno Klapjik
Fauna	Mr Dewald Kamffer	Dr. Theo Mostert
Social	Mrs. Ingrid Snyman	Mr. Rob Dyer
Economic	Mr. William Mullins	n/a
Town & Regional Planning	Mr. Werner Botha	n/a
Geotech Overview	Mr Karsten Drescher	n/a

9.1 FLORA

The Flora Assessment was conducted based on GIS modelling as well as fieldwork applying Braun-Blanguet Method whereby a plot system is used for data collection. As a result of this study, it was found that Midlands Mistbelt Grassland is endangered (the most endangered grassland biome). It was found to cover 27% of the study area.

Table 13: Overview of the Regional Vegetation Units Present within the Study Area

Regional Vegetation Units	Conservation Status	Total of	% Cover

		Hectares	
Southern KwaZulu-Natal Moist Grassland	Vulnerable	7443	2%
Northern KwaZulu-Natal Moist Grassland	Vulnerable	8868	3%
KwaZulu-Natal Highland Thornveld	Least threatened	24298	8%
Mooi River Highland Grassland	Vulnerable	53052	17%
Drakensberg Foothill Moist Grassland	Least threatened	74260	23%
Midlands Mistbelt Grassland	Endangered	87486	27%
Eastern Valley Bushveld	Least threatened	162	0%
Thukela Valley Bushveld	Least threatened	411	0%
KwaZulu-Natal Hinterland Thornveld	Vulnerable	12779	4%
Thukela Thornveld	Least threatened	16217	5%
Ngongoni Veld	Vulnerable	31006	10%
Northern Afrotemperate Forest	Least threatened	34	0%
Southern Mistbelt Forest	Least threatened	2647	1%
Eastern Temperate Freshwater Wetlands	Least threatened	103	0%
TOTALS		**318766**	**100%**

According to the latest information from the SANBI website, 190 species are considered threatened in terms of the IUCN Red Data categories. Of these 122 (64%) are considered to be Vulnerable; 48 (25%) are considered Endangered and 20 (11%) are considered Critically Endangered (Table 12). These threatened species represent 56 plant families of which the following families contain almost 50% of the threatened species: *Apocynaceae, Asphodelaceae, Iridaceae, Orchidaceae, Fabaceae, Asteraceae*. These species represent 110 genera, of which the following 24 genera contain 50% of threatened species: *Brachystelma, Encephalartos, Aloe, Dierama, Asclepias, Kniphofia, Schizoglossum, Senecio, Ceropegia, Streptocarpus, Watsonia, Eriosema, Clivia, Helichrysum, Protea, Cephalaria, Cassipourea, Ocotea, Crassula, Disa, Dioscorea, Cyrtanthus, Knowltonia, Alepidea*.

In terms of identifying areas of conservation importance, the KwaZulu-Natal Biodiversity Conservation Plan is considered to be the main source of data. This data source highlights the distribution and extent of nature reserves and irreplaceable areas in terms of biodiversity and reaching conservation targets. Approximately 25% of the study area is considered to be of high and very high conservation priority (Table 12).

Table 14: Percentage Cover of Various Conservation Categories within the Study Area based on the KZN Ezemvelo C-Plan

			Ecological Status		Derived Conservation Priorities				
C - Plan Category	**Surface (ha)**	**% Cover**	**Transformed**	**Natural**	**Very low**	**Low**	**Moderate**	**High**	**Very high**
Initial Reserve	3992	1%		3992					
Initial Excluded	29158	9%	29158						
Totally Irreplaceable (1)	78645	24%		78645					78645
> 0.6 - 0.8	4399	1%		4399				4399	
> 0.4 - 0.6	17121	5%		17121			17121		
> 0.2 - 0.4	21608	7%		21608		21608			
> 0 - 0.2	167565	52%		167565	167565				
TOTALS	**322487**	**100%**	**29158**	**293329**	**167565**	**21608**	**17121**	**4399**	**78645**
			9%	91%	52%	7%	5%	1%	24%

According to the Flora Specialist, the study area contains four biomes (Table 13), namely azonal vegetation; forest; savannah and grassland. Grassland is the most dominant biome. It is therefore expected that the proposed route alignment corridors will reflect the same composition. Due to the extent of the study area, it was not possible to describe and map the vegetation at community level (1: 50 000 scale or larger) but instead the main drivers of vegetation variation at a landscape level were combined to create potential habitat units within the grassland biome.

The main drivers are geology, landform and land cover. The use of these drivers resulted in the presence of 1,601 potential habitat units within the study area. Not all of these units represent natural habitat, therefore only those units which represented potential natural vegetation were targeted, namely 647 units. Of these the 10 largest units, which represent more than 50% of the remaining natural vegetation along the 2km corridor alternatives, were sampled. Due to the limited extent of the forest biome within the area (2% per corridor), they were excluded from the survey. It should also be noted that the forest biomes are considered to be no-go areas.

Table 15: Overview of the Percentage Biome Covers per Alternative Investigated Based on the 2005 KZN Land Cover Dataset

Land cover category	Alternatives								
	Cover (ha)			Cover (%)					
	1a	1b	2	1a	1b	2	1a	1b	2
NATURAL VEGETATION PER *BIOME*							**66 %**	**65 %**	**58 %**
AZONAL VEGETATION									
Natural Fresh Water	54	54	50	0%	0%	0%			
Wetlands	63	129	29	0%	1%	0%			
FOREST				0%	0%	0%			
Forest	375	373	347	2%	2%	2%			
SAVANNAH									
Dense bush (70-100 cc)	647	709	712	3%	3%	3%			
Bushland (< 70cc)	1556	1725	1073	7%	8%	5%			
Woodland	349	349	275	2%	2%	1%			
Degraded bushland (all types)	189	190	246	1%	1%	1%			
Grassland / bush clumps mix	202	259	242	1%	1%	1%			
GRASSLAND									
Grassland	10606	10237	8292	49 %	46 %	40 %			
Degraded grassland	248	271	581	1%	1%	3%			
TRANSFORMED AREA PER *LAND USE*							**34 %**	**35 %**	**42 %**
CULTIVATION									
Plantation	2272	1923	1783	10 %	9%	9%			
Plantation clearfelled	189	160	118	1%	1%	1%			
Permanent orchards (banana, citrus)		2		0%	0%	0%			

irrigated									
Sugarcane - commercial	6	140	7	0%	1%	0%			
Subsistence (rural)	95	87	86	0%	0%	0%			
Annual commercial crops dryland	1764	2260	1523	8%	10 %	7%			
Annual commercial crops irrigated	685	702	821	3%	3%	4%			
Old cultivated fields - bushland	158	226	224	1%	1%	1%			
Dams	421	426	388	2%	2%	2%			
Erosion	61	61	48	0%	0%	0%			
URBANISATION									
Urban	433	419	2085	2%	2%	10 %			
Golf courses	13	14	49	0%	0%	0%			
Rural dwellings	1016	1007	850	5%	5%	4%			
KZN national roads	58	58	454	0%	0%	2%			
KZN main & district roads	266	300	199	1%	1%	1%			
TOTALS	**21726**	**22082**	**20482**	**100 %**	**100 %**	**100 %**	**100 %**	**100 %**	**100 %**

From the Braun-Blanquet table (above), it is possible to determine that the most common species recorded across the 22 plots wasa grass:*Hyparrhenia hirta* (Table 14). This grass occurred in 73% of the plots surveyed and within 86% of the plots associated with the Savannah unit (Cluster two (2)). Within cluster one (1), the Grassland Unit, the most common species is the grass *Trachypogon spicatus*, that occurred in 88% of the plots associated with the Grassland Unit. *Trachypon spicatus* is typical of sour grassland on the crest in the landscape, where surface rock is common and the soils are well-drained and coarse textured.

In terms of rehabilitation, the species listed in species group B are the species that are most desirable, as these species occurred in 50% or more of the plots recorded within the Grassland Unit. This means that they represent the core or baseline species to reflect the system's structure and diversity. The same applies to species group C for the Savannah Unit although some of these species are associated with disturbance such as over-utilisation. Nonetheless, these species are the *status quo* and should therefore represent the benchmark for rehabilitation in the Savannah areas.

Table 16: Most Common Species Recorded Across 22 Plots within the Study Area

Corridor Status	% Constancy				Fidelity						
Cluster no	**1**	**2**	**Survey**		**1**	**2**	**Survey**		**1**	**2**	**Sequence**
Species Group A											
Hyparrhenia hirta	50%	86%	73%		1	1	100%		1	2	12
Species Group B											
Trachypogon spicatus	88%	7%	36%		1	0	50%		1	0	10
Eragrostis racemosa	75%	29%	45%		1	0	50%		1	0	10
Acalypha angustata	75%	21%	41%		1	0	50%		1	0	10
Eriosema burkei	75%	0%	27%		1	0	50%		1	0	10
Themeda triandra	63%	36%	45%		1	0	50%		1	0	10
Heteropogon contortus	63%	21%	36%		1	0	50%		1	0	10
Vernonia natalensis	63%	21%	36%		1	0	50%		1	0	10
Hypoxis rigidula	63%	14%	32%		1	0	50%		1	0	10
Aristida junciformis	63%	14%	32%		1	0	50%		1	0	10
Helichrysum aureonitens	63%	7%	27%		1	0	50%		1	0	10
Gladiolus crassifolius	63%	0%	23%		1	0	50%		1	0	10
Pelargonium luridum	50%	43%	45%		1	0	50%		1	0	10
Tristachya leucothrix	50%	21%	32%		1	0	50%		1	0	10
Berkheya setifera	50%	21%	32%		1	0	50%		1	0	10
Diheteropogon amplectens	50%	14%	27%		1	0	50%		1	0	10
Cyanotis speciosa	50%	7%	23%		1	0	50%		1	0	10
Alloteropsis semialata s. semialata	50%	0%	18%		1	0	50%		1	0	10
Diheteropogon filifolius	50%	0%	18%		1	0	50%		1	0	10
Species Group C											
Berkheya macrocephala	25%	71%	55%		0	1	50%		0	2	02
Eragrostis curvula	25%	71%	55%		0	1	50%		0	2	02
Cymbopogon excavatus	25%	64%	50%		0	1	50%		0	2	02
Helichrysum rugulosum	25%	64%	50%		0	1	50%		0	2	02
Sporobolus africanus	25%	64%	50%		0	1	50%		0	2	02
Acrotome inflata	0%	57%	36%		0	1	50%		0	2	02
Conyza podocephala	25%	50%	41%		0	1	50%		0	2	02

Hermannia depressa	13%	50%	36%		0	1	50%		0	2	02

Through GIS modelling, land cover attributes and veld conditions were derived. This was coupled with the site visit. This resulted in a vegetation sensitivity map of the study area (Figure 27).

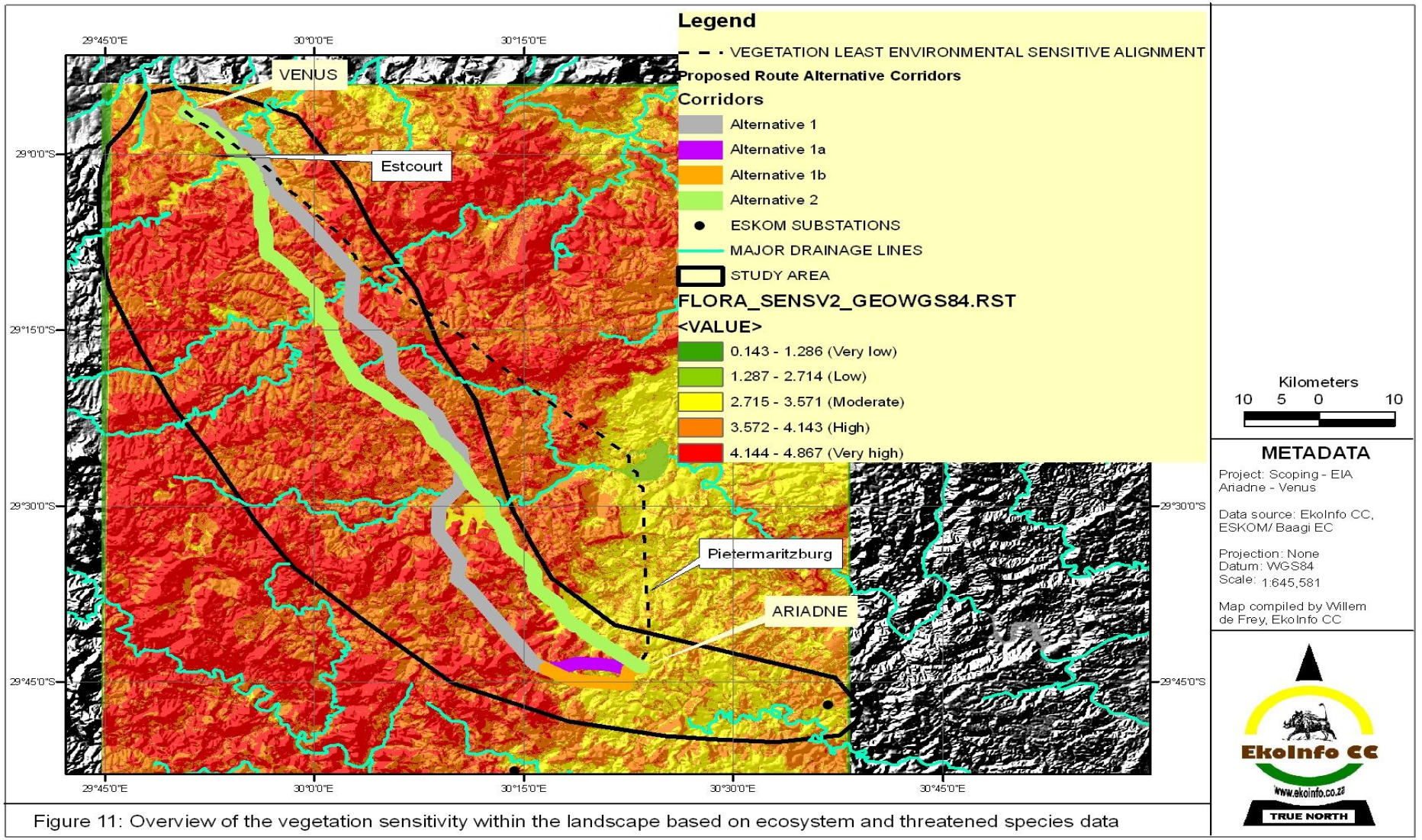


Figure 11: Overview of the vegetation sensitivity within the landscape based on ecosystem and threatened species data

Figure 27: Vegetation Sensitivity Map

9.2 FAUNA

This study was based on fieldwork as well as a desktop study analysis. The importance of regional vegetation units within this study is crucial, because vegetation serves as habitat for faunal life. It was found that 48 Red Data species are known from the region of the study area. This includes 17 Data Deficient (DD) species, 15 Near Threatened (NT) species, 9 Vulnerable (VU) species, Endangered (EN) and 1 Critically Endangered (CR) specie. Two species are considered to have a low probability of occurrence, 5 species a moderate-low, 13 species a moderate-high, 4 species a moderate, 17 species a high and 7 species were confirmed during the field investigation to occur in the study area (red).

Table 17: Forty-eight Red Data Species Known to Occur in the Region of the Study Area

Species Details			Result
Biological Name	**English Name**	**STATUS**	**Probability**
LEPIDOPTERA			
Capys penningtoni	Pennington's Protea-butterfly	VU	Moderate-high
Dingana dingana	Dingaan's Widow	VU	Moderate-high
Durbania amakosa	Amakosa Rocksitter	VU	High
Lepidochrysops pephredo	Estcourt Blue	VU	High
Orachrysops ariadne	Karkloof Blue	VU	High
Species Details			**Result**
Biological Name	**English Name**	**STATUS**	**Probability**
AMPHIBIANS			
Afrixalus spinifrons	Natal Leaf-folding Frog	VU	High
Leptopelis xenodactylus	Long-toed Tree Frog	EN	High
Breviceps bagginsi	Bilbo's Rain Frog	DD	High
Cacosternum poyntoni	Poynton's Caco	DD	Low
Cacosternum striatum	Striped Caco	DD	High
Natalobatrachus bonebergi	Kloof Frog	EN	Moderate
Strongylopus wageri	Plain Stream Frog	NT	Moderate
Species Details			**Result**
Biological Name	**English Name**	**STATUS**	**Probability**
REPTILES			
Bradypodion thamnobates	Natal Midland Dwarf Chameleon	NT	Confirmed

Homoroselaps dorsalis	Striped Harlequin Snake	NT	Moderate-high
Kinixys natalensis	Natal Hinge-back Tortoise	NT	Confirmed
Tetradactylus breyeri	Breyer's Long-tailed Seps	VU	High

Species Details			Result
Biological Name	**English Name**	**STATUS**	**Probability**
MAMMALS			
Amblysomus hottentotus	Hottentot's Golden Mole	DD	Moderate-high
Cercopithecus mitis labiatus	Samango Monkey	EN	Confirmed
Chrysospalax villosus	Rough-haired Golden Mole	CR	Moderate-high
Crocidura cyanea	Reddish-grey Musk Shrew	DD	High
Crocidura flavescens	Greater Musk Shrew	DD	High
Crocidura mariquensis	Swamp Musk Shrew	DD	High
Crocidura silacea	Lesser Grey-brown Musk Shrew	DD	Hoderate-high
Crocuta crocuta	Spotted Hyaena	NT	Confirmed
Dasymys incomtus	Water Rat	NT	Moderate-high
Dendrohyrax arboreus arboreus	Tree Hyrax	VU	Confirmed
Georychus capensis KZN population	Cape Mole-rat	EN	Moderate-low
Grammomys dolichurus	Woodland Mouse	DD	Moderate-high
Lemniscomys rosalia	Single-striped Mouse	DD	Moderate
Leptailurus serval	Serval	NT	Confirmed
Lutra maculicollis	Spotted-necked Otter	NT	Moderate-high
Mellivora capensis	Honey Badger	NT	Moderate-high
Miniopterus fraterculus	Lesser Long-fingered Bat	NT	High
Miniopterus schreibersii	Schreiber's Long-fingered Bat	NT	High
Myosorex cafer	Dark-footed Forest Shrew	DD	Moderate-high
Myosorex varius	Forest Shrew	DD	High
Myotis tricolor	Temminck's Hairy Bat	NT	High
Mystromys albicaudatus	White-tailed Rat	EN	Moderate-high
Otomys slogetti	Sloggett's Rat	DD	Moderate-low
Ourebia ourebi	Oribi	EN	Confirmed

Philantomba monticola	Blue Duiker	VU	Moderate-low
Pipistrellus anchietae	Anchieta's Pipistrelle	NT	Low
Poecilogale albinucha	African Weasel	DD	Moderate-high
Rhinolophus clivosus	Geoffroy's Horseshoe Bat	NT	High
Rhinolophus landeri	Lander's Horseshoe Bat	NT	Moderate-low
Suncus infinitesimus	Least Dwarf Shrew	DD	Moderate
Suncus lixus	Greater Dwarf Shrew	DD	Moderate-low
Suncus varilla	Lesser Dwarf Shrew	DD	High

According to the Fauna Specialist the region of the study area is both biodiverse and sensitive. A total of 408 animals species (excluding birds) are known to occur in the area; 48 of these (almost 12%) are listed Red Data species (of the categories DD, NT, VU EN and CR). During a week-long field investigation of the alternative corridors, 66 of the 408 species known to occur in the area (16%) were confirmed within the 2km corridors of at least one of the alternatives - this included 7 red data species (15%) (Appendix H).

9.2.1 Faunal Sensitivity

In terms of general faunal sensitivity analysis, two basic datasets were used to compare corridors under investigation. The first is the fraction of natural habitat left within each 2km buffer as calculated from the KZN 2005 land cover data set. The proposed alternatives have a varying percentage of natural faunal habitat remaining within the 2km corridor. The most natural habitat remains within 2km buffer of Alternative 1a (64%) while the least natural habitat is found in the Alternative 2corridor (56%). Figure 28indicates that Alternative 2 is the least faunally sensitive in terms of land cover (i.e. it includes the smallest fraction of natural faunal habitat within its 2km corridor).

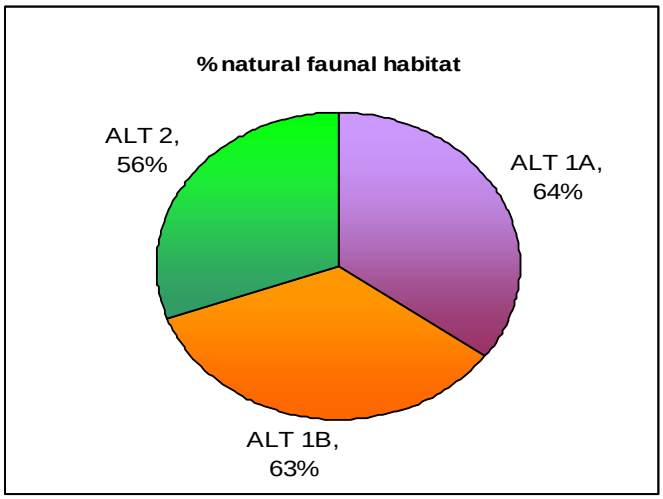


Figure 28: Faunal Sensitivity Based on Natural Faunal Habitat Remaining

The second data set used as indication of faunal sensitivity, was slope/ruggedness. Areas of steep slopes (i.e. rugged areas) are often characterised by the presence of sensitive faunal

habitatsfor example forests and outcrops/cliffs. Such areas harbour many Red Data species and are also very sensitive with regards to the potential impacts associated with the construction and operation of a transmission power line. For the purposes of this assessment, 5 slope/ruggedness categories were included during the data assessment phase (category 1 = the gentlest slopes and category 5 = the steepest slopes).

Table 17 shows that Alternative 1a included the highest fractions of categories 2, 3 and 4 slopes (i.e. steep slopes), while Alternative 2 leaned more towards category 1 slopes (gentle slopes). Alternative 1b seemed slightly steeper than Alternative 2, but not as steep as Alternative 1a.

Table 18: Percentage of Faunal Sensitivity Based on Slope/Ruggedness

Category	ALT 1a	ALT 1b	ALT 2
1	46%	48%	49%
2	39%	38%	38%
3	14%	12%	11%
4	2%	2%	2%
5	0%	0%	0%
TOTAL	**100%**	**100%**	**100%**

Figure 29 below indicates that Alternative 2 is the least faunally sensitive in terms of steepness/ruggedness as it includes the smallest fraction of categories 2-5 (steep slopes) within its 2km corridor.

