ESKOM TRANSMISSION

PROPOSED ARIADNE-EROS 400/132 KV MULTI-CIRCUIT TRANSMISSION POWER LINE FROM ARIADNE SUB-STATION TO EROS SUB-STATION AND THE EXPANSION AND UPGRADE OF THE ARIADNE SUB-STATION (DEA EIA: 12/12/20/1272) AND THE EROS SUB-STATION (DEA EIA: 12/12/20/1277), KWAZULU-NATAL

FINAL ENVIRONMENTAL IMPACT ASSESSMENT REPORT

ESKOM TRANSMISSION

Proposed Ariadne-Eros 400/132 kV Multi-circuit Transmission Power Line from Ariadne Sub-station to Eros Sub-station and the expansion and upgrade of the Ariadne Sub-station (DEA EIA: 12/12/20/1272) and The Eros Sub-station (DEA EIA: 12/12/20/1277), KwaZulu-Natal

FINAL ENVIRONMENTAL IMPACT ASSESSMENT REPORT

Report prepared for:

Eskom Transmission
PO Box 1091
Johannesburg
2000

Report prepared by:

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CHANGE IN INFORMATION

INCLUSION OF FOUR NEW ALTERNATIVES

[Included for record purposes]

Following the public review (05 March 2010 - 23 April 2010) of the Draft Environment Impact Assessment Report including a series of public and stakeholder meetings held within the study area, the EAP undertook to investigate additional corridor alternatives in response to concerns raised by stakeholders. The details of the alternatives are contained in the Executive Summary and Chapter 3 of this report.

This report, the Revised Draft Environment Impact Assessment Report, contains the outcomes of the environmental assessment of the additional corridor alternatives. This report also includes a record of comments received from stakeholders (Appendices 2 and 3) and additional specialist studies (Appendix 7).

The Revised Draft EIA Report will be available for public comment during the period 29 October 2010 - 29 November 2010. Following this comment period, a Final EIA Report will be compiled and submitted to the competent authority, the Department of Environmental Affairs for review and decision-making.

YOUR COMMENTS PLEASE
[Included for record purposes]

Please submit your comments to
Candace Brown/Nolwandle Nkwanyana/Percy Langa Ariadne-Eros EIA Public Participation Office ACER (Africa) Environmental Management Consultants PO Box 503, Mtunzini, 3867 Tel: 035-3402715 or 0860104958 Fax: 035-3402232 Email: eskomAE@acerafrica.co.za
The due date for comments on the Revised Draft Environmental Impact Assessment Report is 29 November 2010

REVISED DRAFT ENVIRONMENTAL IMPACT ASSESSMENT REPORT DISTRIBUTION

[Included for record purposes]

This report is available for public review and will be distributed to key stakeholders (CD copies), posted on the website (www.eskom.co.za/eia) and lodged in the following public venues.

uMgungundlovu District Municipality			
Area	**Venue**	**Street Address**	**Telephone Number**
Pietermaritzburg	uMgungundlovu District Municipality	242 Langalibalele Street Pietermaritzburg	(033) 897 6709
Pietermaritzburg	Msunduzi Local Municipality	City Hall, cnr Church and Chief Albert Luthuli Street Pietermaritzburg	(033) 392 2011
Pietermaritzburg	Pietermaritzburg Public Library	260 Church Street	(033) 392 2634
Camperdown	Mkhambathini Local Municipality	18 Old Main Road, Camperdown	(031) 785 9300 (031) 785 9313
Camperdown	Camperdown Public Library	18 Old Main Road, Camperdown	(031) 785 1742
Richmond	Richmond Local Municipality	57 Shepstone Street, Richmond	(033) 212 2155
Richmond	Richmond Public Library	57 Shepstone Street, Richmond	(033) 212 2155

Ugu District Municipality - Vulamehlo Local Municipality			
Area	**Venue**	**Street Address**	**Telephone Number**
Port Shepstone	Ugu District Municipality	28 Connor Street, Port Shepstone	(039) 688 5700
Port Shepstone	Hibiscus Coast Local Municipality	10 Connor Street, Port Shepstone	(039) 688 2000
Port Shepstone	Port Shepstone Public Library	10 Connor Street, Port Shepstone	(039) 688 2000
Scottburgh	uMdoni Local Municipality	Williamson Street, Scottburgh	(039) 976 1202
Scottburgh	Public Library	Williamson Street, Scottburgh	(039) 976 1202
Dududu	Vulamehlo Local Municipality	Main Road, Dududu (opposite Dududu Police Station)	(039) 974 0450 (039) 974 0452
uMzinto	uMzinto Public Library	Main Road, uMzinto	(039) 974 1121
Hibberdene	uMzumbe Local Municipality	Sipho Funa Road, Hibberdene	(039) 972 0005
Hibberdene	Public Library	124 Minerva Crescent, Hibberdene	(039) 699 2020
Ezingolweni	Ezingolweni Local Municipality	Main Harding Road, Ezinqoleni	(039) 534 1582 (039) 534 1584
Ezinqoleni	Ezinqoleni Library	Main Harding Road	(039) 534 1582/4
Harding	uMuziwabantu Local Municipality	Murchison Street, Harding	(039) 433 1205
Harding	Harding Public Library	Murchison Street, Harding	(039) 433 1205
eThekwini District Municipality - Vulamehlo Local Municipality			
Area	**Venue**	**Street Address**	**Telephone Number**
Durban	eThekwini District Municipality	City Hall, West Street, Durban	(031) 311 2110
Durban	Public Library	City Hall, Pixley Ka Seme Street, Durban City Centre	(031) 311 1111
Sisonke District Municipality - uMzimkhulu Local Municipality			
Area	**Venue**	**Street Address**	**Telephone Number**
Ixopo	Sisonke District Municipality	40 Main Road, Ixopo	(039) 834 8700
uMzimkhulu	uMzimkhulu Local Municipality	169 Main Street, uMzimkhulu	(039) 259 5000 / 147 / 391

The following methods of review of the report are available:

- Completing comment sheets.
- Additional written submissions.
- Comment by email, fax or telephone.
- No public and/or stakeholder meetings will be held during this round of public comment.

EXECUTIVE SUMMARY

INTRODUCTION

As a public utility for South Africa, Eskom is responsible for generation, transmission and distribution of electricity in South Africa. Coal-fired stations provide most of the power, supplemented by additional energy sources such as nuclear and wind. Eskom is faced with an increasing demand for power and the need to improve service quality and reliability in South Africa.

As part of Eskom's plans to address this situation, Eskom Transmission proposes to strengthen its supply network by constructing transmission lines from Mpumalanga (Alpha Sub-station, Standerton) to KwaZulu-Natal (Eros Sub-station, Harding). The new transmission lines will run a total distance of 470 km.

For the purposes of project management and environmental authorisation, the continuous transmission network linking the Alpha Sub-station to the Eros Sub-station has been divided into four separate sections. Each of the four sections of the project will be separately managed and undergo separate environmental authorisation processes. This report deals with the environmental impact assessment (EIA) process Section 4, viz.:

> **Section 4: A 400 kV/132 kV multi-circuit transmission line from the Ariadne Sub-station (near Pietermaritzburg) to the vicinity of Oribi Sub-station (near Port Shepstone) and the continuation of a single circuit 400kV line to the Eros Sub-station (near Harding), including the expansion and upgrade of the Ariadne and Eros Sub-stations. The proposed line will follow a coastal route over a distance of approximately 178 km.**

In accordance with environmental best practice and environmental legislation, Eskom has appointed ACER (Africa) Environmental Management Consultants as the Environmental Assessment Practitioner responsible for identifying the environmental aspects relevant to the proposed Ariadne-Eros Transmission Line.

This Environmental Impact Assessment Report (EIAR) has been compiled in accordance with the requirements of the National Environmental Management Act (NEMA) (Act 107 of 1998). Of particular importance is Government Notice Regulation 385, published on 21 April 2006 (as amended), which outlines the requirements of an Environmental Impact Assessment (EIA) undertaken to apply for environmental authorisation for activities listed in Government Notice Regulation 387 (published on 21 April 2006, as amended).

This report is called the Final EIAR and has been compiled in accordance with the EIA Regulations of 2006. This report includes four new corridor alternatives. These alternatives were included in the process following a public comment period (March 2010 – April 2010), inclusive of public and stakeholder meetings, on the Draft EIAR.

DESCRIPTION OF THE PROPOSED ACTIVITY

The Ariadne-Eros Transmission Line project comprises the following two main components:

- The construction of a 1 x 400/132 kV multi-circuit transmission line between Ariadne and Eros Sub-stations.
- The expansion and upgrading of the Ariadne and Eros Sub-stations.

The project will also entail the construction of associated infrastructure, such as access roads where access is presently unavailable.

ALTERNATIVES

A number of alternatives have been identified for consideration in this Environmental Impact Assessment. Each alternative is investigated with a view to understanding the environmental consequences of the transmission line alternatives selected for consideration.

As indicated above, four new corridor alternatives have been included in this environmental assessment, namely Alternatives E3, W1, C3 and W2.

- Macro Alternatives.
  - No-development alternative.
  - Demand-side management.

  In line with the EIA Regulations of 2006, the no-development option was carried forward in this EIA.

- Corridor Alternatives.
  - Central Alternative (Minor alternatives C1, C2, and C3).
  - Eastern Alternative (Minor alternatives E1, E2 and E3).
  - Western Alternative (Minor alternatives W1 and W2).

  All three major alternatives and eight minor alternatives are considered technically and environmentally feasible, and received attention in this EIA.

- Technical Alternatives.
  - Underground transmission lines.
  - Upgrading existing transmission lines.

  Given the financial and technical complexities, and the magnitude of environmental impacts (in particular, physical impacts) associated with underground transmission lines, this alternative has been discarded from further consideration.

  The upgrading of existing lines was considered further in this EIA, but will continue to be considered as part of the overall KZN Strengthening Project.

- Micro Alternatives.
  - Tower positions.
  - Tower types.
  - Construction camp locations.

Micro-positioning of towers along the transmission lines, different tower types, and suitable construction camp sites continued to receive attention in this EIA.

DESCRIPTION OF THE ENVIRONMENT AND THE MANNER IN WHICH IT MAY BE AFFECTED

The study area is located in the southern part of KZN and extends from Thornville, near Pietermaritzburg (Ariadne Sub-station) in a south-easterly direction to Port Shepstone (Oribi Sub-station) and then westerly to Harding (Eros Sub-station). It falls within three district municipalities: uMgungundlovu, Ugu and Sisonke District Municipalities and ten local municipalities.

The terrain morphology within the study area is typical for KwaZulu-Natal, in that it is diverse and varied. The geology is equally diverse and influences the topography and scenery of the study area. A temperate, sub-tropical climate with warm temperatures and summer rainfall is typical of the climate. Snowfalls in the Harding area have on occasion been severe and could affect the transmission lines and supportive infrastructure.

The study area is rich in biodiversity, with numerous ecosystems, vegetation units, vegetation types, habitat types and topographical features. Mucina and Rutherford (2006) provide a classification of the vegetation units occurring in the study area. A total of nine vegetation units occur within the study area; three are listed by as Endangered (SANBI), three are listed as Vulnerable (SANBI) and three are listed as Least Threatened (SANBI). It is evident that the natural landscapes of much of the study area are sensitive and important to preserve for their aesthetics.

There are areas of conservation-worthy and biologically diverse ecosystems within the study area, which are made up of both protected and unprotected areas: provincial nature reserves (the Oribi Gorge and the Vernon Crookes Nature Reserves) and indigenous forest areas, grasslands and private game reserves.

The faunal biodiversity within the study area is varied. Sensitive avifaunal species identified within the study area include several red data species including cranes and bustards, and other notable species (such as raptors and Korhaans). The South Coast region is a regular destination for birdwatchers. Collisions of birds, in particular large birds, with power lines are a concern. Power lines may also interfere with bird habitats (nesting and flocking sites).

Two riverine environments support and sustain the diversity of flora species, and provide habitat and migratory corridors for a number of faunal species. The study area falls within two key catchment areas, viz. the uMzimkulu and Mkomazi catchments. The overall gradient of the rivers in KZN is generally steep and this increases the erosion potential of these rivers. The rugged landscape in the study area is largely a result of river/water erosion. These rivers play an important economic role in sustaining agriculture and industry in the area.

The combined environmental attributes of the study area contribute to a thriving tourism industry. The increase in electricity availability to the South Coast will undoubtedly be advantageous to the tourism industry. However, the increased electricity supply brings potential visual intrusion and a disruption of a sense of place. It is, thus, necessary to maintain a near natural visual landscape, with limited aesthetic effects, to enable the continuation of nature-based economic activities such as eco-tourism.

The availability of electricity to the area will also be a catalyst for local economic development through opportunities that will be created when lower-cost and reliable electrical energy is made accessible for people in the rural areas. However, it will also raise certain concerns; mainly the loss of use of productive agricultural land and, therefore, a potential reduction of crop land. This will cascade down to secondary economic sectors such as mills, and could negatively affect the financial viability of these sectors. This is also likely to negatively affect employment within the agricultural sector.

The transport infrastructure network within the study area comprises road, rail and air, allowing for generally good access and the mobility of goods and people. However, the inland road system is still at a level where most secondary roads are gravel and impassable in the wet season.

There are a number of institutions that have been identified and notified about the project. These include: the district and local municipalities, Ezemvelo KwaZulu-Natal Wildlife, Traditional Authorities, Farmers' Associations, and the Endangered Wildlife Trust. The proposed power line affects many landowners in both rural and urban areas. Through a landowner identification process, ACER was able to contact, notify and involve the majority of the affected landowners in the EIA process. Servitude negotiation including compensation will be undertaken by Eskom Transmission once a preferred corridor alternative has been considered and approved by the competent authority, the Department of Environmental Affairs.

The findings of the heritage and cultural specialist show that a number of heritage resources are likely to be present along on three the proposed corridor alternatives. The greatest impact on the natural environment is likely to occur during the construction phase rather than the operation phase. The former will involve the establishment of access roads, a servitude centre line access road, construction camps and tower site working areas. Large tracts of land within the Central and Western corridor alternatives are dominated by traditional authorities, where impacts on living heritage, scattered homesteads and settlements could be a significant limitation to defining a suitable power line corridor.

METHODOLOGY USED TO DETERMINE SIGNIFICANCE OF POTENTIAL ENVIRONMENTAL IMPACTS

Issues and potential impacts were identified during Scoping. Those requiring further investigation were addressed by specialist studies and/or further detailed input from the environmental and technical team. Terms of reference were prepared to guide each specialist to ensure that issues and associated impacts were correctly understood and addressed, thereby enabling an integrated assessment of the development proposal. Information was collated, evaluated and integrated. Thereafter, each potentially significant impact was assessed, taking into account a number of assumptions and limitations.

SPECIALIST FINDINGS AND RECOMMENDATIONS

The following specialist studies were undertaken:

- Agricultural Potential and Agricultural Economics (Urban-Econ Development Economists).
- Avi-Fauna (Endangered Wildlife Trust).
- Fauna (GroundTruth Biomonitoring Services and Environmental Consultants).
- Flora (ACER).
- Heritage (eThembeni Cultural Heritage).
- Social (ACER).
- Town and Regional Planning (Overview Study) (ACER).
- Visual (Cave Klapwijk and Associates).

The main findings, identified impacts and recommendations are summarised in this report (Chapter 6) and the full reports are contained in Appendices 6 and 7.

INTEGRATED DESCRIPTION OF ENVIRONMENTAL ISSUES AND POTENTIAL IMPACTS

The key issues identified during Scoping and carried through to the Impact Assessment phase have been formulated as ten main questions:

- What economic and socio-economic benefits will the transmission line have (locally and regionally)?
- What effects will the proposed transmission line have on existing residential settlements and infrastructure including telecommunication structures?
- Will the transmission line result in the loss of use of productive agricultural land (commercial and subsistence) and associated economic opportunities?
- How will the visual changes to the landscape affect the social and socio-economic environment?
- Are the proposed route corridors compatible with town planning initiatives (Integrated Development Plans, Spatial Development Plans and other initiatives)?
- What effects will the transmission line have on the natural environment (flora and fauna) and natural areas worthy of protection and conservation?
- What effects will the transmission line have on avi-fauna (birds)?
- What effects will the transmission line have on cultural and heritage resources?
- What technical constraints will the biophysical environment place on the routing, construction and operation of the transmission line?
- Can the transmission line be detrimental to the health and safety of local communities?

Drawing from the specialist studies, Chapter 7 describes each of these issues, identifies a number of associated impacts and discusses their significance. A number of mitigation measures are provided to mitigate the potential impacts.

ASSESSMENT OF POTENTIALLY SIGNIFICANT IMPACTS

A detailed assessment of the potential impacts is discussed in Chapter 8, both with and without management actions and/or mitigation measures. Impact tables are provided in Tables 38 – 48.

Chapter 8 also provides a summary of key outcomes of the impact assessment.

The preferred corridor alternative is combination of the Western Alternative and Alternative E3 (as indicated in Figure 29).

ENVIRONMENTAL IMPACT STATEMENT

By their nature, the construction and operation of transmission lines have an impact on the environment. However, when appropriate mitigation measures are implemented, the intensity of impacts is reduced. Taking due cognisance of the three primary dimensions that constitute the environment (viz. the biophysical, social and economic dimensions) the preferred corridor alternative is the Western Alternative and Alternative E3.

Importantly, with regards to post-EIA processes, including servitude negotiation and the final alignment of the transmission line, there are a number of significant issues that need to be addressed as part of the acquisition process. In particular, a number of stakeholders raised concerns about the loss of the use of productive agricultural land within commercial farming areas (Eston, Mid Illovo, Sawoti, Harding and others) and the potential impacts on mills. Although it is Eskom Transmission's present policy to establish sugarcane-free servitudes, it is recommended that, where feasible, sugarcane cultivation is allowed to continue subject to agreement with Eskom

ACER, therefore, recommends environmental authorisation for the construction of the multi-circuit transmission line and associated activities with the condition stated above..

UMBIKO OFINGQIWE

ISINGENISO

Njengesizinda somphakathi wase Ningizimu Afrika, kungumsebenzi ka Eskom ukuphehla, ukusabalalisa, nokuphakela noma ukunikezelwa kukagesi e Ningizimu Afrika. Iziteshi ezishisa amalahle izona ezinikeza amandla amaningi kagesi, zilekelelwa ezinye izindlela zokukhiqiza ugesi ezifana namandla enuzi kanye nomoya. U Eskom ubhekene nesidingo esikhulayo sikagesi kanye nokwenzangcono ukulethwa kwezinsiza eziyikhwalithi kanye nokwethembeka kwalezizinsiza eNingizimu Afrika

Njengengxenye yamaqhinga ka Eskom okubhekana nalesisimo, uEskom Transmission uhlongoza ukwenza ngcono imigudu yokuthumela ugesi ngokwakha olayini bokusabalalisa ugesi abasuka eMpumalanga (eSiteshini i Alpha, eStanderton) kuyaKwaZulu-Natali (eSiteshini i Eros, eHarding). Olayini abasha bazohamba ibanga elingamakhilomitha angama-470.

Ngenhloso yokuphathwa kweprojekthi nokugunyazwa kwangokwemvelo, ukuqhutshezwa kwezintambo ziyohlanganisa isiteshi i Alpha nesiteshii i Eros sekuhlukaniswe izigaba ezine ezahlukene. Ingxenye ngayinye kulezizigaba ezine zeprojekthi izophathwa ngokwahlukana futhi izongenelela umgudu wokugunyazwa ngokwemvelo ngokwehlukana. Lomqulu umayelana nomgudu wocwaningo lokungenzeka emvelweni (EIA) iSigaba 4 njalonjalo:

> **Isigaba 4: Ulayini onamandla angama 400 kV/132 wokusatshalaliswa okuphindiwe kukagesi kusuka esiteshini I- Ariadne (eduze naseMgungundlovu) kuya ngasesiteshini i Oribi (eduze kwasePort Shepstone) nokuqhutshezwa komgudu wentambo eyisekethe elihamba ngalodwa elinamanndla angama 400kV iya esiteshini i Eros (eduze ne Harding), kufaka ukwengezwa nokuthuthukiswa kweziteshi i Ariadne ne Eros. Lolayini ohlongozwayo uzolandela umzila wolwandle ngebanga cishe elingaphezu kwamakhilomitha ayi- 178.**

Ngokulandela imigomo kanye nomthetho wezemvelo, uEskom uqashe uACER (Africa) Abeluleki BezokuphathwaKwezeMvelo njengoNgoti Bocwaningo Lwemvelo ukuze babhekane nokuqagulwa kwezingxenye ezibalulekile ngokwezemvelo mayelana nezintambo zokusatshalaliswa kukagesi ezihlongozwe e-Ariadne Eros.

LoMqulu Wocwaningo Lokungenzeka Emvelweni (EIAR) usuhlanganisiwe ngokulandela imigomo yoMthetho kaZwelonke Yokuphathwa Kwezemvelo (NEMA) (Umthetho 107 ka 1998). Okubaluleke kakhulu Umgomo WeSaziso SikaHulumeni unombolo 385 owashicilelwa zingama 21 April 2006 (njengoba uchitshiyelwe), ocacisa imigomo yoCwaningo Lokungenzeka Emveleni (EIA) elandelwe ukufaka isicelo sokugunyazwa kwangokwemvelo kwemisebenzi ebaliwe eMgomweni WeSaziso SikaHulumeni weZaziso nombolo 387 (owashicilelwa zingama 21 April 2006, njengoba uchitshiyelwe)

Lomqulu ubizwa ngoMqulu Owujuqu Wocwaningo Olungenzeka Emvelweni usuhlanganisiwe ngokulandela uMthetho we EIA ka 2006. Lomqulu ufaka imigudu emine emisha engasetshenziswa. Lemigudu engasetshenziswa ibilokhu ifakiwe emgudwini olandela isikhathi sokuphawula somphakathi kusuka ngo (March 2010 kuyaku April 2010) kufaka nemihlangano yomphakathi kanye nabahlomuli kuloMqulu Owuhlahlandlela Osubuyekeziwe Wocwaningo Lokungenzeka Emvelweni.

INCAZELO NGEMISEBENZI EHLONGOZIWE

Iprojecti yomgudu wokusabalalisa ugesi e-Ariadne-Eros iqukethe lezizingxenye ezimbili ezilandelayo:

- Ukwakhiwa kukalayini owodwa osabalalisa ugesi ngokuphindiwe onamandla angu 400/132 kV phakathi kweziteshi I- Ariadne ne Eros.
- Ukunwetshwa kanye nokulungiswa kweziteshi i-Ariadne kanye ne Eros.

Iprojekthi ifaka futhi ukwakhiwa kwengqalasizinda efana nemigwaqo yokufinyelela lapho kungafinyeleleki khona njengamanje.

IMIGUDU ENGASETSHENZISWA

Miningi eminye imigudu engasetshenziswa esiqagulelwe ukubhekwa kanzulu kuloluCwaningo Lokungenzeka Emvelweni. Indlela ngayinye engasetshenziswa icwaningiwe ukuze ibukwe ngokuqondisisa imiphumela engebemihle yemizila yolayini bokutshabalaliswa kukagesi ekhethelwe ukubhekisiswa ukuba ingasetshenziswa.

Njengoba kukhonjisiwe ngenhla, yomine imigudu engasetshenziswa ifakiwe kulolucwaningo lwezenvelo esingabala umgudu ongasetshenziswa E3, W1 kanye no W2.

- Izindlela eZinkulu eZingasetshenziswa
  - Ukuba ingenziwa lengqalasizinda.
  - Demand-side management (DSM) (Ukulawulwa kokudingakala kukagesi)

Ngokwe Migomo yeEIA ka 2006, noma kugakhethwa ukuba yenziwe intuthuko kodwa kuqhutshekiwe nokuba ibhekwe kwi EIA.

- Imigudu engasetshenziswa
  - Umgudu Omaphakathi (Omncane ongasetshenziswa C1, C2, no C3).
  - Umgudu Osempumalanga (Omncane ongasetshenziswa E1, E2 no E2).
  - Umgudu Osentshonalanga (Omncance ongasethsenziswa W1 no W2).

Yonke imigudu yomithathu emikhulu engasetshenziswa kanye neyisishagalombili emincane, ngokobuchwepheshe nangokwemvelo yiyona ebonakala izosebenza nezothola ukubhekisiswa ocwaningweni lwe EIA.

- Ubuchwepheshe Obungasetshenziswa
  - Izintambo zikagesi ezihamba ngaphansi komhlaba
  - Ukulungiswa kolayini bakagesi abavele bakhona

Ngokubheka ezezimali, izingqinamba zobuchwepheshe,nobuningi bemithelela emvelweni (ikakhulukazi, imithelela ebonakalyo) neyeyamene nokuhanjiswa komgudu ngaphansi komhlaba,lendlela isiyekiwe ukuba kuqhutshekwe nokuba ibhekisiswe.

Ukulungiswa kolayini abavele bekhona kwabuye kwabhekwa futhi kule EIA kodwa kuzoqhubeka nokuba yingxenye yayoyonke iProjecti Yokuqiniswa Kwamandla Kagesi eKZN.

- Izindlela ezincane ezingasetshenziswa
  - Indlela yokuma kwemibhoshongo yezintambo zogesi
  - Izinhlobonhlobo zemibhoshongo yezintambo zogesi
  - Indawo yezinkambu zosonkontileka

Ukumiswa okungatheni kwemibhoshongo yezintambo zogesi, izinhlobo ezehlukahlukene zemibhoshongo kanye neziza ezilungele izinkambu zosonkontileka kuqhubekile nokuthola ukubhekisiswa kule EIA.

INCAZELO YEMVELO NANGENDLELA ENGASE ITHINTEKE NGAYO

Indawo yocwaningo itholakala engxenyeni yeningizimu yeKZN iqhubeke isuka e Thornville eduze nase Pietermaritzburg (eSiteshini i Ariadne) eningizimu-mpumalanga uma ubheke e Port Shepstone (Esiteshini i Oribi) kuya entshonalanga neHarding (Esiteshini i Eros). Ingena ngaphansi kwabobobathathu oMasipala besiFunda: uMgungundlovu, uGu kanye ne Sisonke. KulaboMasipala besiFunda, noMasipala baseKhaya abayisishumi.

Indlela indawo eyakheke ngayo endaweni yocwaningo iwukuma okujwayelekile KwaZulu-Natali. Ukuma komhlaba nakho kuhluke ngokufana futhi kunomthelela endleleni umhlaba omi ngayo ngokwendalo endaweni yocwaningo. Amazinga okushisha, afudumele kanti futhi kujwayelekile ukuba kube nezimvula ehlobo. Ukukhithika kweqhwa okwenzeka endaweni yaseHarding kungabaphazamisa olayini nengqalasizinda esebenzisana nabo.