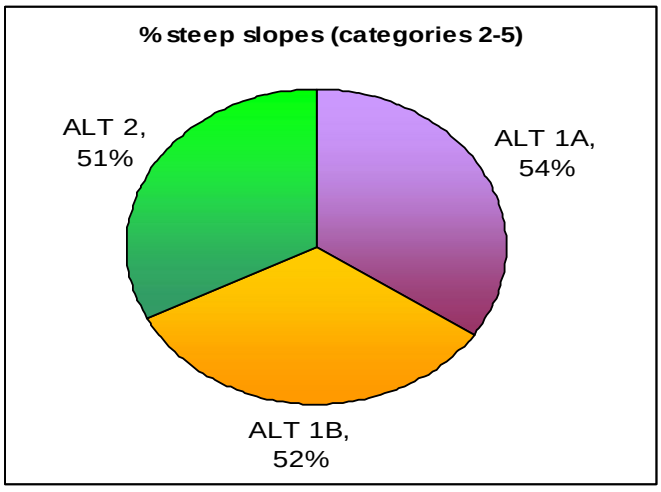


Figure 29: Faunal Sensitivity Based on Slope/Ruggedness

9.3 AVI-FAUNA ASSESSMENT

Grasslands are generally poor in woody plant species, but forms important habitats for many terrestrial and cryptic bird species (e.g. larks, pipits, korhaans and cisticolas). It should be noted that many grassland species are threatened by habitat destruction and fragmentation, making the remaining grassland an important habitat. On the other hand, woodlands are rich in woody plant species and are therefore important to the Savannah Biome that provides habitat for a range of other species that are not partial to the open grasslands.

The identified habitat types found within the study area includes the following:

- Short upland and rocky grassland;
- Ravines and kloofs;
- Tall dense savannoid grassland;
- Mistbelt Forest;
- Arable land and cultivated fields;
- Riparian Areas/Drainage Lines;
- Wetlands (upland seeps and artificial impoundments).

The general description of the habitats and the birds species likely to depend on those habitats can be found in Appendix H.

Powerlines have more impact on birds as compared to other taxa. Transmission line does have general impacts on Avi-fauna. These include electrocution, which happens when a bird bridges the gap between the live components (or a combination of a live and earth component) of a power line, thereby creating a short circuit. Electrocutions occur when a bird, mainly a species with a fairly large wingspan, attempts to perch on a tower or attempts to fly-off a tower. Physical disturbances and habitat destruction can also be caused during construction and maintenance.

9.3.1 Red Data Listed Species

The high diversity of habitat types is responsible for a diversity of Red Data listed bird species (Barnes, 2000), with 34 % (42 spp) of the national threatened and near-threatened species present in the study area.

Table 18 summarizes the Red Data listed species that could potentially occur in the study area. It is evident that the highest reporting rates (according to Harrison et al., 1997) were recorded from the peripheral parts of the study area, corresponding to 2930AB (Mount Alida), 2929BD (Nottingham Road) and 2930CC (Byrne) (see Figure 30). Other parts of the study area with moderate-high reporting rates correspond to 2829DD (Frere), 2830CC (Weenen), 2929DB (Impendle) and 2930CA (Merrivale). In contrast, areas subjected to high urban sprawl and rural densification had the lowest reporting rates of Red Data listed species (e.g. 2930CB Pietermaritzburg and 2930DA Cato Ridge). The latter two areas are sympatric to the Ngongoni Veld, a species-poor grassland subjected to intense grazing.

Areas with high reporting rates were well-utilised by species such as the Southern Bald Ibis (*G. calvus*), Grey Crowned Crane (*B. regulorum*), Blue Crane (*Anthropoides paradiseus*), African Crowned Eagle (*Stephanoaetus coronatus*) and Blue Swallow (*H. atrocaerulea*).

Table 19: Potential Red Data Listed Avi-Fauna Species in the Study Area

QDGC	Status	2829DD	2830CC	2929BB	2929BD	2929DB	2930AA	2930AB	2930AC	2930AD	2930BC	2930CA	2930CB	2930CC	2930CD	2930DA	2930DC
Species		**Frere**	**Weenen**	**Escourt**	**Nottingham Road**	**Impendle**	**Weston**	**Mount Alida**	**Howick**	**Albert Falls**	**New Hanover**	**Merrivale**	**Maritzburg**	**Byrne**	**Richmond**	**Cato Ridge**	**Hammersdale**
African Crowned Eagle	NT	14		8	12	4	8	40	50	41	8	8	28	68	19	8	20
African Grass Owl	V	1		2	2	1				1		1			3		
African Marsh Harrier	V	6	5	4	29	11	4	8	5	16	3	13	6	1	31	8	7
African Pygmy Goose	NT									3					1		1
Bearded Vulture	V	1		2	3	7	4										
Black Harrier	NT	1		1	1	2											
Black Stork	NT	21	23	5		2	4	14		3			2	15		2	34
Black-bellied Bustard	NT	3	2		17			10									
Black-rumped Buttonquail	E					1											
Black-winged Lapwing	NT	1		2		15	8	8	14	17	2	11	9	51	5	4	1
Blue Crane	**V**	**40**	**23**	**30**	**42**	**26**	**18**	**55**	**11**	**18**	**16**	**25**	**1**	**27**	**9**	**2**	**2**
Blue Swallow	**CE**					**3**		**4**			**1**			**34**	**1**		
Broad-tailed Warbler	NT		2		1			6	1	2	1	1	1	1	6	1	
Bush Blackcap	NT				2	8			4	2			1	29	1		
Cape Parrot	**E**				**5**	**3**			**11**	**7**							

QDGC	Status	2829DD	2830CC	2929BB	2929BD	2929DB	2930AA	2930AB	2930AC	2930AD	2930BC	2930CA	2930CB	2930CC	2930CD	2930DA	2930DC
Species		**Frere**	**Weenen**	**Escourt**	**Nottingham Road**	**Impendle**	**Weston**	**Mount Alida**	**Howick**	**Albert Falls**	**New Hanover**	**Merrivale**	**Maritzburg**	**Byrne**	**Richmond**	**Cato Ridge**	**Hammersdale**
Cape Vulture	V	25	6	23	27	27	10	32	1			2		15	1	2	
Corn Crake	V		2					3							1		
Denham's Bustard	**V**	**3**	**2**	**3**	**23**	**20**	**4**	**8**	**3**	**2**		**13**			**1**		
Great White Pelican	NT							1		2						1	
Greater Flamingo	NT	1															
Greater Painted Snipe	NT		1										1				1
Grey Crowned Crane	**V**			**5**	**59**	**47**	**8**	**9**	**19**	**21**	**10**	**42**	**1**	**6**	**53**	**5**	**4**
Half-collared Kingfisher	NT	3	5	2				4	1	1							1
Lanner Falcon	NT	33	40	12	8	10	10	34	6	15	6	1	4	46	18	17	30
Lesser Flamingo	NT														1		
Lesser Kestrel	V	7		8			4	1			1	1			1		
Marabou Stork	NT												1				
Martial Eagle	V	15	12	9	5	3	6	6	7	15	6	1	1	28	6	4	2
Melodious Lark	NT		1														
Orange Ground-thrush	NT								1	5				1			2
Peregrine Falcon	NT												2				

QDGC	Status	2829DD	2830CC	2929BB	2929BD	2929DB	2930AA	2930AB	2930AC	2930AD	2930BC	2930CA	2930CB	2930CC	2930CD	2930DA	2930DC
Species		**Frere**	**Weenen**	**Escourt**	**Nottingham Road**	**Impendle**	**Weston**	**Mount Alida**	**Howick**	**Albert Falls**	**New Hanover**	**Merrivale**	**Maritzburg**	**Byrne**	**Richmond**	**Cato Ridge**	**Hammersdale**
Pinkbacked Pelican	V									7						2	
Red-billed Oxpecker	NT	1					2										
Secretarybird	**NT**	**26**	**13**	**20**	**30**	**21**	**18**	**25**	**6**	**3**		**12**	**1**	**4**	**2**	**1**	
Southern Bald Ibis	V	16	3	12	6	7	44	32			2						
Southern Ground Hornbill	**V**	**23**	**53**	**2**	**10**	**5**		**15**	**3**	**2**				**25**	**23**	**1**	**7**
Tawny Eagle	V	5	5	2			4	18									
Wattled Crane	**CE**			**3**	**31**	**27**	**2**	**10**	**7**	**1**		**10**		**7**			
White-bellied Korhaan	**V**	**30**	**11**	**13**				**19**									
Wooly-necked Stork	NT									3						4	
Yellowbilled Stork	NT	1	4		1	2				1							
Yellowbreasted Pipit	V					1											
Average Totals		**12.04**	**11.21**	**8.00**	**15.70**	**11.00**	**9.29**	**15.74**	**8.82**	**8.17**	**5.09**	**10.07**	**4.21**	**22.38**	**9.63**	**4.13**	**8.62**

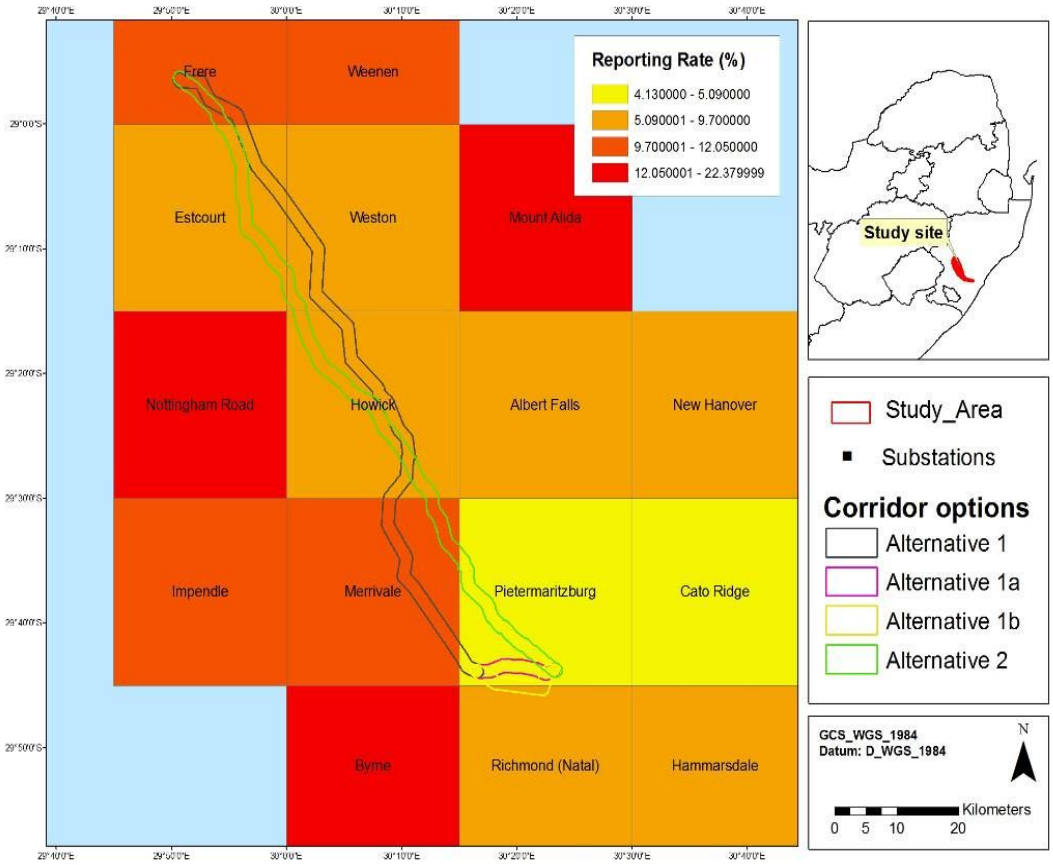


Figure 30: A Spatial Representation of the Mean Reporting Rates (%) For Red Data Listed Bird Taxa Recorded from the Quarter Degree Squares on the Study Area

The highest number of mortalities recorded on the study area pertains to Grey Crowned Crane (*B. regulorum*) collisions (Table 19). Other species with a high susceptibility towards power line interactions include the White Stork (*Ciconia ciconia*), Blue Crane (*A. paradiseus*), Wattled Crane (*B. carunculatus*) and Cape Vulture (*G. corpotheres*).

A number of other bird species are also likely to be affected by the proposed transmission line. These include species such as the Jackal Buzzard (B*uteo rufofuscus*), African Fish Eagle (*Haliaeetus vocifer*), Bearded Vulture (*Gypaetus barbatus*), Denham's Bustard (*Neotis denhamii*), Secretarybird (*Sagittarius serpentarius*), African Crowned Eagle (*Stephanoaetus coronatus*), Long-crested Eagle (*Lophaetus occipitalis*) and a number of waterbird species pertaining to the Anatidae (ducks and geese), Ardeidae (herons and egrets), *Threskiornithidae* (ibises) and *Cerylidae* (large aquatic kingfishers).

Table 20: Power Line Derived Bird Mortalities Recorded in the Study Area

Species	Count of Collision	Count of Electrocution
Grey Crowned Crane	**22**	**2**
White Stork	**10**	
Blue Crane	**9**	

Species	Count of Collision	Count of Electrocution
Wattled Crane	**7**	
Cape Griffon	**3**	**8**
Cattle Egret	2	
Sacred Ibis	2	
Yellow-billed Duck	2	
African Fish Eagle	1	1
Bearded Vulture	1	
Black-headed Heron	1	1
Denham's Bustard	1	
Giant Kingfisher	1	
Hadeda Ibis	1	
Purple Heron	1	
Secretary Bird	1	
Unknown Crane	1	
Whitefaced Duck	1	
Barn Owl		1
Black Crow		1
Crowned Eagle		1
Egyptian Goose		1
Jackal Buzzard		3
Longrcested Eagle		2
Spurwinged Goose		1
Unknown Vulture		2
Grand Total	**67**	**24**

From a bird impact perspective, for any line to be regarded as a suitable it must:

- Traverse the least number of vegetation types, in particular vegetation in pristine condition;
- Traverse the least number of wetland/drainage line/rivers;

- Correspond to an area with low reporting rates for bird species considered to be threatened or "near-threatened" (in this case referring to areas with low occurrence of cranes or an absence of crane nesting sites); and
- Follow existing servitudes (or transmission lines).

Table 21: The Number Crane Sightings (instances) per Corridor

Route Alternative	Blue Crane	Grey Crowned Crane	Wattled Crane	Combined
	Number of Instances	Number of Instances	Number of Instances	**Number of Instances**
Route 1+1a	8	16	18	**42**
Route 1+1b	11	29	21	**61**
Route 2	42	200	86	**328**

Table 22: The Number Confirmed Crane Breeding Localities per Corridor

Route Alternative	Blue Crane	Grey Crowned Crane	Wattled Crane	Combined
	Number of Instances*	Number of Instances*	Number of Instances*	**Number of Instances***
Route 1+1a	0	1	3	**4**
Route 1+1b	0	2	5	**7**
Route 2	3	7	4	**14**

9.4 WETLANDS

The surface watercourse identification and assessment investigation study was done based on a desktop component as well as fieldwork. The northern third of the study area forms part of the Thukela Water Management Area (WMA), while the remaining two thirds drain into the Mvoti to Umzimkulu WMA. A total of 23 quaternary catchments overlap with the study area, of which 12 form part of the Thukela WMA, while the remaining 11 quaternary catchments drain into the Mvoti to Umzimkulu WMA. (Figure 31).

Altogether, the alternative corridors intersect with 12 quaternary catchments. The majority of these catchments (58.33 %) have a Class C or moderately modified Present Ecological State (PES), followed by 16.67 % that are largely natural (Class B PES), 16.67 % that are largely modified (Class D PES) and 8.33 % that are unmodified/natural (Class A PES). Prominent rivers associated with the Thukela WMA include the Boesmans, Mooi and Rensburgspruit. Prominent rivers associated with the Mvoti to Umzimkulu WMA include the uMnsunduze, uMngeni and uMlazi Rivers.

According to the wetland specialist Alternative 1b has the longest length of drainage lines within its corridor and also the highest drainage density (meter of drainage line per hectare of area). All the alternatives have a very similar drainage density. Alternative 2 has the smallest drainage line density and also the shortest total length of drainage lines, which is contributed to the alignment also being the shortest with the smallest corridor area. Drainage line crossings with alternative centerlines also indicate that Alternative 2 is more favourable with fewer drainage line crossings It should, however be noted that the differences among the alternatives are small.

Table 23: Drainage Line Intersections and Density for Each Alternative Corridor

Note that the longest total length of drainage line and the largest drainage density are highlighted for the relevant corridor.

Route Alternative Corridor	Corridor Area	Drainage Line Intersections		Drainage Line Density
	Area (ha)	Number of Instances	Total Length(km)	Length per Unit Area (m/ha)
Route 1+1a	**22001**	875	403	**1.83**
Route 1+1b	**22360**	874	416.55	**1.86**
Route 2	**20425**	617	368.45	**1.80**

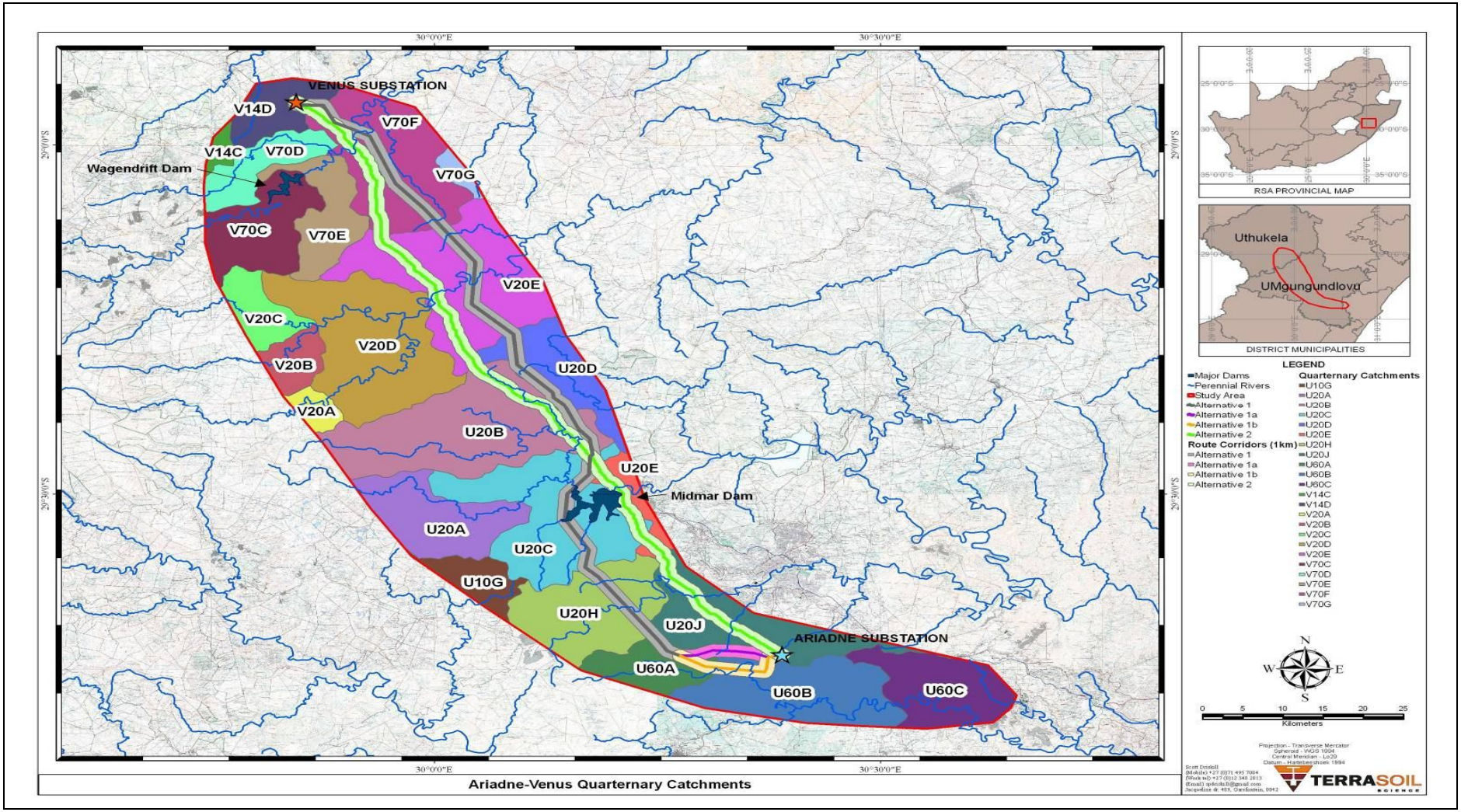


Figure 31: Quarternary Catchments and Perennial Rivers within the Study Area

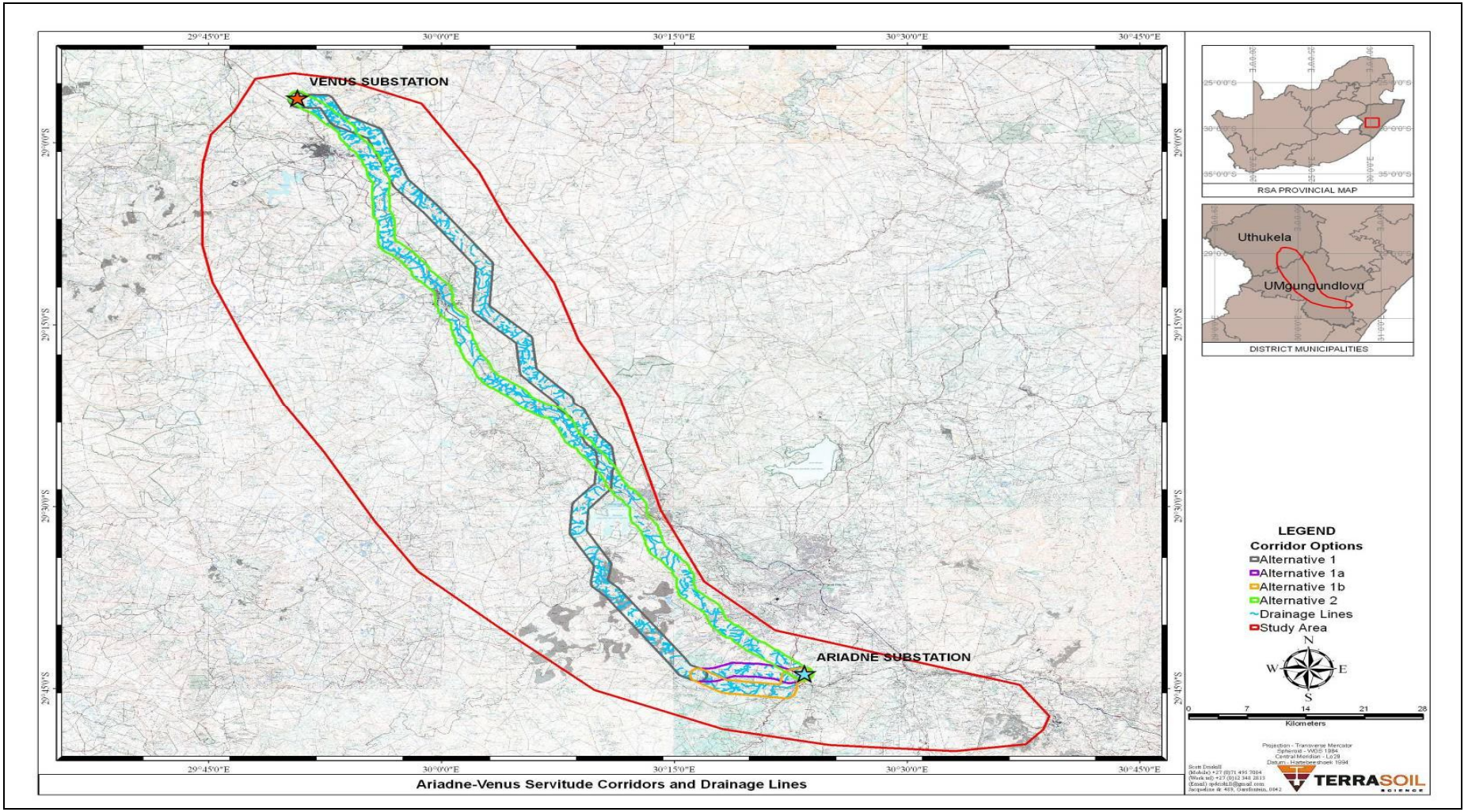


Figure 32: Alternative Corridors and Drainage Lines

Several perennial rivers with riparian and/or wetland habitat in the floodplains and channelled valley bottom hydro-geomorphic units are affected by the proposed alternatives, (Driver et al., 2004), (Figure 26). Perennial rivers in the study area are often associated with wide floodplain wetlands adjacent to their channel. Examples include the uMgeni Floodplain and the Nguklu Floodplain.

Alternative 2 crosses the lowest number of rivers with a high PES class and Conservation status, but its overall length of river crossings is the highest (see Table 22).The larger length of river crossings in Alternative 2 is contributed to crossings parallel to the direction of flow. This is undesirable as it increases the risk of pylon placement within a watercourse. The Ndize River crossing is an example of such a parallel crossing (Figure 33). Alternative 1a has the shortest length of river crossings (Table 22). A shorter total length of river crossings is regarded to have a smaller risk of negative river impacts compared to the lowest number of river crossings. This is based on the rationale that the mitigation of impacts across a larger number of smaller crossings is simpler to achieve than the mitigation of fewer crossing along longer river sections. Hence Alternative 1a is considered to be a more favourable option based on the available river information.

Table 24: The Number and Length of Perennial River Crossings and their Present Ecological Status (PES)

Route Alternative Corridor	PES Class B (Largely natural)		PES Class C (Moderately natural)		PES Class D (Largely modified)		Combined PES Classes	
	Number of crossings	Length of river (km)	Number of crossings	Length of river (km)	Number of crossings	Length of river (km)	**Number of crossings**	**Length of river (km)**
Route 1+1a	3	9.8	7	15.99	4	9.17	**14.00**	**34.96**
Route 1+1b	3	9.8	8	24.26	3	6.92	**14.00**	**40.98**
Route 2	1	4.64	5	25.04	4	13.54	**10.00**	**43.22**

Table 25: The Number and Length of Perennial River Crossings and their Conservation Status

Route Alternative Corridor	Endangered Conservation Status		Vulnerable Conservation Status		Combined Conservation Status	
	Number of crossings	Length of river (km)	Number of crossings	Length of river (km)	**Number of crossings**	**Length of river (km)**
Route 1+1a	10	21.73	4	13.23	**14**	**34.96**
Route 1+1b	10	27.75	4	13.23	**14**	**40.98**
Route 2	8	33.91	2	9.31	**10**	**43.22**

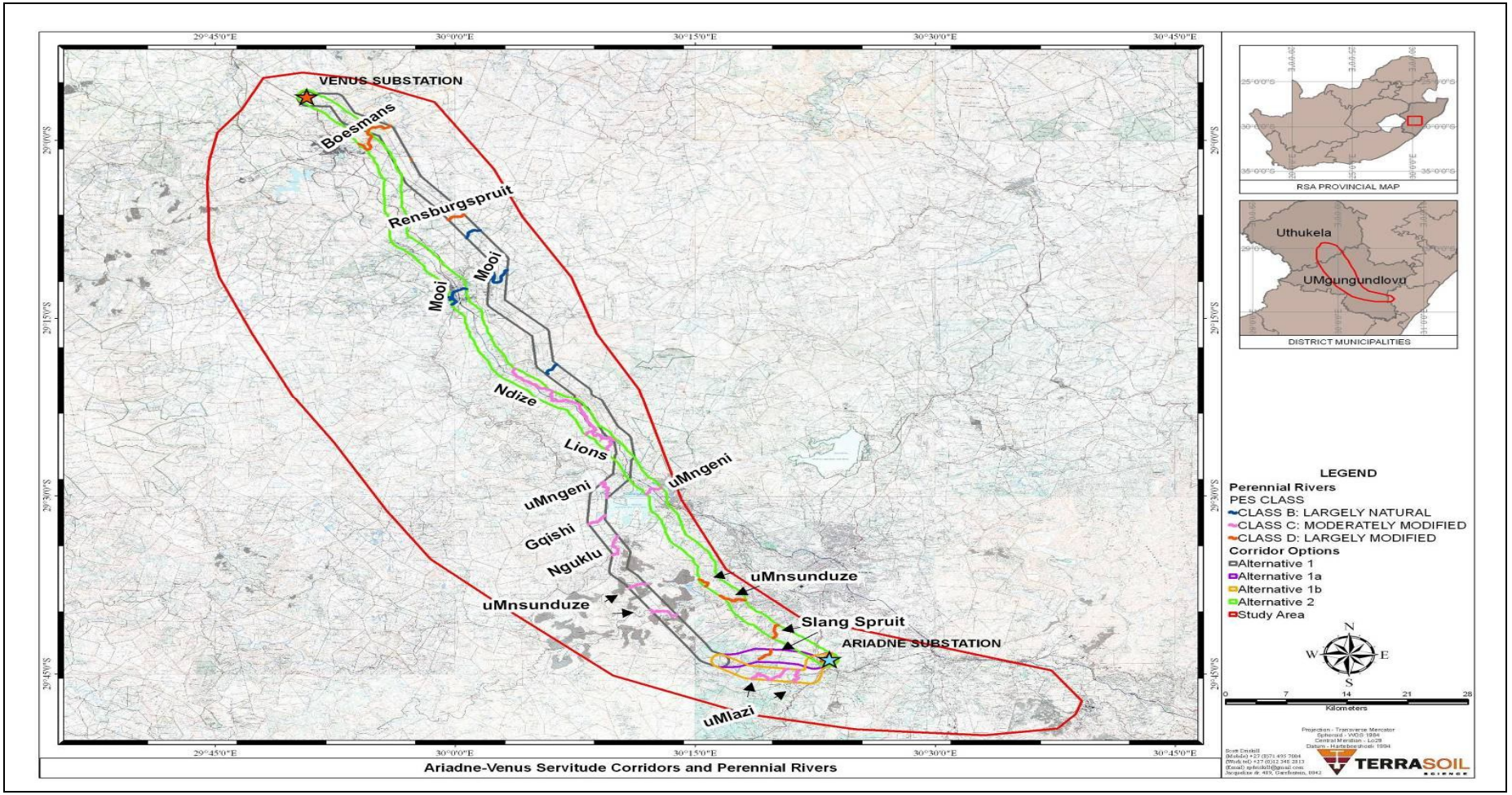


Figure 33: Present Ecological Status of Perennial Rivers within the Route Alternative Corridors

The Crane species breeding sites was used as an indicator for natural wetlands that are likely to be in an untransformed condition and therefore of high conservation value. This is due to the presence of a large grassland buffer that has to surround the Crane's selected wetland-bound breeding nest as Cranes are extremely sensitive to various disturbances such as livestock movement. The assessment of the Crane species associated with wetlands of conservation value can be found in detail in Appendix H. Alternatives 1a and 1b are therefore regarded as more appropriate alignment options compared to Alternative 2.

9.5 SOIL AND AGRICULTURAL POTENTIAL ASSESSMENT

According to the specialist the study was conducted in three phases and included the collection of Land Type data for the site, aerial photograph interpretation, and a site visit and orientation. Land Type data for the site was obtained from the Institute for Soil Climate and Water (ISCW) of the Agricultural Research Council (ARC) (Land Type Survey Staff, 1972 – 2006). The Land Type data is presented at a scale of 1:250 000 and entails the division of land into land types, typical terrain cross sections for the land type and the presentation of dominant soil types for each of the identified terrain units (in the cross section) (Figure 34).

Table 26 contains the areas for the mapped land uses along Alternative 1. It also includes the variation on the route as Alternatives 1a and 1b. The land uses are expressed as areas and percentages of the total buffer zone (corridor) around the lines. The same applies to Table 27 for Alternative 2. Figures 35 and 36 indicate the number of areas where agricultural development (dry land and irrigated agriculture) could be impacted as well as areas where soil erosion is a concern.

Table 26: Land Use Along Alternative 1

Land Use Type	Area	Percentage
Alternative 1		
Agriculture	1304.6	30.9%
Irrigated Agriculture	235.1	5.6%
Erosion	186.2	4.4%
Plantation	1884.2	44.7%
Small Scale Farming / Subsistence Agriculture	-	-
Extensive Grazing	608.4	14.4%
Total	**4218.5**	
Alternative 1a		
Agriculture	-	-
Irrigated Agriculture	-	-
Erosion	-	-
Plantation	694.7	100%
Small Scale Farming / Subsistence Agriculture	-	-
Extensive Grazing	-	-
Total	**694.7**	

Alternative 1b		
Agriculture	531.4	59.2%
Irrigated Agriculture	-	-
Erosion	-	-
Plantation	366.7	40.8%
Small Scale Farming / Subsistence Agriculture	-	-
Extensive Grazing	-	-
Total	**898.1**	

Table 27: Land Use Along Alternative 2

Land Use Type	Area	Percentage
Alternative 2		
Agriculture	1606.3	41.5%
Irrigated Agriculture	148.1	3.8%
Erosion	79.2	2.0%
Plantation	2035.6	52.6%
Small Scale Farming / Subsistence Agriculture	-	-
Total	**3869.2**	

9.5.1 Findings

According to the specialist Alternative 1 poses the greatest risk in terms of erosion, having the highest incidence of observed severely eroded areas. Irrigated agriculture was seldom observed along Alternative 1, though the route did intersect the largest area of irrigated agriculture in the study area. The irrigated areas were involved in maize production. Agriculture was evenly distributed throughout the route and significant commercial production of maize was observed along this route, in addition to fodder grasses, specifically in the central portion of the route. Plantation land uses were observed intermittently throughout the route, with the greatest concentration at the end of the route in the South and middle portions.

Alternative 2 included large stretches of route that did not intersect agricultural related land uses, specifically at the beginning and end of the route. Land uses for the large majority of the route were evenly distributed. Additionally, a large section (>30km) of the route ran alongside or directly over the N3 highway. In terms of erosive soils and erosion risk Alternative 2 poses somewhat of a risk, with the route directly intersecting areas of severe erosion in the northern section. Most observed areas of erosion occurred within the first 20km (north) of the route. A few instances of irrigated agriculture were encountered in the northern half of the route and were generally producing sugarcane. Irrigation infrastructure was not observed in the southern half of the route.

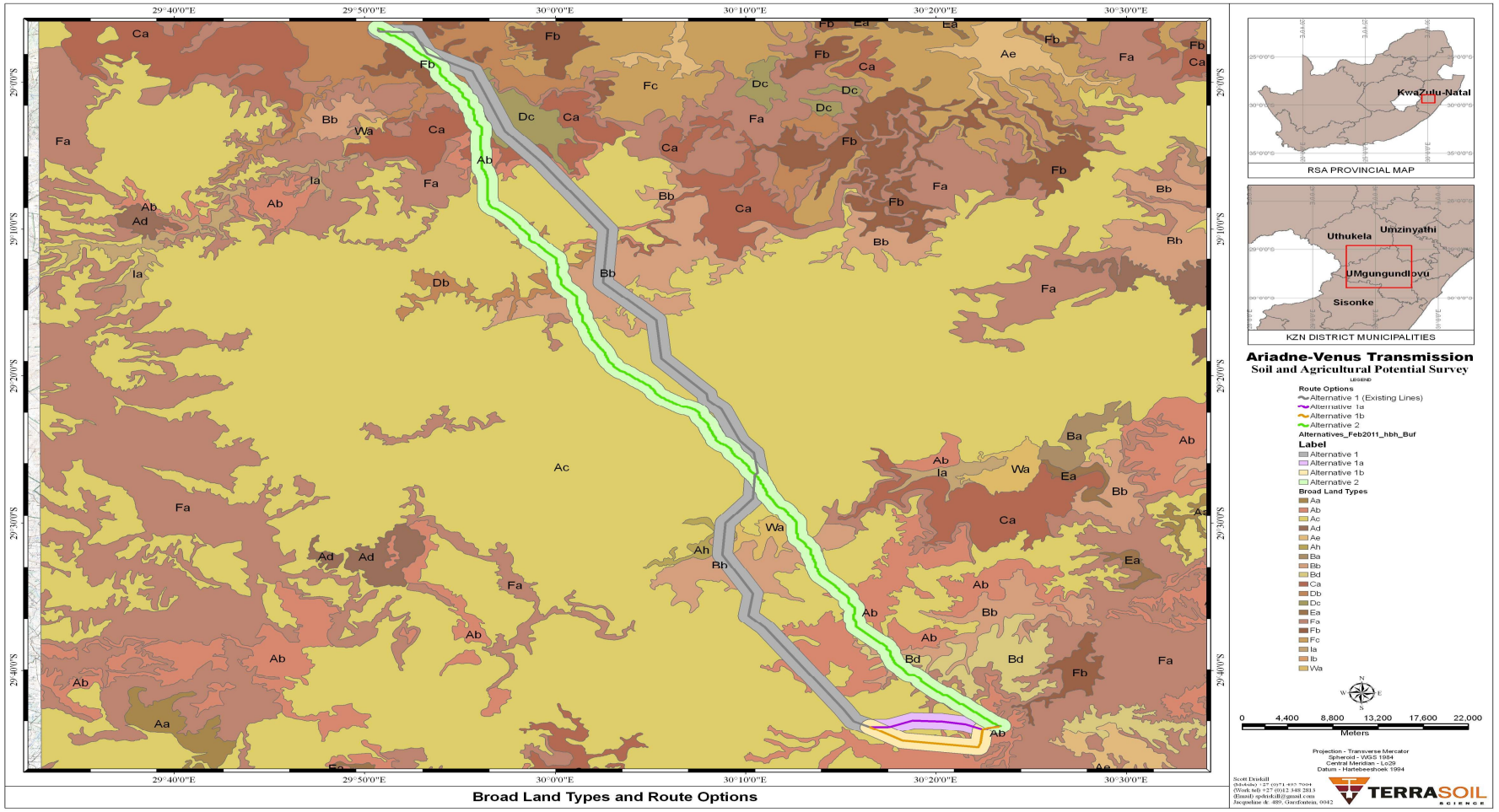


Figure 34: Land Types Affected by the Respective Corridors

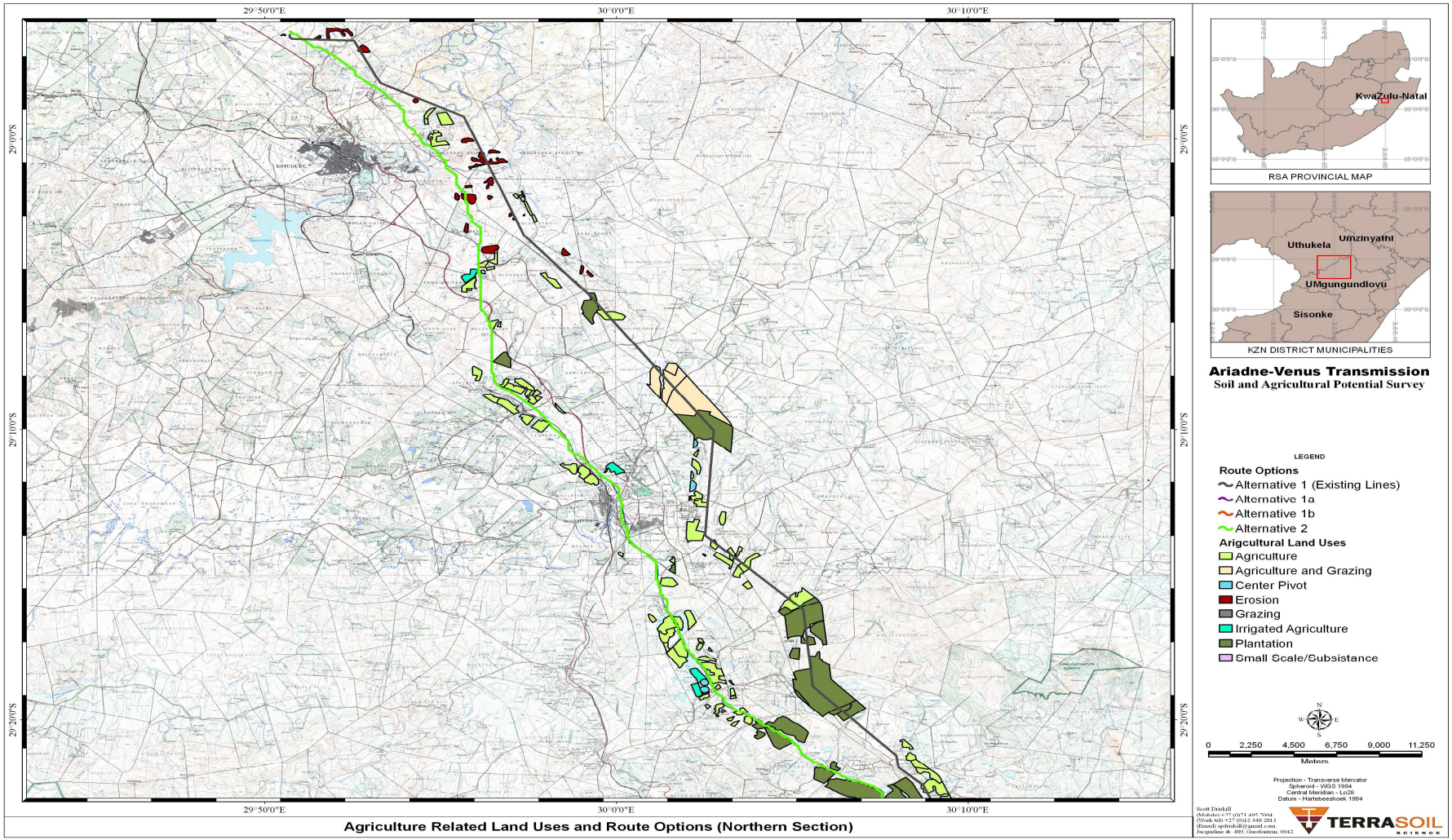


Figure 35: Land Use Affected by the Proposed Corridors (Northern Section – from Venus Substation)

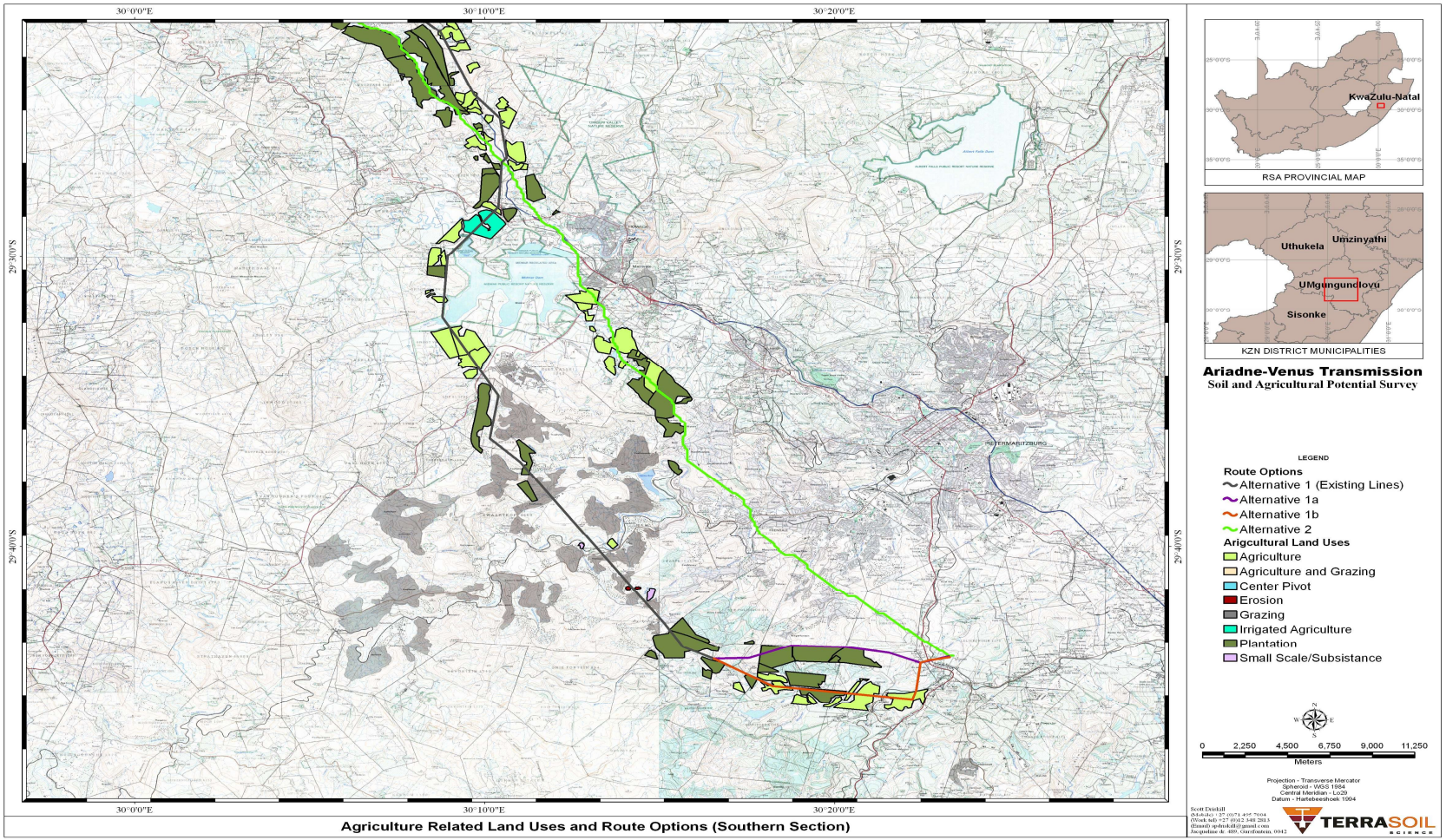


Figure 36: Land Use Affected by the Proposed Corridors (Southern Section – to Ariadne Substation)

9.6. VISUAL IMPACT ASSESSMENT

According to the specialist, GIS was extensively used as a tool for data collection as well as analysing data. This was complemented by fieldwork where site photographs were taken and analysed in detail. The specialist applied visual exposure analysis using the Digital Terrain Model (DTM) and derivatives thereof to determine the extent to which the topography of the study area exposes or hides human structures. The landform position, slope position, relative elevation and ruggedness were used to determine the visual exposure score (See Appendix H).