Indawo yocwaningo icebe kakhulu ngemvelo yezihlahla nezilwane, nezindlela eziningi ezisebenza ngayo (izitshalo ngokuhlukana kwazo, izitshalo ezinhlobonhlobo, izindawo ezitholakala kuzo, nendlela indawo ehleleke ngayo. Ngokuka Munica no Rutherford (2006) banikeza uhlelo lwezitshalo ezikhula endaweni yocwaningo. Sezizonke zingu 9 izinhlobo zezihlahla ezimila endaweni yocwaningo ezintathu zazo zibhaliswe ngaphansi kweZisengozini (SANB), ezinye ezintathu kweZisengcupheni (SANB) zintathu futhi ezibhaliswe njengeZingekho Encuphupheni Enkulu (SANBI). Kunesiqiniseko sokuthi ingxenye enkulu yendlela imvelo yomhlaba emingayo zibucayi futhi zibalulekile ukuba zingciwe ngenxa yokubukeka kwazo.

Kunezindawo ezifanele ukongiwa kanye nezindlela ezahlukahlukene imvelo esebenza ngazo endaweni yocwaningo ezifaka zombili izindawo ezivikelekile nezingavikelekile: Izindawo zesifundazwe zokugcina imvelo, indawo yase Oribi Gorge ne Vernon Nature Reserves) kanye nezindawo zamahlathi endalo, izindawo ezinengongoni neziqiwi ezizimele.

Imvelo yezilwane endaweni yocwaningo ihlukahlukene. Imvelo yezilwane ezwelayo etholakele endaweni yocwaningo ifaka nezinye izilwane eziningi ezisohlwini lwezilwane ezivikelwe okufaka izinkalankala nezinyoni kanye nezinye izilwane ezaziwayo. Isifunda esiseNingizimu noGu iyona ndawo ehanjelwa kakhulu ababuki bezinyoni. Ukushayisa kwezinyoni kolayini bakagesi ikakhulukazi izinyoni ezinkulu ikhona okuyinkathazo. Olayini bakagesi bangaphazamisa indawo yezinyoni lapho (zizalela khona kanye nalapho zihlangana khona).

Mibili imifula esiza nesimamisa imvelo yezihlahla, enikeza amakhaya kanye nemizila yokufuduka emvelweni eningi yezilwane. Indawo yocwaningo ingena ngaphansi kwalemifula emibili ebalulekile njenge mifula uMzimkhulu noMkhomazi. Ukwakheka kwalemifula eKZN kujwayeleke ukuba yenyukele kanti kwenyusa amathuba okuguguleka kwalemifula. Indawo emahhadlahhadla endaweni yocwaningo ibanzi kakhulu okungenxa yomphumela wokuguguleka kwemifula namanzi. Lemifula idlala indima ebaluleke kakhulu emnothweni nasekusimamiseni ezolimo nezimboni endaweni.

Zonke izinto ezihlanganisa imvelo endaweni yocwaningo zineqhaza ekwenzeni kahle kwemboni yezohwebo. Ukwenyuka kwezinga lokutholaka kukagesi Ogwini oluseNingizimu (South Coast) kuyoba yinto enhle ngokungangabazi embonini yezohwebo. Noma ukunyuka kwezinga lokuthunyelwa kukagesi kungaletha ukungabukeki kahle nokuphazamiseka komuzwa wendawo. Ngakho-ke kubalulekile ukugcineka komhlaba usesimweni esicishe sibe njengaleso sendabuko, futhi kube nemithelela emincane endleleni umhlaba obukeka ngayo ukuze imisebenzi yezomnotho, encike kakhulu kwezokuvakasha, iqhubeke.

Ukuba khona kukagesi endaweni iyonanto ezohamba phambili ekuthuthukisweni komnotho wendawo ngokudaleka kwamathuba uma abantu basezindaweni zasemakhaya sebekwazi ukuthola ugesi onamanani aphansi nothembakele. Noma kuzoletha okunye ukukhathazeka ikakhulukazi ngokungasasetshenziswa komhlaba wokukhiqiza ngakho besekuba nokuncipha komhlaba wezitshalo. Lokhu kusiphindisela kwimikhakha yomnotho efana nemishini yokugaya okungaba nomthelela omubi esimeni sezimali. Kanti futhi lokhu kungaba nomthelela omubi ngakwezemisebenzi emkhakheni wezolimo.

Ingqalasizinda yezokuthutha endaweni yocwaningo ifaka imigwaqo, ujantshi kanye nezindiza okuvumela ukuba abantu nezimpahla kuhambe kahle, noma imigwaqo engaphakathi ezindaweni zasemakhaya isesezingeni lemigwaqo engakhonkiwe okungadluleki kuyo ngezikhathi zokuna kwemvula.

Ziningi izikhungo eseziqaguliwe zaziswa futhi mayelana naleprojecti. Lokhu kufaka: omasipala besifunda nabasemakhaya, Ezemvelo, KwaZulu-Natal Wildlife, Imikhandlu Yamakhosi, Izinhlangano Zabalimi kanye ne Endangered Wildlife Trust. Lomgudu wezintambo zikagesi ohlongozwayo uthinta abanini bomhlaba abaningi nxazombili, ezindaweni zasemadolobheni nezasemakhaya. Ngokulandela umgudu wokukhonjiswa ngabanini bomhlaba, uACER wakwazi ukuthintana, ukwazisa nokumbandakanya abanini bomhlaba abaningi abathintekile emgudwini we EIA. Izingxoxo ngendawo nokufinyelela emgudwini nokunxephezelwa kuyokwenziwa ngabakwa Eskom Transmission uma ngabe umzila okubonakala kuyiwo ongasetshenziswa usukhethiwe wagunyazwa Iziphathimandla ezifanele, uMnyango Wezemvelo.

Okutholwe ngongoti bezamagugu namasiko ukuthi ziningi izinto zamagugu futhi maningi amathuba okuba zilokhu zivela kuyo yomithathu lemigudu ehlongozelwe ukusetshenziswa. Umthelela omkhulu kakhulu emvelweni ungenzeka kakhulu ngesikhathi sesigaba sokwakhiwa kunangesikhathi isisebenza lengqalasizinda. Lokhu kuzofaka ukwenziwa kwemigwaqo yokufinyelela emgudwini yezintambo zogesi, ukwakhiwa kwezinkambu zenkontileka, nendawo yeziza zemibhoshongo. Ingxenye enkulu yomhlaba oMaphakathi naseNtshonalanga nomgudu ozosetshenziswa ziphethwe kakhulu imikhandlu yamakhosi, lapho imithelela ezintweni ezingamagugu eziphilayo, ukugqagqana kwemizi kungaba yisona sithiyo esikhulu ekutholeni okuyiwona mgudu olungele umzila kagesi.

INDLELA ESETSHENZISWE UKUTHOLA IMITHELELA EBALULEKILE YOKUNGENZEKA EMVELWENI

Izingqinamba nemithelela engase ibekhona kwaqagulwa ngesikhathi sokuQoqwa kweZimvo. Lezo ezazidinga ukuba ziqhubeke nokuhlolwa zabhekwa ngongoti bocwaningo kanye nango lwazi olunzulu olusuka kwithimba lezemvelo nelochwepheshe. Imigomo ecacile yenziwa ukuqondisa ongoti ngamunye ukuqinisekisa ukuthi izingqinamba nemithelela ehambisanayo ibhekisisiwe futhi yaqondisiswa kahle ngokuthi kwenziwe ucwaningo ngokuhlanganyela lwesicelo salentuthuko. Ulwazi seluqoqiwe, lwahlolwa lwase luhlanganiswa. Emva kwalokho umthelela ngamunye otholakele wahlolwa kusetshenziswa uhla lokuhlola amazinga emithelela ngokuqagela kanye nezithiyo.

OKUTHOLWE NGONGOTI KANYE NEZINCOMO

Ilolucwaningo olulandelayo olwenziwe ngongoti:

- Okungenziwa khona ezoLimo kanye noMnotho wezoLimo (Urban-Econ Development Economists)
- Imvelo yeziNyoni (Endangered Wildlife Trust)
- Izilwane (GroundTruth Biomonitoring Services and Environmental Consultants).
- Izimili (ACER)
- Amagugu, (eThembeni Cultural Heritage)
- Ukuphila kwabantu ACER
- Ukuhlelwa kwaMadolobha neziFunda (Ucwaningo Olukhela phezulu) ACER
- Ukubukeka kwendawo (Cave Klapwijk nabaBambisene nabo)

Okumqoka okutholakele, imithelela eqaguliwe nezethulo kuyatholakala ngokufingqiwe kuyatholakala kulombiko (kwiSahluko 6) kanti imiqulu ephelele itholakala kumqulu oyiSengezelo 6 and 7.

INCAZELO EDIDIYELWE YEZINGQINAMBA ZEMVELO NEMITHELELA ENGASE IBEKHONA

Izingqinamba eziqavile ezitholakale ngesikhathi sokuQoqwa kweZimvo nezidluliselwe esigabeni soCwaningo Lokungenzeka Emvelweni zihlanganiswe njengemibuzo elishumi ebalulekile:

- Yini ezohlonyulwa emnothweni, nasemnothweni wabantu ngokufakwa kwalomgudu kagesi (ezindaweni zasemakhaya nasesiFundazweni)?
- Yikuphi ukuphazamiseka okungenziwa yilomgudu kagesi ohlongoziwe emizini yabantu abavele behlala khona kanye nengqalasizinda efaka izakhiwo zezokuxhumana?
- Ngabe lomgudu uzokwenza kulahleke umhlaba osetshenziselwa ezolimo (ukuhweba nokuziphilisa) kanye namathuba ezomnotho afanayo?
- Kungabathikameza kanjani abantu kanye nomnotho wabo ukuguquka kwendlela indawo ebukeka ngayo?
- Ngabe lemizila ehlongoziwe iyahambisana yini nemisebenzi esezinhlelweni zedolobha (Iqhinga Lentuthuko Edididyelwe, Spatial Development Plans) kanye neminye imisebenzi?
- Yimiphi imithelela lomgudu kagesi ongabanayo emvelweni yezi (lwane nezihlahla) kanye nezindawo zemvelo ezifanelwe ukuvikelwa nokongiwa?
- Yimiphi imithelela umgudu kagesi ongabanayo kwimvelo yezinyoni?
- Yimiphi imithelela umgudu kagesi ongabanayo emasikweni nasezintweni zamagugu?
- Yiziphi izingqinamba zobuchwepheshe ezingabangwa indlela imvelo emi ngayo ehambisana nomgudu, ukwakhiwa nokusebenza kukalayini kagesi?
- Umgudu kagesi ungaba yini yingozi ezimpilweni nase kuphepheni kwemiphakathi eyakhele?

Kusukela ocwaningweni longoti, iSahluko 7 sichaza ingqinamba ngayinye, siqagula imithelela eminingi ehlobene iphinde ikhulume nangokubaluleka kwayo. Ziningi izinyathelo ezinikeziwe zezisombululo imithelela engenzeka.

UCWANINGO LWEMITHELELA EBALULEKILE ENGASE IBEKHONA

Ucwaningo olunzululwemithelela engase yenzeke idingidwe eSahlukweni 8, yomibili lemithelela ibukwe zikhona noma zingekho izindlela zokulawula /noma izisombululo. Amathebula emithelela anikeziwe eThebuleni nombolo 38 – 48.

Isahluko 8 sinikeza umbiko ofingqiwe wokubalulekile okutholakale ocwaningweni lokungenzeka emvelweni .

Okuyiwona mgudu ongasetshenziswa osentshonalanga ngokuhlangana nomunye umgudu ongasethsenziswa u E3.

UMBIKO WOKUNGENZEKA EMVELWENI

Ngokwemvelo ukwakhiwa nokusebenza komgudu wezintambo zikagesi kunomphumela omubi emvelweni. Kodwa, ke uma zikhona izisombululo ezisetshenziswayo amandla alowomthelela angehla. Ngokubheka ulwazi olufanele ngalezigaba zontathu ezibalulekile ngokwehluka neziphethe imvelo (imvelo, abantu nomnotho ngokwehlukana kwayo) okuyiwona mgudu ongasetshenziswa owasentshonalanga omunye ongasetshenziswa u E3.

Okubalulekile maqondana nemigudu yaphimbilini ye EIA, kufaka izingxoxo ngendawo yokufinyelela emgudwini kanye nokulingana ngokuphelele kolayini bokusabalalisa ugesi, ziningi nezinye izinqinamba ezibonakalayo ezisadinga ukubhekisiswa. Ikakhulu baningi abahlomuli abaphakamisa ukukhathazeka kwabo ngokulahleka kokusebenza komhlaba wokulima ngendlela enezithelo ezindaweni ezisetshenziselwa ukulima ngenjongo yokuhweba e (Eston, Mid Illovo, Sawoti, Harding nabanye) kanye nemithelela engabakhona ezimbonini Noma kuyinqubomgomo ka Eskom Transmission ukudala izindawo ezivulelekile okuzotshalwa kuzo umoba ngokukhululekile, kungcomeka kakhulu ukuthi la okuvuma khona ukuba ukutshalwe umoba, kuvunyelwe ukuba kuqhubeke kube kuxhumeleleke esivumelwaneni no Eskom.

Ngakho-ke U ACER, uncoma ukuba kugunyazwe ngokwemvelo ukwakhiwa komgudu wokuthumela amandla kagesi ngokuphindiwe nemisebenzi efanayo kodwa ngokulandela imigomo eshiwo ngenhla.

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ABBREVIATIONS AND ACRONYMS

ACER	ACER (Africa) Environmental Management Consultants
DAEARD	Provincial Department of Agriculture, Environmental Affairs and Rural Development
DEA	National Department of Environmental Affairs
EAP	Environmental Assessment Practitioner
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
EKZNW	Ezemvelo KwaZulu-Natal Wildlife
EMF	Electro-Magnetic Field
EMP	Environmental Management Plan
EWT	Endangered Wildlife Trust
ha	Hectare
I&APs	Interested and Affected Parties
IDP	Integrated Development Plan
KZN	KwaZulu-Natal Province
m	metre
NEMA	National Environmental Management Act

1. INTRODUCTION

1.1 Background

Eskom, a South African public utility, is responsible for the generation, transmission and distribution of electricity. Power is primarily generated in a number of coal-fired stations but also from additional energy sources such as nuclear and wind. From generation facilities, electricity is transmitted to load centres from where it is distributed to consumers. The Eskom transmission network supplying electricity to the KwaZulu-Natal (KZN) midlands and southern KZN requires strengthening to meet growing demand as well as to improve service quality and reliability.

To address this situation, Eskom Transmission proposes to strengthen its network by constructing new transmission lines over a total distance of 470 km in four continuous sections (Figure 1) from the Alpha Sub-station (Standerton, Mpumalanga) to the Eros Sub-station (Harding, KwaZulu-Natal). For purposes of project management and environmental authorisation, the continuous transmission network linking the Alpha Sub-station to the Eros Sub-station has been divided into four separate sections (listed below), each of which is being separately project managed and are undergoing separate environmental authorisation processes.

- Section 1. Two 765 kV lines from the Alpha Sub-station near Standerton, Mpumalanga to the Majuba Sub-station near Amersfoort, Mpumalanga, over a distance of approximately 50 km.
- Section 2. A 765 kV line from the Majuba Sub-station near Amersfoort to the Venus Sub-station near Estcourt, KZN, over a distance of approximately 200 km.
- Section 3. A 765 kV line continuing from the vicinity of the Venus Sub-station to a proposed new Sigma Sub-station, over a distance of approximately 100 km. From the new Sigma Sub-station, a 400 kV double circuit transmission line is proposed to connect the Sigma Sub-station to the Hector Sub-station close to Cato Ridge. In addition, it is proposed to energise the second 400 kV conductor installed on the Ariadne-Hector 400 kV double circuit line, which currently exists, to complete the link between the Ariadne and Venus Sub-stations.
- **Section 4. A 400 kV/132 kV multi-circuit transmission line[1] from the Ariadne Sub-station (near Pietermaritzburg) to the vicinity of Oribi Sub-station (near Port Shepstone) and the continuation of a single circuit 400 kV line to the Eros Sub-station (near Harding), including the expansion and upgrade of the Ariadne and Eros Sub-stations. The proposed line will follow a coastal route over a distance of approximately 178 km (Appendix 1).**

This report deals with the Environmental Impact Assessment (EIA) process for **Section 4**.

For ease of reference, for the remainder of the report, this project will be referred to as the proposed Ariadne-Eros Transmission Line Project (which includes the expansion and upgrading of the Ariadne and Eros Sub-stations).

[1] A multi-circuit transmission line is a transmission line where two circuits are carried or transported on a single tower line (i.e. on a single servitude and single towers). In this case, the proposed transmission line will carry a 400 kV and a 132 kV circuits.

Figure 1 Map illustrating Eskom's KZN Strengthening Project

1.2 Details and expertise of the environmental assessment practitioner

Below is a brief pen picture of the experience and expertises of key EIA Team members.

Dr Dieter Heinsohn (EIA Project Director)
Originally trained as a plant physiologist, Dieter has developed an impeccable reputation in environmental management. Of particular note is his experience in social impact assessments, the design and running of public involvement programmes, resettlement planning and implementation, and the management of large and/or complex environmental impact assessment processes.

Mr Percy Langa (EIA Project Manager – Environmental Assessment Practitioner (EAP))
A graduate from the University of the Witwatersrand, Percy holds a BSc (Hons) in Town and Regional Planning. He joined ACER as an environmental consultant following years of experience as a state employee within the field of Integrated Environmental Management and Environmental Compliance. In particular, he has valuable experience in the review of environmental impact reports and environmental management plans within South Africa.

Ms Candace Brown (EIA Public Participation Consultant)
Ms Brown holds a BCom (Hons) in Marketing from the University of KwaZulu-Natal. Ms Brown has attended an intensive public participation training course run by Golder Associates. Ms Brown joined ACER in 2008 and has already proved herself to be capable of managing public participation programs efficiently.

For ease of reference, for the remainder of this report, the EIA Team will be referred to as ACER.

1.3 Environmental authorisation process

In terms of the Environmental Impact Assessment Regulations of 2006 (R. 385, R. 386 and R. 387, April 2006), published under Section 24 and read with Section 44 of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA), the proposed Ariadne-Eros Transmission Line Project includes activities that may significantly affect the environment. As a consequence, the project may not commence without environmental authorisation from the competent authority, the Department of Environmental Affairs (DEA). Both in terms of the law and environmental best practise, the potential impacts of the project on the environment, socio-economic conditions and cultural heritage must be considered, investigated and assessed prior to implementation. Given that the project triggers activities listed in both R. 386 and R. 387 (Table 1), the application for environmental authorisation requires a process of Scoping and an Impact Assessment as outlined in Regulations 27-36 of R. 385.

The EIA process is currently in the Impact Assessment Phase. Figure 2 illustrates the main stages of the environmental authorisation process (Scoping and Impact Assessment). This report is an outcome of the Impact Assessment stage.

Table 1 Scheduled activities in terms of which Eskom is seeking environmental authorisation for the proposed Ariadne-Eros Transmission Line Project

Number and Date of Relevant Notice	Activity Number	Activity Description
No. R. 387, 21 April 2006	1(c)	The construction of facilities or infrastructure, including associated structures or infrastructure, for the above-ground storage of dangerous goods, including petrol, diesel, liquid petroleum gas or paraffin, in containers with a combined capacity of more than 1,000 m^3 at any one location or site, including the storage of one or more dangerous goods, in a tank farm
No. R. 387, 21 April 2006	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 132 kilovolts or more
No. R. 387, 21 April 2006	2	Any development activity, including associated structures or infrastructure, where the total area is, or intended to be, 20 hectares or more
No. R. 386, 21 April 2006	1(m)	The construction of facilities or infrastructure, including associated structures or infrastructure, for any purpose in the one in ten year flood line of a river or stream, or within 32 m from the bank of a river or stream where the flood line is unknown, excluding purposes associated with existing residential use, but including canals, channels, bridges, dams and weirs
No. R. 386, 21 April 2006	4	The dredging, excavation, infilling, removal or moving of soil, sand or rock exceeding 5 cubic metres from a river, tidal lagoon, tidal river, lake, in-stream dam, floodplain or wetland
No. R. 386, 21 April 2006	12	The transformation or removal of indigenous vegetation of 3 hectares or more of any size where the transformation or removal would occur within a critically endangered or an endangered ecosystem listed in terms of Section 52 of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)
No. R. 386, 21 April 2006	14	The construction of masts of any material or type and of any height, including those used for telecommunication broadcasting and radio transmission
No. R. 386, 21 April 2006	15	The construction of a road that is wider than 4 meters or that has a reserve wider than 6 meters, excluding roads that fall within the ambit of another listed activity or which are access roads less than 30 meters long
No. R. 386, 21 April 2006	20	The transformation of an area zoned for use as public open space or for a conservation purpose to another use

1.4 EIA Guidelines

The following EIA Guidelines, prepared by the National Department of Environmental Affairs (DEA), are applicable:

- DEA EIA Guideline 3: General Guide to the EIA Regulations (2006).
- DEA EIA Guideline 4: Public Participation Process (2006).
- DEA EIA Guideline 5: Assessment of Alternatives and Impacts (2006).

1.5 Environmental impact assessment

In terms of Regulation 32 (1) of GN R. 385, the EAP must undertake the tasks contemplated in the Plan of Study for EIA, including the public participation process, as outlined in Chapter 8 of the Final Scoping Report (ACER, 2009), and prepare an EIA Report in respect of the proposed activity.

Table 2 indicates the activities undertaken in terms of the Plan of Study for EIA approved by DEA.

1.6 Public participation process during the environmental impact assessment

Table 3 lists the steps undertaken for public participation. The stakeholder list (database), Issues and Response Report and copies of all relevant correspondence are provided in Appendix 2 (Record of Correspondence), Appendix 3 (Issues and Response Report) and Appendix 4 (Stakeholder Database).

1.7 Environmental Impact Assessment Report

In terms of Regulation 32 (2) of GN R. 385, an Environmental Impact Assessment Report must contain all information that is necessary for the competent authority to consider the application and to reach a decision, and must include certain components, which are listed in Table 4. The latter also indicates where in this EIA Report these various components are covered.

Figure 2 Main stages of the environmental authorisation process

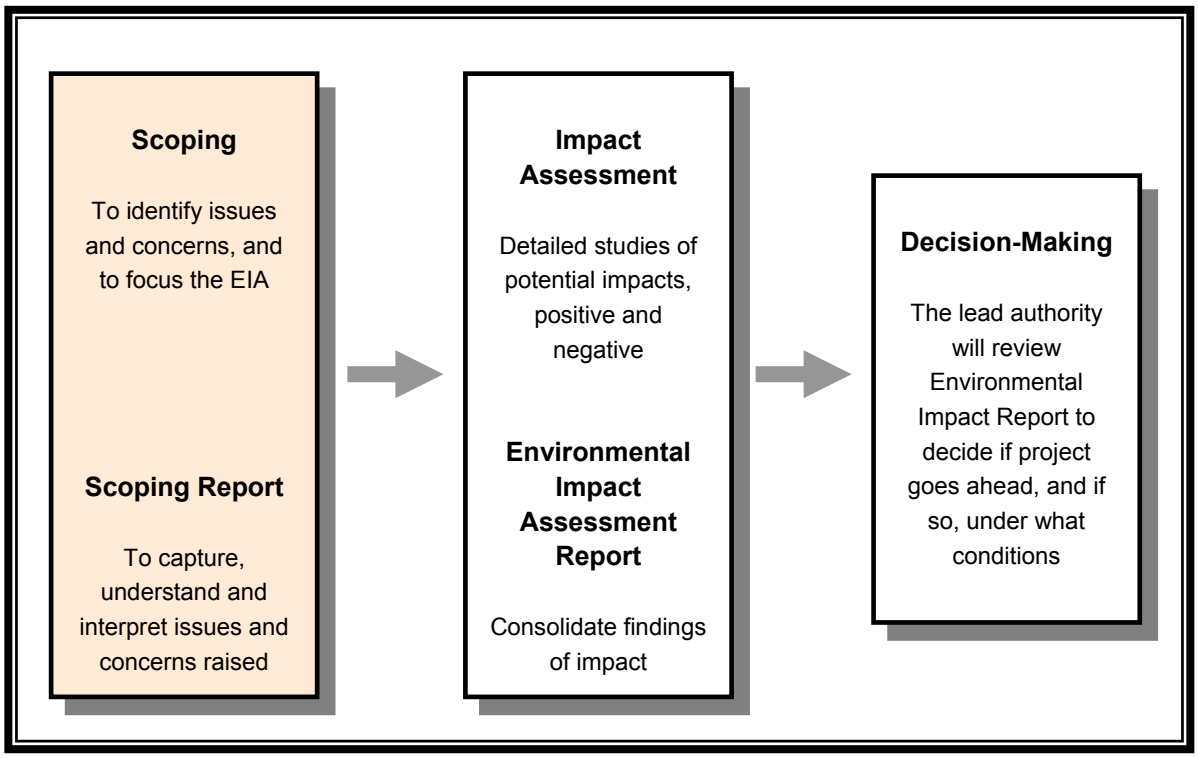


Table 2 Checklist of activities undertaken in accordance with the Plan of Study for EIA

No	Activities undertaken in accordance with Plan of Study for EIA	Reference/Comment
1	Take into consideration any comments from DEA with respect to the Final Scoping Report and Plan of Study for EIA	The following conditions have been stipulated by DEA: • Comments from all relevant authorities must be included in the Final Environmental Impact Report. • Should an application for Environmental Authorisation (EA) be subject to the provisions of Section 38 of the National Heritage Resources Act, then DEA will not make or issue a decision on the application for EA pending a decision by the relevant heritage authority.
2	Commission and undertake focused specialist studies on the potentially significant issues identified during the Scoping Phase	Refer to Chapter 6 and Appendix 6
3	Maintain communication and interaction with stakeholders for the duration of the Impact Assessment Phase	Refer to Appendix 2
4	Integrate the findings of the detailed studies into a comprehensive and objective EIA Report, inclusive of mitigation measures to ameliorate the affects of negative impacts and optimise positive ones	Refer to Chapters 6 & 8 and a Draft EMP in Appendix 8
5	Prepare an Environmental Management Plan (EMP)	The EMP is provided in Appendix 8
6	Distribute the Draft EIA Report and EMP to registered stakeholders for review	Undertaken during Impact Assessment
7	Process and consider stakeholder review comments	Undertaken during Impact Assessment
8	Amend and finalise the Draft EIA Report and EMP as required, incorporating review comments into a Final Issues and Response Report	Undertaken during Impact Assessment
9	Submit the final EIA Report and EMP to DEA for their consideration and decision-making	It is anticipated the Final EIAR will be submitted to DEA in January 2011
10	Notify registered stakeholders of the decision on the application (Environmental Authorisation) and of their right to appeal	This will be undertaken following the issuing of the Environmental Authorisation by DEA

Table 3 Checklist of public participation activities undertaken in accordance with the Plan of Study for Impact Assessment

NO	**Public participation tasks undertaken during Impact Assessment Phase in accordance with Plan of Study**	**Reference/Comment**
1	Continued interaction with I&APs	Refer to Appendix 2 for letter notifying I&APs of the submission of the Final Scoping Report
2	Database updated	Refer to database in to Appendix 4
3	Queries and comments responded to and recorded	Comments and responses on the Draft and Revised Draft EIA Reports have been recorded in the Issues and Response Report (Appendix 3)
4	Issues and Response Report	Refer to Appendix 3
5	ACER in continued contact with I&APs	Interactions are recorded in to Appendix 2
6	Meetings held by ACER with key authorities and stakeholders as necessary	Undertaken during Impact Assessment
7	I&APs timeously notified of the availability of the Draft EIA Report for public review	Undertaken during Impact Assessment
8	Draft EIA Report distributed for public review (30 day review period)	Undertaken during Impact Assessment
9	EIA Report amended in accordance with public review comments prior to submission of final EIA Report to DEA	Undertaken during Impact Assessment
10	Registered I&APs notified when Environmental Authorisation is issued and informed of appeal procedure	This will be undertaken following the issuing of the Environmental Authorisation by DEA

Table 4 Adherence to Regulatory Requirements, Regulation No R. 385 published in terms of the National Environmental Management Act, 1998 (Act 107 of 1998)

Regulation 32(2): Contents of Environmental Impact Assessment Report		Covered in the Final EIA Report
(a)	details of - (i) the EAP who compiled the report (ii) the expertise of the EAP to carry out an environmental impact assessment	Section 1.2
(b)	a detailed description of the proposed activity	Chapter 2
(c)	a description of the property on which the activity is to be undertaken and the location of the activity on the property, or if it is (i) a linear activity, a description of the route of the activity (ii) an ocean-based activity, the coordinates where the activity is to be undertaken	Section 2.2, 2.3 and 4.1
(d)	a description of the environment that may be affected by the activity and the manner in which the physical, biological, social, economic and cultural aspects of the environment may be affected by the proposed activity	Chapter 4
(e)	details of the public participation process conducted in terms of sub-regulation (1), including - (i) steps undertaken in accordance with the plan of study (ii) a list of persons, organisations and organs of state that were registered as interested and affected parties (iii) a summary of comments received from, and a summary of issues raised by registered interested and affected parties, the date of receipt of these comments and the response of the EAP to those comments (iv) copies of any representations, objections and comments received from registered interested and affected parties	Section 1.6, 5.1.2 and Appendices 2, 3 & 4
(f)	a description of the need and desirability of the proposed activity and identified potential alternatives to the proposed activity, including advantages and disadvantages that the proposed activity or alternatives may have on the environment and the community that may be affected by the activity	Section 2.1
(g)	an indication of the methodology used in determining the significance of potential environmental impacts	Chapter 5
(h)	a description and comparative assessment of all alternatives identified during the environmental impact assessment process	Chapters 3 and 8
(i)	a summary of the findings and recommendations of any specialist report or report on a specialised process	Chapter 6
(j)	a description of all environmental issues that were identified during the environmental impact assessment process, an assessment of the significance of each issue and an indication of the extent to which the issue could be addressed by the adoption of mitigation measures	Chapter 7
(k)	an assessment of each identified potentially significant impact, including - (i) cumulative impacts (ii) the nature of the impact (iii) the extent and duration of the impact (iv) the probability of the impact occurring (v) the degree to which the impact can be reversed (vi) the degree to which the impact may cause irreplaceable loss of resources (vii) the degree to which the impact can be mitigated	Chapter 8
(l)	a description of any assumptions, uncertainties and gaps in knowledge	Chapter 5
(m)	an opinion as to whether the activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation	Chapter 10
(n)	an environmental impact statement which contains - (i) a summary of the key findings of the environmental impact assessment (ii) a comparative assessment of the positive and negative implications of the proposed activity and identified alternatives	Chapter 9

Regulation 32(2): Contents of Environmental Impact Assessment Report		Covered in the Final EIA Report
(o)	a draft environmental management plan that complies with regulation 34[2];	Appendix 8
(p)	copies of any specialist reports and reports on specialised processes complying with regulation 33[3]; and	Appendices 6 and 7
(q)	any specific information that may be required by the competent authority.	Not applicable

[2] A draft environmental management plan must include -
(a) details of -
(i) the person who prepared the environmental management plan
(ii) the expertise of that person to prepare an environmental management plan
(b) information on any proposed management or mitigation measures that will be taken to address the environmental impacts that have been identified in a report contemplated by these Regulations, including environmental impacts or objectives in respect of -
(i) planning and design
(ii) pre-construction and construction activities
(iii) operation or undertaking of the activity
(iv) rehabilitation of the environment
(v) closure, where relevant
(c) a detailed description of the aspects of the activity that are covered by the draft environmental management plan
(d) an identification of the persons who will be responsible for the implementation of the measures contemplated in paragraph (b)
(e) where appropriate, time periods within which the measures contemplated in the draft environmental management plan must be implemented
(f) proposed mechanisms for monitoring compliance with the environmental management plan and reporting thereon

[3] 33. (2) A specialist report or a report on a specialised process prepared in terms of these Regulations must contain -
(a) details of -
(i) the person who prepared the report
(ii) the expertise of that person to carry out the specialist study or specialised process
(b) a declaration that the person is independent in a form as may be specified by the competent authority
(c) an indication of the scope of, and the purpose for which, the report was prepared
(d) a description of the methodology adopted in preparing the report or carrying out the specialised process
(e) a description of any assumptions made and any uncertainties or gaps in knowledge
(f) a description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives, on the environment
(g) recommendations in respect of any mitigation measures that should be considered by the applicant and the competent authority
(h) a description of any consultation process that was undertaken during the course of carrying out the study
(i) a summary and copies of any comments that were received during any consultation process
(j) any other information requested by the competent authority

2. DESCRIPTION OF PROPOSED ACTIVITY

2.1 Purpose and Need

Eskom's transmission network supplying electricity to the KZN midlands and southern parts of KZN requires strengthening in order to meet growing demand and to improve service quality and reliability. The proposed Ariadne-Eros Transmission Line Project forms part of Eskom's KZN Strengthening Project and will service the southern part of KZN and parts of the Eastern Cape.

At present, there is only one 400 kV transmission line between the Ariadne and Eros sub-stations[4] feeding the area south of Pietermaritzburg to Harding (Figure 3). It is Eskom's Transmission licence requirement that the transmission network must be able to withstand a loss of a power line without affecting customers. The current situation is that unplanned loss of the existing Ariadne – Eros 400 kV line during peak demand will result in low voltages in the networks being supplied from Eros Sub-station to surrounding users in the Kokstad-Harding-Port Shepstone-Margate complex. To improve reliability and avoid shedding of load, Eskom proposes to construct a second 400 kV transmission line running from south of Pietermaritzburg (Ariadne Sub-station) to the vicinity of Port Shepstone (Oribi Sub-station) and on to Harding (Eros Sub-station) (Figure 4). This will create a much-needed second 400 kV circuit linking the Ariadne and Eros sub-stations.

Furthermore, the approved Eskom Distribution Margate Master Plan, completed in 2009 by NetGroup Consultants has confirmed the need for a 400 kV injection into the Port Shepstone area as previously indicated in the EIA Application Form (Appendix 1). The precise sub-station site and associated power lines has not been determined. A separate environmental assessment process will be followed. See Figure 4 for the approximate location of this proposed 400 kV sub-station.

In order to accommodate the new multi-circuit transmission line, Ariadne and Eros Sub-stations will need to be expanded and upgraded. This will entail the establishment of a 400 kV feeder bay and 132 kV feeder bay at Ariadne Sub-station and a 400 kV feeder bay at Eros Sub-station. This will take place within the existing Sub-station terrace, and thus, no extension of Sub-station terrace is required. The existing telecommunication infrastructure within the sub-stations will be used.

An A1 sized map indicating the locality of the study area is provided in Appendix 9.

2.2 Project location and main components

The proposed Ariadne-Eros Transmission Line Project is located in the southern part of KZN. It affects three (3) district municipalities, viz. Ugu, uMgungundlovu and Sisonke District Municipalities. The study area covers the area between the Ariadne Sub-station (Pietermaritzburg), the Oribi Sub-station (Port Shepstone) and the Eros Sub-station (Harding). The approximate length of the proposed transmission line is 178 km.

[4] A sub-station is an important element of an electricity generation, transmission and distribution system. Its function is normally to transform voltages from high to low or the reverse, using transformers and other heavy-duty electrical switchgear. By having a sub-station in a transmission network, it is possible for Eskom to de-energise a transmission line or other electrical switchgear for maintenance or for new construction or installation. In this way Eskom is able to maintain reliability of supply as maintenance work is being performed while still keeping the whole system running.

Figure 3 Map showing the existing transmission and large distribution power lines

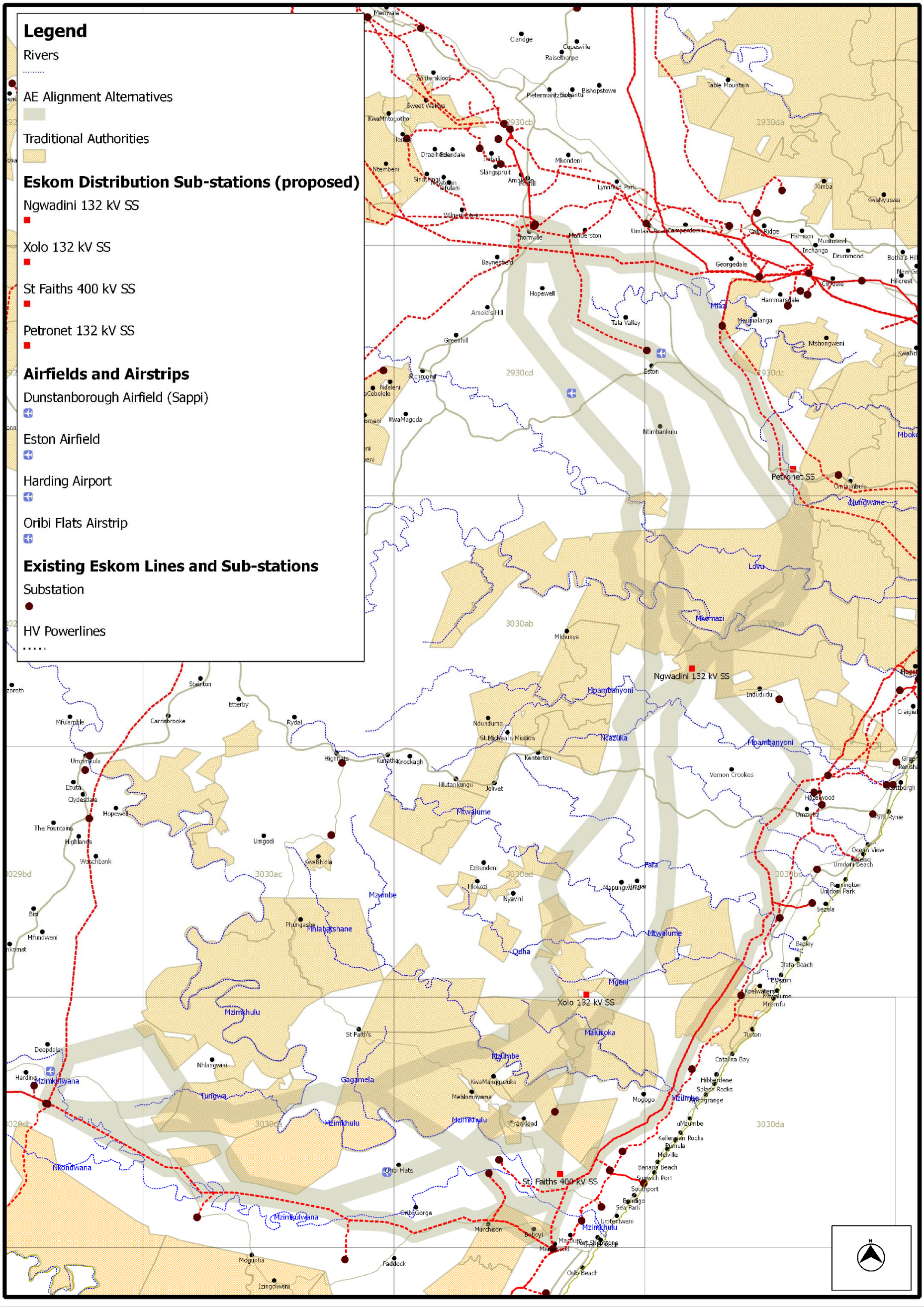
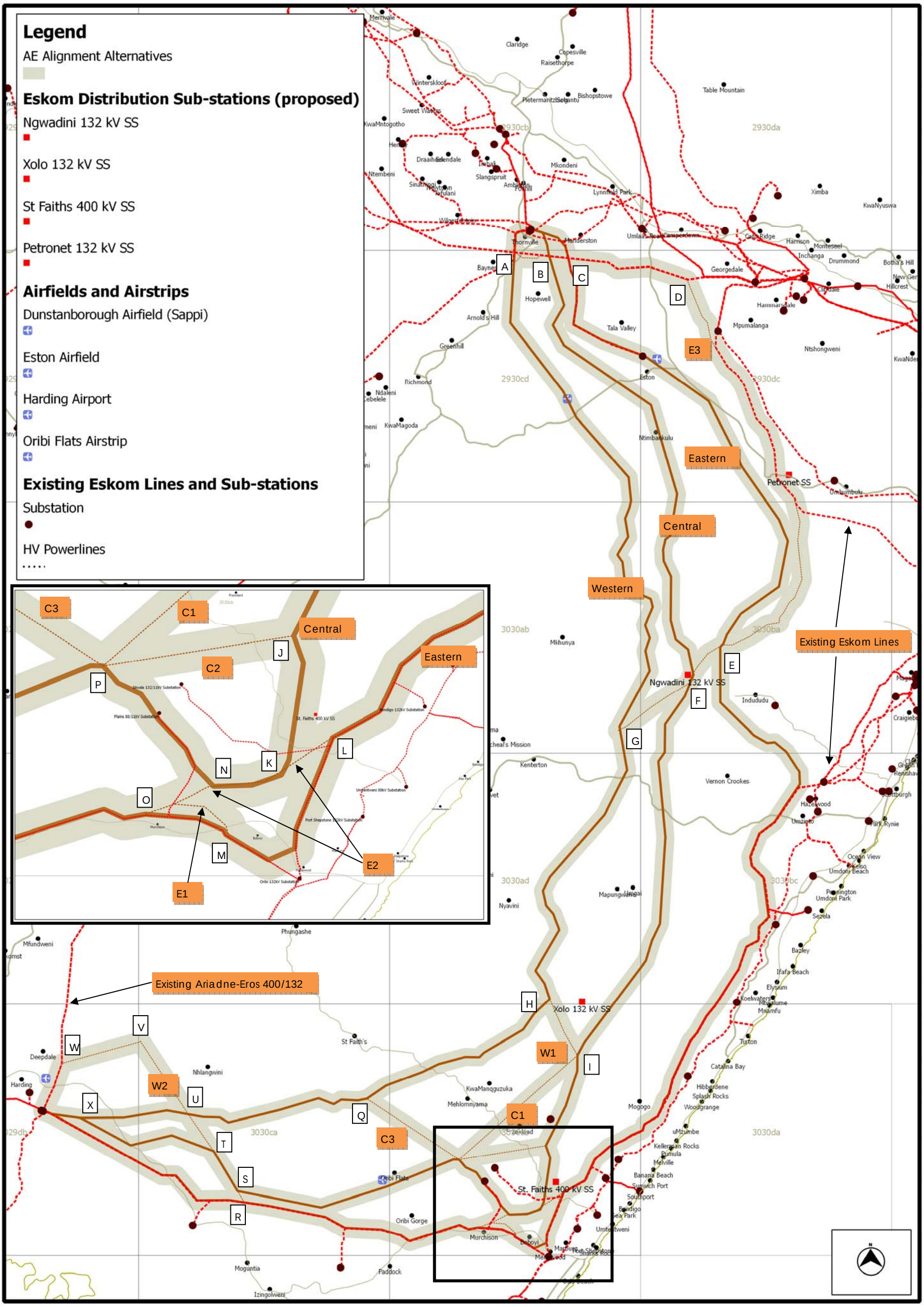


Figure 4 Map illustrating the proposed Ariadne-Eros Transmission Line Project and the corridor alternatives



The Ariadne-Eros Transmission Line Project comprises the following two main components:

- The construction of a 1 x 400/132 kV multi-circuit transmission line between the Ariadne and Eros Sub-stations.
- The expansion and upgrading of the Ariadne and Eros Sub-stations. This will entail the construction of a 400 kV Feeder bay on the existing sub-station terraces. No extension of the sub-stations is required and, thus, no environmental authorisation is required.

The project will also entail the construction of associated infrastructure such as access roads and a centre line track within the servitude. Access roads will be established in areas where access is presently unavailable and are required to move construction equipment and personnel to and from the construction sites (tower positions). The centre line track is required for conductor stringing and on-going line inspections and maintenance activities.

A number of technically and environmentally feasible options were assessed as part of this study (Chapter 3 and Figure 4). Following the statutory EIA process, and the issuing of a final decision (an environmental authorisation) by DEA, Eskom Transmission will commence with servitude negotiations with the affected landowners, and agree on compensation terms.

2.3 Ariadne-Eros 400kV/132 kV Multi-Circuit Transmission Line

2.3.1 Typical process for the construction and operation of transmission lines

A typical process followed by Eskom Transmission in the construction and operation of transmission lines is outlined below.

With respect to construction:

- Aerial survey of the route.
- Determine technically feasible alternative transmission line routes or corridors.
- Investigate the environmental feasibility of alternatives and recommend a preferred route or corridor.
- Environmental authorisation with regard to the preferred route or corridor.
- Negotiation of final route corridor within corridor with landowners.
- Selection of best-suited structures and foundations.
- Final design of line and placement of towers.
- Establishment of construction camps and construction of access roads.
- Vegetation clearance and gate erection.
- Centre line track establishment.
- Construction of foundations.
- Assembly and erection of towers.
- Stringing of conductors.
- Rehabilitation of working areas and protection of areas susceptible to erosion.
- Testing and commissioning of the power line.

With respect to operation:

- Ongoing maintenance in accordance with an approved Operational Environmental Management Plan (including aerial inspections, vehicle patrols, live-line maintenance using helicopters, periodic clearing and pruning of servitude vegetation, and periodic clearing of the centre line track).

2.3.2 Specifications for servitudes and towers

The proposed transmission line will require a servitude 55 m wide, i.e. 27.5 m either side of the centre line. For forestry, the required servitude is 76 m wide, i.e. 38 m each side of the centre line, due to fire risk and tree-felling. No permanent residence is allowed within the servitude. The servitude is required for the safe operation of the power line and reliability of electricity supply to consumers.

Steel towers will be constructed at intervals along the route of the transmission line, at a spacing of approximately 300 - 400 m. Each tower is approximately 30 - 35 m high (Figure 5) and it is anticipated that the majority of these will be Guyed V towers (Figures 6a and 6b). Strain towers (Figures 7a and 7b) will be used for bends greater than 3º and/or in difficult terrain. Cross-roped suspension towers (Figure 8) could also be used for this transmission line. Final towers to be used will be determined after surveying and profiling of the line.

For safety reasons, the transmission line requires minimum clearance distances. These are summarised as follows:

- The minimum vertical clearance distance between the ground and power line conductors is 8.1 m (Figure 9).
- The maximum crop height permitted within the servitude is 4.3 m (Figure 9).
- The minimum vertical clearance to any fixed structure that does not form part of the power line is 5.6 m.
- The minimum distance of a 400 kV power line from a proclaimed public road is 95 m from the centre line of the road.
- The minimum safe distance required from the centre of the power line to the edge of a domestic house is 40 – 50 m.

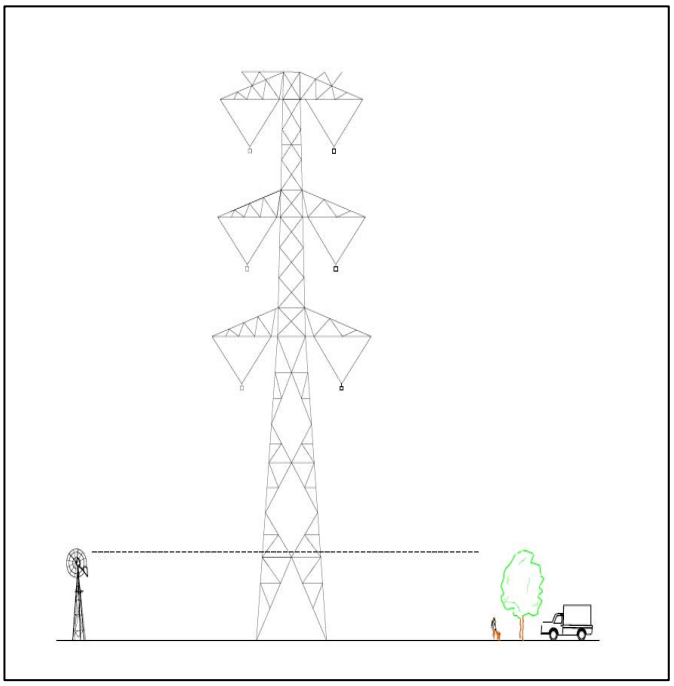
Farming activity, except[5] for sugarcane and commercial forestry, can be practiced under the conductors, provided that there is adherence to safe working clearances, crop height restrictions and building restrictions.

2.3.3 Servitude negotiations and registration

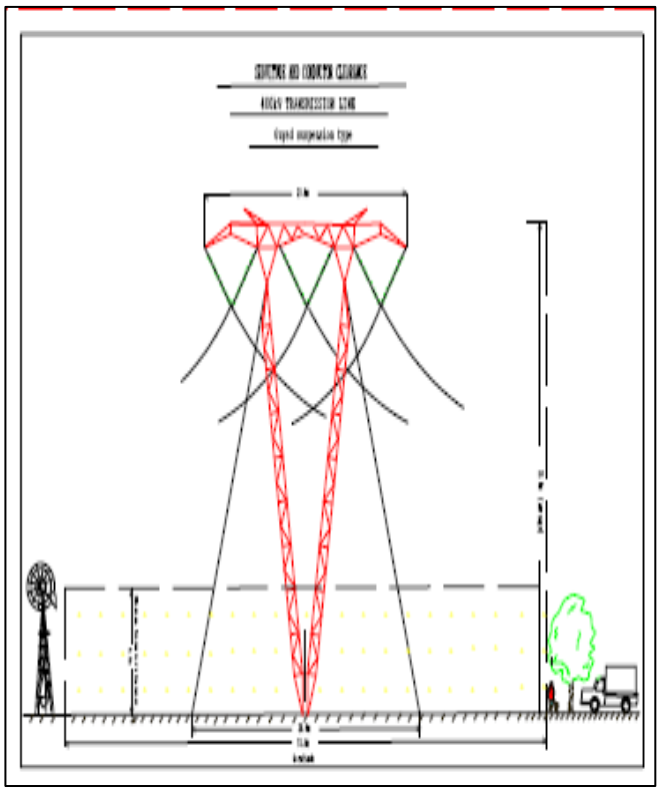
Before construction commences on a transmission line, Eskom Transmission needs to secure servitude rights via negotiations with affected landowners.

[5] This is Eskom's current policy, which is under review.