A Land Use Raster Dataset was created using land use (ENPAT), conservation (ENPAT), natural features, formal protected areas and informal protected areas. Land Use Analysis was used to determine the viewer sensitivity value. In this analysis, 1 represent low sensitivity and 5 represents high sensitivity. The use raster was thus classified as follows:

Table 28: Land Use and Allocated Sensitivity Ratings

Land Use	Sensitivity
Commercial / Industrial	1
Conservation	5
Cultivated Land	2
Cultural	4
Forestry	2
Mining	1
Natural Features	5
Residential	3
Subsistence Farming	3
Vacant / Unspecified	1

The Viewer Sensitivity Raster Dataset was added to the final visual exposure dataset to obtain the modelled visual impact raster dataset (Figure 38), which was rescaled to 1-5 and clipped to fit the study area (Figure 39). The areas with a score of 4 and 5 were combined and ranked according to size. The 18 largest areas were visited during the site visit.

The photographs that were taken during the site visit were described and used to derived viewer sensitivity and visual contrast in determining the visual impact. The areas are described in terms of land, water, vegetation and structures. Photographs that were taken during the site visit form part of the respective site descriptions (e.g. Figure 37).

Characteristic Landscape Description

		Land/Water	Vegetation	Structures
Elements	Form	Sloping, rolling to flat terrain, focal feature	regular shape (plantation), patches (grass)	rectangular (dam wall) and band (road)
	Line	Butt edge, diffuse edge, bold skyline	moderate, regular	Straight mostly horizontal
	Colour	light brown	light brown to mottled green	Brown
	Texture	fine to medium	coarse	fine to medium

Proposed Activity Description

		Land/Water	Vegetation	Structures
Elements	Form	Linear forms: servitude / access roads	Linear forms created by clearings (servitude / access roads)	Lattice Towers, power lines
	Line	Bands	irregular lines: edge effect of servitude / access roads	Strong, Horizontal, vertical and diagonal
	Colour	green to brown	green to brown	steel grey
	Texture	fine	fine	fine / medium

Contrast Rating

		Land/Water				Vegetation				Structures			
Degree of Contrast		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
Elements	Form	X				X				X			
	Line	X					X			X			
	Colour			X				X		X			
	Texture			X				X				X	

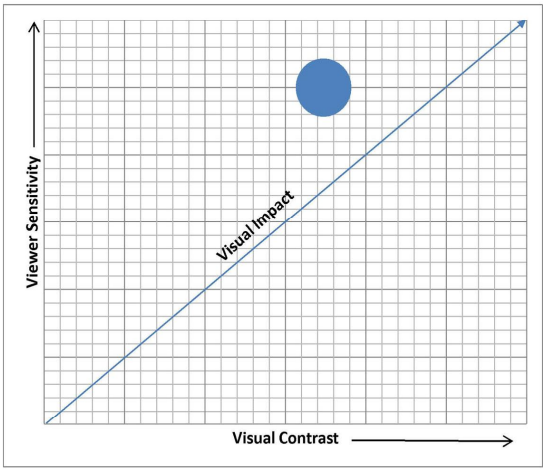


Figure 37: Example of a Site Assessment Based on a Site Photograph

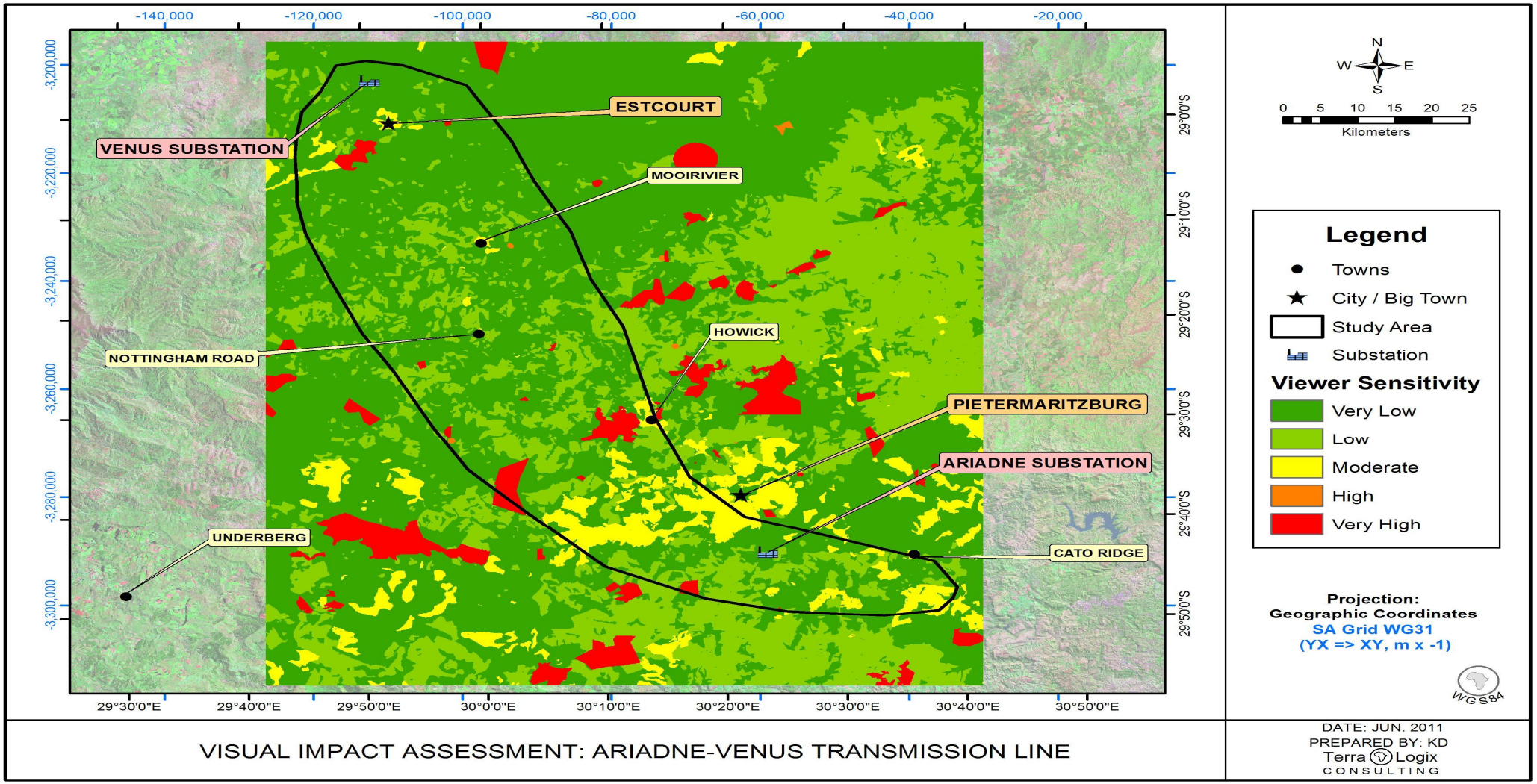


Figure 38: Viewer Sensitivity Map in Terms of Visibility

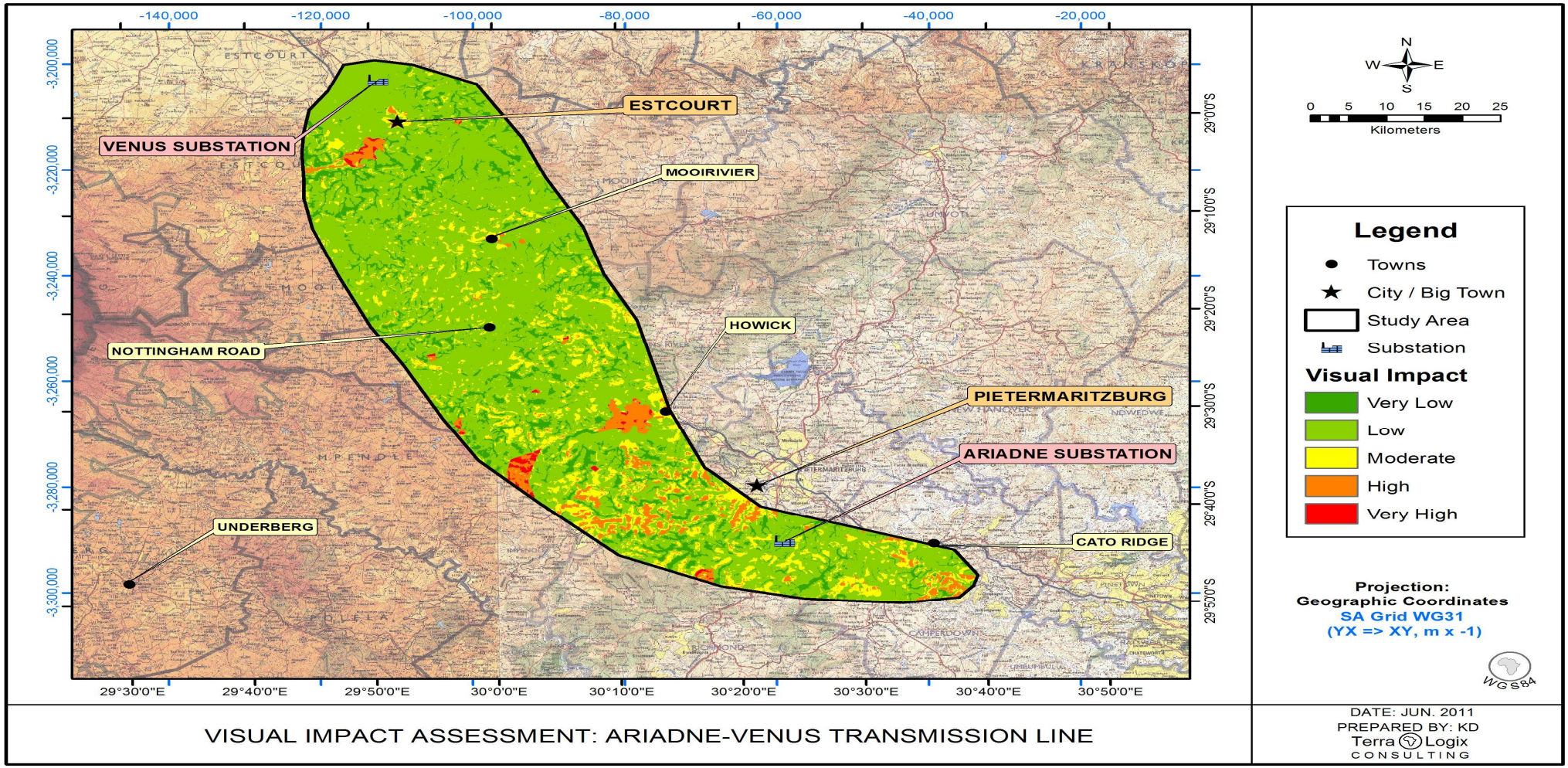


Figure 39: Modelled Visual Impact Derived from Viewer Sensitivity Dataset Combined with Visual Exposure

9.7 MACRO-ECONOMIC IMPACT ASSESSMENT

The specialist conducting the Macro-Economic Impact Analysis study focussed on:

- Determining of the present economic situation prevailing in each Alternative. This involves the determination of the economic benchmark against which it will be possible to measure the possible economic impact of the construction and operation of the power lines. The economic benchmark is expressed per identified corridor as turnover and macro-economic indicators. The macro-economic indicators in each corridor are expressed in terms of:
  - o Gross Domestic Product (GDP);
  - o Employment; and
  - o Household Income.

  The results were expressed in terms of Direct, Indirect and Induced results for GDP and employment, also Low-Income and other levels for Household Income.
- Determining the economic sectors that will be negatively impacted upon and providing an estimate of the extent of the negative impacts.
- Estimating the cost of construction and the annual maintenance of the power lines including the construction of alternative infrastructure where existing facilities are rendered inoperative due to the construction and operation of the power lines e.g. an airfield used by helicopters to fight forestry fires. This was also expressed in terms of macro-economic indicators.
- The construction of a Cost Benefit Analysis Econometric Model to determine the most beneficial option to the economy at large. The identified two corridors present different outcomes as far as electricity delivered. The one 275 kV line at presently delivers about 600 MW and the 400kV line to be constructed in its place will deliver between 1 500 and 2 000 MW, a net delivery of between 900 and 1 400 MW. While the new corridor if selected will deliver between 1 500 and 2 000 MW.
- A Macro-Economic Impact Analysis of the construction phase of the line. A final estimation was done to calculate the future macro-economic impacts once the electricity was available in the targeted area, which in effect represents the negative impacts if the electricity is not available.

9.7.1 Risk Profile

According to the economic specialist, the risk the local economic activities are exposed to, should the power lines be constructed, differ for each of the proposed alternatives in terms of the corridor width and the present exposure of the local inhabitants to the power line (Appendix H).

In the case of the proposed Alternative 1 plus 1b (Grey with Orange) and Alternative 1 plus 1a (Grey with Purple), the existing servitude only needs to be widened, except for the short distance where the existing Corridor 1b (Orange Corridor) turns north to connect to the Ariadne Substation. In the case of this corridor option the local inhabitants are accustomed to servitude area and have adapted their activities taking the power lines into consideration.

The proposed Alternative 2 will need a totally new servitude area to be registered over the length of the 2km alignment. In the case of Alternative 2, the local inhabitants have developed their activities without the interference of a power line and are therefore much more sensitive to accommodate a power line. This fact necessitated a very detailed study of the available maps of the area and Google Earth images to determine the best options avoiding infrastructure and buildings, taking into consideration that the power lines cannot pass over existing buildings. In the case of the accommodation establishments it was necessary to also estimate the possible intrusion made on "Sense of Place" and the possible impact that could have on the tourist and other customers.

In the final instance the possible impacts on farming and forestry activities were maximised in favour of the current local activities. The impact on the sawmill activities was based on the risk factor for the commercial forestry. The loss in wood produce was used as the basis for the loss in the sawmill activity.

The tourism and accommodation sector posed unique problems, due of the fact that the selection of Alternative 1 would entail an increase in the existing servitude width and the current establishments developed with the power lines already in place. In the case of Alternative 2 a different situation arises. In conclusion, after establishing the position of the establishments and comparing the situation to Alternative 1 it was decided that the difference in the impact for Alternative 2 would be around 10% greater than the impact on Alternative 1. The impact on Alternative 1 was set at 5% and Alternative 2 at 15%.

In the table below (Table 28), the percentage-projected impact per corridor is presented for the different activities.

Table 29: Percentage Impact per Corridor

Activity	Corridor 1	Corridor 1 a	Corridor 1 b	Corridor 2
Forestry	5%	5%	0%	1%
Vegetables	0%	5%	5%	5%
Irrigated Maize	0%	2%	5%	4%
Dry land Maize	0%	0%	1%	0%
Pastures – Dairy	3%	0%	0%	1%
Livestock Grazing	1%	1%	0%	1%
Saw Mills	5%	5%	0%	1%
Tourism activities	5%	0%	0%	15%

As the areas within and adjacent to the different alternatives differ, the impacts also differ when quantified, this is presented in the following table (Table 29). The comparison of impacts on current local activities are reflected in the following table which only shows the totals for the expected negative impacts on GDP, employment and payments to households.

Table 30: Comparison of Impacts on Current Local Activities

Corridor	Total GDP Rand mil.	Total Employment Number	Total Households Rand mil.
Corridor 1 and 1a	-R13.89	-84	-R4.05
Corridor 1 and 1b	-R15.65	-95	-R4.87
Corridor 2	-R22.26	-139	-R10.23

Table 29 above shows that, in terms of impacts on current local activities, Alternatives 1 plus 1a are the alternatives with the lowest impact and that Alternative 2 has the highest impact on local activities. According to the specialist, the three analysis approaches provide conflicting results in terms of economic impacts:

- Impacts on current local economic activities show that Alternative 1 and 1a will be the option with the lowest impact;
- The Cost Effectiveness Analysis (CEA) indicates that the Alternative 2 will be the option with the lowest cost ratio to provide the reserve capacity; while
- The Macro-Economic Impact Analysis shows that the Alternative 1 with the alternative combinations in the south will be the best in terms of employment creation and other indicators during the construction period.

9.8 SOCIAL IMPACT ASSESSMENT

Two types of data were gathered for the Social Impact Assessment. The data was gathered in a number of ways:

- Primary Data – Data that assisted the consultants in establishing the social setting and characteristics of the study area, as well as the key economic activities. This was done by (firstly) interviewing 'key' persons. Furthermore, two types of detailed questionnaires were submitted to the representatives of the various organisations and landowners forming part of the public participation database. The aim of the questionnaires was to gather specific information related to the area and affected properties, possible developments in the area and departmental or organisational specific issues and concerns with regards to the proposed Ariadne-Venus Transmission Line project.
- Secondary Data - which was not originally generated for the specific purpose of the study - were gathered and analysed for the purposes of the study. Such data included the census data, project maps, local histories, planning documentation such as the draft Integrated Development Plans (IDP) and Strategic Development Frameworks (SDF) of the various municipalities found in the study area.

9.8.1 General Findings

The following General Findings were made:

- In areas or on properties with existing power lines, Eskom should at all times aim to place the new transmission line away from the residential dwellings and sensitive activities taking place on those properties.

- This could assist in limiting the intrusion factor, lessen the negative impact on the property value and possibly contain the impact on the overall sense of place of each property. Further activities or developments could then most probably be focused away from the transmission line "corridor".
- It is recommended that the towers be placed along the boundary of the properties to limit the intrusion and impact on the property value, as well as on the residents' daily living and movement patterns, except in cases where this would result in more negative social impacts on the property.
- Resettlement of individuals should be avoided as far as possible. Due to the rural character of the study area, it is anticipated that resettlement can be avoided even if it results in placing the proposed new transmission line in "unspoilt areas".
- Should the economic potential of a property be proven to be negatively impacted upon by the addition of a new servitude, especially with regards to smallholdings, Eskom should consider buying these properties.
- Eskom should assist in creating awareness among all role players of the importance of the contents of the EMP to assist in avoiding adverse impacts. It should be clearly stipulated that the EMP would remain a working document, as it has to be amended to continue to mitigate against any possible negative impacts.

9.8.2 Route Alternatives

Based on the Social Impact Assessment, it is apparent that there is little differentiation between the alternatives assessed, but still the following recommendations regards to the route alignments assessed are made:

- Should it be feasible (based on the outcome of Eskom's feasibility study) to recycle and upgrade one of the existing 275kV lines to a 400kV line, it is highly recommended that this option be implemented. The widening of the servitude is not anticipated to have negative impacts that could not be successfully mitigated. As indicated in the following point, it is considered that the transmission lines would have been incorporated in the development plans of the local authorities, as well as the property owners and that activities on the properties have been adapted to accommodate the servitude.
- If recycling and/or upgrading of the line are not an option, Alternative 1 (Grey Corridor) is the preferred option from a social perspective. This recommendation is based on the presence of the existing lines along this alignment. As stated, it is safe to conclude that the adverse impacts of these lines have been reduced over time. It is thus recommended that an alignment along Alternative 1 could be followed, as it is not anticipated that the introduction of the proposed transmission line would exacerbate the present status quo. It could just become another element of the existing land use without adversely affecting the land use realities in the affected areas.
- Alternative 1 can thus be pursued on condition that the negative impact of the new proposed transmission line on tourism ventures, due to the visual impact, be sensitively considered and that Eskom make every effort to limit these new impacts by carefully considering tower placements.
- It should furthermore be considered to place the proposed new transmission line in certain sections of the study area along the alignment of the N3 (between Mooi River and Howick). This could prove to assist in limiting negative impacts on tourist establishments.

- It is anticipated that the visual impact on passing motorists / tourists would be less than the intrusion on the visual character of the tourism establishments in the study area. Such a proposal could for example be considered in the Curry's Post area depending on agreements from the affected property owners and whether technically feasible.
- From the area where Alternative 1 splits into Alternative 1a (purple) and 1b (orange), Alternative 1b (orange) is recommended if the line can be recycled. Should this be possible, Alternative 1b would be the preferred option. If this section of the line cannot be recycled an additional servitude next to the existing servitudes would definitely have negative impacts on the forestry area and thus timber production, as well as on the conservancy situated along this alignment. An alignment along Alternative 1a next to the existing lines would thus not be preferred from a social perspective.
- If Alternative 1b is not recycled, it is recommended that the most northern section of Alternative Corridor 1a (purple) be followed to reach the Ariadne Substation. An alignment within the northern section of this corridor could limit the creation of a servitude through forestry and timber areas and could also avoid dense settlements to the north. The tower positions should thus be between the settlements and the forestry areas.
- Upon entering Ariadne Substation care should be taken to avoid placing the towers in close proximity to the dwellings of Thornville, a settlement situated just south of the substation.