Figure 5 A typical multi-circuit tower



Figures 6a-b Guyed V towers



Figures 7a-b Strain towers

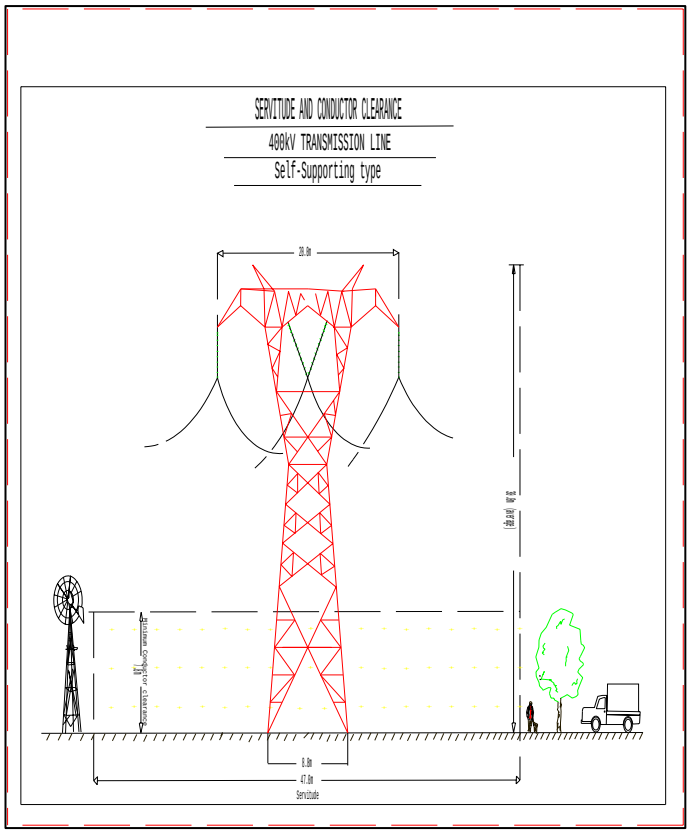


Figure 8 Cross-rope suspension tower

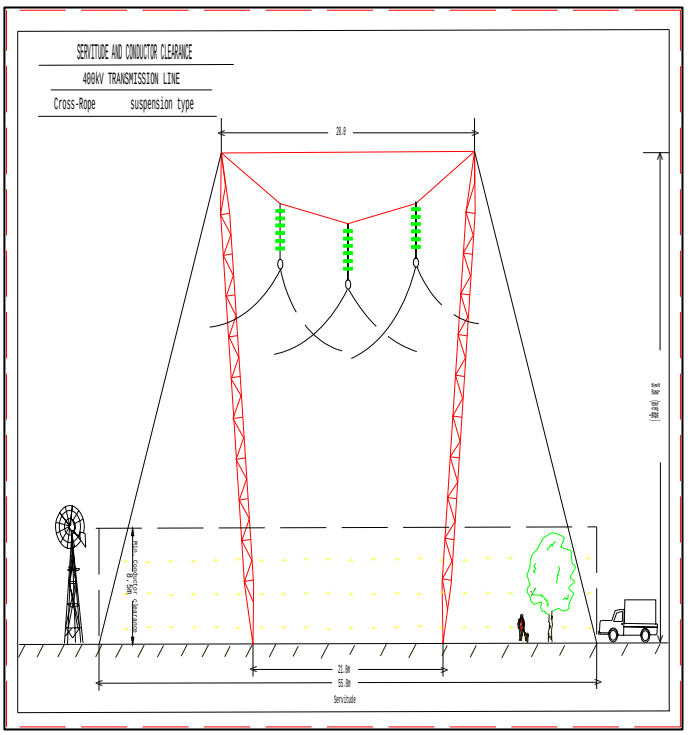
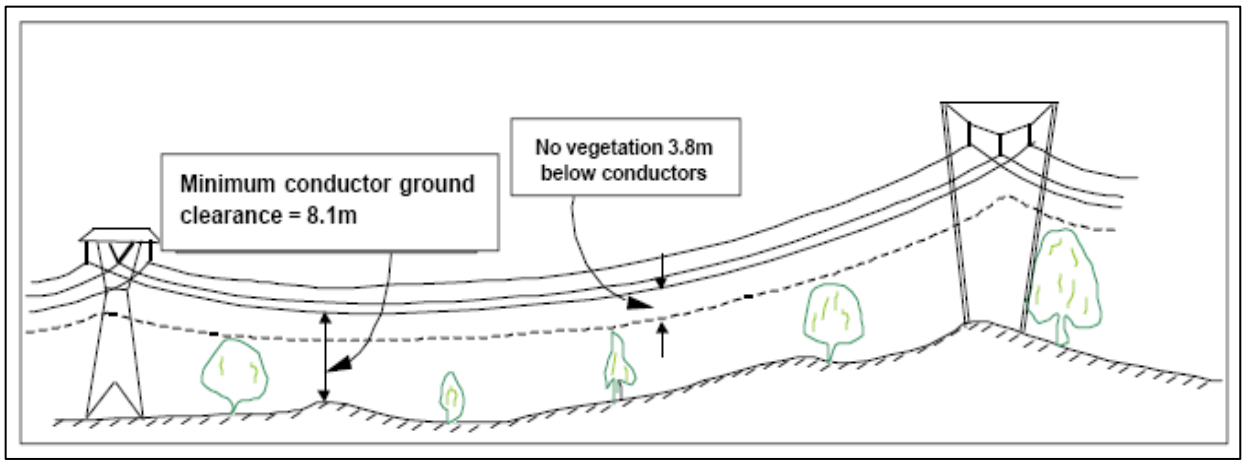


Figure 9 Tower illustration indicating minimum conductor ground clearance and vegetation height specifications



A servitude does not mean that the holder of the servitude, viz. Eskom, is the owner of the land, but merely that Eskom has the right of way to convey electricity across the land, subject to conditions agreed between Eskom Transmission and affected landowners.

A servitude provides Eskom certain defined rights for the use of the specific area of land:

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

The registration of servitudes can be a lengthy process, as it requires contractual negotiations with each affected landowner. Once this is complete, an application for registration of the servitude is lodged with the Provincial Deeds Office against the property deed.

The actual location of the towers on which the conductors will be strung is determined by a number of different factors, including:

- The outcome of Eskom negotiations with landowners, including landowner preferences.
- Environmental features and technical requirements.

As a result of these factors, it is challenging to predict the exact position of the towers within the EIA process, and final positions are often identified at the stage when the Final Environmental Management Plan is compiled, with site-specific input from specialists.

2.3.4 Construction activities

The construction of the transmission line is expected to require 14 months to complete. There are five main phases during construction:

- Excavation of tower foundations.
- Concrete works on tower foundations.
- Erection of steel structures.
- Stringing of transmission cables (conductors and the earth wire).
- Site rehabilitation.

All activities, including the centre line access track and tower anchors, are required to take place within the negotiated servitude. This is excepting access roads which usually are located and aligned in accordance with landowner preferences.

Construction activities will not be continuous for long but intermittent over periods of time. Therefore, it is anticipated that any impacts associated with construction workers are likely to be of medium intensity as a result of the low numbers of people employed intermittently over a large area.

Specifications necessary for construction camps are contained within the Draft EMP, with specialist input where required. However, the final location of construction camps may be determined only once contractors have been appointed.

Construction activities will comply with relevant legislation including the National Environmental Management: Waste Act (Act 59 of 2008), National Environmental Management: Air Quality Act (Act No 39 of 2004) and the Occupational Health and Safety Act (Act 85 of 1993).

A summary of the different construction activities is outlined below.

ACCESS NEGOTIATIONS

Negotiations between the landowner, contractor and Eskom Transmission are undertaken in order to determine access routes. Access roads are established on existing corridors where ever possible, and are only constructed or upgraded under special circumstances.

ESTABLISHMENT OF CONSTRUCTION CAMPS

The establishment of construction camps will be done in accordance to the stipulations of the Final Environmental Management Plan and negotiations with the affected landowners. Importantly, the location of construction camps will be determined only after the appointment of contractors.

TOWER PEGGING

Eskom appoints a surveyor to undertake the pegging of tower positions. Once central line pegging has taken place, the surveyor sets out the footprint of the transmission line and towers. This is done in two phases:

- The centre points of the proposed route and towers are marked.
- The position of the tower pegs is marked.

The surveying team then makes the first basic track[6] to the proposed site, and pegs the position of the tower. However, if there are difficulties with the site, for example, gully erosion, then the problem is recorded and the site is moved[7]. Once the site has been pegged, the team moves to the position of the next tower, and the process begins again. The surveyed line and tower positions are passed onto the relevant environmental specialists (for example, cultural heritage and flora specialists) who undertake their inspections before there is any construction. If there is a problem with a route or tower site, the surveyor is recalled to find a suitable alternative.

[6] Repeated vehicular movement on the same tracks create the access roads along the servitude.

[7] Within the negotiated servitude.

GATE INSTALLATION

Gates are installed where it is necessary to breach existing fence lines.

EXCAVATION OF FOUNDATIONS

Foundation holes (each 1.5 m x 1.5 m) for a tower are excavated (Figure 10). The minimum working area required for a tower varies depending of the tower type (20 m x 20 m for a Strain tower and 30 m x 30 m for a Guyed V tower). The foundations are filled with concrete (Figure 11). During construction, fences will be temporarily erected around holes and working areas as a safety precaution. The anchor holes are covered with a safety plate.

Figure 10 Transmission line tower foundation

Figure 11 Pouring of concrete into a tower foundation

FOUNDATION STEELWORK

The foundation structures are positioned into the excavated holes, and are tied together for support.

CONCRETE FILLING/FOUNDATION POURING

A "ready-mix" truck, which contains 6 m^3 of concrete, moves onto site and concrete is poured into the foundation holes. If there are difficulties in gaining access for the truck, concrete is mixed on site by hand or using mobile "mini mixers".

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 truck. If access is difficult by truck, then a helicopter is used. Access roads are clearly marked to facilitate movement to and from each tower position.

ASSEMBLY TEAM, PUNCH AND PAINT

A team of approximately 50 people assembles the galvanized steel tower. 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").

ERECTION OF TOWERS

A new team, with a maximum of two 70-ton cranes, lifts the towers into place (Figures 12 - 13). If different tower structures[8] are erected along the route, the number of cranes required per site may vary. If the cranes cannot access a site, a helicopter is used to lift the tower into position.

STRINGING, SAGGING AND TENSIONING

Large equipment is utilised during this activity. Two cable drums, with a winch in-between, are placed approximately 5 km apart. A pilot tractor lays the cable, which is then pulled up to the pylons with the use of pulleys. Once the tension has been exacted, the conductor cables are strung, never touching the ground.

In mountainous areas, the pilot cables are flown in by helicopter or shot across valleys, to create the correct tension to pull through the conductor. A small team of people, with survey equipment, conducts the sag and tension process. Tension is then created, the conductors clamped into place at the tower, and the excess cable is cut off.

SITE REHABILITATION

This is a continuous process, conducted throughout the construction phase. Temporary access roads are ploughed over, contoured and replanted with endemic grasses.

Where the transmission line crosses a fence between neighbouring landowners and there is no suitable access gate in place, Eskom will erect a suitable gate in consultation with the landowners. These gates are necessary to ensure access to the land for maintenance and repair purposes. The installation and use of access gates is regulated through Eskom's Gates Guideline[9].

[8] Guyed V and Strain tower types.
[9] The Guideline forms part of the Draft EMP (refer to Appendix 6).

Existing road infrastructure will be utilised as far as possible, to provide access for construction vehicles during the construction process, and for inspection and maintenance during operation. It is also likely that new access roads will need to be established, which will be done in consultation with landowners.

Figure 12 Illustration showing the tower erection process

Figure 13 Illustration of a crane lifting the tower into place

2.3.5 Temporary proposed infrastructure

Temporary infrastructure is mainly associated with contractor's camps and includes accommodation, and sanitary and storage facilities, which will be erected on separate sites identified and rented by contractors during construction (and also during major repair work to the towers during operation).

2.3.6 Design limitations and physical parameters required for the transmission line

Although some aspects of the transmission line corridor can be negotiated or altered due to the presence of environmental limitations or landowner preferences, there are some parameters that are obligatory: These include:

- A 55 m wide sugarcane-free and 76 m wide forestry-free servitude for the proposed 400 kV line.
- In forestry areas (both commercial and natural areas), a 76 m wide servitude is required. The wider servitude provides the line with protection from potential forest fires and falling trees.
- Legislation prevents the construction of new transmission lines through Protected Areas (except where existing servitudes are used).
- A 400 kV transmission line may not be closer than 95 m from the centre line of a proclaimed public road, unless agreed to by the roads department.
- A Guyed V tower cannot bear the strain of a bend of more than 3 degrees. Where the line needs to accommodate such a bend, a Strain tower is required. Given that Strain towers contain significantly more steel than Guyed V towers, it is imperative to keep a transmission line as straight as possible for as long as possible, avoiding sharp bends.
- The spacing between pylons is approximately 300 - 400 m. The minimum clearance between the mid-span point of the line and the ground is 8.1 m.
- It is not economically viable to place a transmission line of this voltage underground, as the cost is estimated at 10 times more expensive, and the environmental damage is extremely high as a significantly wider servitude is required for oil-cooled conductors. Added to this, no land-use is permitted within this servitude. There are currently no underground 400 kV transmission lines in South Africa.
- The minimum safe distance required from the centre of the line to the edge of a domestic house is 40 m (27.5 m of servitude plus an additional 12.5 m).

2.3.7 Construction and maintenance of roads

The proposed transmission line will follow existing utility services (such as local and district roads) where possible. However, new access roads may be required. New access roads are typically type-6 gravel roads that comprise of the following:

- Widening to a final gravel carriageway width of 6 m on raised earthworks.
- Drainage is to be provided in the form of meadow drains (on flat terrain) and "v" drains (on steeper terrain). Some new culverts may be required.
- Fencing will be erected where required.

- The total width of carriageway and drainage ranges between about 14 m (flat terrain) and 16 m (rolling terrain).
- Gravel will be obtained from the nearest legal quarry or borrow pit of suitable material.

Particular attention will be paid to stormwater management, with erosion protection measures being put in place where indicated by the terrain (geology, soils, and topography) and climate (in particular, rainfall and high rainfall events in short periods of time). Furthermore, all new access roads will be aligned and constructed within the provision and specifications of the private landowners. This is considered important for three reasons:

- The access roads should fulfil multipurpose functions, serving the needs of Eskom and the landowner.
- Landowners are acutely aware of sensitivities on their land, and should be in an excellent position to inform Eskom of optimum corridors.
- Post construction, Eskom will be responsible for the maintenance of the access roads[10]. It is possible that Eskom will enter into a contractual agreement with landowners to undertake road maintenance on their properties.

The specifications for access roads are contained within the Draft EMP that has been prepared for construction, and which will become legally binding on Eskom, and contractually binding on Eskom-appointed contractors.

2.3.8 Temporary storage of hazardous substances

The hazardous substances referred to comprise fuels, oils and lubricants that will be stored and dispensed at construction camps. Specifications for the storage and dispensing of fuels, oils and lubricants include the following:

- Specifically designated areas.
- All fuels, oils and lubricants shall be stored above ground and under cover.
- All designated areas will be bunded.
- 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 relevant employees must be properly trained in the storage and dispensing of specific fuels, oils and lubricants.
- A specific procedure for emergency situations, including accidental spills, must be formulated and must be available on site at all times.

Specifications are contained within a Draft EMP that has been prepared for construction and which will become legally binding on Eskom, and contractually binding on Eskom-appointed contractors.

[10] Where the roads are built exclusively for Eskom use.

2.3.9 Use of services and resources during construction

WATER

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

SEWERAGE

The generation of sewerage is anticipated for the duration of construction. Use will be made of chemical toilets that will be regularly serviced by the service provider. Grey water from construction camps will be directed to soak-aways.

ROADS

Existing roads will be utilised as far as possible during construction and operation. The use of roads on landowner property is subject to the provisions of a Draft EMP that has been prepared for the project, with individual landowner specifications being determined during discussions with landowners during the servitude negotiation process.

STORMWATER

Stormwater will be managed according to the Eskom Guidelines for Erosion Control[11] and Vegetation Management (Appendix 8), as well as the provisions of the Draft EMP, which has been compiled for the project.

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.

ELECTRICITY

Diesel generators will be utilised for the provision of electricity.

HUMAN RESOURCES

Approximately 200 people, including drivers, will be employed for the entire construction process. However, it is anticipated that there will seldom be more than 50 people employed in any one phase at a time. Construction activities will not be continuous, and people will be employed throughout the process over a wide area for a long period of time. Therefore, it is anticipated that any impacts associated with construction workers are likely to be limited as a result of the low numbers of people employed over a large area.

It is important to note that the construction of transmission lines is a specialised undertaking, requiring skilled people. It is 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, local people and businesses will benefit through the supply of goods and services to the appointed contractors.

[11] The Guideline forms part of the Draft EMP (refer to Appendix 6).

2.4 Expansion of the Ariadne and Eros Sub-stations

Eskom also needs to expand both the Ariadne and Eros Substations to accommodate the additional 400 kV transmission line. This expansion is expected to occur within the existing sub-station terrace and will entail the establishment of 400 kV of feeder bays at both sub-station. No extension will be required at either sub-station.

2.5 Environmental Management Plan

An EMP (one each for construction and operation) has been/will be compiled for the project, and this document will detail the specific controls, which must be in place for the duration of construction and operation. An independent and qualified Environmental Control Officer (ECO), who acts as an intermediary between individual landowners and Eskom (including Eskom-appointed contractors), will ensure compliance with the EMP.

The EMP outlines 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. This is a legally binding document, which is used to ensure that Eskom adheres to all conditions of the Environmental Authorisation. Once this document has been approved by DEA, the appointed contractor can commence construction.

2.6 Operation and maintenance

During operation, Eskom Transmission requires access to the servitude to enable maintenance of the transmission line. This could require traversing private property. Maintenance is carried out at regular intervals, and is often done by helicopter so that electricity supplies are not disrupted (Figure 14). Maintenance activities are highly specialised and are, therefore, carried out by Eskom Transmission employees/contractors.

The servitude will need to be cleared occasionally to ensure that vegetation does not interfere with the operation of the line.

Figure 14 Maintenance undertaken by helicopter

2.7 Decommissioning

Decommissioning generally entails the following activities:

- The physical removal of the transmission line and pylons would entail the reversal of the construction process.
- A rehabilitation programme would need to be agreed upon with the landowner before being implemented.
- The disposal of materials from the 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 the servitude and landowner rights would need to be negotiated with the landowner at the time of decommissioning.

Importantly, at the appropriate time, decommissioning would most likely be subject to an environmental impact assessment and possibly environmental authorisation.

2.8 Project timeframes

Eskom's target is to start operation of the transmission line by 2013. Construction is anticipated to take 14 months. This EIA is being managed with a target date for the granting of an environmental authorisation by DEA in January 2011.

3. ALTERNATIVES

The identification and examination of alternatives is fundamental to environmental assessment. It provides decision-makers with information that enables them to properly consider optimal solutions to development proposals. Alternatives illustrate and contrast the environmental implications and consequences of different options available to achieve the proposed objective. In this way, both the proponent and the authorities who must consider granting the authorisation are put in a position where all involved are able to make informed choices or decisions.

During the Scoping Phase and in line with the EIA Regulations, a number of alternatives were considered for the proposed Ariadne-Eros Transmission Line Project. These were divided into four categories:

- Macro Alternatives.
- Corridor Alternatives.
- Technical Alternatives.
- Micro Alternatives.

Following the 30-day public review period of the Draft EIA Report (05 March 2010 - 16 April 2010[12]), four additional corridor alternatives were recommended by stakeholders. Section 3.2.4 below provides details on these alternatives.

Each alternative was investigated in detail with a view to understanding the environmental consequences of the proposed transmission line.

3.1 Macro alternatives

3.1.1 No-development alternative

This alternative simply means that Eskom does nothing to address the purpose and need for the transmission line. The most significant outcome of this approach would be a negative impact on current and future KZN Eskom supply networks, and the possibility of complete blackouts at times of high and peak demand. Against the background of load shedding[13] events during the first quarter of 2008, not strengthening electricity supply to KZN could have potentially negative effects, such as a continual lack of supply electricity for many communities and a reduction of economic growth, not only in KZN, but also in South Africa as a whole.

Positive outcomes associated with the no-development option include the maintenance of the current aesthetic landscape with no negative impacts on the social and socio-economic environment, the primary economy (agriculture) and the biophysical environment (wetlands, rivers, flora and fauna).

[12] The public comment period initially extended from 05 March – 09 April 2010. At the request of stakeholders, this period was extended by 14 days from 09 April – 23 April 2010.

[13] A combination of factors, such as planned and unplanned maintenance, as well as weather, resulted in an electricity shortfall of around 3,000 MW daily in January 2008. This forced Eskom to embark on a load-shedding schedule that had serious negative effects on the general public and industry. The situation led to a forced decrease in production in the industrial and mining sectors, and, in certain instances, forced the temporary and permanent closure of factories and mines. The situation was described by Public Enterprises Minister Alec Erwin as a “national emergency” (www.globalinsight.co.za).

It is the professional opinion of ACER that this alternative is undesirable as it would result in the stagnation or cessation of many Government strategies that have been planned and implemented. Nonetheless, this alternative provides the baseline assessment of the impacts of other alternatives and also demonstrates the consequences of not authorising the development proposal. Therefore, this alternative remains the default option.

Consistent with the EIA Regulations of 2006, the no-development option was carried forward in this EIA

3.1.2 Demand-side management (DSM)

DSM is a function carried out by the electricity supply utility, aimed at encouraging a reduction in the amount of electricity used at peak times. This is achieved by influencing customer usage to improve efficiency and to reduce overall demand. These efforts are intended to produce a flat load duration curve, to ensure the most efficient use of the present network capacity. By reducing peak demand and shifting load from high load to low load periods, reductions in capital expenditure (for network capacity expansion) and operating costs can be achieved. One of the basic tools is price differentiation (such as time-of-use tariffs) between peak demand time and low demand time.

DSM was implemented during the period of scheduled load shedding during the first quarter of 2008, i.e. shifting load and demand in order to maintain the integrity of the network. However, in order to implement DSM effectively, a more regular and stable electricity supply to KZN is needed. Thus, while implementation of DSM should continue, it does not obviate the need to provide the infrastructure required for increasing reliability and quality of supply.

This option is currently being implemented by Eskom and energy distributors (municipalities), and, although it will continue to be implemented, it is currently considered unfeasible for addressing the purpose and need of the project. As a result, this alternative was discarded from further consideration in this EIA

3.2 Corridor alternatives

Three (3) major corridor alternatives (Western, Central and Eastern Alternatives) including eight (8) linking corridors are being investigated in this EIA (Figure 4). These were identified by Eskom Transmission, ACER and the public based on the technical and environmental criteria listed below (taking note that each criterion is applied as far as is practically possible):

- Minimise visual impacts, especially over high terrain such as hills and mountains.
- Optimise corridors over difficult terrain, providing sufficient space for the supporting towers, for example, mountaintops and saddles, and gradients with manageable side-slopes.

- As far as possible, avoid the sudden changes in topography and altitude such as valley-mountain interfaces.
- Avoid unstable geological and soil areas with potential slip zones and other forms of substrate instability.
- Avoid areas with a high potential for erosion and overgrazed areas with fragile soils.
- Avoid sensitive bird areas including foraging, nesting and roosting sites.
- Avoid sensitive natural areas including protected natural areas, nature reserves, conservancies and wildlife areas.
- Avoid wetlands including vleis, rivers, streams, ox-bow lakes, seepages and sponges.
- Avoid, where possible, areas of human habitation, including farm houses, rural homesteads, tourist destinations, places of religious worship, educational facilities, health facilities, settlements, villages and towns.
- Avoid sand mining areas.

The following criteria were added by specialists (see Chapter 6 for a detailed outline):

- Avoid airfields and airstrips within the corridors or by realigning the corridors to within a safe distance, so as not to interfere with light aircraft communication systems and takeoff and landing distance requirements.
- Blend in with the natural topographic profile by sculpturing or shaping the cut and fill slopes of access roads to angles and forms that are reflected in the adjacent landscape so as to reduce the visual impact.
- Where possible, place the proposed transmission line along properties boundaries or within land with low economic value in order to reduce the amount of productive (agricultural) land affected.
- Where possible, give preference to the corridor over the large-scale farms rather than small-scale farms to minimise the impact on small-scale farmers who are more susceptible to relatively higher economic losses of area under sugarcane and forestry.
- Where avoidance of agricultural land is impossible, farmers could be assisted with the establishment of alternative crops within the servitude to be able to still receive income from the land.
- Eskom should review the costs of sugarcane-free servitudes, the subsequent cost to the local economy and sustainability of the South Coast sugar industry against the cost of allowing servitudes with sugarcane and Eskom incurring the costs of transmission line maintenance.
- Forest patches and other sensitive areas must be avoided as far as possible.
- It is recommended that once a route has been selected and approved by DEA, a detailed investigation of natural habitats should be conducted that aims to define habitat areas of particular importance.
- Sensitive areas of vegetation can be avoided, firstly, by routing the transmission line around sensitive vegetation, or, secondly, routing over sensitive vegetation. This will require placement of towers within transformed land, i.e. either within areas of agriculture or degraded natural vegetation.
- Placement of towers in wetlands should be considered a fatal flaw in the tower site selection process, and alternative sites should be considered.
- Clearance of indigenous forest/thicket across ravines and gullies should not be permitted, as these areas will very rarely interfere with minimum conductor clearance requirements.

Each alternative alignment is detailed below. Also highlighted below is a description of the receiving environment within each alternative alignment.

The scope of environmental investigation for each alternative alignment is 2 km wide (i.e. 1 km from the either side of the centre line). This will enable to Eskom, ACER and specialists to make informed recommendations when selecting the final route corridor. The latter could comprise of a combination of major and minor alternative corridors.

3.2.1 Central Alternative

From the Ariadne Sub-station en route to Eston, the Central Alternative route passes through an area of Ngongoni veld of which a large portion of the area has been converted to commercial agriculture, such as sugarcane, timber plantations and vegetables. Patches of Ngongoni veld prevail on the less arable hillsides and on farms where animal husbandry is practiced. This veld type is dominated by *Aristida junciformis* (ngongoni grass or bristlegrass (Eng), steekgras (Afr), ingongoni (Zulu)) and when heavily grazed, develops low species diversity. South of Eston the route follows a southerly direction to the town of Dududu. On the upper plains before the Umkomaas River Valley, the route passes through KZN Sandstone Sourveld, an endangered veld type rich in diversity. However, much of this area has been converted to commercial agriculture or utilised as communal land, and is prone to annual burns and overgrazing. As the topography changes in the region of the Umkomaas River Valley, Eastern Valley Bushveld dominates the valleys sides and bottom. The terrain in this area is rugged and access is difficult.

From Dududu to Port Shepstone (Oribi Sub-station), the route passes through Ngongoni Veld in the Breamar area, it then heads southwards into the dominant vegetation type in this region - KZN Coastal Belt, an endangered veld type. This is a large portion of the study area and dissects a landscape of undulating hills, valleys and rivers. The vegetation along this section of the route is influenced by a range of land uses, from communal land where small-scale agriculture and grazing of livestock is practiced, to large-scale commercial sugarcane plantations, forestry and banana farming. On entering Port Shepstone and the Oribi Sub-station, the natural vegetation is sparse and mostly limited to the uMzimkhulu River course.

From the Oribi Sub-station the route heads westward leaving the KZN Coastal Belt, and crossing through Pondoland-Ugu Sandstone Coastal Sourveld (a very vulnerable veld type), into Eastern Valley Bushveld, which dominates the Oribi Gorge, and finally into Ngongoni veld leading up to the Eros Sub-station (Harding). As with the majority of the route, the vegetation (bar the Oribi Gorge, which is too steep to be farmed), has been converted into sugarcane plantations, commercial forestry and where it is communal, subsistence farming.

CENTRAL ALTERNATIVE (MINOR ALTERNATIVES C1, C2 AND C3)

A preliminary Avi-Faunal Assessment was undertaken during Scoping, in which bird sensitive areas were identified (Figure 15). This gave rise to the identification of additional minor alternatives (Alternatives C1, C2 and C3) to avoid these areas. Importantly, however, these avi-faunal aspects were confirmed during the Impact Assessment.

All three minor alternatives cross the KZN Coastal Belt (an endangered veld type). Near Oribi Gorge, Alternatives C1 and C2 cross patches of Scarp Forest and Pondoland-Ugu Sandstone Coastal Sourveld. North of Oribi Gorge, Alternative C3 connects to the Western Alternative (as an alternative corridor link), crossing over Pondoland-Ugu Sandstone Coastal Sourveld, Eastern Valley Bushveld and small patches of Scarp Forest.

3.2.2 Eastern Alternative

The Eastern Alternative follows a similar route as that of the Central Alternative, passing through predominantly Ngongoni veld and similar land use. East of Umbumbulu the route passes through KZN Hinterland Thornveld, a vulnerable veld type. As the route enters the Umkomaas River Valley it follows the river course for a section before redirecting out of the valley towards the town of Dududu. The proximity and parallel route of the transmission line to the river would affect the riverine vegetation and associated fauna and avifauna.

From Dududu the route enters the KZN Coastal Belt, mostly under agriculture or utilised as communal land. Towards uMzinto an area of rugged undeveloped terrain exists and patches of Scarp Forest are found. This route runs parallel (sometimes within 4 km of the seashore) to the coast and traverses areas of mixed land use including mostly communal land, sugarcane, forestry and banana farming.

From Oribi Sub-station the route turns westward, crossing through Pondoland-Ugu Sandstone Coastal Sourveld, it crosses the expansive Oribi Gorge where Scarp Forest dominates the valley floor and sides, heading through Eastern Valley Bushveld, Ngongoni Veld and small pockets of Southern Mistbelt Forest (Least Threatened) towards the Eros Sub-station. Most of this area is under intensive commercial agriculture.

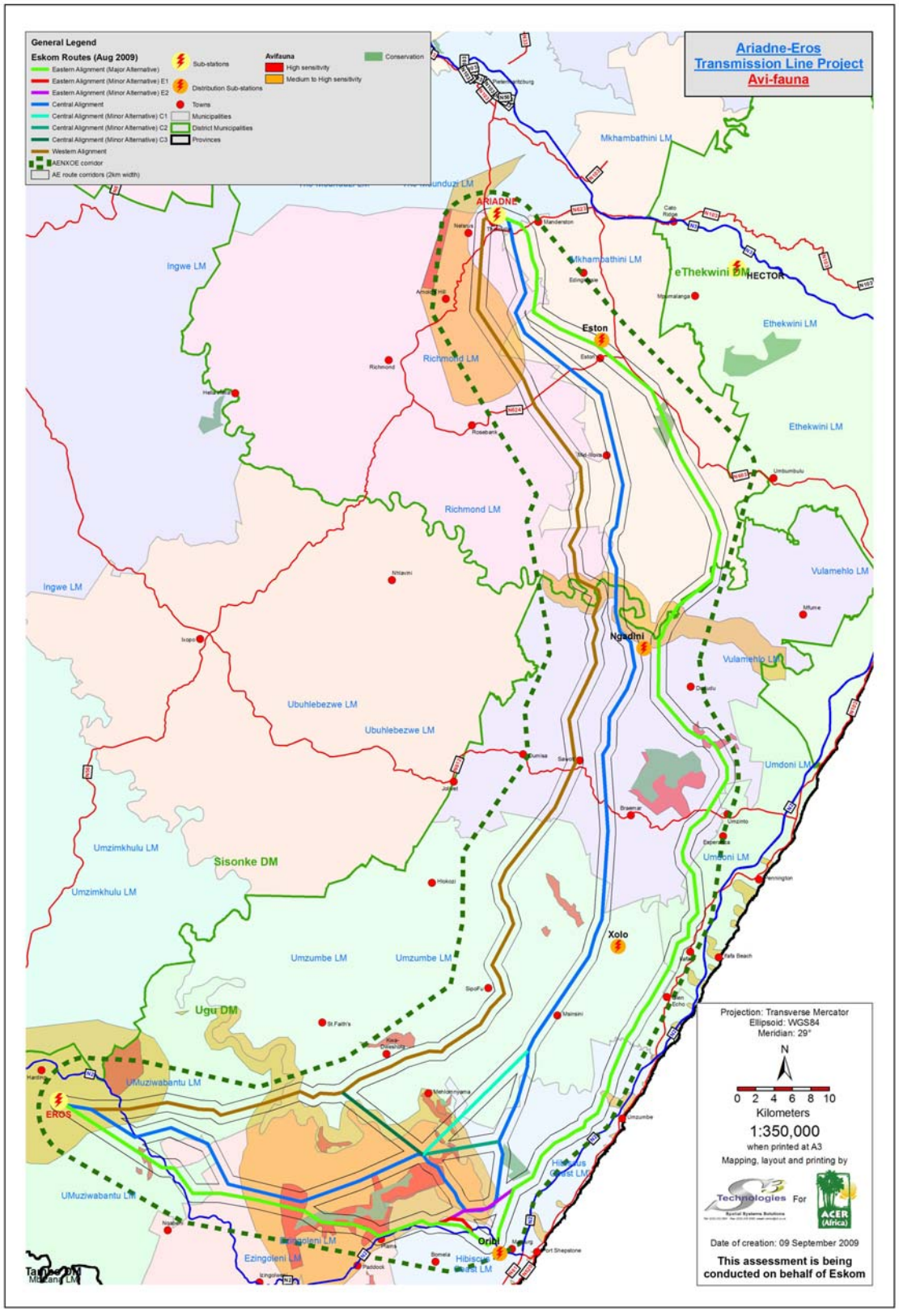
EASTERN ALTERNATIVE (MINOR ALTERNATIVES E1 AND E2)

These minor alternatives were identified by Eskom Transmission (based on the criteria listed previously) specifically to avoid areas of dense urban settlements in the Port Shepstone area. Both minor alternatives pass through KZN Coastal Belt and Pondoland-Ugu Sandstone Coastal Sourveld.

3.2.3 Western Alternative

The Western Alternative passes through Ngongoni Veld and then dissects pockets of Midlands Mistbelt Grassland (one of the most threatened vegetation types in KZN), heading towards the rugged terrain of the Mid-Illovo area where KZN Sandstone Sourveld and Eastern Valley Bushveld dominate, into the Umkomaas River Valley. Where the route crosses the Umkomaas River it follows the river course for a section before redirecting out of the valley. The proximity and parallel route of the transmission line to the river would affect the riverine vegetation and associated fauna and avifauna. From here the Western Alternative takes an inland course through terrain that is undulating, the valleys are moderately deeper and more incised, with the land use being predominantly communal subsistence farming and small-scale agriculture. The route passes through areas dominated by Ngongoni Veld, Eastern Valley Bushveld, small pockets of KZN Hinterland Thornveld and pockets of KZN Coastal Belt. Where the route takes a westward course to link with the Eros Sub-station it passes through areas of commercial agriculture including sugarcane and forestry.

Figure 15 Map showing areas of potential collisions of birds with the proposed power lines as well as crane nesting and flocking sites (EWT, 2009)



3.2.4 Stakeholder suggested alternatives

EASTERN MINOR ALTERNATIVE 3 (ALTERNATIVE E3)

Alternative 3 exits the Ariadne Sub-station, travelling south along the Western, Central or Eastern Alternatives, turning east and running in parallel to the existing Venus-Georgedale 275 kV line for a distance of 12 km (6 km east of the Georgedale Sub-station), passing a variety of land uses and vegetation including sugarcane, grasslands, thicket and bushland, and commercial/subsistence dryland, before turning south-east, joining the existing Georgedale-Illovo 275 kV line for a distance of 22 km, towards the Umbumbulu area including Traditional Authority areas of Langa, Madala, Embo-Timuni, Toyane, Embo-Nkasa Isimahla, Qiko and Zembeni. It crosses sugarcane plantations, tribal settlements and vegetation, and the Umlass Road (R603). South of the R603, it changes direction and turns south-west heading for the Umkomazi valley (north of Dududu). On the southern side of the Umkomazi River, it intersects all three major corridor alternatives (Corridor Joints E, F and G) (Figure 4), passing close to the proposed Ngwadini 123 kV Sub-station (Joint F) and terminates in the Western Alternative (Joint G).

WESTERN MINOR ALTERNATIVE 2 (ALTERNATIVE W2)

Originating from the Eastern Corridor (Joint R) it travels in a north-westerly direction for approximately 20 km crossing both the Central (Joint S) and Western (Joint V) Alternatives, passing through traditional (rural) settlements of Qinisela Manyuswa, Mbotho, Jabulani Beshwawo and Tokozani Madumisa, forestry plantations, sugarcane, grasslands, thicket and bushland. It then makes a sharp turn towards the west, travels 7 km flanked by commercial forestry on the south and rural settlements on the north before it intersect the existing Ariadne-Eros 400/132 kV line (Joint W), and turning south passing grasslands, forestry and commercial dryland farming (running in parallel to the existing Ariadne-Eros line) into Eros Sub-station.

WESTERN MINOR ALTERNATIVE 1 (ALTERNATIVE W1)

This alternative extends for approximately 6 km and links the Western Alternative (Joint H) and Central Alternative (Joint I). As it leaves Joint H, it travels south, passing the western side of the proposed Xolo 132 kV Sub-station. It traverses forest plantations, grasslands and rural settlements of the Ndelu and Qwabe Traditional Authorities.

CENTRAL MINOR ALTERNATIVE 3 (ALTERNATIVE C3)

This alternative is described in 3.2.1 above. It resulted from the preliminary avi-fauna specialist input by EWT (Figure 15). It links the Central Alternative (Joint P), near Oribi Flats, and Simuma, and Western Alternative (Joint Q).

All three major alternatives and eight minor alternatives are considered technically and environmentally feasible, and were considered in this EIA

3.3 Technical alternatives

3.3.1 Underground transmission lines

It is not economically viable to place a high voltage (400 kV) transmission line underground as the cost is estimated at 10 times more than for conventional overhead transmission lines.

In addition to the financial factor, it must be noted that transmission lines produce heat and require cooling. Overhead transmission lines are air cooled while for underground transmission lines, the conductors are oil-cooled. However, these conductors are significantly larger in diameter than overhead conductors. The larger conductors require a larger servitude to keep the conductors apart. Ultimately, a servitude approximating the width of a 10-lane highway may be required for one underground transmission line.

Of significance with this servitude is that the line would need to be buried to a depth of between 1.5 m and 2 m, generating significant spoil that will need to be disposed. Also, once completed, the servitudes would need to be maintained as open grassland. Not only is this inappropriate for some parts of the study area, but, importantly for landowners, the servitude area becomes sterile for the purposes of continued agricultural activities.

With due consideration of the cost implications, technical complexities and environmental impacts associated with underground transmission lines, this alternative was discarded from further consideration in this EIA

3.3.2 Upgrading existing transmission lines

The option to upgrade the existing, inland Ariadne-Eros 400 kV transmission power line has been considered by Eskom Transmission. However, this option would not address the need and purpose of the project. The added benefit of building a second transmission power line is the establishment of a closed circuit, therefore improving the reliability of electricity supply. In addition, by designing the proposed transmission line as a multi-circuit line, Eskom is able to better serve its distribution needs.

With respect to upgrading other existing, large distribution power lines (mainly 88 kV and 132 kV lines), larger steel towers would be required, as existing towers would not be strong enough to carry larger conductors carrying a higher voltage (400 kV). Secondly, the temporary decommissioning of an existing power line, therefore de-energising the line, for a significant period of time to carry out the necessary upgrade will negatively affect consumers who would not have a supply for the period of construction (greater than 12 months). The supply-demand scenario for the KZN region is such that all existing lines are needed at any one time to meet the current power needs. The upgrade of existing lines is not seen as optimising existing infrastructure.

However, Eskom cannot continue to erect lines, acquire servitudes and visually scar the landscape. In time, when the KZN Strengthening Project has been completed and there is sufficient capacity in the system, it may be possible to decommission some older and smaller lines with a view to using these now vacant servitudes for new and larger lines into the future.

This option was not be considered further in this EIA, but will continue to be considered as part of the overall KZN Strengthening Project

3.4 Micro alternatives

3.4.1 Tower positions

The spacing of towers ranges between 300 - 400 m. This will enable the micro-positioning of towers along the transmission line and, therefore, enable Eskom to avoid environmentally sensitive sites, infrastructure, and the like. Micro-positioning usually occurs following the completion of the EIA and the issuing of the Environmental Authorisation, and forms part of the negotiation process between Eskom and affected landowners. Specialist input (for example, cultural heritage, botanical, wetland and avi-fauna) is obtained where required to minimise environmental impacts.

Micro-positioning will continue to receive attention post this EIA for the purpose of identifying environmentally-sensitive sites

3.4.2 Tower types

The amount of steel and the footprint requirements of a tower vary depending on the choice of tower (see Section 2.3.2 for details on tower types). Towers with less steel are less visible at a distance. With regards to footprint requirements, a Self-supporting/Strain tower will require a larger working area as compared to a Guyed V tower.

This EIA discusssed the effects of the different tower types with the view to minimising negative impacts on the environment, particularly in visually sensitive areas (such as conservation areas and areas of scenic beauty) and ecologically sensitive areas (such as wilderness and natural forest areas).

The consideration of different tower types continued to receive attention in this EIA

3.4.3 Construction camp locations

The number of construction camps that will be required will be a factor of the number of contractors appointed to construct the transmission line. This will be determined by the actual amount of time that Eskom has available to construct the line.

A number of criteria for the selection for suitable construction sites are provided in Chapter 8 and Section 1.5.1 – 1.5.2 of the Draft EMP (Appendix 8). These include the use of degraded and non-agricultural land. The exact location of construction camps will be established subsequent to the issuing the environmental authorisation by DEA and as part of the servitude negotiation process.

4. DESCRIPTION OF THE ENVIRONMENT AND THE MANNER IN WHICH IT MAY BE AFFECTED

A description of the receiving environment was provided in Chapter 6 of the Scoping Report (ACER, 2009). In this EIA Report, only those elements of the receiving environment pertaining to key environmental issues and impacts associated with the proposed activity are elaborated upon. Chapter 6 of this report details findings of the specialist studies and provides a more detailed description of the receiving environment.

4.1 Location of the study area

The study area is located in the southern part of KZN and extends from near Pietermaritzburg (Ariadne Sub-station) in a south-easterly direction to Port Shepstone (Oribi Sub-station) and then westerly to Harding (Eros Sub-station). It falls within two district municipalities: uMgungundlovu District Municipality (DC22) and Ugu District Municipality (DC21). Within these district municipalities, a number of local municipalities are affected by the proposed development (Figure 16).

Within the uMgungundlovu District Municipality, three (3) local municipalities are affected:

- Msunduzi Local Municipality (KZ225).
- Richmond Local Municipality (KZ227).
- Mkhambathini Local Municipality (KZ226).

Within the Ugu District Municipality, six (6) local municipalities are affected:

- Vulamehlo Local Municipality (KZ211).
- uMdoni Local Municipality (KZ212).
- uMzumbe Local Municipality (KZ213).
- uMuziwabantu Local Municipality (KZ214).
- Ezingolweni Local Municipality (KZ215).
- Hibiscus Coast Local Municipality (KZ216).

Subsequent to the public review of the Draft EIA Report (March-April 2010), four additional alternatives were included in this environmental assessment process (see Chapter 3). As a consequence, there are two (2) additional municipalities affected by the project:

- Sisonke District Municipality: uMzimkhulu Local Municipality (KZ214).
- eThekwini Metropolitan Municipality.

Therefore, a total of thirteen (13) municipalities comprising of three (3) district municipalities and ten (10) local municipalities fall within the study area.

4.2 The biophysical environment

4.2.1 Terrain, Geology and Soils

The terrain morphology within the study area is typical for KwaZulu-Natal, in that it is diverse and varied. The Drakensberg mountain range inland and to the west has a multitude of rivers that drain from its watershed into river catchments that follow an easterly course dissecting the corridor and emptying into the Indian Ocean on the KZN South Coast. The river catchments dominate the landscape creating a terrain of closed hills and mountains, with a moderate to high relief, deep valleys and hilltop plains with a moderate relief. It is further characterised by extensive river gorges and hilly areas, for example, the Oribi Gorge found in the south of the study area.

The geology is equally diverse and influences the topography and scenery of the study area. From a provincial perspective, the geological foundation comprises two distinct geological units, viz.:

- The Kaapvaal Craton (a composition of early granite greenstone terrains, older gneisses and granitic plutons).
- The Natal Metamorphic Group (deep mountain roots of granite and gneiss). This geological unit gives rise to the impressive folded rock forms such as those found in the Oribi Gorge region.

The following groups overlay the aforementioned geological foundations:

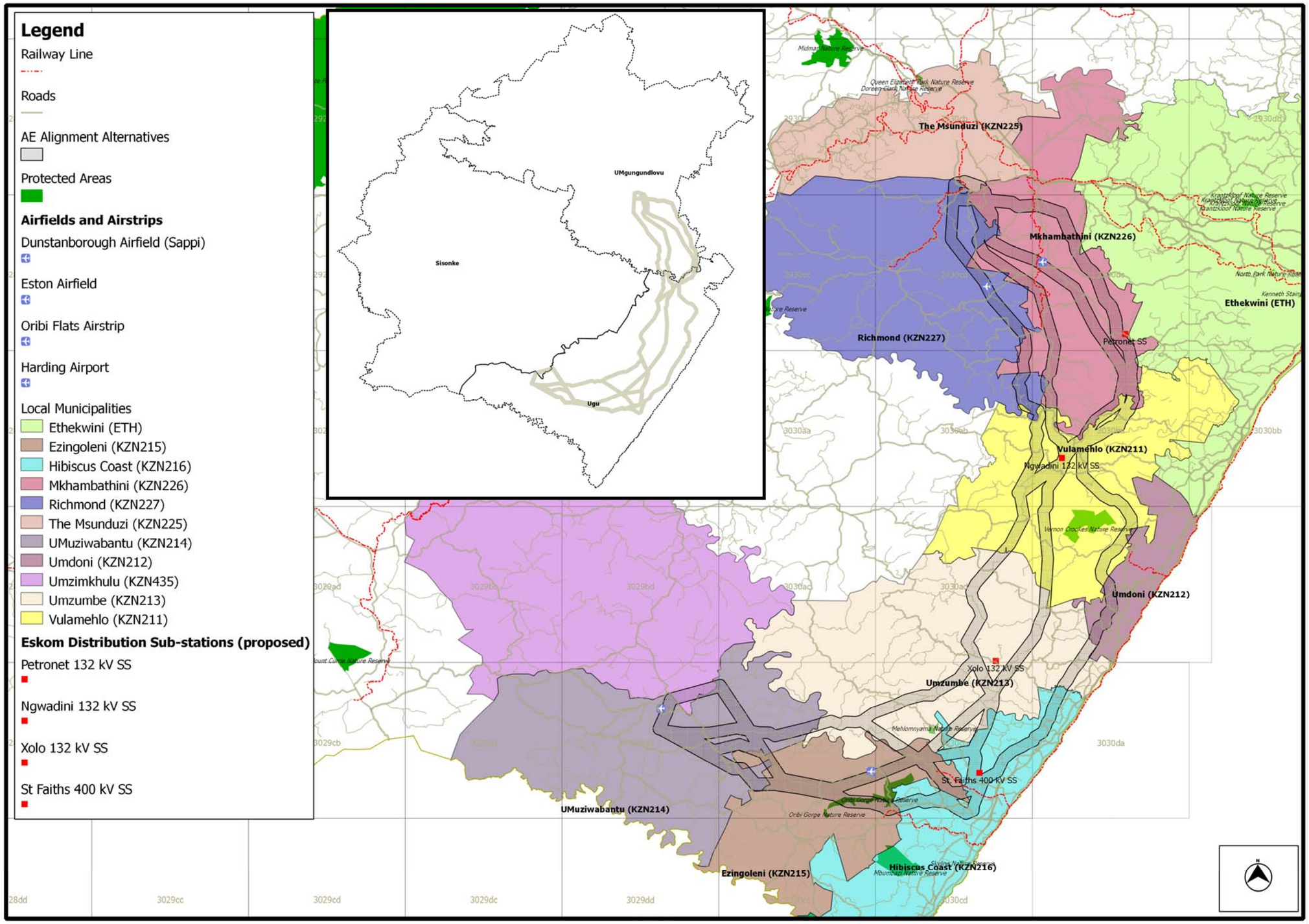
- The Natal Group (sandstone).
- The Dywka Group (tillite rocks).
- The Ecca Group (shale and sandstones).

Major soil forms within the study area are Glenrosa, which occurs near the coastline (Port Shepstone-Amanzimtoti) and in the hinterland zones (reaching towns of Kokstad in the south and Eston in the north), and Pinedene, which occurs in continuous bands in the hinterland zone.

4.2.2 Climate

A temperate, sub-tropical climate with warm temperatures and summer rainfall is typical of the climate of the study area. Summers are hot and humid with an average temperature of 20 - 30^{o} C and regular showers, with a mean annual precipitation of 500 – 1,000 mm. Winters are milder and drier with an average temperature of 12 - 24^{o} C. The more inland sections of the study area such as Pietermaritzburg and Harding experience lower winter temperatures due to increased altitude and greater distance from the coast. Frost and occasional light snowfalls are regular in the winter months. Snowfalls in the Harding area have on occasion been severe and could affect the transmission lines and supportive infrastructure. Lightning storms are frequent in the summer months, particularly in the Pietermaritzburg area, but generally occur throughout the study area.

Figure 16 Local and district municipalities, and conservation areas, within the study area



4.2.3 Flora

The study area is rich in biodiversity, with numerous ecosystems, vegetation units, vegetation types, habitat types and topographical features. Mucina and Rutherford (2006) provide a classification of the vegetation units occurring in the study area. A total of nine vegetation units occur within the study area, three are listed by as Endangered (SANBI), three are listed as Vulnerable (SANBI) and three are listed as Least Threatened (SANBI).

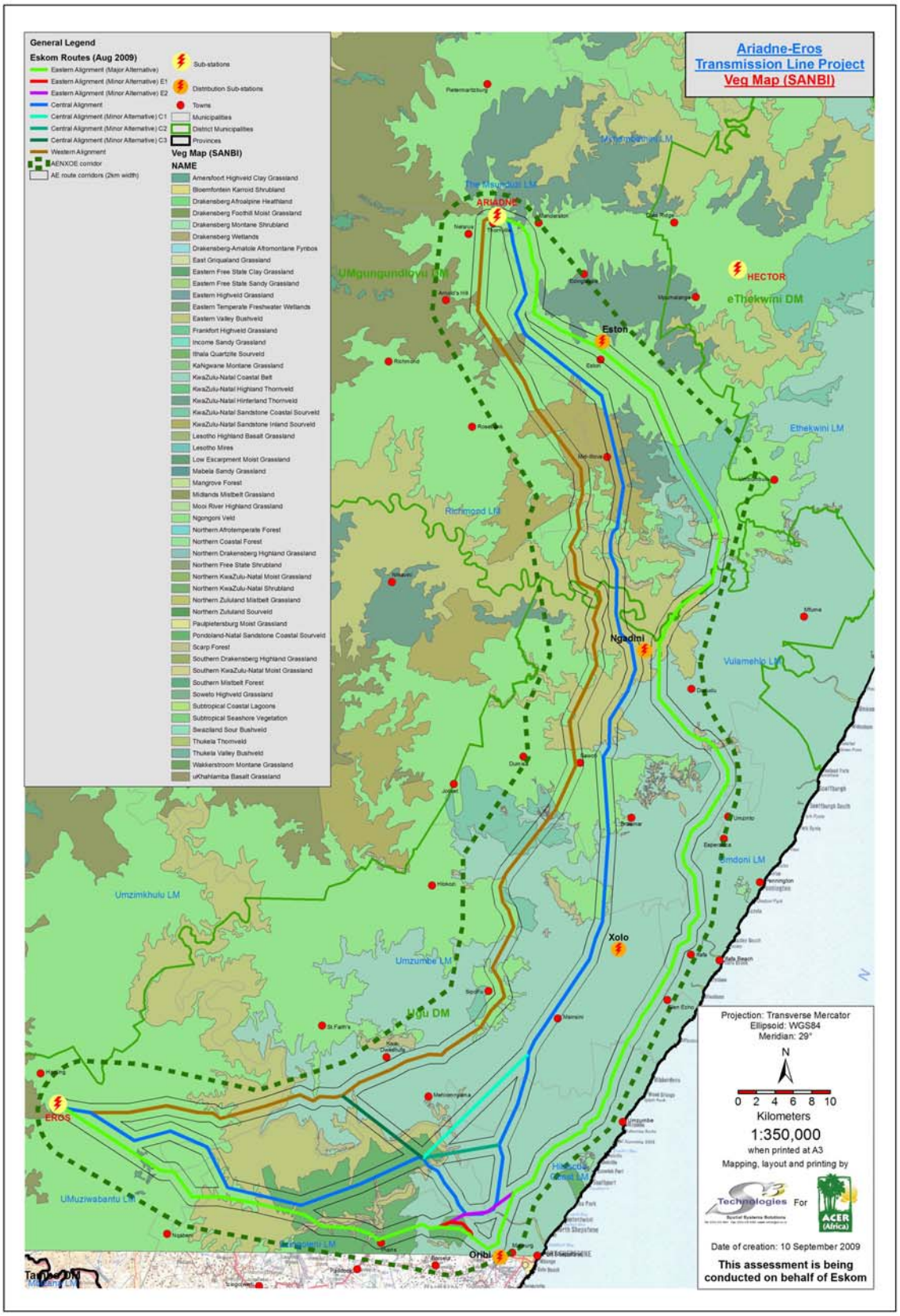
Section 6.5 of this report contains an exhaustive list of vegetation units and types, including their conservation status as determined by SANBI and updated by EKZNW.

Table 5 provides a list of vegetation units and types including their conservation status. Figure 17 illustrates the vegetation types within the study area.

Table 5 List of the vegetation types that occur within the study area

Bioregion Name	Vegetation Type	Conservation Status
Sub-Escarpment Grassland	Midlands Mistbelt Grassland	Endangered
Sub-Escarpment Savanna	Ngongoni Veld	Vulnerable
	Southern Mistbelt Forest	Vulnerable
	Eastern Valley Bushveld	Least Threatened
	KwaZulu-Natal Sandstone Sourveld	Endangered
	KwaZulu-Natal Hinterland Thornveld	Vulnerable
Indian Ocean Coastal Belt	KwaZulu-Natal Coastal Belt	Endangered
	Pondoland-Ugu Sandstone Coastal Sourveld	Vulnerable
Zonal & Intrazonal Forests	Scarp Forest	Least threatened in protected areas, but exposed to over-exploitation elsewhere.

Figure 17 Vegetation types within the study area



4.2.4 Conservation areas, fauna and avifauna

The study area comprises areas of conservation-worthy and biologically diverse ecosystems, which are made up of both protected and unprotected areas: provincial nature reserves (Figure 16), indigenous forest areas, grasslands, and private game reserves. A number of conservancies are also functional within the area.

CONSERVATION AREAS

There are two protected nature reserves within the study area, which are administered by Ezemvelo KZN Wildlife. The largest and most prominent is the Oribi Gorge Nature Reserve, which is located near Port Shepstone within the Hibiscus Coast Municipality. The reserve encompasses scarp forests, rivers and narrow valleys. High sandstone cliffs dominate the gorge carved out by the uMzimkhulu River. The reserve is home to a number of species including: leopards, common reedbuck, oribi, blue duiker, grey duiker, baboons, bird life (including five species of kingfisher and seven species of eagle) and various small antelope. Cape Vultures (endemic and vulnerable) nest on the sandstone cliffs and are extremely prone to collisions with transmission lines. The Oribi Gorge and its surrounding areas have been flagged as having high sensitivity regarding avi-faunal activity.