9.9 HERITAGE IMPACT ASSESSMENT

The following methodology was used to do heritage impact assessment:

- **Literature Review -** A survey of literature was undertaken in order to obtain background information regarding the cultural heritage (archaeology and history) of the area. Sources consulted in this regard are indicated in the bibliography (see Specialist Report in Appendix H). The Natal Museum's Archaeological Database was also consulted for information on sites that could be located in the area.
- **Field Survey -**The field survey constituted a drive through the area covered by the alternative routes, visiting known museums and heritage sites to obtain information on the cultural heritage resources in the area,

These sources, along with the information gathered during the February 2010 fly-over and information from the Natal Museum database was used to indicate the range of cultural heritage sites that could be expected on the routes.

In terms of the historical age, the following may be affected:

- **Stone Age -** Although no sites, including rock art locations, were identified or visited, it is known that Stone Age sites and rock art do occur in the wider geographical area. Some erosion dongas were noticed during the fly-over on the line and these locations might reveal Stone Age tools and other material. Similarly, hilly areas with possible rock shelters and overhangs were also observed. These, together with the dongas these locations will have to be visited and assessed in detail during the final Heritage Walkdown phase of the project, to ensure that the line and individual pylons do not impact on any sites.

- **Iron Age -** A number of Late Iron Age stone walled features and sites were visible on the line during the fly-over and include livestock enclosures, hut bays and other features that represent larger settlements and smaller homesteads.
- **Graves -** A total of 51 formal graveyards were identified in the area stretching from Estcourt to Pietermaritzburg (SA Genealogical Society Graves Database). These include church cemeteries, war cemeteries, private (family) cemeteries, farm cemeteries and community cemeteries (e.g. Commercial Road Cemetery in Pietermaritzburg). Many more single graves, unknown or undocumented graveyards could still be present in the area. Due to the sensitive nature of graves, this aspect will have to be dealt with very carefully and once the final alignment has been determined, all graveyards will have to be visited and recorded during the final walkdown to ensure that they will not be negatively impacted on by the powerline construction. This will include obtaining GPS coordinates of each graveyard in the area.
- **Anglo-Boer War (1899-1902) Sites -** This includes concentration camp sites near Howick (Howick Internment Camp) and Pietermaritzburg, as well as the Battle of Willow Grange site on Nottingham Road. This battle was fought during 23 November 1899, during the early phases of the War. There are also a number of Anglo-Boer War Memorials in Howick.

9.10 TOWN AND REGIONAL PLANNING

The assessment encompasses various disciplines, which includes Town and Regional Planning where an overview of the Spatial Development Frameworks (SDF) and Integrated Development Plan (IDP) of the Municipalities that are affected were conducted in order to form a broad understanding of the potential areas of conflict between land uses and the power line proposals. The proposed two main (Grey and Green) alternatives for the proposed power line find its way through the following Municipal areas in the KwaZulu-Natal Province:

- Msunduzi Municipality;
- uMngeni Municipality;
- Mpofana Municipality; and
- uMtshezi Municipality.

Land claims by communities or persons for the return of their past ownership or occupation of land, which they lost because of Apartheid Law, may lead to complicated land tenure issues and time constraints. The Land Claims Commission is responsible for these matters and areas affected by land claims should be avoided. Certain SDFs indicate areas affected, but these areas need to be confirmed in more detail with the Municipalities and the Land Claims Commission by conducting a thorough investigation.

9.10.1 Findings

Alternative 2 (Green Line) cuts through a great deal of urban fabric making it less preferred, but attempts to utilise existing utility corridors that is also very effective in keeping the impact of the proposed power line as low as possible. Alternative 1 (Grey Line) cuts through areas of lesser importance by Town and Regional Planning values.

Alternative 1 is estimated to be the best option, since it utilises existing power line servitude areas and will therefore have the least impact.

9.11 GEOTECHNICAL OVERVIEW

The purpose of the geological assessment was to provide a better understanding of the geological stability of the area whereby recommendations can be made with regard to type of foundations required as the condition of the area for powerline construction. A geological engineer was approached to provide the geological overview based on the following factors: flooding potential, heave potential, excavatibility, unstable slope and dispersive soils. The description of this factors considered here on geological overview can be read in Appendix H. Figure 40 is a geological map of the study area.

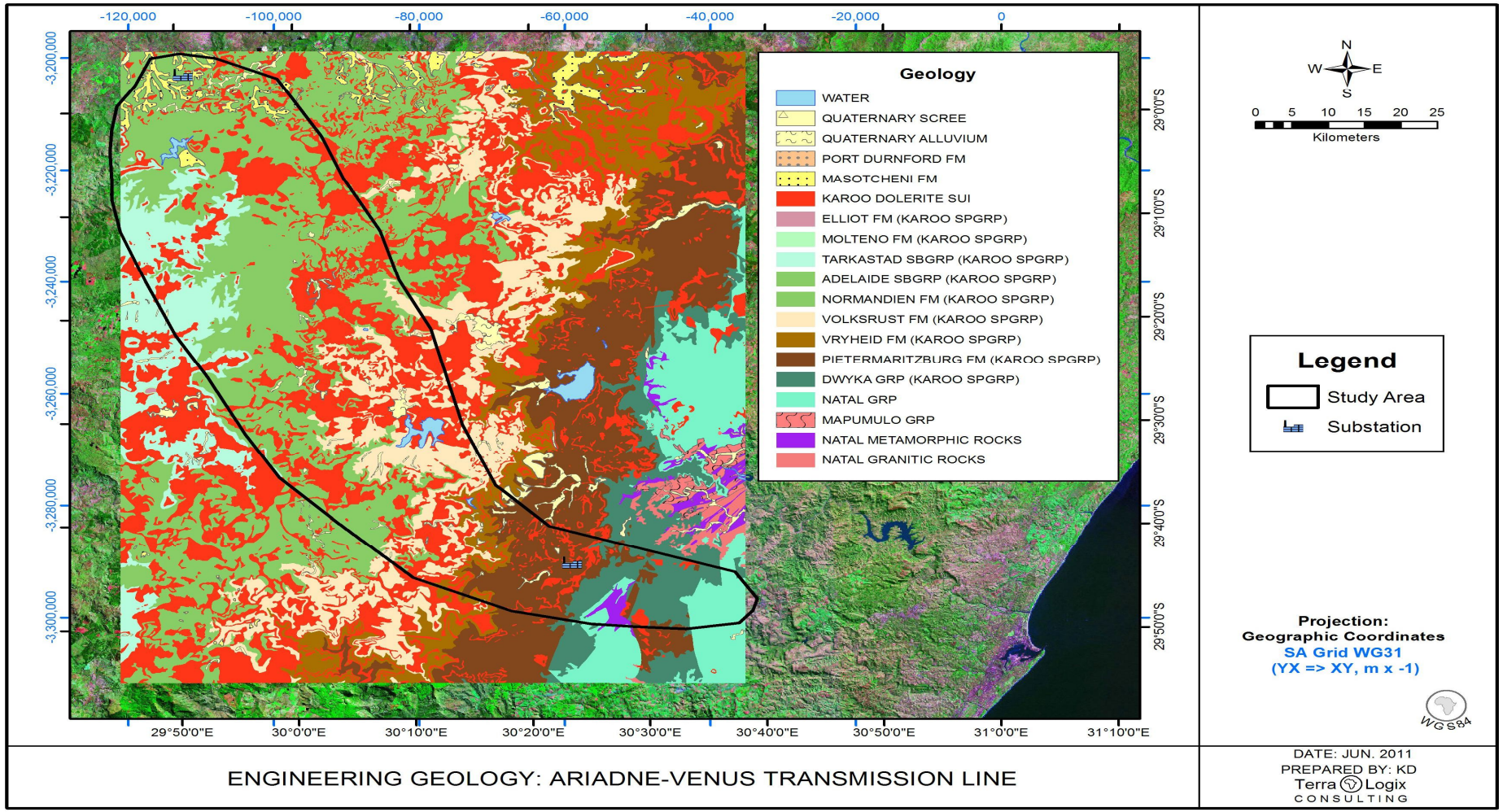


Figure 40: The Geology Underlying the Study Area

9.12 ELECTRO-MAGNETIC FIELD (EMF) ASSESSMENT

Power system frequencies (50Hz) (static or low frequency) are much lower than the frequencies of electromagnetic energy experience in other instances. For example, radio broadcasting uses 88-108 MHz and microwave systems operate at 2.4 GHz (high frequency or radio frequency). This is important to note when assessing the potential biological effects as the safety precautions differ greatly. Safety precautions in for power lines are based on limiting field levels that may induce electric current in the subject that are considered harmful.

According to the EMF study commissioned Eskom in 2006 (Appendix F), Electro-Magnetic Fields (EMF) are created, in varying levels, with the generation and the use of electricity and at the frequency of the electrical power system. In South Africa, electric power is supplied as an alternating current (AC) at a frequency of 50 Hz, i.e. electric current flowing in system changes direction 50 times per second.

At low frequency of 50 Hz two fields exist, viz.

- Electric field - Electric fields are produced by the presence of electric charges and therefore, the voltage (V) applied to a conductor. Voltage on a system is generally stable. Notably, electric fields decrease with an increase in distance from a source. Electric fields levels are measured in Volts per metre (V/m), but are generally reported as kilovolts per metre (kV/m) due to the levels reported in power system environments. Electric fields can be reduced (shielded) fairly easily.
- Magnetic field - Magnetic fields are produced by the current flowing (i.e. the movement of electric charge) on a conductor. Electric current is measured in Ampere (A) and may vary depending on the number of devices (i.e. the load), supplied by the system. As the load changes so does the magnetic field. As is the case with electric fields, it also decreases with an increase in distance from the source. Magnetic field levels are measured in Tesla (T), but more generally reported as microtesla (µT). While magnetic field can be reduced, this requires special engineering techniques and line design.

Tables 31 and 32 summarises some typical electric and magnetic field levels in various environments. On a clear sunny day, a natural electric field is a few tens of V/m, but can increase to several thousand V/m during a thunderstorm. The natural magnetic field, in Johannesburg, is in the order of 30µT and may vary up to 70µT at the North or South Pole. However, the field is considered static and varies very slowly with time.

Interestingly, as shown in Table 31 (magnetic), some appliances, particularly those with electric motors (for example, vacuum cleaners and electric drills) can generate magnetic field levels similar to those of transmission lines, albeit that exposure time is usually of short duration.

Table 31: Typical Electric Field Levels Encountered in Various Environments and Close to Household Appliances

Description	Maximum Electric Field (V/m)	Electric Field at Servitude Boundary(V/m)	Electric Field (V/m)
765kV transmission line	7,000(or 7kV/m)	2,500 (servitude 80 m)	
400kV transmission line	4,700(or 4,7kV/m)	1,500(servitude 47 m)	
Near typical domestic appliances			10 – 250
Typical levels in homes			1 -10
Typical levels outside homes			< 1

Table 32: Typical Magnetic Field Levels Encountered in Various Environments and Close to Household Appliances

Description	Maximum Magnetic Field (µT)	Magnetic Field at Servitude Boundary (µT)	Magnetic Field (µT)[18]
765 kV transmission line (current of 560A)	6	1.5 (servitude 80m)	
400kV transmission line (current of 560 A)	10.5	2.5 (servitude 47 m)	
Vacuum cleaner, electric drill			2 -20
Hairdryer			0.01 -7
Dishwasher			0.6 -3
Washing machine			0.15 - 3
Fluorescent lamp			0.15 -0.5
Ambient field inside homes			0.01- 0.2

Many studies (epidemiology, laboratory and live animal) have been conducted over the past three to four decades to determine whether health effects may arise from exposure to EMFs. The main focus of the research has been on a possible association between long-term exposure to magnetic fields and childhood leukaemia. The suggestion for this health outcome stems mainly from some of the epidemiological studies. This has, however, not been confirmed by controlled laboratory studies. *In conclusion, there is no evidence of a casual relationship between magnetic field exposure and childhood leukaemia and no dose-response relationship has been shown to exist between EMF exposure and biological effects.* Likewise, studies on behaviour, reproduction, health, meat and milk production have found minimal or no effects of EMFs on animals. Similarly, studies have found no significant effect of EMFs on plant growth, crop production and seed germination.

The absence of evidence on health effects is generally not considered to mean evidence of the absence of health impacts and has resulted in some scientist advocating caution and finding ways to avoid and / or reduce exposure. The guideline for EMF exposure set by the International Commission for Non-Ionising Radiation Protection (ICNIRP) (an organisation formally recognised by the World Health Organisation) (see Table 33) receive worldwide

support and is endorsed by the Department of Health in South Africa, as well as the South African Forum for Radiation Protection.

Utilities in South Africa involved in the generation and distribution of electrical energy are bound by the Occupational Health and Safety Act (Act 85 of 1993) to provide such services in a safe manner. However, there are currently no regulations under the Hazardous Substances Act (Act 15 of 1973) in terms of exposure to power frequency EMFs in South Africa. As such ICNIRP guidelines are used for assessing human exposure to these fields.

Table 33: Electric and Magnetic Field Exposure Guidelines as set by the ICNIRP (1998)

	Electric Field (kV/m)	**Magnetic field (µT)**
Reference level [21] :		
Occupational	10	500
Public	5	100
	Current density (mA/m^2)	
Basic restriction:		
Occupational	10	
Public	2	

10. TECHNICAL CHALLENGES AND SOLUTIONS FOR UPRATING EXISTING 275kV LINE TO 400kV LINE

There are two Georgedale-Venus 275kV lines run parallel from Venus (Estcourt) to Georgedale (Mpumalanga) in the KZN Province. The lines run parallel to the existing Ariadne-Venus 1 (400kV) line in some sections. All this lines are found under grey corridor which is alternative1 that involves option to recycle one of the existing 275kV lines. There are challenges with regards to decommissioning one of the 275kV line as this lines keep on crossing each other (see appendix G).

The Ariadne-Venus 1 (400kV) line crosses the two 275kV lines in four places. The crossings are not the same and use different structures. The height of the structures is also not the same and the terrain is not similar, making it complex in some instances. Technically any line can be dismantled, but there are associated challenges and costs. This report looks at different sections on the line and provides solutions to minimize cost and distraction to the transmission network.

Line swapping means that Line 1 of the Georgedale-Venus 275kV line would be connected to Line 2 of Georgedale-Venus 275kV and the disconnected part of the line will then be dismantled. This is to allow for continuous supply on the one Georgedale-Venus 275kV line whilst the decommissioning project goes on and also during construction.

Advantages of line swapping are:

1. Contractors working on dismantling will work away from the centre of the three transmission lines, which is a safer place to work from.
2. Contractors working on constructing the new 400kV line likewise work away from the two transmission lines, which makes it safer.
3. The risk of a fault or colliding with the existing lines is reduced.
4. There will be much less disturbance of power supply during dismantling and construction.
5. Heavy-duty vehicles and cranes can be easily placed on the outside compared to centre where space is limited.
6. It minimises the crossing of vehicles and cranes under live transmission lines during dismantling and construction.
7. Minimum scaffolding is required during construction and decommissioning.

Disadvantages of line swapping are:

1. Line outages for swapping preparation are required.
2. A number of pre-decommissioning work and preparations are required which increases the cost and project timelines.
3. No decommissioning can take place before the line swapping occurs.
4. Re-labelling of the line is required.

At the Venus substation the lines are orientated as shown in Figure 41. If the new feeder bay is constructed as located on the figure 41, Line 1 should be decommissioned from the terminal tower at Venus Substation. This will avoid any crossings within the substation 20 towers and thus continuity of the earthwire will be maintained. This continuity and good footing resistance is necessary for draining the fault currents to ground and thus protecting the substation equipment from high-level fault currents.

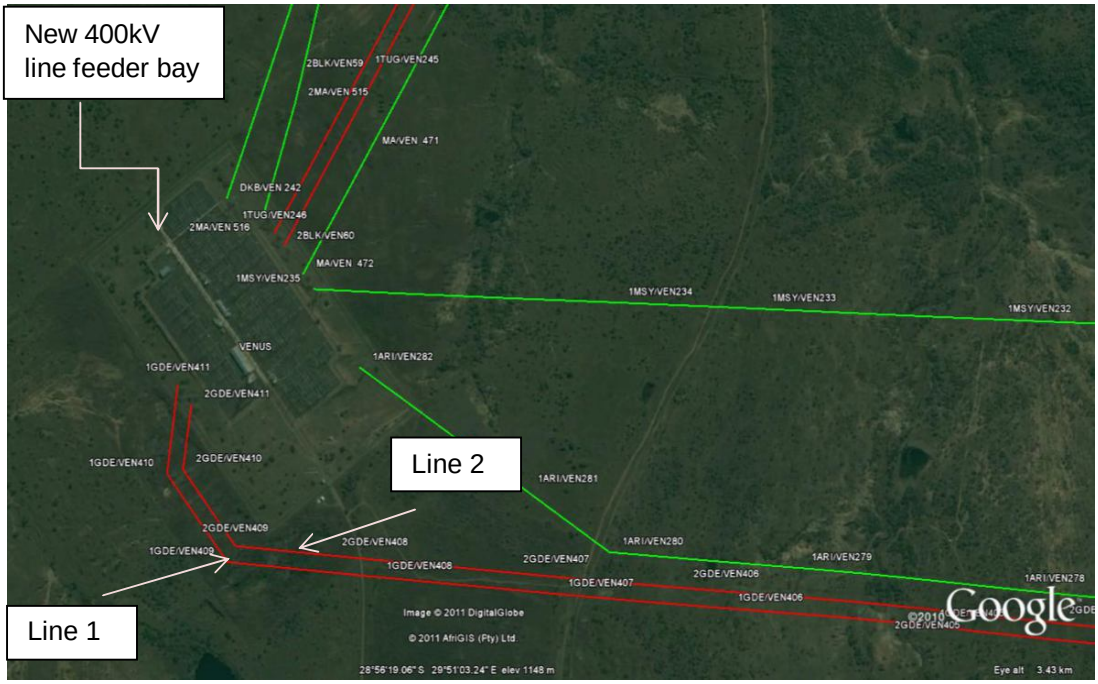


Figure 41: Venus Substation Line Configuration

The first crossing from Venus Substation is between towers 1ARI/VEN211 and 1ARI/VEN212 of the Ariadne-Venus 1 (400kV) line, Figure 42. At crossing 1, a line swapping should be done. From there onwards (i.e. towards south to Ariadne) Line 2 should be decommissioned, which is the line on the outer side. This will make it easy when it comes to tower 1ARI/VEN203 where the contractors dismantling (and during construction) will work outside the live transmission lines.

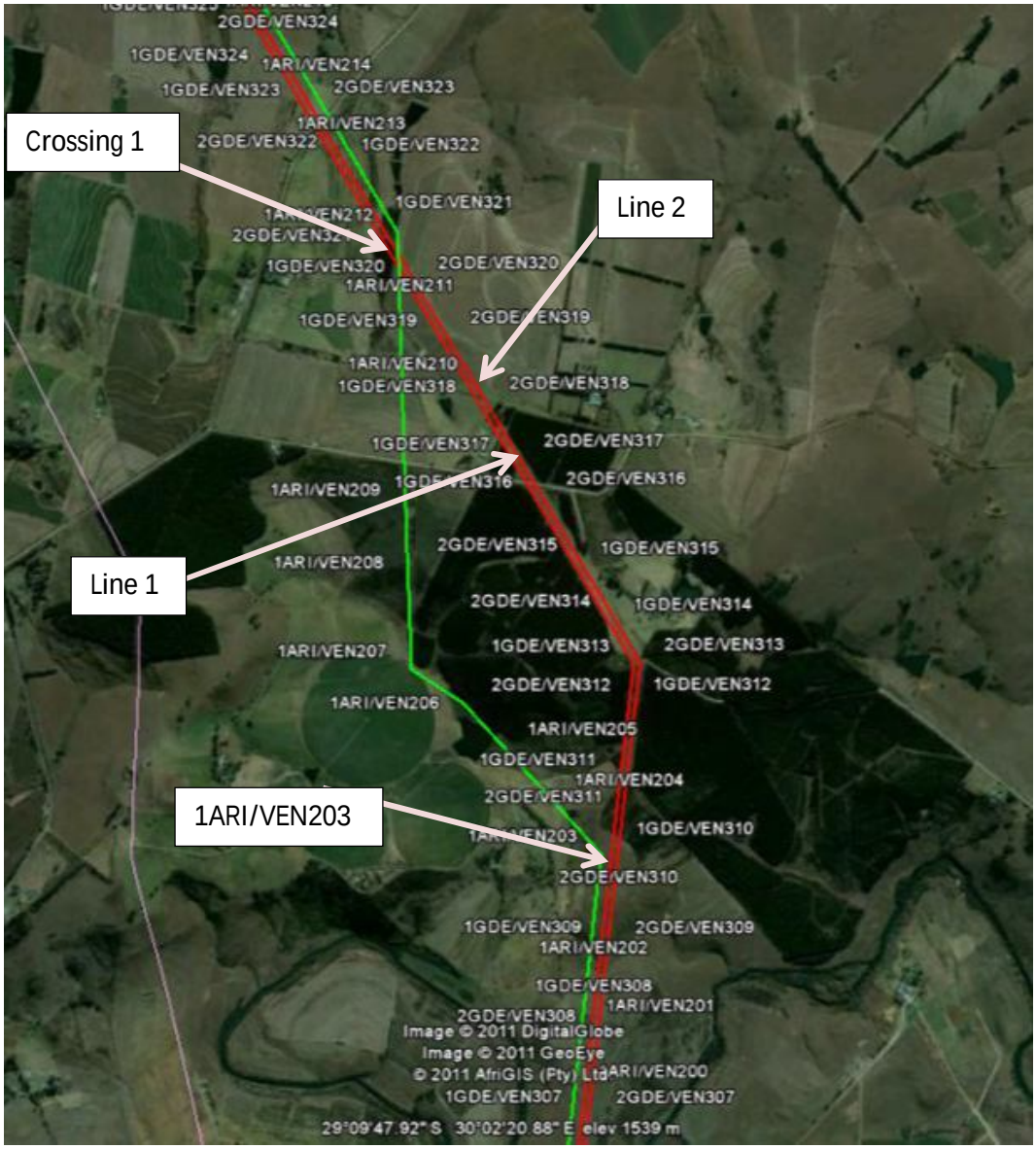


Figure 42: Crossing 1 (Swapping 4) from Venus Substation

The second crossing is between towers 1ARI/VEN135 and 1ARI/VEN136 of the Ariadne-Venus 1 (400kV) line, Figure 43. There is also the Gowrie/Pentrich 3 (132kV) Line running parallel to the three transmission lines. This 132kV line is between the 400kV line and Line 1 of the 275kV lines before the crossing and after is on the outside near Line 1.

North of this crossing - towards Venus - Line 2 is decommissioned, but after the crossing line swapping should be done and Line 1 needs to be decommissioned. The section where the 132kV is on the outside, from the crossing to tower 1ARI/VEN130 of the 400kV line, should be deviated before decommissioning commences to allow for enough working space for contractors. Also the 400kV line requires a wider servitude and thus the centre-to-centre spacing between 400kV and 132kV lines would be violated.

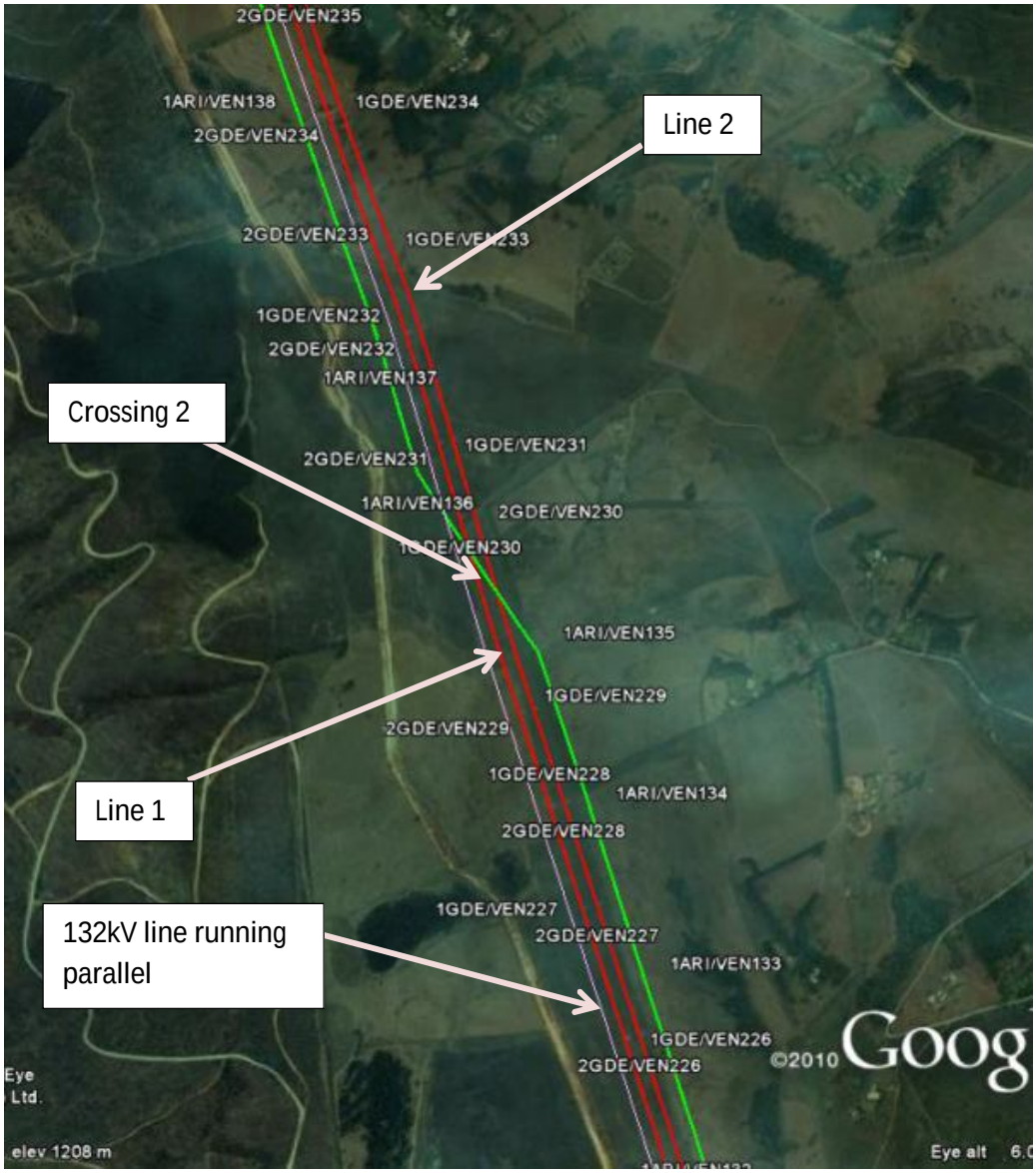


Figure 43: Crossing 2 (Swapping 3) and the 132KV Line

The third crossing is between tower 1ARI/VEN75 and 1ARI/VEN76 of the Ariadne-Venus 1 (400kV) line, Figure 44. At the third crossing both the 400kV line and the 275kV lines use the tallest structures and the earthwire on the 275kV line is discontinuous. Before the crossing Line 1 would be decommissioned, but after the crossing Line 2 would be decommissioned. Although the 400kV line seems like it is going away from the 275kV lines, it comes back and runs parallel from tower 1ARI/VEN34 towards Ariadne Substation.

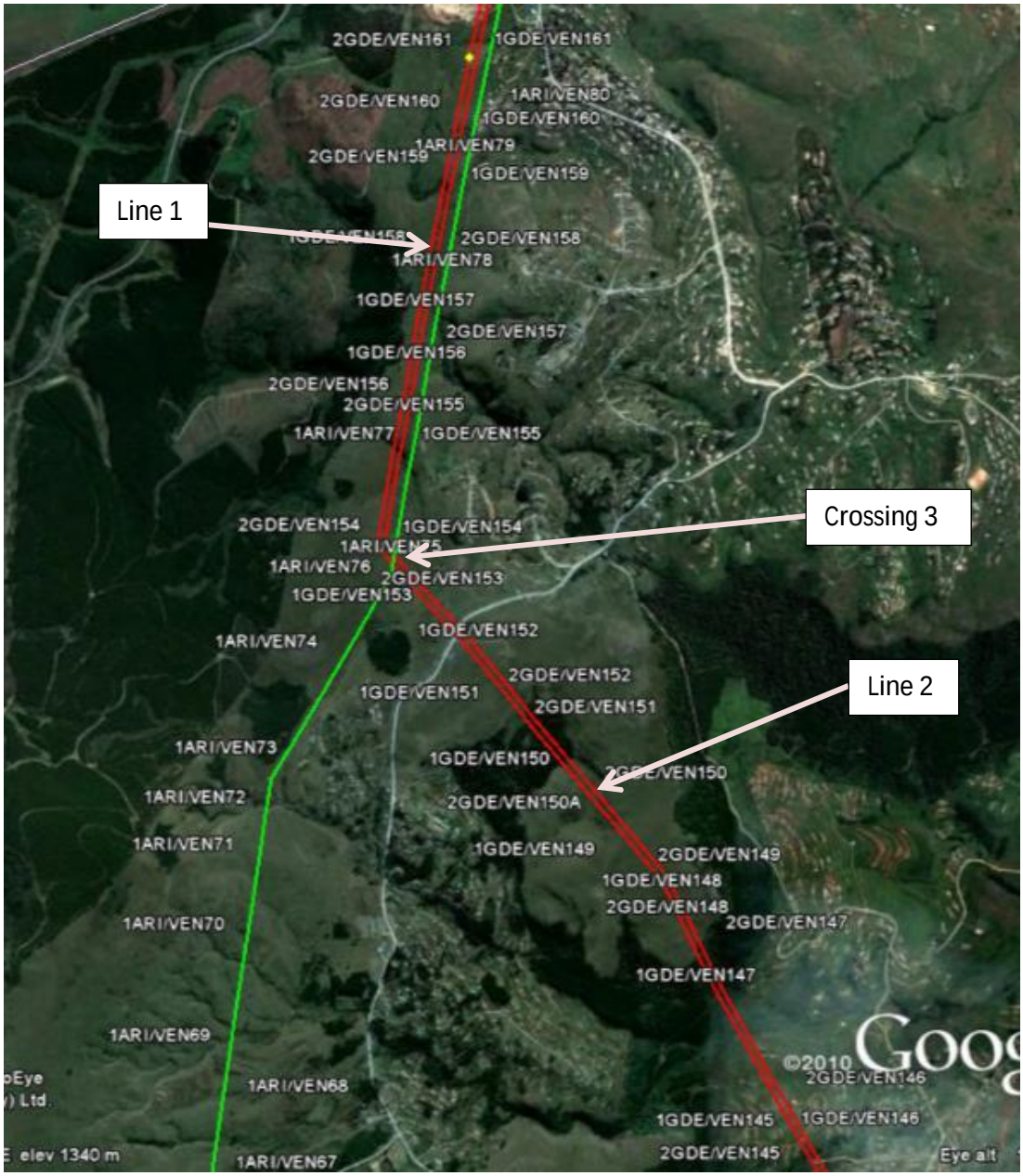


Figure 44: Crossing 3 (Swapping 4)

The fourth crossing (Figure 40) is between towers 1ARI/VEN30 and 1ARI/VEN31 of the Ariadne-Venus 1 (400kV) line. After this crossing the lines do not come back together and run parallel, the 400kV lines runs across towards Ariadne substation. Since Line 2 is the one decommissioned above the crossing, Line 2 will still be decommissioned after the crossing. This will avoid a crossing when constructing a line towards the Ariadne substation. The decommissioning will be done up to where the line crosses the Ariadne-Eros 132kV/400kV multi-circuit line (Figure 45). The multi-circuit line has high structures and it will be impossible to cross the line with 400kV towers. The new 400kV line will follow the multi-circuit line toward Ariadne substation.

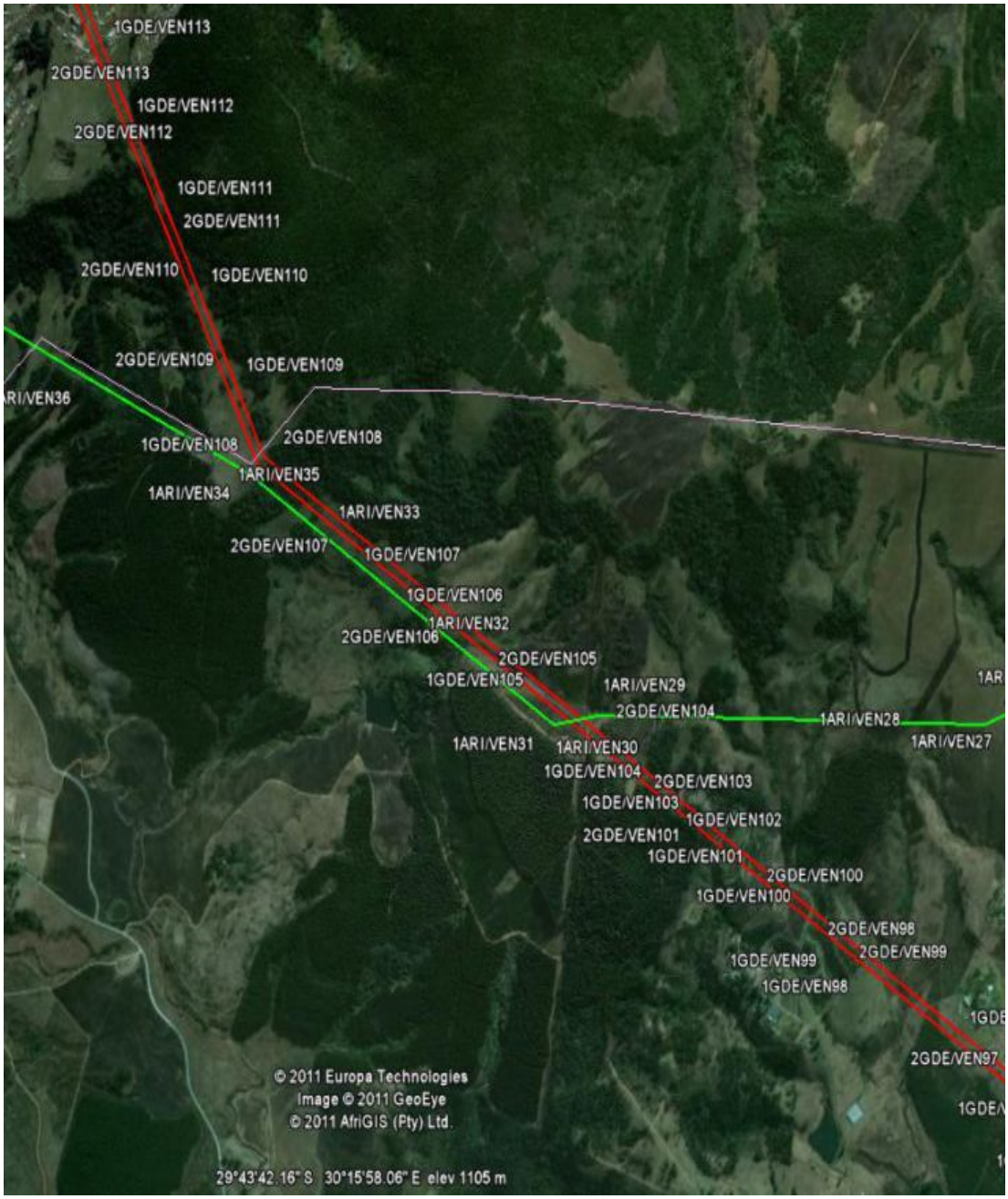


Figure 45: Crossing 4 (Swapping 4)

Figure 46: The Ariadne-Eros 132/400 kV Multi-Circuit Line Crossing

The solutions listed above are yet to be technically evaluated and compared to decommissioning one line throughout. The full design review team will look at other options and see if other solutions are cheaper and would take shorter to construct. If the swapping on the 275kV lines is done during the dismantling and decommissioning of the lines then the swapping of the 400kV line would also be recommended. But for the 400kV line swapping the motivation and reasons would be different compared to the 275kV lines. The line swapping will be done on the three line swapping done for the 275kV line. At the fourth crossing the 400kV line should be swapped too, to avoid line crossings. There are two main reasons why 400kV swapping are recommended:

1. No 400kV line will cross another 400kV line - There are limited tall structures that can be used to achieve a 400kV line crossing over another 400kV line. The cost of these structures is significant and usually not recommended unless there is no other option. The scaffolding required is also significantly larger and this will increase the cost and also lengthen the project timeline.
2. When two 400kV lines cross over another the earthwire of the line at the bottom is usually discontinued from the towers where the crossing is. This causes a lot of operating and maintenance issues and increases the fault count on the line in areas where lightning is predominant. Other mitigation solution will be required and this will also increase the cost of the project.

The benefits of doing a line swapping for the 400kV line would be to avoid the two main problems listed above. This will facilitate the ease of grid maintenance on one line without affecting the other. The main disadvantage of doing the line swapping on the 400kV lines is that outages will be required. The line swapping can only be done when the new 400kV line is completed and the substation connection is done. Both the new line and the existing line will have new labels since the lines will be swapped.

11 SUMMARY OF SPECIALISTS RECOMMENDATIONS FOR COMPARISON OF THE ALIGNMENT ALTERNATIVES IN TERMS OF PREFERENCE

The table below is a summary of the recommendations of the various specialists:

Table 34: Summary of Specialist Comparison of Alignment Alternatives

Specialist Study	Alternative 1	Alternative 1a	Alternative 1b	Alternative 2
Flora	X		X	X
Fauna	X		X	X
Avi-Fauna	X	X		
Wetland	X	X		
Heritage (HIA)	X	X	X	X
Soil & Agricultural Potential	X		X	X
Visual (VIA)	X	X		X
Economic	X	X		
SIA	X	X	X	
Town Planning & Regional	X	X	X	

BOX:

The colour used on the columns of the table above represent the colour code of the investigated corridors

In overall, all the specialists indicate a preference for Alternative 1 (recycling option), however they differ in terms of preferences with regards to Alternative 1a or 1b at the southern section of the study area (towards Ariadne Substation).

The Heritage Specialist has no preference, since none of the alternatives will have significant impacts that have been observed. This is why the Heritage Specialist considers a walkdown Phase as a key for the determination of impacts and mitigation measures.

12 IMPACT ASSESSMENT WITH THE PROPOSED MITIGATION MEASURES FOR THE PROPOSED PROJECT

The purpose of this section is to identify potential impacts and to recommend mitigation measures to minimise detrimental environmental impacts. The following are identified as possible activities that will have impacts on the environment.

12.1 IMPACTS ON FLORA

As outlined in the specialist report, once established, the power line have no to very low impact on the vegetation within the study area. This was confirmed during the site visits when the existing power line was observed. No evidence of soil erosion or other disturbance due to the power line was observed, exploitation of the veld in terms of grazing and quarries was found to have a much more significant impact than the established power line. The major concern is in terms of the edge effects of the construction phase:

- Unauthorised off-road driving;
- Removal of medicinal or aesthetic plants; and
- The harvesting of wood from drainage lines, outcrops or bush clumps for warming and cooking.

If these activities could be strictly controlled, the mitigation will be highly effective and the impact of the proposed power lines, irrespective of the alternative will be definitely very low in the long term.

12.1.1 Identified Impacts and Mitigation Measures

Potential Impact: Removal of vegetation at construction camps and borrow pits

Proposed Mitigation: Placing construction camps in already transformed areas such as cultivated fields or revamping derelict homesteads or other abandoned infrastructure. New borrow pits should be kept to the minimum; existing ones should rather be used.

Potential Impact: Harvesting of medicinal plants and wood.

Proposed Mitigation: The following mitigation is recommended:

- Contractors should make sure that the necessary medical facilities are available for their staff on site. The Health and Safety Act will most probably cover this aspect.
- Gas and electrical cooking facilities should be provided. The same apply to heating during the winter months. Open fires should be discouraged and only used under controlled circumstances as the area is prone to large fires on a regular basis. Care should especially be taken during the late winter / early spring months (Juneto September).

If successfully mitigated, the impact on the vegetation could be considered low on a local scale in the long-term.

Potential Impact: Construction of access roads

The construction of access roads will naturally result in the removal of natural vegetation especially in rugged terrain.

Potential Mitigation: Where possible, existing routes into rugged terrain should be used and enhanced. If the access roads are required to cross green fields (untransformed) areas, it is strongly recommended that the plants present be surveyed, collected for documentation at SANBI, medicinal plants rescued instead of being destroyed and rare or threatened species moved to nurseries for re-establishment after construction or used for rehabilitation in areas where construction activities had resulted in the significant loss of natural vegetation.

Potential Impact: Alien vegetation control at construction camps, within servitudes and along access roads.

Proposed Mitigation: Where encountered, declared alien vegetation should be controlled and the spread thereof proactively managed. Declared alien vegetation should be controlled and removed in compliance with the Conservation of Agricultural Resource Act and the National Environmental Management Biodiversity Act.

Table 35: Assessment of Impacts (Flora)

Construction Camp							
Nature of Impact	**Management Measures**	**Extent**	**Duration**	**Intensity**	**Frequency**	**Probability**	**Significance**
Loss of natural vegetation	Without management	2	3	3	1	4	Moderate
	With management	2	3	2	1	2	Low
Degradation of vegetation	Without management	2	3	3	1	4	Moderate
	With management	2	3	3	1	2	Low
Harvesting of medicinal plants and wood	Without management	2	3	3	1	4	Moderate
	With management	2	3	3	1	2	Low
Erosion associated with off-road driving and poor storm water management	Without management	2	3	3	2	3	High
	With management	2	3	3	2	2	Low
Borrow Pits							
Nature of Impact	**Management Measures**	**Extent**	**Duration**	**Intensity**	**Frequency**	**Probability**	**Significance**
Loss of natural vegetation	Without management	2	3	3	1	4	Moderate
	With management	2	3	2	1	2	Low

Degradation of vegetation	Without management	2	3	3	1	4	Moderate
	With management	2	3	3	1	2	Low
Erosion associated with off-road driving and poor storm water management	Without management	2	3	3	2	3	High
	With management	2	3	3	2	2	Low
Power Lines							
Nature of Impact	**Management Measures**	**Extent**	**Duration**	**Intensity**	**Frequency**	**Probability**	**Significance**
Loss of natural vegetation	Without management	2	3	3	1	4	Low
	With management	2	3	2	1	2	Very
Degradation of vegetation	Without management	2	3	3	1	4	Moderate
	With management	2	3	3	1	2	Low
Erosion associated with off-road driving and poor storm water management	Without management	2	3	3	2	3	High
	With management	2	3	3	2	2	Low
Control of alien vegetation	Without management	2	3	3	4	3	High
	With management	2	3	3	4	3	Moderate
Access Roads							

Nature of Impact	Management Measures	Extent	Duration	Intensity	Frequency	Probability	Significance
Loss of natural vegetation	Without management	2	3	3	1	4	High
	With management	2	3	2	1	2	Moderate
Degradation of vegetation	Without management	2	3	3	1	4	Moderate
	With management	2	3	3	1	2	Low
Erosion associated with off-road driving and poor storm water management	Without management	2	3	3	2	3	High
	With management	2	3	3	2	2	Low
Infringement on rare or sensitive flora habitat	Without management	2	4	4	2	3	High
	With management	1	4	4	2	3	Moderate
Control of alien vegetation	Without management	2	3	3	4	3	High
	With management	2	3	3	4	3	Moderate

12.2 IMPACTS ON FAUNA

12.2.1 Potential Impacts

The following potential impacts were identified as potentially influencing ecological processes and functioning of the study area itself as well as on regional and provincial scale:

- The loss and/or degradation of sensitive faunal habitat within the study area as a result of the construction of access roads, construction camps and other infrastructure/activities associated with the construction phase;
- The loss and/or degradation of sensitive faunal habitat as a result of tower placements;
- The loss and/or degradation of sensitive faunal habitat as a result of the operation of the new transmission power – specifically with regards to maintenance;
- The loss and/or disruption of mammal migration routes;
- The loss of regional ecosystem processes, functions and services; and
- The pollution of air, soils and surface water during the construction phase.