Vernon Crookes Nature Reserve, a smaller reserve, is located near uMzinto within the Vulamehlo Municipality. The reserve encompasses open grassland (Ngongoni Veld and KZN Coastal Belt), rolling hills, small pockets of scarp forest and ocean views. It is home to a range of wildlife including zebra, blue wildebeest, bushbuck, blesbok, oribi, reedbuck, blue and grey duiker, black-backed jackal, vervet monkeys, rock hyrax, tree hyrax, caracal, slender mongoose, white tailed mongoose, Egyptian mongoose, banded mongoose and porcupine, and an abundance of bird life. The latter includes raptors such as the Crowned and Martial Eagle. This area is a high sensitivity zone regarding avi-faunal activity.

FAUNA (TERRESTRIAL MAMMALS)

The faunal biodiversity within the study area is varied. The inland areas of the study area (along the Western Alternative) have the lowest faunal significance, and hence a low faunal biodiversity. The near-coast areas of the study area (Central and Eastern Alternatives) have a higher level of transformation (as a result of urban development and commercial agriculture) and relatively high faunal biodiversity.

Sensitive faunal species identified within the study area include several red data species and other notable species[14]. Detailed findings of the faunal specialist study are contained in Section 6.4.

AVI-FAUNAL SPECIES (BIRDS)

A diversity of bird life (recorded bird species are in the hundreds) and wildlife (predominantly in the protected areas) is found in the study area. The South Coast region is a regular destination for birdwatchers.

[14] Faunal species not currently listed as red data species but that are considered sensitive because they have localized distributions (endemic), are naturally rare or have specialized habitat requirements.

The Eros Sub-station site (Harding) falls within an area where the rare Blue Swallow has its habitat and, thus, this area is classed as having medium to high sensitivity. The turn-in from the transmission line has to feed into this sub-station and it is inevitable that this habitat will be disturbed. Figure 15 shows the areas of potential collision of birds with the proposed power lines, as well as crane nesting and flocking sites, as identified from existing EWT data (ACER, 2009).

According to the avi-faunal specialist, Endangered Wildlife Trust (EWT), there are fifty-two red data species within the study area, including bird species classified as critically endangered (1), endangered (3), near-threatened (31) and vulnerable (17). Sections 6.2 and 6.10 contain the detailed findings of the avi-faunal specialist study.

4.2.5 Hydrology

The study area falls within two key catchments, viz. the uMzimkhulu and Mkhomazi catchments. Medium sized catchments include (from south to north), Illovo and Umlazi, and smaller catchments include Mzumbe, Mtwalume, Ifafa and Mpambanyoni. The catchments drain in an east to south-easterly direction and empty into the Indian Ocean. The surface hydrology is characterised by different river types, from large, perennial rivers that rise from the Drakensberg (uMzimkhulu and Mkhomazi Rivers) to medium-sized rivers found in the hinterland area (Illovo and uMlazi Rivers), to several coastal, sandy rivers. The larger perennial rivers have a range of perennial and non-perennial rivers and streams that feed into them. The non-perennial streams usually dry up in the drier winter months. The overall gradient of the rivers in KZN is generally steep and this increases the erosion potential of these rivers. The rugged landscape in the study area is largely a result of river/water erosion.

A diversity of flora species is supported and sustained by these riverine environments. They also provide habitat and migratory corridors for a number of faunal species. Of importance economically, is that these rivers also sustain agriculture and industry in the area.

4.3 Cultural heritage resources

Heritage KwaZulu-Natal (Amafa aKwaZulu-Natali) is the provincial heritage authority for KwaZulu-Natal, including archaeological resources. In terms of the National Heritage Resources Act, 1999 (Act No 25 of 1999), Heritage KwaZulu-Natal has a mandate to protect these resources acting as the provincial heritage management organisation.

Section 38(1) of the National Heritage Resources Act indicates that a Heritage Impact Assessment is required in the case of the following:

- Construction of a road, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300 m in length.

The heritage specialist noted that natural environment within the Eastern Alternative, and to a lesser extent within the Central Alternative, is transformed by urban and agricultural land use, and such, it is unlikely to reveal any heritage resources with the exception of the Oribi Gorge area. Large sections of the Western and Central Alternative traverse traditional authority areas where impacts on the living heritage and tangible heritage resources (homesteads, burial grounds and settlements) could be a significant limitation to defining the transmission line servitude.

A heritage practitioner must be appointed to conduct a 'walk-through' and to develop monitoring requirements for a suitable transmission line servitude and all other activity areas (access roads, construction camps, etc.) prior to the start of any construction activities.

4.4 Social environment

4.4.1 Infrastructure

TRANSPORT

The transport infrastructure network (Figure 16) within the study area comprises road, rail and air, allowing for generally good access and the mobility of goods and people. Within the greater area, the national roads (N2 coastal road and N3 (Durban – Pietermaritzburg)) create a good link between the Ariadne and Eros Sub-stations. Within the study area the main roads, viz. the R56, R603, R102, R612, R624 and various secondary roads allow access to large parts of the area. However, the inland road system is still at a level where most secondary roads are gravel and impassable in the wet season. Within the Mkomazi and Mzimkhulu Valley areas, roads are generally built on ridges/spurs and along the main river courses.

A rail line runs from Durban to Port Shepstone and from Port Shepstone to Harding. There is an international airport in Durban and a light aircraft airport south of Port Shepstone in Margate. A number of airfields and airstrips are also found within the study area (see Section 6.8 for detailed findings of the transportation networks).

ELECTRICITY

The agricultural economics specialist noted that electricity is a basic service that needs to be provided as per the commitment of government. However, many areas, particularly rural, still lack access to this service. In 2007, approximately 82.1% of households in the country had access to electricity in their dwellings. Within the study area, about two thirds of households have access to electricity. The situation is the worst in the Mkhambathini LM, where only half of households had access to electricity.

Unfortunately, the access to electricity within the study area was even worse than that of South Africa in general. In KwaZulu-Natal, about 7 out of 10 households have access to electricity.

There is a great need to improve access to electricity in the study area. This was also confirmed during the public participation process, where most of the communities complained about having poor electrification in their areas (Broughton, 2009). However, to realise the benefits of electricity to communities, Eskom Distribution and the local municipalities will need to develop and implement a macro-plan for the connection of new consumers.

POTABLE WATER

In general, coastal areas have a higher level of service provision when compared to inland rural areas. Potable water originates from dams, rivers, ground water and bulk purchases, and is then distributed to consumers (landowners, local residents, business and industry) via bulk and household connections and communal stand taps. The latter is found mainly in the inland rural areas.

4.4.2 Land use and settlements

Land use and settlements within the study area are varied and will influence the ultimate route that the transmission line will follow. During an aerial survey of the study area, photographs were taken of the general study area corridor. These provide a good representation of land use throughout the study area.

The land use of the study area can be described as follows (refer to Appendix 5 for Plates).

Starting at the Ariadne Sub-station (Plates 1-17) and heading south-east towards Mid-Illovo, the study area corridor comprises smallholdings that are close together, making it difficult to find a passage through them. The study area corridor then covers intensive commercial agricultural lands, where sugarcane and timber farms/forestry dominate, including the small town of Eston (Plate 10) and its sugar mill. Continuing (Plates 11-17) the study area corridor comprises intensive sugarcane lands.

Thereafter, the study area corridors pass through communal land held in trust by the Ingonyama Trust Board (Plates 18-35) where scattered homesteads, comprising residential houses with stock pens, granaries, subsistence farming (mostly maize, vegetables and in some cases sugarcane), bananas, and grazing land are dispersed over the rugged hilly landscape. The study area corridors then pass over the Mkomazi River (Plate 31), which has no noteworthy developments and is largely rural and well vegetated. Heading out of the Mkomazi Valley through the Mid-Illovo area towards Port Shepstone (Plate 33 – 51), the study area corridor comprises a mixture of communal land (Plate 37), where settlement nodes are around churches, missions and schools, and where there are homesteads scattered throughout the landscape. It will be difficult to acquire a servitude that does not impact on one or more homesteads. This will require resettlement, the biggest challenge being the identification of resettlement land that does not have some or other land use right associated with it. As currently indicated, the potential transmission line routes avoid impacting on the Vernon Crookes Nature Reserve. sugarcane plantations (Plate 44), commercial forestry (Plate 39) and banana plantations (Plate 45) make up the privately owned land use practices within the area and developing a servitude through this area will impact on the individual landowners, especially in the case of forestry, where no trees can be grown within the servitude.

Outside Port Shepstone (Plate 50), informal settlements make it difficult for a large power line to transverse into and out of Oribi Sub-station, again requiring resettlement. The formal town of Port Shepstone is also built up around the Oribi Sub-station (Plate 52).

From Port Shepstone, the study area corridor takes a westerly course (Plates 55-60), the exact corridor hinging on whether it by-passes the Oribi Gorge Nature Reserve to the north or skirts around it to the south. Apart from conservation and associated eco-tourism, land use in the area is a mixture of communal land (Plate 56), settlements (Plate 58) and commercial agriculture (Plate 60), predominantly sugarcane. The Oribi Flats to the south of Oribi Gorge are under intense sugarcane production. Oribi Gorge (Plate 62) is a deeply incised valley, and a notable conservation area and will, thus, need to be avoided as far as is practically possible. West of Oribi Gorge, the study area corridor heads towards the Eros Sub-station near Harding (Plate 63-71). Land use varies from commercial sugarcane production (Plate 64), communal land, indigenous Scarp Forest and Eastern Valley Bushveld (Plate 66), betterment planning settlements (Plate 68) and intensive commercial forestry (Plate 70).

4.4.3 Visual and aesthetics

Much of the study area is managed for purposes of conservation, agriculture, forestry or is communal land devoid of any imposing infrastructure such as transmission lines. The natural landscapes of much of the study area are sensitive and important to preserve for their aesthetics. It is, thus, necessary to maintain a near natural visual landscape, with limited aesthetic affects, to enable the continuation of nature-based economic activities such as eco-tourism.

According to the visual specialist, Cave Klapwijk and Associates, the extent of the visual impact of the development proposal depends on the following characteristics of the environment:

- Topography.
- Vegetation cover.
- Land use.
- Landscape diversity.
- Landscape character.
- Visibility.

In this regard, it is imperative that Eskom be sensitive from a visual impact perspective, to the requirements of the local communities including, but not limited to, rural communities, farmers, tourism operators and conservationists. Many topographical features influence this environment and these features will need to be utilised when selecting a corridor so as to minimise visual impacts and intrusions. Detailed findings of the visual specialist study are contained in Section 6.9 of this report.

4.4.4 HIV/AIDS pandemic

The HIV/AIDS pandemic in South Africa is likely to have profound negative, long-term impacts on the socio-economic environment. In 2006, statistics showed that approximately 18.34% of the country's population between the ages of 15 and 49 years, and 10.8% of the South African population over the age of 2, was living with HIV (www.avert.org/safricastats.htm).

It has been reported that KZN and Gauteng are the regions most affected by the AIDS pandemic. This is partly due to high rates of urbanisation and high mobility among the residents in these provinces (Amajuba District Municipality, 2002). It has been reported that in KZN, 39.1% of pregnant women are living with HIV, the highest rate out of all nine provinces in South Africa (www.avert.org/safricastats.htm).

The pandemic is likely to cause a slowing of the population growth rate in municipal areas (Indaka Local Municipality, IDP) and alter the demographic profile of municipalities. Women are particularly susceptible to the HIV/AIDS epidemic and the burden of AIDS related illnesses and deaths would be felt not only by infected individuals but also their families. Households will suffer a loss of income when economically active family members are unable to work.

It is anticipated that the HIV/AIDS pandemic will affect medium- and long-term development planning at a district and local municipal level in all municipalities. The HIV/AIDS pandemic will, therefore, affect infrastructure planning by reducing the projected number of people for which infrastructure will be required. Consideration must be given to the impacts of HIV/AIDS on the ability of households to pay for services and the potential increase in demand for health care facilities and social services.

The social impact specialist study noted the following health-related impacts:

- Within the uMgungundlovu District Municipality (DM), the number of HIV cases makes up 26% of provincial HIV cases. Unlike the number of HIV infections that are decreasing, AIDS cases have increased in all the local municipalities within the DM. To some extent, this contributes to the shape of the population pyramid that is characterized by a sharp decline in population particularly between the ages of 30-40.
- In the Ugu District, the percentage of the HIV infected population increased from just over 5% in 1996, to over 13% in 2004. This is compared to an estimated 1.5 million (15%) people in KwaZulu-Natal living with HIV/AIDS in 2005, and 11% by 2004 nationally. The province is, therefore, above the national average and, while the District is just below the provincial average, it is still above the national average. The same trend is observed in AIDS related death statistics. In 2004, AIDS related deaths accounted for approximately 46.7% of the deaths in South Africa, 57.6% in KwaZulu-Natal and 54% in Ugu.
- During the construction of the project, there is a risk that the presence of incoming construction workers can lead to deviant social behaviour in the communities they occupy. Large portions of the communities are very poor and there are high levels of unemployment within the study area. An influx of people with disposable money is likely to lead to an increase in prostitution and teenage pregnancies, which can increase HIV/AIDS infection rates (Dyer, 2010).

Within the traditional authority areas for the study area, it appears that some homesteads are abandoned or are being headed by the youth or elderly as a result of HIV/AIDS causing deaths or terminal illness of the middle age groups and young adults. People infected with HIV/AIDS are a vulnerable component of society. If this project requires the resettlement of households where vulnerable members are involved, resettlement could negatively affect these individuals.

Detailed findings of the social specialist study are contained in Sections 6.7 and 6.10 of this report.

4.4.5 Economic profile and tourism

ECONOMIC PROFILE

The study area is characterised by a dual space economy with an urbanised coastal zone with large commercial farms (sugarcane, banana and forestry) and a largely impoverished rural hinterland with small-scale and subsistence farmers.

The agricultural economics specialist noted that, through the review of the 2008 economic data, the economic structure of the study area differs considerably from the national (SA) and provincial (KZN) economies where primary industries are concerned:

- Agriculture: 10.4% (KZN: 4.9%, SA: 2.9%).
- Mining: 0.8% (KZN: 1.3%, SA: 5.5%).
- Manufacturing: 16.3% (KZN: 22.7%, SA: 17.4%).
- Utilities: 2.4% (KZN: 2.3%, SA: 2.2%).
- Construction: 4.3% (KZN: 3.4%, SA: 4.1%).
- Trade: 15.2% (KZN: 15.6%, SA: 15.1%).
- Transportation: 17.3% (KZN: 14.5%, SA: 11.0%).
- Finance and business services: 15.9% (KZN: 17.9%, SA: 22.0%).
- Personal services: 6.2% (KZN: 5.9 %, SA: 5.9%).
- General government services: 11.2% (KZN: 11.4%, SA: 13.8%) (Broughton, 2009).

The agricultural sector within the study area indicates a relatively high dependence on the performance of agriculture. At a local municipal level, the Richmond and Mkhambathini economies are very dependent on the agricultural sector with it contributing 28.1% and 23.8% to their economies, respectively.

The breakdown of the agricultural sector reveals the sugarcane industry, comprising of sugarcane farming and mills, contributes about 13% to the sector, and the forestry industry contributes about 9.1% to the sector (Broughton, 2009).

The increase in electricity availability in the southern region of KZN will undoubtedly be advantageous to the overall economy of the region, however, with this increased electricity supply comes the potential negative impact on primary sectors on the economy (both commercial and subsistence agriculture), secondary (manufacturing) and tertiary (services) sectors. The main concern will be loss of productive agricultural land and, therefore, a potential reduction of crop land (this will translate to a reduction of agricultural output or production and a potential negative impact on the financial viability of some farms and the potential loss of employment). This will cascade down to secondary economic sectors such as mills, and could negatively affect the financial viability of these sectors.

Detailed findings of the agricultural economics specialist study are contained in Sections 6.1 and 6.10 of this report.

TOURISM

A combination of environmental attributes contribute to a thriving tourism industry within the study area, from rolling hills in the hinterland that offer tranquil and scenic country drives, to sandy coastal rivers, and the beaches and warm coastal waters of the Indian Ocean.

The South Coast offers a variety of activities for the tourist, ranging from urban based entertainment, various beach and marine based activities, and extreme sports, to more relaxed activities such as sight-seeing. A number of tourist facilities (hotels and resorts) offer amenities such as golfing, game viewing and hiking.

Again, the increase in electricity availability to the South Coast will undoubtedly be advantageous to the tourism industry. However, with this increased electricity supply, comes the potential visual intrusion of power line infrastructure. Depending on the final corridor, the visual impact could be intrusive. The coastal area is a corridor of tourism developments that prefer unspoilt scenery. If the transmission lines were to be situated in the Eastern Alternative (for a section or the full length of the corridor), it is likely that it would be visible from the coast even though it will be no less than 4 km away from the coast at any time.

4.5 Institutional environment

A range of formal institutions are found within the study areas including conservation organisations, tourism organisations, residents' associations, farmers' associations, industrial and business organisations, and traditional authorities.

According to the social specialist, the institutional environment ranges from conservation organisations to farmers' associations, traditional authorities and district and local municipalities. These are described below.

4.5.1 Farmers' Associations

A total of ten Farmers' Associations (FAs) fall within the study area. FAs are organisations which are established and run by farmers. Their main function is to serve as a representative body which looks after the interests of its members. All ten of these associations have been involved in the public participation process and their comments and concerns have been taken into consideration in the EIA process.

4.5.2 Ezemvelo KwaZulu-Natal Wildlife

Ezemvelo KwaZulu-Natal Wildlife (EKZNW) is a provincial conservation body that manages KZN's natural resources. Their aim is to ensure effective management and sustainable use of KZN's biodiversity and protected areas, in collaboration with the community. The study area incorporates two conservation areas managed by EKZNW, including the Vernon Crookes Nature Reserve and Oribi Gorge Game Reserve (which is intersected by the Eastern Alternative).

4.5.3 Conservancies

There are eleven conservancies within the study area. A conservancy is a registered voluntary association between land users/owners who cooperatively wish to manage their natural resources in an environmentally sustainable manner without necessarily changing the land-use of their properties. Within the study area, conservancies fall predominantly within the commercial agricultural zones and are therefore closely, and in some cases, directly linked to the farmers' associations.

4.5.4 Traditional Authorities

A total of twenty-one (21) Traditional Authorities fall within the study area:

Within the uMgungundlovu District Municipality:

- Embo-Vumukwenza.
- Embo-Thimuni.

Within the Ugu District Municipality:

- Mbele.
- Dumisa.
- Qiko.
- Nyavini.
- Thulini.
- Hlongwa.
- Ndelu.
- Mabheleni.
- Qwabe.
- Madlala.
- Mbotho.
- Jabulani Beshawu.
- Nsimbini.
- Mavundla.
- Zembeni.
- Izibonda.
- Macala-Gwala.

Within the eThekwini Metropolitan Municipality:

- Langa.
- Sobonakona Makhanya.

Within the Sisonke District Municipality, no traditional authorities are affected.

During Scoping, the above-mentioned stakeholders were involved in the public participation process through community meetings held with individual traditional authorities and through district-level meetings. At the meetings, the need for electricity in their areas was vigorously highlighted, which is something this project does address via the proposed Ariadne-Oribi 132 kV line.

In line with the EIA Regulations, the Revised Draft EIAR was circulated for public review to the above-mentionped traditional authorities.

4.5.5 Endangered Wildlife Trust

The Endangered Wildlife Trust (EWT) is a non-profit organisation which works towards saving and protecting threatened species, their habitats and ecosystems, and the role of surrounding communities and landowners. The EWT fills the key niche of conservation action, through applied fieldwork, research and direct engagement with stakeholders. Specialist Working Groups, such as the Crane Working Group, support the conservation of threatened species and ecosystems throughout Southern Africa. The priority focus is on identifying the key factors threatening biodiversity and developing mitigating measures to reduce risks and reverse the drivers of species extinction and ecosystem degradation.

Eskom has a close working relationship with the EWT in minimising the impact that transmission lines and associated infrastructure have on various endangered bird species, such as cranes and vultures.

5. METHODOLOGY USED TO DETERMINE SIGNIFICANCE OF POTENTIAL ENVIRONMENTAL IMPACTS

5.1 Assessment

5.1.1 Methodology

Issues and potential impacts were identified during Scoping. Those requiring further investigation were addressed by specialist studies and/or further detailed input from the environmental and technical team. Terms of Reference[15] were prepared to guide each specialist to ensure that issues and associated impacts were correctly understood and addressed, thereby enabling an integrated assessment of the development proposal. Information was collated, evaluated and integrated. Thereafter, each potentially significant impact was assessed using the assessment conventions outlined in Table 6.

5.1.2 Public participation and landowner identification

The public participation process (PPP) for the Scoping phase is complete. The PPP during Scoping involved the following activities:

- Announcement of the project and the distribution of the Background Information Document and Comment Sheets to stakeholders (February 2009).
- Conduct key stakeholder meetings (March 2009) and one-on-one meetings with affected Farmers' Associations and Traditional Authorities (March – June 2009).
- Compile, and continuously update, the Issues and Response Report (IRR).
- Announcement of the Draft Scoping Report including the Issues and Response Report (July 2009), a public review period (July – August 2009) and public meetings (July – August 2009).
- Distribution of a Stakeholder Update Letter following the submission of the Final Scoping Report to the competent authority, DEA (December 2009).

In conjunction with the public participation process, ACER conducted a comprehensive landowner identification process where affected landowners were contacted and notified about the project. Landowners were also provided the opportunity to raise concerns and issues. Affected landowners are part of the stakeholder database, and such, continue to receive information about the project on an on-going basis.

5.2 Assumptions, uncertainties and limitations

5.2.1 General assumptions

The main assumptions and limitations that applied to this impact assessment are listed below. Additional assumptions and limitations are listed in the individual specialist reports.

- It is assumed that technical data supplied by the applicant was correct and valid at the time of compilation of the Draft and Revised Draft EIA Reports.
- It is assumed that data supplied by outside institutions (for example, EKZNW C Plan, IDPs, SDFs) were correct and valid at the time of compilation of the specialist reports and the Draft and Revised Draft EIA Reports.

[15] Terms of Reference for each specialist are contained in their relevant reports (Appendices 6 and 7).

Table 6 Conventions applied to the impact assessment

Notation	Description
Nature	An impact is either positive or negative. Importantly, even after mitigation, few negative impacts become positive. Most negative impacts will remain as negative impacts. However, after mitigation, significance should reduce.
Extent	Describes the spatial scale of the impact: ❑ Local – limited to the immediate area(s) around the project site. ❑ Regional – extends over a larger area that would include a major portion of an area or province. ❑ National/International – an even wider area that would have national or international implications.
Duration	Provides a prediction of whether the duration of the impact would be: ❑ Short-term (0 to 3 years) – or confined to the construction period. ❑ Medium-term (3 to 10 years). ❑ Long-term (> 10 years). ❑ Permanent (beyond the anticipated lifetime of the project).
Intensity	This provides an order of magnitude of whether or not the intensity (magnitude/size/frequency) of the impact would be high, medium, low or negligible (no impact). ❑ High. ❑ Medium. ❑ Low. ❑ Negligible (no impact).
Frequency	This provides a description of any repetitive, continuous or time-linked characteristics of the impact(s) as: ❑ Continuous (i.e. without interruption). ❑ Intermittent (occurring from time to time, without specific periodicity). ❑ Periodic (occurring at more or less regular intervals).
Probability	This provides a description of the probability of the impact actually occurring as: ❑ Improbable (very low to low likelihood). ❑ Probable (distinct possibility). ❑ Highly probable (most likely). ❑ Definite (the impact would occur regardless of prevention or mitigation measures).
Significance	The significance of the identified impacts on components of the affected environment (and where relevant, with respect to potential legal infringement) will be described as: ❑ Low, where the impact will not have a significant influence on the environment, and, thus, will not be required to be significantly accommodated in the project design. ❑ Medium, where it could have an adverse influence on the environment, which would require modification of the project design or alternative mitigation actions. ❑ High, where it could block the project regardless of any possible mitigation.
Confidence	Provides a measure of confidence in the assessment expressed as low, medium or high.

6. SUMMARY OF SPECIALIST FINDINGS AND RECOMMENDATIONS

This chapter provides a brief synopsis of the findings and recommendations by specialists. Eight specialist studies were undertaken and peer-reviewed by independent specialists (Table 7), the results of which are summarised in this chapter. Copies of the specialist reports are provided in Appendix 6.

In addition, three additional specialist studies were undertaken in order to investigate the four additional corridor alternatives (see Section 3.2.4 for details on these alternatives). These are:

- Agricultural Potential and Agricultural Economics (Mrs E. Broughton of Urban-Econ).
- Avi-Fauna (Mr L. Strugnell of EWT).
- Social (Mr R. Dyer of ACER).

The findings of the additional specialist studies are provided in Section 6.10. Copies of the specialist reports are provided in Appendix 7.

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 6), which was externally peer-reviewed. ACER has used the findings of this study to inform this EIA in addressing EMF-related matters.

Table 7 Details of specialist studies undertaken, name of specialists and independent, external peer reviewers

Specialist Study	Name of Specialist	Name of Peer Reviewer
1. Agricultural Potential and Agricultural Economics	Mrs E Broughton Urban-Econ Development Economists	Mr D Pringle Phatisa
2. Avi-Fauna	Mr L Strugnell Endangered Wildlife Trust (EWT)	Mr D Alan Durban Natural Science Museum
3. Fauna	Mr G de Winnaar GroundTruth	Mr R Lechmere-Oertel Biodiversity Planning and Management
4. Flora	Mr B Patrick ACER (Africa) Environmental Management Consultants	Mr R Lechmere-Oertel Biodiversity Planning and Management
5. Heritage	Mr L van Schalkwyk eThembeni Cultural Heritage	Dr M Murimbika Nzumbulo Heritage Consultants
6. Social	Mr R Dyer ACER (Africa) Environmental Management Consultants	Mr J vd Walt Ntshebe Consulting
7. Town and Regional Planning (Overview Study)	Mr R Dyer ACER (Africa) Environmental Management Consultants	Mr J van der Vegte UDIDI Town Planners
8. Visual	Mr M Klapwijk Cave Klapwijk and Associates	Mr A Cooper Outer-Space Landscape Architects

6.1 Agricultural Potential and Agricultural Economics

6.1.1 Agricultural Potential

With respect to agriculture, the study area is dominated by sugarcane farming and forestry plantations.

The sugarcane industry in the study area is an important contributor to employment in the region and comprises sugarcane farming and three sugar (Illovo Sugar) mills. The industry employs approximately 21,062 people, of whom 14,323 are permanent workers. This means that the industry contributes just above 13% to the formal employment in the study area (comprising of the Ugu DM, Richmond LM, Mkhambathini LM, and the Ubuhlebezwe LM where parts of the Sezela mill area are located).

Utilisation of the Eston and Sezela Mills are dependent on the production of sugarcane in these areas. Due to their linkages, changes in sugarcane output to either the Eston Mill or the Sezela Mill areas would impact the efficiency of the Sezela Mill. Similarly, changes in the area under cane in the Umzimkhulu Mill area would affect the uMzimkhulu Mill. Most critical, the reduction of sugarcane farming in the uMzimkhulu Mill area would negatively affect the viability of the uMzimkhulu Mill that already operates at a breakeven point.

The forestry industry (made up of Mondi, Sappi, Masonite, NCT Forestry, and other small growers) in the study area is represented by forestry plantations that supply raw materials to primary processing facilities situated in Durban and other areas. The potentially affected area, according to the CSIR land use map, encompasses about 25,394 hectares of afforested area. Most of the forestry plantations in the area are hardwood (eucalyptus and wattle) that are managed for pulp production. The industry is vertically-integrated which means that timber produced at these plantations is largely processed further by the companies owning these plantations.

Within the country, all afforested areas per species have experienced a decline between 2001 and 2006, with the area under *Eucalyptus* plantations (commonly known as blue gum) decreasing at a faster pace than other species. This is due to a number of factors including fires, withdrawal of forestry from riparian zones and wetlands, and a decrease in investment due to pending land claims. At the same time, the supply of timber cannot meet the demand, particularly with respect to the secondary processing and manufacturing industries (furniture and wood products). As a result, a large proportion of wood products are being imported to the country.

Apart from the sugarcane and forestry areas, the study area has a number of conversation-worthy areas and tourism attractions of which cognisance should be taken. These sites are mainly agricultural estates that also encompass tourism activities, and include:

- Lake Eland Game Reserve.
- Durban Skydive Centre at Angel's Way Farm.
- Kinroy and Invernettie Estate.
- Phoenix Wattle Farm.
- Bellavista Country House.

From a land use perspective, a large part of the study area is under the custodianship of traditional authorities. It is estimated that about 200,000 people reside on this land comprising about 39,000 households. These households are sparsely populated across the study area with an average density of 56 households per km^2. Many of the households in these areas engage in subsistence farming, which, in most cases, represents the sole source of income or food security.

The study area also falls within urban areas in its south-eastern corner (Port Shepstone area), with the area directly affected by the proposed corridor alternatives (Eastern and Central) being occupied by residences.

The study revealed that all three major alternatives will result in the significant loss of agricultural potential. With respect to forestry, the greater impact on the forestry industry will result from the Western Corridor because a large portion of afforested land is located along this corridor. In contrast, land use along the Central and Eastern Corridors is dominated by sugarcane.

Both sugarcane and forestry plantations not only provide opportunities for large-scale, commercial growers, but also provide opportunities for small scale growers or farmers. Agriculture is an essential sector of the economy and is the largest contributor to employment within the KZN South Coast region. The sugarcane industry, due to its nature, has a relatively higher direct employment multiplier compared to forestry. However, forestry plantations have higher indirect labour multipliers among forward and backward industries.

6.1.2 Economics

It is anticipated that there will be nationwide positive economic impacts as the increase in new business sales, generation of additional Gross Value Adding (GVA), creation of new employment opportunities, and an increase in local government earnings as a result of the construction phase of the project. Table 8 summarises the positive economic impacts to be expected during construction and indicates that the Eastern Corridor would create the largest economic stimulus during this phase.

Table 8 Cumulative economic impacts during construction (R m, 2009 prices)

Variable	Western	Central	Eastern	C1	C2	C3	E1	E2
Production	R 740.2	R 865.1	R 958.9	R 79.0	R 45.4	R 54.8	R 25.7	R 35.5
GVA	R 267.9	R 313.0	R 347.0	R 28.6	R 16.4	R 19.8	R 9.3	R 12.9
Employment	1,764	2,062	2,285	188	108	131	61	85
Fiscal	R 3.4	R 4.0	R 4.5	R 0.4	R 0.2	R 0.3	R 0.1	R 0.2
Preference	3	2	1	1	3	2	2	1

The operational phase is expected to provide positive impacts such as improved supply of electricity to the region, electrification of households in the rural areas and creation of additional employment for maintenance of the servitude. The improvement of the supply of electricity to the region would enable it to continue growing. Employment creation during the operational phase (such as for the maintenance of the servitude) will have a relatively low impact on the regional economy, however this will still provide a much needed income for poor households.

In cumulative terms, the significance of the positive economic impacts during operation is high. The choice of a preferred corridor cannot be determined only on the basis of improved supply of electricity to the region. This must be balanced against the potential electrification of households in the region, in particular the provision of electricity to rural households in the hinterland. For these reasons, the Western Corridor would likely create the largest social benefits.

6.1.3 Potential impacts

POSITIVE IMPACTS

The following impacts have been identified:

- The creation of employment opportunities.
- The provision of a reliable and quality supply of electricity.
- Electrification of households[16].
- Capital expenditure resulting in a positive contribution to the GDP of the region and a positive stimulus in the economy.

NEGATIVE

The following impacts have been identified:

- The loss of use of productive agricultural land (mainly sugarcane and forestry).
- The loss of agricultural potential due to the location of the construction camp sites.
- The long-term loss of agricultural potential due to the location of towers.
- The long-term loss of agricultural potential due to the location of the servitude.
- The closure of farms due to them becoming unviable.
- Loss of agricultural production due to worker's movement.
- Negative impacts on mills (due to loss in agricultural output at farms).
- In-migration of job seekers and contractors.
- Safety and security concerns.
- Negative contribution to the GDP (due to reduced agricultural activity).
- Negative impact on subsistence farming.
- Negative impact on tourism.

6.1.4 Recommendations for mitigation

- If possible, align the proposed transmission line to cross forestry plantations and farms (a) next to their borders to reduce the affected area under crop or forestry and/or (b) along the area of the farm that is not used for any economic activity.
- If possible, give preference of the corridor over the large-scale farms rather than small-scale farms to minimise the impact on small-scale farmers who are more susceptible to the loss of area under sugarcane.
- If possible, prioritise the corridor over farms where the transmission line would cross the farm in the width rather than in the length to allocate the adverse effects over a number of farms rather than clustering them on one farm, posing a threat to its viability.
- Encourage farmers, and if possible, assist them financially and through training to engage in other crop cultivation within the servitude (for example, macadamia nuts), to increase the production output and income from the land.
- Routing of the transmission line could be done in such a way as to avoid traversing agricultural land in the middle minimising the area that will need to be cleared out of sugarcane and forestry plantations.
- Where avoidance of agricultural land is impossible, farmers could be assisted with the establishment of alternative crops within the servitude to be able to still receive income from the land.
- Careful selection of tower positions could also reduce the potential negative impacts, in particular, the impacts on subsistence farming.
- Develop a Monitoring Framework to monitor positive and negative impacts and their management (Table 9).

[16] However, in order to realise the benefits of electricity to communities, Eskom Distribution and the local municipalities will need to develop and implement a macro-plan for the connection of new consumers.

Table 9 A framework for monitoring impacts on the agricultural sector associated with the proposed power line

Indicator	Measurement	Target/Objective	Frequency of Monitoring
Monitoring of actions resulting in temporary impacts (Construction phase impacts)			
Loss of agricultural potential due to location of the construction site	• Area of sugarcane • Area of forestry plantations • Area of subsistence farming	Do not affect the area used for economic activity	At the establishment of the camp
		Do not affect subsistence farming	At the establishment of the camp
Loss of agricultural production due to worker's movement	• Area (ha) • Rand value paid for lost output	• Establish strict rules for access to sites and movement within the site • In cases where production is lost due to workers' breaking the rules (if it was avoidable), penalties should be imposed to discourage in the future	Continuously during construction
Monitoring of actions resulting in permanent impacts (Operational phase impacts)			
Loss of agricultural potential due to location of towers	• Area of subsistence farming	Avoid subsistence farming areas	At the point of identification of tower positions (aerial survey)
Establishment of new subsistence farming areas	• Area of subsistence farming	Ensure that it at least matches the area lost	After construction
Loss of agricultural potential due to location of the route	• Area (hectares) • Approximate lost production in tons • Tons lost as % of the average annual production in the area in the past • Farmers' reimbursement	• Use the estimated area for the respective corridor as a baseline • Avoid traversing sugarcane and forestry plantations in the middle where possible • Try to route the line along the borders of the farms • Try to avoid traversing small-scale farmers' land	At the point of making the final decision on the routing of the line
Closure of farms due to them becoming unviable	• Number of farms • Total area of farms per type of activity • Estimate lost production output (tons) • The above as % of the total local production output	Minimise the number of farms lost, particularly with respect to small scale farms	During and after construction

6.2 Avi-Fauna

From an avi-faunal perspective, the study area is significantly important for birdlife. The study area covers 11 quarter degree squares and the South Africa Bird Atlas Project reports 52 red data bird species). The latter includes bird species classified as critically endangered (1), endangered (3), near-threatened (31) and vulnerable (17). The study area also covers several bird species protected internationally under the Bonn Convention.

Various data sources were consulted in determining the distribution and abundance of bird species:

- The South African Bird Atlas Project (SABAP1) dataset (Harrison *et al*., 1997) (sourced from the Avian Demography Unit of the University of Cape Town) in order to determine the distribution and abundance of birds. This dataset also contains a list 52 species of Red Data bird species (including cranes, bustards, the Secretary bird and storks) found within the study area (Table 11). A number of non-Red Data, large bird species such as water birds, raptors and Korhaans occur in the study area. [Due to the SABAP1 being relatively old (having been last updated in 1997), a SABAP2 has been initiated in order to update the dataset].
- The Co-ordinated Waterbird Count (CWAC) dataset (Taylor *et al*., 1999). Two CWAC sites (the Harding dam and Mtwalume river estuary) occur within or near the study area.
- The Important Bird Areas (IBA) project (Barnes, 1998). Two IBA sites occur within the study area:
  - SA 085.
    Oribi Gorge contains Crowned Crane, Ground Hornbill, Spotted Thrush, Delegorgue's Pigeon and others. The cliffs associated with the gorge contain a breeding colony of Cape Vultures and Peregrine Falcons.
  - SA 078.
    The Natal Mistbelt Grasslands is a series of disconnected grassland patches on farmland. This IBA is important for Blue Swallows and holds the largest concentration of Blue Swallows in Southern Africa. Other important species found within this IBA includes the Stanleys Bustard, Bald Ibis, Stack Stork, all three species of crane and the Secretary bird.
- The Eskom Red Data Bird Book of South Africa (Barnes, 2000) was consulted in order to determine the conservation status of bird species occurring within the study area.
- The EWT Strategic Environmental Assessment on the occurrence and conservation status of birds in the Southern KZN.
- The Eskom-Endangered Wildlife Trust Power Line Bird Mortality Incident Database (1996 to present) was consulted in order to determine which bird species occurring in the study area are likely to be impacted on by power lines and the extent of the impact.
- The CSIR's GIS Land Cover Dataset.
- Data collection during field work.
- Surveyor General's 1:50 000 topographic maps.

According to Barnes (Barnes, 1998), IBAs should be avoided as far as possible by new power lines.

Table 10 Red Data bird species within the study area as reported by the South African Bird Atlas Project (SABAP1, 1997)

Table legend:
CR = Critical, **E** = Endangered, **V** = Vulnerable, **NT** = Not Threatened, **Bonn** = protected internationally by the 'Bonn Convention on Migratory Species'

Total Cards		696	198	122	44	26	16	28	690	41	286	174
Total Species		349	301	286	224	236	222	230	356	228	331	273
Total Breeding Species		129	79	47	62	49	13	12	138	35	102	78
Square		**2830CB**	**2930CD**	**2930DC**	**3029DB**	**3030AB**	**3030AD**	**3030BA**	**3030BC**	**3030CA**	**3030CB**	**3030DA**
Blue Swallow	CR	0	1		27							
Black-rumped Buttonquail (pre-split)	EN								0			
Cape Parrot (pre-split)	EN	0					6					
Spotted (Natal) Ground-Thrush	EN							7	2		4	1
African Finfoot	VU								1		2	
African Grass-Owl	VU	0	3		7				0		0	
African Marsh-Harrier	VU	6	31	7	7	4	6		6	22	2	1
Blue Crane	VU	1	9	2		4			1			
Cape Gannet	VU								2		9	18
Cape Vulture (Griffon)	VU		1		34				0	24	1	1

Cape Vulture (Griffon)	VU		1		34				0	24	1	1
Denham's (Stanley's) Bustard	VU		1		25	23						
Eastern Bronze-naped (Delegorgue's) Pigeon	VU	0										
Grey Crowned-(Crowned) Crane	VU	1	53	4	45	15	25	43	32	61	7	6
Lesser Kestrel	VU		1			19						
Mangrove Kingfisher	VU								0			7
Martial Eagle	VU	1	6	2		23	13	4	31	5	6	1
Pink-backed Pelican	VU	0							0			
Short-tailed Pipit	VU								1			
Southern Bald (Bald) Ibis	VU										0	
Southern Ground-Hornbill	VU		23	7	23	42	6	4	1	10	14	1
Striped (Red-tailed) Flufftail	VU								1			
African Broadbill	NT						6		14	5	11	
African Crowned (Crowned) Eagle	NT	28	19	20	2	19	13	7	42	22	41	16
African Pygmy-Goose	NT		1	1						2	1	

Black Harrier	NT	0									0	
Black Stork	NT	2		34		8			1			
Black-bellied Bustard	NT				18	8					1	
Black-throated (Wattle-eyed) Wattle-eye (Flycatcher)	NT								1			
Black-winged Lapwing (Plover)	NT	9	5	1	11				1		2	
Broad-tailed Warbler	NT	1	6		11			7	28		1	
Bush Blackcap	NT	1	1								0	
Cape Cormorant	NT								4		5	32
Caspian Tern	NT								1			1
Collared (Red-winged) Pratincole	NT	0										
Corn Crake	NT	0	1									
Great White Pelican	NT								1		0	
Greater Flamingo	NT	0							1			
Greater Painted-snipe	NT	1		1								
Half-collared Kingfisher	NT		3	1	5				0		1	
Knysna Woodpecker	NT						6			2	13	
Lanner Falcon	NT	4	18	30	2	15	19	25	31	27	14	1

Lesser Flamingo	NT		1									
Lesser Jacana	NT	0							1		1	
Magpie (Pied) Mannikin	NT								0		3	2
Marabou Stork	NT	1									0	
Orange Ground-Thrush	NT	0		2								
Peregrine Falcon	NT	2										
Secretarybird	NT	1	2		23	27		4	2	5	1	
Southern Giant-Petrel	NT											1
White-chinned Petrel (pre-split)	NT										1	2
Woolly-necked Stork	NT						6		3		0	1
Yellow-billed Stork	NT	0										
White Stork	BONN	2	31	2	18	27	13		1		1	

In addition, the avi-faunal investigation has revealed a number of bird micro-habitats that are important for bird life.

- Agricultural lands.
  A large portion of the study area is under sugarcane cultivation. As a habitat, sugarcane is a highly unattractive micro-habitat for a large number of birds, especially the red data bird species. The Black-rumped Buttonquail is the only species known to use sugarcane as habitat.

- Wetlands.
  The slow-flowing water and tall-emergent vegetation associated with wetlands is attractive to a large number birds as a micro-habitat. Due to the rapid loss of natural wetlands as a result of development in many parts of South Africa, the conservation status of many of the bird species associated with wetlands is critical. Within the study area, wetlands are particularly important for the cranes and storks as well as other smaller species such as the African Finfoot, various Kingfishers, the Lesser Jacana and others.

- Rivers.
  A number of water bird species (such as the Half-collared Kingfisher) are mostly restricted to riverine habitat and their map distribution correlates with the river courses within Southern African.

- Dams.
  Although dams, whether earthen or other types, have modified the flow patterns of streams and rivers resulting in negative impacts on water bird species, a number of species have benefited, such as pelicans, darters and cormorants. Many species from these families occur in the study area.

- Exotic plantations.
  Exotic plantations such as forestry are found in large numbers in the study area. These species have become important micro-habitat for certain bird species such as the Lesser Kestrels. This species uses the trees for roosting.

Within the study area, birds tend to be abundant within their preferred habitat. However, by virtue of the mobility, birds will occasionally utilise other habitats in a landscape.

Generally, a high density of Red Data species is expected to be found in the western areas of the study area. Due to their habitats and resulting distribution in higher-lying, inland locations, these species are vulnerable to collisions with overhead power lines.

6.2.1 Potential impacts

Due to their size and prominence, electrical infrastructure constitutes an important interface between wildlife and man. A number of unintended, negative consequences between wildlife and the electricity structures have been documented for a number of years. Two common problems are electrocutions of birds and collisions with power lines (Van Rooyen, 2000).

Other negative consequences includes (i) electrical faults (thus affecting the quality and reliability of electricity supply) caused by bird excreta when roosting or breeding on electrical infrastructure (Van Rooyen and Taylor, 1999) and (ii) the disturbance and destruction of habitat (during construction and operation).

Overall, impacts of power lines on birds and *vice versa* can be described in detail as follows:

- Electrocutions.
- Collisions.
- Loss and disturbance of habitat during construction and operation.
- Nesting on towers.
- Impact on quality and reliability of supply (as a result of bird streamers and bird excreta).

Electrocution occurs when a bird attempts to perch on an electrical structure and causes an electrical short circuit by bridging the gap between live components (called phases). Birds commonly use transmission towers and sub-stations for perching, roosting and hunting. Birds could be at electrocution risk, particularly on smaller power lines (such distribution lines where the voltage ranges from 132 kV and smaller) and in sub-stations where the electric phases are closer together, rather than on larger transmission structures (voltage range: 220 kV and higher) where they are further apart. A bird is at electrocution risk if it contacts two energized components or an energized component and a grounded component.

Collisions are the biggest single threat posed by electrical infrastructure to birds in Southern Africa. Most heavily impacted upon are cranes and various species of water birds. These species are mostly heavy-bodied birds with limited manoeuvrability, which makes it difficult for them to take the necessary evasive action to avoid colliding with power lines. Many of these heavy-bodied, long-living and slow reproducing species are threatened in southern Africa. Birds are at collision risk on smaller power lines as the conductors (including the earth wire) are less visible in comparison to larger power lines. Tower stay lines on larger lines also pose a collision risk for birds.

6.2.2 Recommendations for mitigation

It is recommended that a walk-through must be conducted by a qualified avi-faunal specialist once the final route and siting of steel towers has been completed. Forest patches and other sensitive areas must be avoided as far as possible. Where the need is indicated, bird flappers and bird guards should be installed on the transmission lines and towers (as advised by an avi-faunal specialist).

6.3 Electromagnetic Fields

According to the EMF study commissioned by Eskom in 2006 (Appendix 6), electric and magnetic fields (EMF[17]) are created, in varying levels, with the generation and 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 the system changes direction 50 times per second.

[17] Information sourced (*verbatim* at times due to the technical nature of the report), from Empetus cc, Report Number EMP/D/06/005/R01, entitled *Electric and Magnetic Fields from Overhead Powerlines: A summary of Technical and Biological Aspects (Final Report)*, August 2006, compiled by Dr PH Pretorius, unless otherwise stated.

Power system frequencies (50 Hz) (static or low-frequency) are much lower than the frequencies of electromagnetic energy applied 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 biological effects. Biological effects as a result of exposure to microwave frequencies are as a result of heating of the biological tissue, and, as such, safety precautions for this frequency range are based on limiting field levels that may cause a rise in tissue temperature, whereas biological effects associated with exposure to power system frequency EMF, occur as a result of electric current being induced in the subject. Safety precautions are, therefore, based on limiting field levels that may induce electric current in the subject that are considered harmful.

At a 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 and remains the same. Electric fields decrease with an increase in distance from the source. Electric field 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. 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.

Electric and magnetic fields may exist alone, or in combination. For example, there is an electric field around the electric lead/cord of a lamp plugged into and switched on at the wall, but the device itself is off (light is off). When the lamp is switched on at the wall and at the device (light on), an electric current will flow and a magnetic field will co-exist with the electric field in the vicinity of the electric lead. This field effect is what occurs on transmission lines.

Tables 11 and 12 summarise some typical electric and magnetic field levels in various environments. On a clear sunny day, the 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 30 μT and may vary up to 70 μT at the North or South Pole. However, the field is considered static, and varies very slowly with time.

Interestingly, as shown in Table 12 (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 11 Summary of 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)
765 kV transmission line	7,000 (or 7kV/m)	2,500 (servitude 80 m)	
400 kV transmission line	4,700 (or 4,7kV/m)	1,500 (servitude 47 m)	
Near typical domestic appliances			10 – 250
Typical level in homes			1 – 10
Typical level outside homes			<1

Table 12 Summary of 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 560 A)	6	1.5 (servitude 80 m)	
400 kV transmission line (current of 650 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[19]. The suggestion for this health outcome stems mainly from some of the epidemiological studies, but has not been confirmed by controlled laboratory studies. In conclusion, there is no evidence of a causal relationship between magnetic field exposure and childhood leukaemia and no dose-response relationship has been shown to exist between EMF exposure and biological effects.

Given the lack of a known biophysical mechanism that would explain these effects, many question the existence of clinical responses, which, if any, as a result of power frequency electric and magnetic field exposure to levels typically found in residential and transmission line environments, appear insignificant.

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 scientists advocating caution and finding ways to avoid and/or reduce exposure.

[18] Measured at a distance of 30 cm from the appliance.

[19] A working group of the World Health Organisation's International Agency for Research on Cancer's review of studies relating to EMF concluded that extremely low magnetic fields could be classified as being "possibly carcinogenic to humans", based on studies of epidemiological studies of childhood leukaemia. Carcogenicity is a well-known agent classified in the same category as coffee, which may increase the risk of kidney cancer, but at the same time might be protective against bowel cancer. This classification denotes an agent where there is limited evidence of carcinogenicity in humans and less than sufficient evidence in experimental animals, and it is stated that it remains possible that there are other explanations for the observed association (WHO, 2002).

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 guidelines for EMF exposure set by the International Commission for Non-Ionising Radiation Protection (ICNIRP) (an organisation formally recognised by the World Health Organisation) (Table 13) receive worldwide support and are 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 13 Electric and magnetic field exposure guidelines as set by the ICNIRP (1998)

	Electric field (kV/m[20])	Magnetic field (µT)
Reference level[21]:		
Occupational	10	500
Public	5	100
	Current density (mA/m^2)	
Basic restriction:		
Occupational	10	
Public	2	

6.4 Fauna

The study approach focused on key faunal groups (mammals, reptiles and amphibians) on the assumption that the protection of these faunal groups and their species-specific habitats would provide sufficient protection for other important taxonomic groups of fauna such as invertebrates.

Mapping of faunal habitats and faunal biodiversity
In order to determine faunal biodiversity and the spatial distribution of faunal species within the study area, dominant biomes and vegetation types were mapped (Mucina and Rutherford, 2006). Thereafter, key habitats occurring within each biome were mapped using the DEA and EKZNW Land Cover Data (2008) in order to identify important vegetation communities and landscape features that potentially support faunal biodiversity. Once mapped, the overlaying of the dominant vegetation types data with the land cover data generated a baseline template map to spatially define habitat areas that will potentially support various species of fauna. The Wetland Data, Forest Coverage Data and Conversation Plan (C-Plan) of Ezemvelo KZN Wildlife were also used during the study.

[20] Means 'kilovolt per metre': The unit of measurement of electric field levels (electric field strength). 1kV = one thousand volt per metre.

[21] Reference level refers to a field level easily measured and spatially averaged across the volume taken up by the body of the exposed person, while the basic restriction is a restriction on exposure based directly on established health effects and is a safe induced current density. Should the reference level be exceeded, then further evaluation is required to ensure that the basic restriction is not exceeded.

The following main habitat types were mapped in terms of the above process.

Forest, Savanna and Grassland
The majority of the natural vegetation areas comprise forest, savanna or grassland. These habitat areas were extracted from the land cover map whereby only patches exceeding one hectare were considered suitable for mapping as it is assumed that small habitat patches are a) less likely to support sensitive fauna as opposed to large patches, and b) less likely to support viable faunal populations.

Grassland areas, a threatened habitat, should be avoided as much as possible.

Wetlands and other water bodies
Wetlands and other water bodies, such as rivers and dams, are important habitats for fauna, particularly amphibians, which depend largely on the availability of various aquatic habitats.

Rocky habitats
Some faunal species are confined specifically to rocky areas. Thus, bare rock surfaces and cliffs were mapped using the land cover map in conjunction with a digital elevation model (DEM), which is useful for defining the physical topography of the study area. The later was used to determine the locality of steep cliffs, which generally contain exposed rocky surfaces. This was done by calculating slope in Arcview GIS using the DEM and extracting those areas where slopes exceeded 50 degrees. The areas marked by cliffs were merged with the bare rock surfaces to generate a map of rocky habitats.

C-Plan (EKZNW's Conversation Plan)
The C-Plan database is a useful source of information for prioritising areas whereby gridded areas are ranked according to the presence of important biological features. According to C-plan, there are a number of areas that are important for the purpose of conservation of biodiversity. Other remaining areas have a lesser importance. Figure 18 shows which areas within the study area are highly sensitive to habitat loss/disturbance (i.e. "totally irreplaceable"), which areas less important from a biodiversity conservation perspective, and those areas that are largely transformed to due to anthropogenic activities.

Identification of faunal species and communities
Individual sensitive faunal species occurring within the study area were identified using recent publications on mammals (Friedmann and Daly, 2004); reptiles (South African Reptile Atlas and Red Data Book, In Prep.), and amphibians (Minter *et al*., 2004). Sensitive species for the purposes of this assessment include:

- Red Data species: species that have been identified as being threatened or near-threatened with extinction over part or all of their range, and have been classified in one of the Red Data categories, as defined by the International Union for the Conservation of Nature (IUCN)[22] (IUCN, 2008). The Red Data status for each Red Data species was determined using the latest Red Data publications for all taxa surveyed (South African Reptile Atlas and Red Data Book, In Prep.; Friedmann and Daly, 2004; IUCN, 2008; Minter *et al*., 2004).