12.2.2 Proposed Mitigation

The following measures are proposed for the EMP and should be implemented throughout the project as required, starting in the walk down phase:

- Prohibit the loss of and degradation of sensitive faunal habitat by avoiding construction activities (both construction camps and construction or access roads) in the faunally sensitive areas (i.e. wetlands, forests, outcrops etc.) – keep all construction activities away from these areas;
- Use the walk down phase to ensure that towers are placed in areas that are not in sensitive faunal habitat areas (i.e. outside of wetlands, outcrops, forests etc.);
- Prohibit the construction of maintenance roads in any of the faunally sensitive habitat; and
- All chemicals used during the construction phase and related activities (such as oil, diesel etc.) must be properly contained and leakage of these as well as all other potential contaminants must be avoided at all costs.

Table 36: Assessment of Impacts (Fauna)

Construction Phase							
Nature of Impact	**Management Measures**	**Extent**	**Duration**	**Intensity**	**Frequency**	**Probability**	**Significance**
Sensitive faunal habitat loss/degradation: construction related	Without management	2	3	3	1	4	Moderate
	With management	2	3	2	1	2	Low
Sensitive faunal habitat loss/degradation: tower placements	Without management	2	3	3	1	4	Moderate
	With management	2	3	3	1	2	Low
Loss/disruption of mammal migration routes	Without management	2	3	3	1	4	Moderate
	With management	2	3	3	1	2	Low
Loss of regional ecosystem processes, functions and services	Without management	2	3	3	2	3	High
	With management	2	3	3	2	2	Low
Air, soil and surface water pollution: construction phase	Without management	2	2	3	1	4	Moderate
	With management	1	1	2	1	3	Low
Operation Phase							
Nature of Impact	**Management Measures**	**Extent**	**Duration**	**Intensity**	**Frequency**	**Probability**	**Significance**

Sensitive faunal habitat loss/degradation: operation (maintenance)	Without management	2	3	3	1	4	Moderate
	With management	2	3	2	1	2	Low
Loss/disruption of mammal migration routes	Without management	2	3	3	1	4	Moderate
	With management	2	3	3	1	2	Low

Decommissioning Phase							
Nature of Impact	**Management Measures**	**Extent**	**Duration**	**Intensity**	**Frequency**	**Probability**	**Significance**
Sensitive faunal habitat loss/degradation: decommissioning related	Without management	2	3	3	1	4	Low
	With management	2	3	2	1	2	Very
Loss/disruption of mammal migration routes	Without management	2	3	3	1	4	moderate
	With management	2	3	3	1	2	Low
Loss of regional ecosystem processes, functions and services	Without management	2	3	3	2	3	high
	With management	2	3	3	2	2	Low
Air, soil and surface water pollution: construction phase	Without management	2	3	3	4	3	high
	With management	2	3	3	4	3	moderate

12.3 IMPACTS ON AVI-FAUNA

12.3.1 Potential Impacts

The potential impacts regarding transmission lines on birds are follows:

- Electrocution;
- Collision;
- Loss of habitat and disturbances; and
- Poaching and trade of birds.

12.3.2 Proposed Mitigation

The following mitigations measures are proposed obligatory recommendations are applicable to the project area, and only if a Record of Decision for Alternative 1 +1a is issued by the authorities:

1. A walk down of the selected route must be conducted prior to the construction phase:

- The walk down will aim to identify areas where marking of lines by means of "deterrent devices" is considered to be beneficial or compulsory;
- All intact/primary grassland, wetland, river and drainage line crossings should by default be marked;
- Where the line crosses a wetland/river, the actual crossover span as well as one span on either side of the wetland/river/ should be marked;
- Marking devices to be used should include large dynamic "bird flappers". Spans in close proximity to crane nesting sites or areas known to provide foraging habitat should be marked by alternating between large dynamic devices and the Inotec BFD88;
- All devices should be applied in a staggered fashion to the phase while alternating between black and white diverters. The maximum distance between the diverters should not exceed 5 m; and
- A representative of EWT (preferably a field officer affiliated with the Drakensberg Crane Conservation Project) with a good local knowledge of the area should assist during the walk down.

2. Mitigation measures to be implemented during the construction/decommissioning1 phase:

- The construction sites must be confined to disturbed areas or those identified with low conservation importance. All construction sites must be demarcated on site layout plans (preferably), and no construction personnel or vehicles may leave the demarcated area except those authorised to do so. Those areas surrounding the construction sites that are not part of the demarcated development area should be considered as "no-go" areas for employees, machinery or even visitors;

[1]Decommissioning of the 275kV line

- A natural buffer zone (to be announced by the wetland specialist) should be allowed between the line servitude and any wetland or other sensitive habitat type;
- All road networks must be planned with care to minimize dissection or fragmentation of important avifaunal habitat type. Where possible, the use of existing roads is encouraged. Access must be determined during the "walk-through" process;
- The breeding status of Red listed species, in particular bustards and korhaan species, should be evaluated prior to construction/decommissioning. If breeding is confirmed, the nest site must be barricaded and appropriately buffered (by at least 500 m). Construction/ decommissioning activities shall only commence once the fledglings are successfully reared and has left the nesting site;
- Construction/decommissioning activities are not allowed within 500 m of a known crane breeding site – even when the nesting site is not in use/occupied;
- Depending on the crane species, construction/decommissioning activities should cease during the peak breeding period when within 1 km of a nesting site: May to August for Wattled Cranes and November – February for Grey Crowned Cranes. The breeding status of known nesting sites should be verified by a representative of EWT;
- It is recommended that the "cross-rope suspension" type tower be used for the proposed transmission line;
- A representative of EWT (preferably a field officer affiliated with the Drakensberg Crane Conservation Project) should oversee the construction/decommissioning activities and act as a temporary Environmental Control Officer;
- Open fires is strictly prohibited and only allowed at designated areas; and
- Killing or poaching of any bird species (in particular cranes) should be avoided by means of awareness programmes presented to the labour force. The labour force should be made aware of the conservation issues pertaining to the bird taxa occurring on the study area. Any person found deliberately harassing any bird species in any way should face disciplinary measures, following the possible dismissal from the site.

Table 37: Assessment of Impacts (Avi-Fauna)

Alternative 1a							
Nature of Impact	**Management Measures**	**Extent**	**Duration**	**Intensity**	**Frequency**	**Probability**	**Significance**
Collision	Without management	2	3	3	1	4	moderate
	With management	2	3	2	1	2	Low
Loss of habitat & disturbance	Without management	2	3	3	1	4	moderate
	With management	2	3	3	1	2	Low
Poaching & trade of birds	Without management	2	3	3	1	4	moderate
	With management	2	3	3	1	2	Low
Alternative 1b							
Nature of Impact	**Management Measures**	**Extent**	**Duration**	**Intensity**	**Frequency**	**Probability**	**Significance**
Collision	Without management	2	3	3	1	4	moderate
	With management	2	3	2	1	2	Low
Loss of habitat & disturbance	Without management	2	3	3	1	4	moderate
	With management	2	3	3	1	2	Low

Poaching & trade of birds	Without management	3	4	4	3	3	High
	With management	2	3	3	2	2	Moderate

Alternative 2							
Nature of Impact	**Management Measures**	**Extent**	**Duration**	**Intensity**	**Frequency**	**Probability**	**Significance**
Collision	Without management	4	3	4	3	3	High
	With management	3	2	3	2	2	Moderate
Loss of habitat & disturbance	Without management	3	3	4	3	3	High
	With management	2	3	3	1	2	Moderate
Poaching & trade of birds	Without management	3	3	4	3	3	high
	With management	2	3	3	2	2	Moderate

12.4 IMPACT ON WETLANDS

12.4.1. Potential Impacts

The potential impacts regarding transmission lines on birds are follows:

- Compaction of watercourse soils
- Surface flow modifications caused by access and maintenance road crossing structures
- Establishment of a substrate discontinuity and hence dispersal barrier as a result of the construction of a watercourse road crossing
- Pollution damage a result of construction vehicle refuelling and spills in drainage lines
- Loss of drainage line vegetation and habitat as a result of tower construction, new quarries and created construction camps
- Erosion damage in the form of channel bank and bed scour, as well as headcut development at permanent road crossings and towers in watercourses. Erosion risks are greatest during flooding or high rainfall events
- Encroachment of invasive alien vegetation in response to soil disturbances and deteriorating water quality
- Surface flow modifications caused by road access crossing structures to reach towers in or across watercourses that need to be removed. *Only relevant to alternatives 1a and 1b.*
- Removal of tower structures in watercourses. *Only relevant to alternatives 1a and 1b.*

12.3.2 Proposed Mitigation

The following mitigations measures are proposed obligatory recommendations are applicable to the project area:

- Avoid driving on watercourses during construction of the transmission line to prevent vehicle track incisions and the potential for channel initiation. Where this is unavoidable, crossing structures should be in place across affected wetlands and other watercourses. These crossing structures can include the following (Meyer 2002):
    - A wearing course (wear surface) should be added as a surface layer on top of geotextile fabrics, which forms base for surface capping.
    - A wearing course (surface cap) of good quality clastic or gravel material also has the potential to reduce surface scour by creating a mix that will easily bind together and minimise detachment of particles.
    - Geotextiles provide four important functions in temporary road and trail surface construction that includes separation, drainage, reinforcement, and stabilisation.
    - Geotextiles work as separation fabrics when they are placed between gravel caps and underlying soils to prevent the materials from mixing.
    - Additional benefits of such as crossing structure include:

- It defines a single route alignment for vehicle travel.
- Provides a 'wear and carry' surface over unsuitable and easily compactable wetland soils.
- This results in a stable, durable crossing surface for vehicle access, including heavy motor vehicle traffic.
- Halts the widening and the development of braided crossing sections, while formerly used track alignments are allowed to naturally stabilise and revegetate.

- Construction of access or maintenance road crossings should not be made through watercourses. Where this is unavoidable temporary structures should be used that will be removed at the end of the construction phase. Temporary crossing structures should not concentrate surface flows or storm water runoff in such a manner that they pose a risk to scour and head cut erosion, or sedimentation impacts in downstream watercourses. Permanent crossings structures should only be considered as the last resort where it is absolutely necessary and no other means of future access is available. The following recommendations are included in addition to the recommendations listed under impact 1 (Kemp 2004; Lohnes et al, 2001; Meyer 2002):
  - Management of roadside drainage is the most effective way of controlling sediment runoff from unsealed roads.
  - To minimise sediment load, an unsealed road network should have an emphasis on slowing drainage flows and dispersing them more frequently.
  - Storm water should be diverted away from the road early and often, so as to reduce the catchment area of the road.
  - The use of drains, such as table drains and cut-off drains, should not be used in any of the watercourse crossings. These types of drains typically have concentrated high-velocity flows and can frequently form channels within the watercourse. These channels provide an easy pathway for sediment to reach streams and adversely impact on water quality.
  - Alternative options for storm water control should therefore be considered. These include the use of:
    - Grass swales.
    - Entrenched rock (rip rap) aprons.
    - Sediment traps, such as hay bales or silt traps. These structures do, however, require maintenance.
    - Vegetated buffer/ filter strips. The use of vegetation in the watercourse, especially downstream of unsealed road surfaces, will help to provide soil stability and reduce sediment input. It is important to use local and indigenous plant species.
  - Permanent crossing structures across channelled watercourses can include unvented fords that are constructed of riprap, gabions, or concrete to provide a stream crossing without the use of pipes. Water will periodically flow over the crossing.
  - Unvented fords are best suited for ephemeral or intermittent streams (streams that are dry most of the year). Unvented fords may also be used across some shallow, low velocity perennial streams.
  - Other important best management practices associated with ford design, construction, operation and maintenance that should be adhered to as far as possible, include (Anon 2006):
    - Where possible locate crossings on straight channel segments (avoid meanders).

  - To the extent possible align crossings perpendicular to the stream channel.
  - Minimize the extent and duration of the hydrological disruption.
  - Use appropriate energy dissipaters and erosion control at the outlet drop.
  - Minimize impact to riparian vegetation during construction
  - Prevent excavated material from running into water bodies and other sensitive areas.
  - Use appropriate sediment barriers (silt fence and hay bales).
  - Dewater prior to excavation.
  - Check construction surveys to ensure slopes and elevations meet design specifications.
  - Use appropriately graded material (according to design specifications) that has been properly mixed before placement inside the structure.
  - Compact bed material.
- Tie constructed banks into upstream and downstream banks.
- Evaluate structure stability.
- If the construction of a crossing is unavoidable make sure that substrate continuity is maintained within upstream and downstream portion of the channel bed.
- No refuelling of construction vehicles should occur within 30 m of demarcated watercourses. Hydrocarbons should not be stored within 30 m of watercourses.
- **No towers, construction camps or quarries should not be constructed within watercourses (i.e. wetlands, riparian habitat, rivers and other natural channels).**
- The smallest possible footprint should be utilized and positioned as close to the boundary of the affected watercourse in cases where towers construction in a watercourse is unavoidable.
- Tower construction activities in these areas should be completed in the shortest possible time and preferably during the dry season.
- Excavated watercourses should be re-sloped to a stable gradient (e.g. at least a slope of 1:3), revegetated with naturally occurring indigenous species, and covered with biojute to help facilitate revegetation soon after construction.
- Towers in wetlands or other watercourses should not be located on steep slopes, channels or other surfaces with visible erosion features.
- Tower construction recommendations are the last mitigation option and all other attempts should first be attempted to prevent towers in watercourses.

- Permanent watercourse road crossings and towers in watercourses should be monitored for signs of erosion during maintenance works. Erosion features need to be stabilised once identified through appropriate stabilisation measures such as gabions, riprap and soft rehabilitation interventions such as biojute and hyson cells to address smaller erosion problems.
- Transmission line infrastructure (e.g. towers) should be located outside of demarcated watercourses with a buffer of 30m to avoid edge effects and opportunity for the encroachment of invasive alien plant species.
- Remove all alien plant infestation from the servitude. This should be a long-term action for the duration of the operation phase.

- This impact is similar to impacts 1 and 2.
- Similar mitigation measures should be followed to help mitigate these impacts.
- It is recommended that existing tower foundations are not be removed from watercourses in alternative 1a and 1b.
- Local wetland soil will, in all likelihood, not be available to refill and reshape these footprint areas, while the use of introduced soil material carries the risk of resulting in the establishment of invasive alien plant species.
- This may create an unstable environment over time and result in erosion damage in the watercourse.

Table 38: Assessment of Impacts (Wetlands)

Alternative 1a							
Nature of Impact	**Management Measures**	**Extent**	**Duration**	**Intensity**	**Frequency**	**Probability**	**Significance**
Compaction of watercourse soils	Without management	3	3	4	2	4	High
	With management	2	1	2	1	2	Moderate
Surface flow modifications caused by access and maintenance road crossing structures	Without management	4	2	3	1	4	High
	With management	2	1	1	1	3	Moderate
Establishment of a substrate discontinuity and hence dispersal barrier as a result of the construction of a watercourse road crossing	Without management	3	2	3	1	3	Moderate
	With management	2	1	2	1	2	Low
Pollution damage a result of construction vehicle refuelling and spills in drainage lines	Without management	3	3	4	2	4	High
	With management	2	2	3	1	2	Moderate

Loss of drainage line vegetation and habitat as a result of tower construction, new quarries and created construction camps	Without management	3	2	3	1	3	Moderate
	With management	2	1	2	1	2	Low
Erosion damage in the form of channel bank and bed scour, as well as head cut development at permanent road crossings and towers in watercourses. Erosion risks are greatest during flooding or high rainfall events	Without management	3	3	2	1	3	Moderate
	With management	2	2	1	1	1	Low
Encroachment of invasive alien vegetation in response to soil disturbances and deteriorating water quality	Without management	3	3	3	1	3	High
	With management	2	2	2	1	1	Moderate
Surface flow modifications caused by road access crossing structures to reach towers in or across watercourses that need to be removed.	Without management	3	3	3	1	3	High

Only relevant to alternatives 1a and 1b.	With management	2	2	1	1	2	Moderate
Removal of tower structures in watercourses. *Only relevant to alternatives 1a and 1b.*	Without management	3	3	3	1	4	high
	With management	2	3	2	1	2	Low
Alternative 1b							
Nature of Impact	**Management Measures**	**Extent**	**Duration**	**Intensity**	**Frequency**	**Probability**	**Significance**
Compaction of watercourse soils	Without management	3	3	4	2	4	High
	With management	2	2	2	1	2	Moderate
Surface flow modifications caused by access and maintenance road crossing structures	Without management	3	2	3	2	3	Moderate
	With management	2	1	2	1	2	Low
Establishment of a substrate discontinuity and	Without management	3	2	3	1	3	Moderate

hence dispersal barrier as a result of the construction of a watercourse road crossing	With management	2	1	2	1	2	Low
Pollution damage a result of construction vehicle refuelling and spills in drainage lines	Without management	3	2	3	2	4	high
	With management	2	3	2	1	2	Moderate
Loss of drainage line vegetation and habitat as a result of tower construction, new quarries and created construction camps	Without management	4	3	3	3	4	High
	With management	2	3	2	1	2	Moderate
Erosion damage in the form of channel bank and bed scour, as well as head cut development at permanent road crossings and towers in watercourses. Erosion risks are greatest during flooding or high rainfall events	Without management	3	3	4	1	4	High
	With management	2	2	2	1	2	Moderate

Encroachment of invasive alien vegetation in response to soil disturbances and deteriorating water quality	Without management	3	3	3	2	4	High
	With management	2	2	1	1	3	Moderate
Surface flow modifications caused by road access crossing structures to reach towers in or across watercourses that need to be removed. *Only relevant to alternatives 1a and 1b.*	Without management	3	3	3	1	3	High
	With management	2	2	1	1	2	Moderate
Removal of tower structures in watercourses. *Only relevant to alternatives 1a and 1b.*	Without management	2	3	3	1	4	High
	With management	1	2	2	1	3	Moderate

Alternative 2							
Nature of Impact	**Management Measures**	**Extent**	**Duration**	**Intensity**	**Frequency**	**Probability**	**Significance**
Compaction of watercourse soils	Without management	4	3	3	1	4	High
	With management	2	2	2	1	2	Moderate
Surface flow modifications caused by access and maintenance road crossing structures	Without management	4	3	4	1	4	High
	With management	3	2	2	1	3	Moderate
Establishment of a substrate discontinuity and hence dispersal barrier as a result of the construction of a watercourse road crossing	Without management	3	3	3	1	4	High
	With management	2	2	2	1	2	Moderate
Pollution damage a result of construction vehicle refuelling and spills in drainage lines	Without management	4	3	4	1	4	High
	With management	3	2	3	1	3	Moderate

Loss of drainage line vegetation and habitat as a result of tower construction, new quarries and created construction camps	Without management	3	3	4	1	4	High
	With management	2	2	3	1	3	Moderate
Erosion damage in the form of channel bank and bed scour, as well as head cut development at permanent road crossings and towers in watercourses. Erosion risks are greatest during flooding or high rainfall events	Without management	3	4	3	2	3	High
	With management	2	3	2	1	2	Moderate
Encroachment of invasive alien vegetation in response to soil disturbances and deteriorating water quality	Without management	3	3	4	1	4	High
	With management	2	2	3	1	3	Moderate
Surface flow modifications caused by road access crossing structures to reach towers in or across watercourses that need to be removed.	Without management	3	3	4	2	4	High

Only relevant to alternatives 1a and 1b.	With management	2	2	3	1	3	Moderate
Removal of tower structures in watercourses. *Only relevant to alternatives 1a and 1b.*	Without management	3	3	4	2	4	High
	With management	2	2	3	1	3	Moderate

12.5 IMPACTS ON AGRICULTURE

12.5.1 Potential Impacts

The potential impacts on agricultural activities include:

- Impact on stock farming activities;
- Impact on timber farms and plantations; and
- Impact on agricultural and irrigation activities.

12.5.2 Potential Mitigation

The following mitigation measures are proposed:

- Eskom should discuss the construction schedule and activities with the affected farmers to enable them to plan their farming activities and animal movement accordingly.
- Conditions and/or specific requests relating to construction activities raised by property owners should be included in the EMP.
- Placement of the line and towers should preferably not impact on income generating activities.
- Sensitivities with regards to farming practices should be considered when finalising a line alignment.
- The location of the construction camp where workers would be housed should be carefully considered to limit any possible negative social impacts.
- The construction camp should be located near support services, and ideally not in the vicinity of residential dwellings.
- Construction camp management should adhere to the EMP specifications.

Table 39: Assessment of Impacts (Agriculture)

Construction Phase							
Nature of Impact	**Management Measures**	**Extent**	**Duration**	**Intensity**	**Frequency**	**Probability**	**Significance**
Impact on Stock farming activities	Without management	2	3	3	1	4	Moderate
	With management	2	3	2	1	2	Low
Impact on timber farms and plantations	Without management	2	3	3	1	4	Moderate
	With management	2	3	3	1	2	Low
Impact on Agricultural and Irrigation Activities	Without management	2	3	3	1	4	Moderate
	With management	2	3	3	1	2	Low
Operation Phase							
Nature of Impact	**Management Measures**	**Extent**	**Duration**	**Intensity**	**Frequency**	**Probability**	**Significance**
Impact on Stock farming activities	Without management	4	3	3	1	4	High
	With management	2	3	2	1	2	Moderate
Impact on timber farms and plantations	Without management	3	3	3	1	4	Moderate
	With management	2	3	2	1	2	Low

Impact on Agricultural and Irrigation Activities	Without management	3	3	4	1	4	High
	With management	2	2	3	1	3	Moderate

12.6 IMPACTS ON THE SOCIAL ENVIRONMENT

12.6.1 Potential Impacts

The potential impacts on the social environment include:

- Impacts on Existing Residential area and Estates;
- Impacts on Towns and Dense settlement;
- Impacts on Schools and College;
- Impacts on Tourism;
- Impact on Land Value; and
- Inflow of workers.

12.6.2 Proposed Mitigation

The following mitigatory measures are proposed:

- Should relocation be required, residents should be resettled nearer to their places of work and amenities.
- Avoid placing the transmission line in close view of restaurants and accommodation facilities where the visual beauty of the area is the main attraction.
- Avoid placing the transmission line across properties used for eco-tourism and leisure activities, such as horse riding and horse-based tourism. Should avoidance not be possible, the alignment should avoid the main activity areas and preferably be placed on the border of the properties.
- Avoid placing the transmission line across nature reserves at all costs.
- Avoid negatively impacting on the Midmar Dam area and its potential for further development as a key tourism node.
- Placement of a new transmission line along the N3 in those sections of the study area where numerous tourism establishments are situated, could limit the negative impacts on the tourism industry rather than placing the new proposed transmission line in close proximity to these tourism establishments. This could be considered as an option in the central section of the study area and e.g. the Curry's Post area depending on an agreement with the affected property owners and whether technically feasible.
- Careful consideration should be given to the tower designs in order to minimise impacts on existing structures and activities on affected properties.
- Careful consideration should be given to the final route alignment and tower placements to ensure minimal disruption of resources and infrastructure, especially on the smaller properties.
- Where possible, towers should be placed on the border of properties. The negotiation process would have to determine whether this is acceptable for the property owners involved and whether feasible.
- Recycling / Upgrading of the existing 275kV line would be preferred.

Table 40: Assessment of Impacts (Social)

Construction Phase							
Nature of Impact	**Management Measures**	**Extent**	**Duration**	**Intensity**	**Frequency**	**Probability**	**Significance**
Impacts on Existing Residential area and Estates	Without management	2	3	3	1	4	Moderate
	With management	2	3	2	1	2	Low
Impacts on Towns and Dense settlement	Without management	2	3	3	1	4	Moderate
	With management	2	3	3	1	2	Low
Impacts on Schools and College	Without management	2	3	3	1	4	Moderate
	With management	2	3	3	1	2	Low
Impact on Land Value	Without management						
	With management						
Operation Phase							
Nature of Impact	**Management Measures**	**Extent**	**Duration**	**Intensity**	**Frequency**	**Probability**	**Significance**
Impacts on Existing Residential area and Estates	Without management	2	3	3	3	4	High
	With management	2	3	2	1	2	Moderate
Impacts on Towns and Dense settlement	Without management	4	3	4	3	4	High

	With management	2	3	3	1	2	Moderate
Impacts on Schools and College	Without management	3	4	4	3	3	High
	With management	2	3	3	2	2	Moderate
Impact on Land Value	Without management	4	3	4	3	3	High
	With management	3	2	3	1	2	Moderate

12.7 IMPACTS ON THE VISUAL ENVIRONMENT

12.7.1 Potential Impacts

The potential impacts on the visual environment include:

- Impact on sense of place;
- Visual Intrusion and reduction of open space;
- Deposition of litter; and
- Night light.

12.7.2 Proposed Mitigation

The following mitigation measures are proposed:

- Avoid placing the proposed transmission line within nature reserves and conservation areas.
- Consider placing the proposed transmission line along the N3 for sections of the route, if the property owners agree.
- Careful consideration should be given to the type of towers to be used to ensure the least intrusive technology possible.
- Avoid tourism nodes where possible.
- Mitigation measures as proposed by the Visual Impact Assessment should be strictly adhered to.
- No litter, refuse, waste, rubble and builder's waste generated on the premises are to be placed, dumped or deposited on adjacent/surrounding properties including road verges, roads or public places and open spaces during or after the construction period of the proposed development. Refuse must be disposed of at a dumping site approved by the Council. Site cleaning and screening of storm water outlets is essential to prevent large debris from impacting on stream banks downstream of the site. Dustbins must be provided at strategic places within the construction area, and cleared at regular intervals as required to avoid overflow.
- The construction site must be kept in a clean and orderly state at all times. All signs and advertisements erected for the development and within its confines must be in line with the guidelines of the South African Manual for Outdoor Advertising Control.
- Security lights in the construction camp are to be angled downwards and into the centre of the site to avoid disturbance to adjoining residents. No tall lighting masts are to be erected or operated during the construction or operational phases. Only standard height lighting poles (shorter than 3m) may be used.

Table 41: Assessment of Impacts (Visual)

Construction Phase							
Nature of Impact	**Management Measures**	**Extent**	**Duration**	**Intensity**	**Frequency**	**Probability**	**Significance**
Impacts on Existing Residential area and Estates	Without management	2	3	3	2	4	Moderate
	With management	2	3	2	1	2	Low
Impacts on Towns and Dense settlement	Without management	2	3	3	4	4	Moderate
	With management	2	3	3	2	2	Low
Impacts on Schools and College	Without management	2	3	3	1	4	Moderate
	With management	2	1	2	1	2	Low
Impact on Land Value	Without management	3	4	3	3	3	High
	With management	2	3	1	2	2	Moderate
Operation Phase							
Nature of Impact	**Management Measures**	**Extent**	**Duration**	**Intensity**	**Frequency**	**Probability**	**Significance**
Impacts on Existing Residential area and Estates	Without management	2	3	3	1	4	Moderate
	With management	2	3	2	1	2	Low
Impacts on Towns and Dense settlement	Without management	2	3	3	1	4	Moderate

	With management	2	3	3	1	2	Low
Impacts on Schools and College	Without management	3	3	4	2	3	Moderate
	With management	2	2	3	1	2	Low
Impact on Land Value	Without management	3	4	3	4	3	High
	With management	2	3	1	2	2	Moderate

12.8 IMPACTS OF THE CONSTRUCTION CAMPS

12.8.1 Potential Impacts

The potential impacts of the construction camps include:

- Health risk;
- Safety and security risks;
- Deposition of contaminants;
- Stockpiling of Construction Materials; and
- Oil Spillages.

12.8.2 Proposed Mitigation

The following mitigation measures are proposed:

- Staff or personnel should be properly trained in handling of their equipments in order to avoid oil spillage that will increase deposition of contaminants. Construction camps should not be positioned in areas that has natural vegetation, preferably highly transformed area or already paved areas that do not have conservation value should be used.
- Construction vehicles should take into cognizance of peak hour traffic and they should avoid movement during those period. The speed of construction vehicles within the built up area should be limited to 40km/h.
- Careful consideration should be given to storm water control that will result in compaction or paving of surfaces within construction camps.
- Clearance of vegetation should only be done on areas that deem absolutely necessary.
- The areas to be cleared for roads and services should be restricted only to those that are essential for the operation and should be clearly demarcated. Construction vehicles and workers should not stray from these areas. All building rubble from the demolition of current structures is to be removed immediately in appropriate manner. The period between vegetation clearing and construction of the infrastructure must be kept to a minimum.
- Stockpiles are to be covered during windy conditions and material stockpiled for longer periods should be retained in a bermed area. Excavated and stockpiled soil material are to be stored and bermed on the higher lying areas of the site and not in any storm water run-off channels or any other areas where it is likely to be eroded or where water would naturally accumulate.
- Refuse collection should take place on a regular basis. A litter patrol around the construction area is to take place twice a week to collect any litter that may have been strewn around. Adequate provision must be made for sanitation of the construction workers. Chemical toilets on site are to be emptied regularly so as to prevent overflow. In addition, construction materials that are left over after completion of the development are to be removed from the site and disposed of in an appropriate manner.

- Storage of potentially hazardous materials should be above the 100-year flood line, or as agreed with the ECO. These materials include fuel, oil, cement, etc. Surface water draining off contaminated areas containing oil and petrol must be channelled towards a sump, which will separate these chemicals and oils. Oil residue shall be treated with oil absorbent products such as Drizit or similar and this material removed to an approved waste site.

Table 42: Assessment of Impacts (Construction Camps)

Construction Phase							
Nature of Impact	**Management Measures**	**Extent**	**Duration**	**Intensity**	**Frequency**	**Probability**	**Significance**
Health risk	Without management	2	3	3	1	4	Moderate
	With management	2	3	2	1	2	Low
Deposition of contaminants	Without management	2	3	3	1	4	Moderate
	With management	2	3	3	1	2	Low
Stockpiling of Construction Materials	Without management	2	3	3	1	4	Moderate
	With management	2	3	3	1	2	Low
Oil Spillages	Without management	2	3	3	4	4	High
	With management	1	2	2	2	2	Low
Increase volume of Traffic	Without management	3	3	4	2	4	High
	With management	2	2	3	1	2	Moderate
Operation Phase							
Nature of Impact	**Management Measures**	**Extent**	**Duration**	**Intensity**	**Frequency**	**Probability**	**Significance**
Health risk	Without management	3	3	3	2	4	High

	With management	1	2	2	1	2	Low
Deposition of contaminants	Without management	2	3	3	1	4	Moderate
	With management	1	2	2	1	2	Low
Stockpiling of Construction Materials	Without management	3	3	3	3	2	Moderate
	With management	2	2	1	2	1	Low
Oil Spillages	Without management	3	2	4	2	3	Moderate
	With management	2	1	2	1	2	Low

12.9 CRIME, SAFETY AND SECURITY

12.9.1 Potential Impacts

The potential impacts include:

- Safety of personnel and equipment;
- Increase activity and vigilance;
- Decrease in uncontrolled criminal areas; and
- Increased crime and reduction in personal safety.

12.9.2 Proposed Mitigation

The following mitigation measures are proposed:

- The associated risk of increased crime due to work staff being located on site would be reduced if the number of staff and people on site were limited. The site and crew are to be managed in strict accordance with the Occupational Health and Safety Act, 1993 (Act 85 of 1993) and the National Building Regulations.
- Ensure that the handling of equipment and materials is supervised and adequately instructed. The entrance will have to be supervised to monitor entry and exit.
- Adequately barricade any exposed excavations or erect warning signs to notify the public of the inherent dangers. The contractor must have 24-hour security during the construction phase.
- Ensure that construction vehicles are under the control of competent personnel.
- Adequate facilities should be provided on site to treat emergencies to staff.
- No fires should be allowed on site.
- Access should be limited to the construction crew camp only to the workforce. Congregation of informal workers in front of the entrance/exist road should not be allowed. Vehicles used for construction are to be in good working condition, and not the source of excessive fumes.
- The maintenance of fire breaks by landowners is of critical importance.
- The servitude should be monitored on an ongoing basis.
- Eskom should take a strong stance with regard to the illegal entering of the servitude areas and people erecting building in the servitude. Such dwellings should be removed immediately.
- Eskom should, in conjunction with the local municipalities, develop an emergency management plan to specifically deal with the increased risk of fires from possible flash overs.
- Eskom should engage with the Working on Fire Programme managers to ensure the threat of wildfire is managed.

Table 43: Assessment of Impacts (Crime, Safety and Security)

Construction Phase							
Nature of Impact	**Management Measures**	**Extent**	**Duration**	**Intensity**	**Frequency**	**Probability**	**Significance**
Safety of personnel and equipment	Without management		3	3	1	4	moderate
	With management	2	3	2	1	2	Low
Increase activity and vigilance. Decrease in uncontrolled criminal areas.	Without management	3	3	3	1	4	moderate
	With management	2	2	3	1	2	Low
Increased crime and reduction in personal safety	Without management	2	3	3	1	4	moderate
	With management	1	2	2	1	2	Low
Operation Phase							
Nature of Impact	**Management Measures**	**Extent**	**Duration**	**Intensity**	**Frequency**	**Probability**	**Significance**
Safety of personnel and equipment	Without management	2	3	3	1	4	Moderate
	With management	2	3	2	1	2	Low
Increase activity and vigilance. Decrease in uncontrolled criminal areas.	Without management	4	3	3	1	4	Moderate
	With management	2	3	3	2	2	Low
Increased crime and reduction in personal	Without management	3	2	3	2	3	Moderate

safety	With management	1	1	2	2	1	Low

13. CUMULATIVE IMPACTS

Cumulative impacts result from actions, which may not be significant on their own, but which are significant when added to the impact of other similar actions. Cumulative impacts relating to this development include:

- Traffic;
- Crime
- The contribution of vegetation clearing;
- Earthworks; and
- Surface water pollution.

The biggest impact will be during construction due to the added air and noise pollution as well as the disturbance it might cause other stakeholders. These impacts will be over a relatively long to medium period of time.

14. RESIDUAL IMPACTS

Residual impacts are those that are likely to remain, notwithstanding the implementation of mitigation measures. Potential residual impacts are those associated with the following:

- Limited Faunal displacement and destruction;
- Limited Floral destruction;
- An increase in ambient noise levels;
- Reduce viability of agricultural potential land;
- Visual Impact; and
- The maintenance of the storm water management system to ensure limited effect on the valley bottom and sites further down the system is essential especially on the substation sites.
- Storm water must be relayed within a storm water management system and end up in attenuation ponds to be released at a similar rate as the current water flow rate on site. This will ensure significantly limit soil erosion.

15. DRAFT ENVIRONMENTAL MANAGEMENT PLAN

An important component of the EIR is the section dealing with the EMP for construction. The EMP outlines the mitigation and monitoring measures for avoiding or minimizing negative impacts and optimizing benefits during project implementation. In this regard, the EMP provides a critical link between the mitigation measures described in the EIR and their actual implementation. Please refer to Appendix E for a copy of the Draft EMP.

16. ENVIRONMENTAL IMPACT STATEMENT (EIS)

16.1 INTRODUCTION

The Environmental Impact Assessment study conducted for the proposed 400kV line between Ariadne-Venus substation is believed to fulfil the NEMA EIA regulation 2006. This Draft EIR was compiled in adherence to regulatory requirements, particularly Regulation 385 published in terms of the National Environmental Management Act, 1998 (Act 107 of 1998). The necessary steps have been taken to provide Interested and Affected Parties to participate in the identification of project impacts, alternatives and other issues that deemed further investigation during the EIA process.

The specialist studies were conducted in relation to key issues identified during scoping process. The specialist studies conducted covered the biophysical, social, cultural and economic environment while addressing issues pertaining the project alternatives as well as potential impacts whereby mitigation measures were recommended.

16.2 GENERAL FINDINGS

It was found that the study area is rich in biodiversity in terms of flora, fauna, and avi-fauna and many Red Data species were identified across the taxa. The most notable threatened species of high conservation value within the study area were crane species. Most habitats associated with crane species were delineated or marked as highly sensitive areas and all efforts were made to ensure that the preferred corridors avoided those sensitive areas. Other sensitive areas that were taken into cognizance were based on agriculture in terms of commercial (avoiding centre pivot point), social (avoiding resettlement, school, and other infrastructure) whereby the preferred corridors should avoid those areas.

The construction and operation of transmission lines will have negative effects on the environment. However, when appropriate mitigations are implemented, the intensity of the impacts is reduced.

After careful consideration of the key aspects of environment (i.e. biophysical, social and economic aspects), the preferred corridor is Alternative 1b. There was not much distinction between Alternative 1a and Alternative 1b,but Alternative 1b was chosen on the basis that it follows two existing 275kV until where it turns into Ariadne Substation. Therefore, it makes sense that the recycling or decommissioning of one of the two existing 275kV line in favour of the proposed new 400kV line be decommissioned in its entirety.

16.3 RECOMMENDATIONS

Baagi Environmental Consultancy as an Independent Environmental Practitioner for the proposed 400kV line between Ariadne and Venus Substation recommend the authorisation of the Alternative 1b (see figure 47) with the following conditions:

- Compilation of a detailed decommissioning report outlining the process of how the existing towers will be dismantled and how waste will be dealt with.
- Compilation of a dedicated decommissioning EMP be requested and the document must at least include the following:
  - The sequence of activities for decommissioning the lines;
  - Compilation of a decommissioning EMP should be compulsory for the successful contractor;
  - Landowners' special conditions; and
  - Defined communication channels between Eskom, the contractor and affected land owners;
- The decommissioning EMP must be made available to affected landowners as well as other interested parties for review prior submission to department for approval.
- Compensation for temporary loss of agricultural productivity during construction, including the loss of crops, fruit trees and grazing.
- Appointment of an independent and suitably experienced Environment Control Officer to ensure compliance with the mitigation measures and/or management actions.
- Appointment an independent and qualified botanist to ensure that all construction activities including access roads, working areas and tower assembly sites comply with the mitigation measures and/or management actions as specified in the Flora Specialist Report.
- Avoidance and/minimisation visual impacts on tourism-related cultural heritage sites.
- Avoidance of sensitive birding habitats and, where the need is indicated, the use of bird flappers and bird guards on conductors and towers respectively.
- Development of a Fire Safety and Response Plan to deal with accidental fires and to address training requirements and reporting procedures.
- That the construction personnel must undergo safety and awareness training on wild animals, including rescue and poaching.
- Where possible, use must be made of existing access roads.
- Fires must be restricted to designated areas and designed to limit the risk of spreading to the surrounding environment.
- Driving at high speeds should be prohibited.
- Construction activities must be restricted to daylight hours. No construction should take place at night.
- All bush clearing activities should be considered in terms of slope (steepness) and soil type (such as duplex soils).
- All waste material must be collected at designated temporary waste disposal areas and transported to a licensed municipal site disposal site. Waste must not be stored on-site for longer the maximum, legal stipulated time.
- Construction activity-related noise and lighting should be kept to a minimum.
- All existing large trees that fall outside the construction area must be retained. These will assist to soften the forms of structures and to obscure views to them.

- Mitigation measures during post-construction must focus on the rehabilitation of the construction areas and access roads.
- A clear and efficient communication channel must be established between Eskom and Planning authorities (local and regional spheres) in order to address potential incompatibilities with present and future land use.

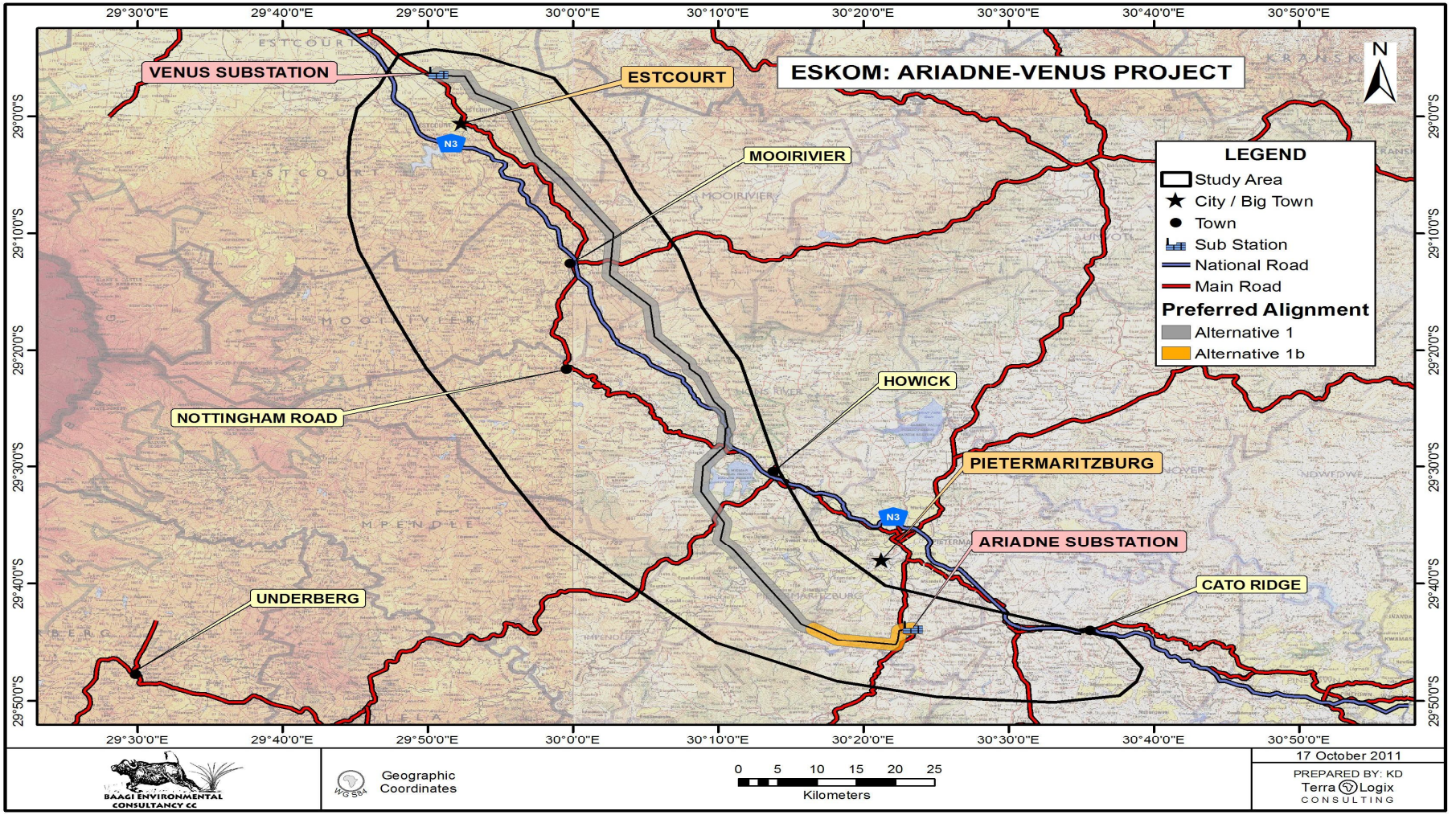


Figure 47: Configuration map of the preferred corridor (alternative 1b).

17. OPIOINION ON THE CONDITIONS OF THE ENVIRONMENTAL AUTHORISATION

It is the opinion of the EAP that the proposed 400kV line between Ariadne and Venus Substation and the refurbishment, upgrade and extension should be authorised based on the Environmental Impact Report that is in adherence to regulatory requirements, Regulation R385 published in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998).

All comments received during Public Participation Process and detailed specialist report are included in this Final Environmental Impact Report.

The following conditions should form part of the EA:

- Strict environmental control must be applied by the proponent on contractors and staff to ensure that the impact on the areas is limited.
- The EMP in its totality must be adhered to.
- On completion, a management plan must be drawn up for the management of the sensitive areas.
- A Specialist walk down is critical for compilation of final Construction EMP.
- On the ground that alternative 1b is approved then dedication Decommissioning EMP must be compiled and approved by authority
- A rehabilitation plan need to be compiled for decommissioning and construction process
- Waste management Plan need to be compiled for decommissioning process
- All mitigation measures proposed needed to be carried forward in the implemented of the project
- During Negotiation process of acquiring the servitude by applicant, we recommend that all land owners conditions be captured and carried forward to form part of final Environmental Management Programme.

APPENDIX A: ABRIDGED CV OF THE EAP

APPENDIX B: NATIONAL DEPARTMENT OF ENVIRONMENTAL AFFAIRS ACCEPTANCE LETTER

APPENDIX C: PUBLIC PARTICIPARTION REPORT

APPENDIX D: ISSUES AND RESPONSE REPORT

APPENDIX E: DRAFT ENVIRONMENTAL MANAGEMENT PLAN

APPENDIX F: ELECTRO-MAGNETIC REPORT

APPENDIX G: FINAL DECOMMISSIONG REPORT

APPENDIX H: SPECIALIST REPORTS