[22] **IUCN Categories:**
Extinct – there is no reasonable doubt that the last individual of the species has died.
Extinct in the Wild – the species no longer occurs in the wild, and is only found in cultivation or in captivity.
Critically Endangered – the species is considered to be facing an extremely high risk of extinction in the wild, based on IUCN criteria.
Endangered – the species is considered to be facing a very high risk of extinction in the wild, based on IUCN criteria.
Vulnerable – the species is considered to be facing a high risk of extinction in the wild, based on IUCN criteria.
Near Threatened – when evaluated against IUCN criteria, does not qualify for a Threatened category but is close to qualifying for or is likely to qualify in one of those categories in the near future.
Least Concern – when evaluated against IUCN criteria, does not qualify for any category as Threatened or Near Threatened. Widespread and abundant species fall in this category.
Data Deficient – there is inadequate information regarding the species' population size, distribution or threats for an assessment to be made.

- Other notable species: species not currently listed but which are considered sensitive because they have localized distributions, are naturally rare or have specialized habitat requirements.

Mammals

Several mammal species occur within the study area (Table 14). Of these, four are Endangered, five are Vulnerable, three are Near Threatened, and three are Data Deficient. Those that are particularly notable especially as they are currently Endangered are the Oribi (*Ourebia ourebi*), Damara Woolly Bat (*Kerivoula argentata*), Swinny's Horseshoe Bat (*Rhinolophus swinnyi*) and Syke's Monkey (*Cercopithecus albogularis*). Vulnerable Red Data species are the Rough-haired Golden Mole (*Chrysospalax villosus*), Blue Duiker (*Philantomba monticola*), Tree Hyrax (*Dendrohyrax arboreus*), De Winton's Long-eared Bat (*Laephotis wintoni*) and Maquassie Musk Shrew (*Crocidura maquassiensis*). Of the nine threatened species, Oribi (*Ourebia ourebi*) is possibly a more important Red Data mammal given that it is a "flagship" species with the result that organisations, such as the Oribi Working Group, have been established to ensure ongoing protection and improve conservation of the Oribi. Syke's Monkey is also regarded as a highly sensitive mammal and given that it is restricted predominantly to large forest patches, it is considered to be a priority species that requires protection through habitat preservation.

Reptiles

A number of reptile species occur within the study area and several of these species will be listed as Red Data species in the upcoming South African reptile Red Data book (In prep.). These include six species of lizard and ten species of snake. The Variable Legless Skink (*Acontias poecilus*), a species that is restricted to indigenous forest patches, is the only reptile species is currently considered Endangered. However, two other species are likely to be classified as Endangered in the future, namely Fitzsimon's' Dwarf Legless Skink (*Scelotes nr fitzsimonsi*) and Forest Thread Snake (*Leptotyphlops sylvicolus*) (South African Reptile Atlas and Red Data Book, In Prep.).

The Green Mamba (*Dendroaspis angusticeps*), listed as Vulnerable, is the only other threatened reptile species that is known to occur in the study area.

Table 15 lists threatened species including Red Data and rare endemic reptiles. Table 15 also lists the broad habitat requirements of these species of reptiles.

Figure 18 Faunal habitats that are sensitive to disturbance and/or loss (C-Plan)

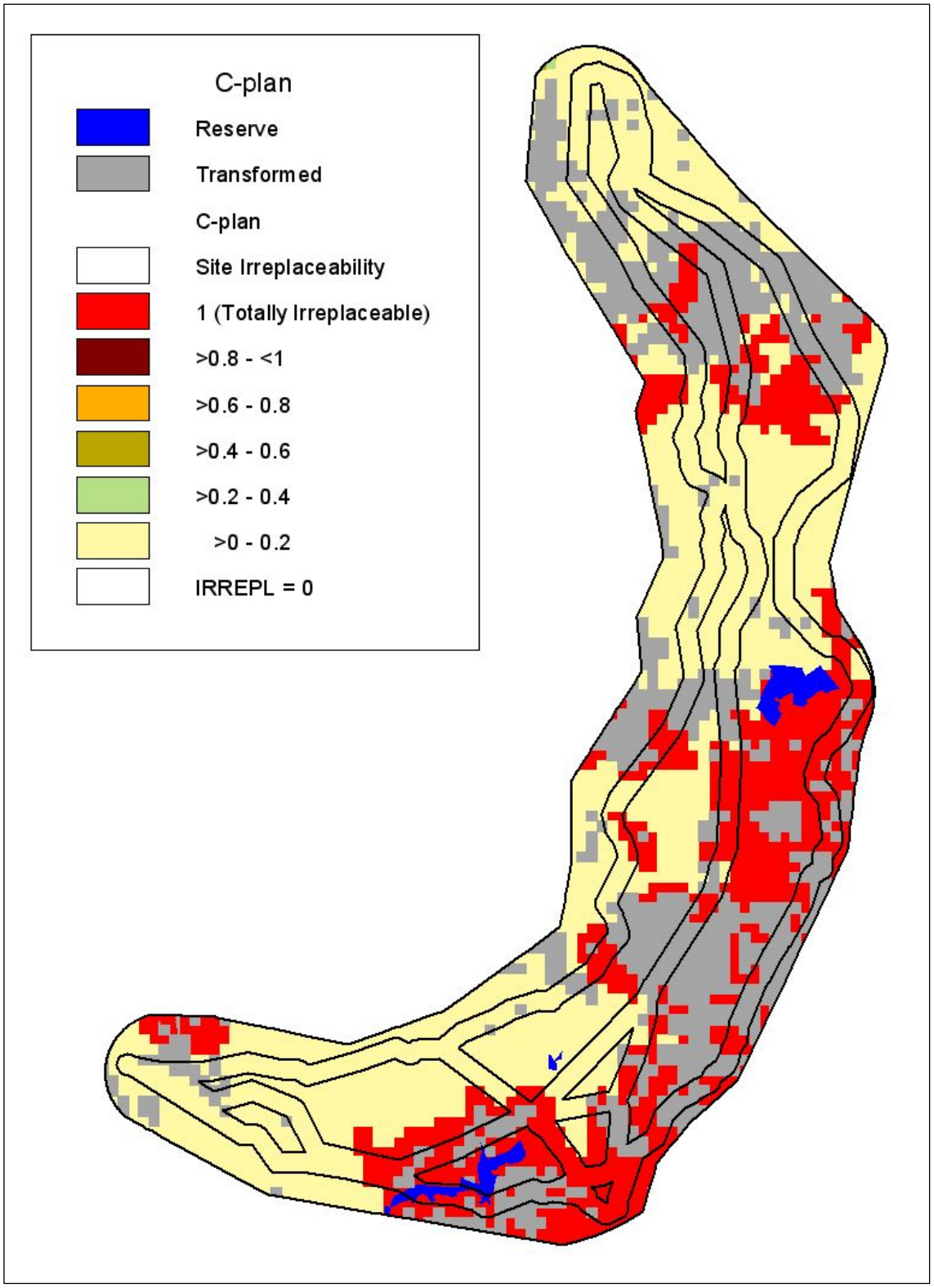


Table 14 List of Red Data mammal species occurring within the study area

Species	Common Name	Conservation Status	Habitat Requirements
Chrysospalax villosus	Rough-haired Golden Mole	Vulnerable	Grasslands and savanna
Ourebia ourebi	Oribi	Endangered	Grasslands
Kerivoula argentata	Damara Woolly Bat	Endangered	Savanna and drainage lines in savanna
Rhinolophus swinnyi	Swiny's Horseshoe Bat	Endangered	Forest and savanna
Cercopithecus albogularis	Syke's (Samango) Monkey	Endangered	Forests in excess of 100 ha
Philantomba monticola	Blue Duiker	Vulnerable	Forests
Dendrohyrax arboreus	Tree Hyrax	Vulnerable	Forests
Laephotis wintoni	De Winton's Long-eared Bat	Vulnerable	Savanna
Crocidura maquassiensis	Maquassie Musk Shrew	Vulnerable	Dense vegetation
Leptailurus serval	Serval	Near Threatened	Grassland and wetlands
Mellivora capensis	Honey Badger	Near Threatened	Grasslands and savanna
Dasymys imcomtus	Water Rat	Near Threatened	Wetlands, dams and drainage lines in grasslands
Poecilogale albinucha	African Weasel	Data deficient	Grasslands and savanna
Grammomys dolichrus	Woodland Mouse	Data deficient	Woodland and forests
Lemniscomys rosalia	Single-striped Grass Mouse	Data deficient	Grasslands and savanna

Amphibians

Five Red Data species of frogs are found or may be found within the study area (Table 16). Of these, three of are listed as Endangered: Pickersgill's Reed Frog (*Hyperolius pickersgilli*), Long-toed Tree Frog (*Leptopelis xenodactylus*) and Kloof Frog (*Natalobatrachus bonebergi*); two are Vulnerable: Spotted Shovel-nosed Frog (*Hemisus guttatus*) and Natal Leaf-folding Frog (*Afrixalus spinifrons*); and one is Data Deficient, Striped Caco (*Cacosternum striatum*). Other frogs which are not currently classed as Red Data species, but which are considered sensitive because of their limited distribution ranges and specialised habitat requirements are Natal Ghost Frog (*Hadromophryne natalensis*), Sharp-nosed Reed Frog (*Hyperolius acuticeps*) and Forest Tree Frog (*Leptopelis natalensis*).

Frogs are particularly restricted to aquatic habitats (wetlands and other surface water bodies) and, thus, impacts on these habitats (as a result of the clearing of the centre line and the tower positioning) are likely to negatively impact on amphibian species. Frogs also require terrestrial habitats adjoining aquatic habitats.

Table 15 List of Red Data reptile species occurring within the study area

Species	Common Name	Conservation Status	Habitat Requirements
Acontias poecilus	Variable Legless Skink	Endangered	Forests
Dendroaspis angusticeps	Green Mamba	Vulnerable	Forests and forested drainage lines
Scelotes nr fitzsimonsi	Fitzsimon's' Dwarf Legless Skink	Near threatened*	Forests and forested drainage lines
Bradypodion melanocephalum	KwaZulu Dwarf Chamaeleon	Near Threatened	Most habitats excluding forests
Chamaesaura anguina	Cape Grass Lizard	Near Threatened	Grasslands
Chamaesaura macrolepis	Large-scaled Grass Lizard	Near Threatened	Grasslands
Homoroselaps dorsalis	Striped Harlequin Snake	Near Threatened	Grasslands
Lamprophis fuscus	Yellow-bellied House Snake	Near Threatened	Grasslands
Macrelaps microlepidotus	Natal Black Snake	Near Threatened	Forests and forested drainage lines
Leptotyphlops sylvicolus	Forest Thread Snake	Data deficient*	Forests
Amblyodipsas concolor	Natal Purple-glossed Snake	Rare endemic	Forests and forested drainage lines
Elapsoidea sundewallii	Sundevall's Garter Snake	Rare endemic	Grasslands and savanna
Lamprophis guttatus	Spotted House Snake	Habitat specialist, endemic	Very rocky areas and cliffs
Mehelya capensis	Cape File Snake	Rare throughout its range	Forests and savanna
Python natalensis	Southern African Python	Uncommon	Savanna and drainage lines in savanna
Tropidosaura montana natalensis	Common Mountain Lizard	Rare endemic	Grasslands

Table 16 List of Red Data amphibian species occurring within the study area

Species	Common Name	Conservation Status	Habitat Requirements
Hyperolius pickersgilli	Pickersgill's Reed Frog	Endangered	Coastal wetlands
Leptopelis xenodactylus	Long-toed Tree Frog	Endangered	Wetlands in grassland areas
Natalobatrachus bonebergi	Kloof Frog	Endangered	Forested drainage lines
Hemisus guttatus	Spotted Shovel-nosed Frog	Vulnerable	Wetlands
Afrixalus spinifrons	Natal Leaf-folding Frog	Vulnerable	Wetlands and dams
Cacosternum striatum	Striped Caco	Data deficient	Wetlands
Hadromophryne natalensis	Natal Ghost Frog	Habitat specialist, endemic	Fast flowing, rocky rivers (most likely to be forested)
Hyperolius acuticeps	Sharp-nosed Reed Frog	Rare endemic	Wetlands
Leptopelis natalensis	Forest Tree Frog	Habitat specialist, endemic	Wetlands and streams close to forests

6.4.1 Potential impacts

- Loss of faunal habitat.
- Direct impacts on faunal species.
- Disturbance to the overall environment.
  - Generation of waste and pollution.
  - Alien plant infestations.

6.4.2 Recommendations for mitigation

- Construction and operation activities should be minimal and the servitude centre line should be established only where necessary, in particular in areas where habitats are in good condition.
- Minimise access to individual tower sites and limit construction activities to the immediate tower site.
- Ensure that towers are positioned on land that is already transformed.
- Ensure that construction camps, site offices and other facilities are positioned on land that is already transformed.
- Where construction camps are positioned in proximity to natural areas inhabited by various fauna, construction personnel should be monitored continuously to ensure collection and/or poaching by personnel does not take place.
- Pollution and waste impacts should be avoided as much as possible as they may potentially affect fauna in localised areas. It is recommended that waste material be stored in an appropriate area from where it should be removed as soon as possible for recycling or disposal in a licensed waste facility. Under no given circumstances should excavation or building material be dumped on stable vegetation.
- Habitat destruction from construction works, vehicles, machinery, or any other construction requirements should not occur in natural habitat areas that are situated outside the permitted construction area.
- Forest patches should not be disturbed nor cleared. Where avoidance is not possible, it is acceptable for conductor lines to pass over sections of forests. If it is required for a section of a forest to be disturbed or cleared (as a result of a tower positioning or conductor snag requirements), attempts should be made to align the power line so that it traverses the shortest possible distance of forest.
- It is strongly recommended that adequate buffering is in place to limited disturbance to aquatic habitats. For certain frog species this may be as much as 80 metres from the edge of the aquatic habitat.
- To prevent unnecessary alien plant infestations, an alien plant monitoring and eradication program needs to be in place, at least until the disturbed areas have recovered and properly stabilised.
- Where destruction and/or loss of highly sensitive habitat areas is completely unavoidable, a suitable ‘offset’ program will need to be established whereby adequate restitution is properly defined to ensure rehabilitation of similar habitat.
- Faunal species encountered during construction and which are at risk of being harmed or self-injury should be removed by the ECO from the immediate site and relocated to an adjacent, suitable area. In order to prevent cases where fauna may fall into excavations, it is strongly recommended that suitably designed barriers or covers are used when excavated pits remain open.

- Once construction is complete, adequate rehabilitation of disturbed areas should be employed in order to restore the areas back to natural condition.
- It is recommended that once a route has been selected and approved by DEA, a detailed investigation of natural habitats should be conducted that aims to define habitat areas of particular importance.

6.5 Flora

The description of the vegetation was obtained from the following data sources:

- The vegetation of South Africa, Lesotho and Swaziland (Mucina & Rutherford, 2006).
- The vegetation of KwaZulu-Natal, Ezemvelo KZN Wildlife (EKZNW).
- Centres of Endemism.
- The Terrestrial Systematic Conservation Plan (C-Plan), Ezemvelo KZN Wildlife (EKZNW).
- The Strategic Environmental Assessment database, Ezemvelo KZN Wildlife (EKZNW).
- The land cover data of KwaZulu-Natal, SANBI (2005).

There are nine national vegetation units affected by the proposed development, viz. Midlands Mistbelt Grassland, KwaZulu-Natal Hinterland Thornveld, Ngongoni Veld, KwaZulu-Natal Sandstone Sourveld, Eastern Valley Bushveld, KwaZulu-Natal Coastal Belt, Pondoland-Ugu Sandstone, Coastal Sourveld Scarp Forest, and Northern Coastal Forest.

At a provincial level, EKZNW has further subdivided these vegetation units into twelve (12) vegetation types. These are listed in Table 17 and shown in Figure 19.

With respect to Centres of Endemism, southern KwaZulu-Natal generally has a low incidence of endemism, which is evident along much of the coast, while the Midlands centre of endemism tends to occur inland, to the west. The northern end of the Pondoland Centre of Endemism is located in the vicinity of Oribi Gorge Nature Reserve (Figure 20).

The C-Plan is presently being updated and the new version uses watersheds as planning units and incorporates the 2005 KZN land cover data. The version used in this study represents a substantial improvement in accuracy and correlates better with field observations during the site inspection than the previous version of the C-Plan. The new version presented here is, however, based on draft findings which could be subject to minor changes in the final product. Figure 21 displays the irreplaceability index[23] with route alternatives super-imposed on the C-Plan.

[23] Each planning unit has associated with it an 'Irreplaceability Value', which is a reflection of the unit's importance with respect to the conservation of biodiversity. Irreplaceability reflects the planning unit's ability to meet set targets for selected biodiversity features. **The irreplaceability value is scaled between 0 and 1**. Where a planning unit has an irreplaceability value of 0, all biodiversity features recorded here are conserved to the target amount, and there is unlikely to be a biodiversity concern with the development of the site. Where a planning unit has an irreplaceability value of 1, these planning units are referred to as totally irreplaceable and the conservation of the features within them are critical to meet conservation targets. Where values lie between 0 and 1, some of these planning units are required to meet biodiversity conservation targets. If the value is high then most units are required with few options available for alternative choices. If the value is low, then many options are available for meeting the biodiversity targets.

Table 17 National vegetation units and corresponding KZN vegetation types with their conservation status

National Vegetation Unit Name (Mucina & Rutherford, 2006)	National Code	National Conservation Status (SANBI)	KZN Vegetation Type Name (EKZNW)	KZN Conservation Status (EKZNW)
Midlands Mistbelt Grassland	Gs 9	Endangered	Midlands Mistbelt Grassland	Critically Endangered
KwaZulu-Natal Hinterland Thornveld	SVs 3	Vulnerable	KwaZulu-Natal Hinterland Thornveld	Vulnerable
Ngongoni Veld	SVs 4	Vulnerable	Dry Ngongoni Veld	Endangered
Ngongoni Veld	SVs 4	Vulnerable	Moist Ngongoni Veld	Critically Endangered
KwaZulu-Natal Sandstone Sourveld	SVs 5	Endangered	KwaZulu-Natal Sandstone Sourveld	Critically Endangered
Eastern Valley Bushveld	SVs 6	Least Threatened	Eastern Valley Bushveld	Least Threatened
KwaZulu-Natal Coastal Belt	CB 3	Endangered	South Coast Grassland	Critically Endangered
KwaZulu-Natal Coastal Belt	CB 3	Endangered	South Coast Bushland	Endangered
Pondoland-Ugu Sandstone Coastal Sourveld	CB 4	Vulnerable	Pondoland-Ugu Sandstone Coastal Sourveld	Critically Endangered
Scarp Forest	FOz 5	Least Threatened	Pondoland Scarp Forests	Least Threatened
Scarp Forest	FOz 5	Least Threatened	Eastern Scarp Forests: Southern Coastal Scarp Forest	Least Threatened
Northern Coastal Forest	FOz 7	Least Threatened	KwaZulu-Natal Coastal Forests	Least Threatened

Figure 19 EKZNW's vegetation types for the study area

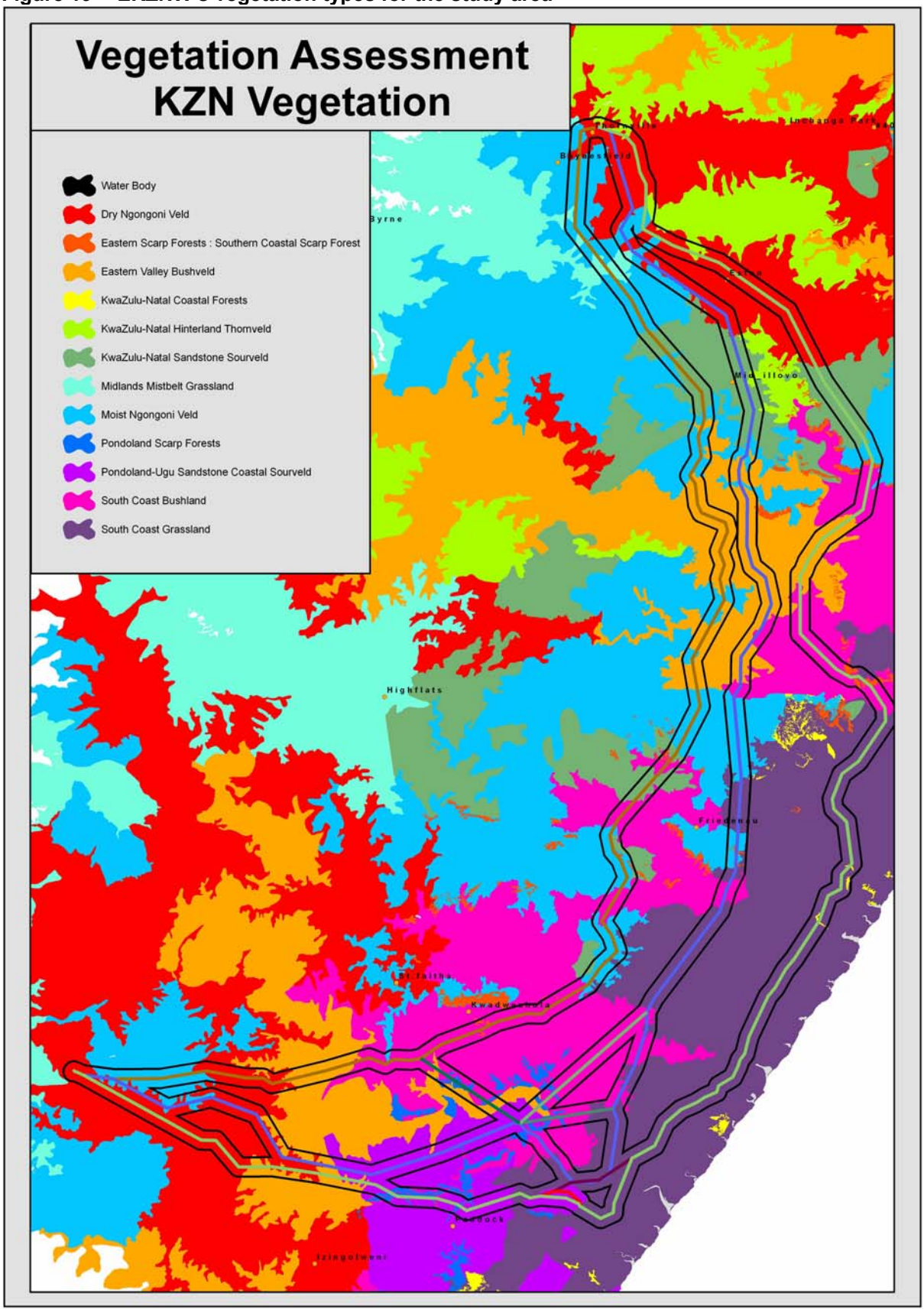


Figure 20 Centres of endemism in southern KZN

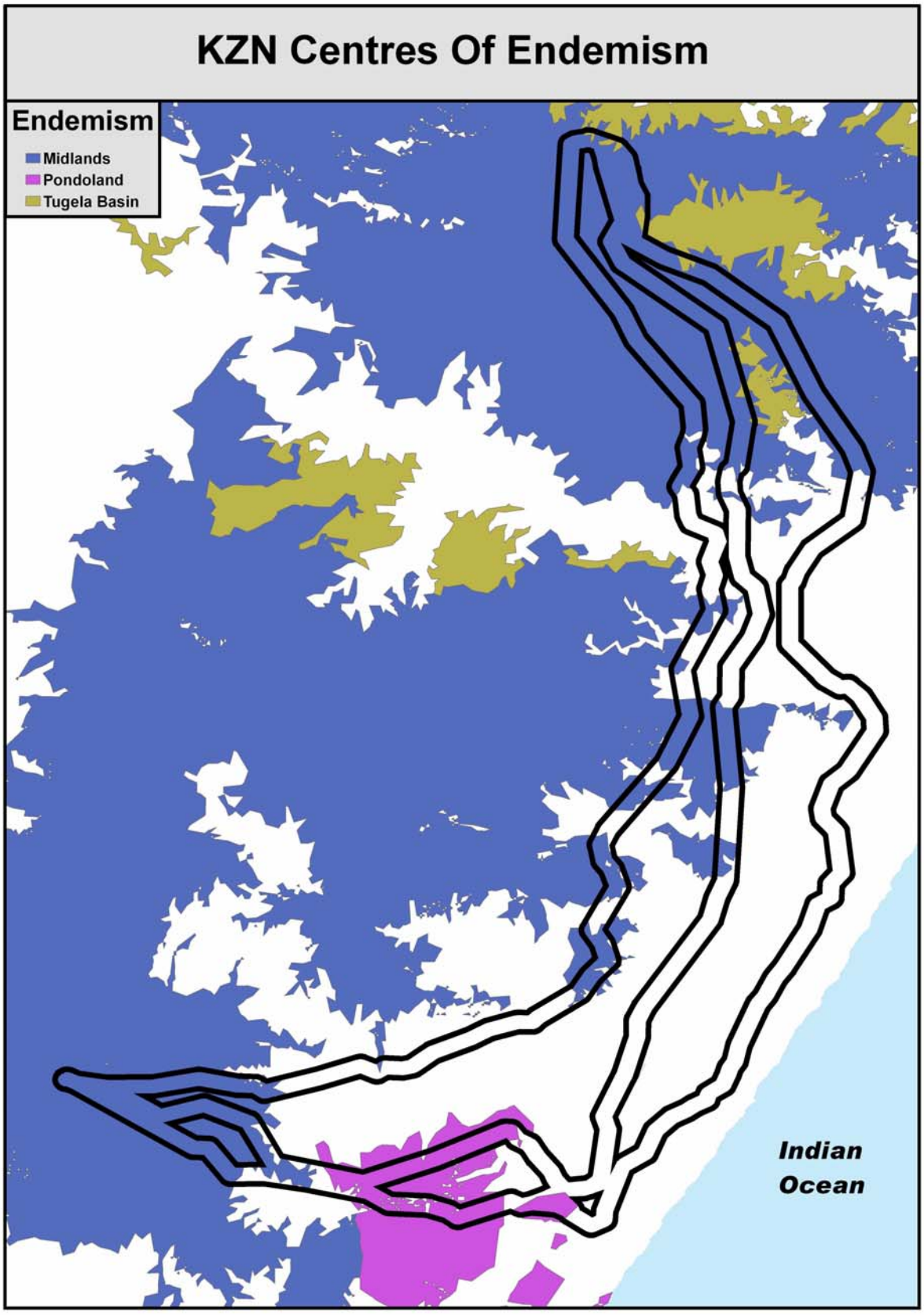
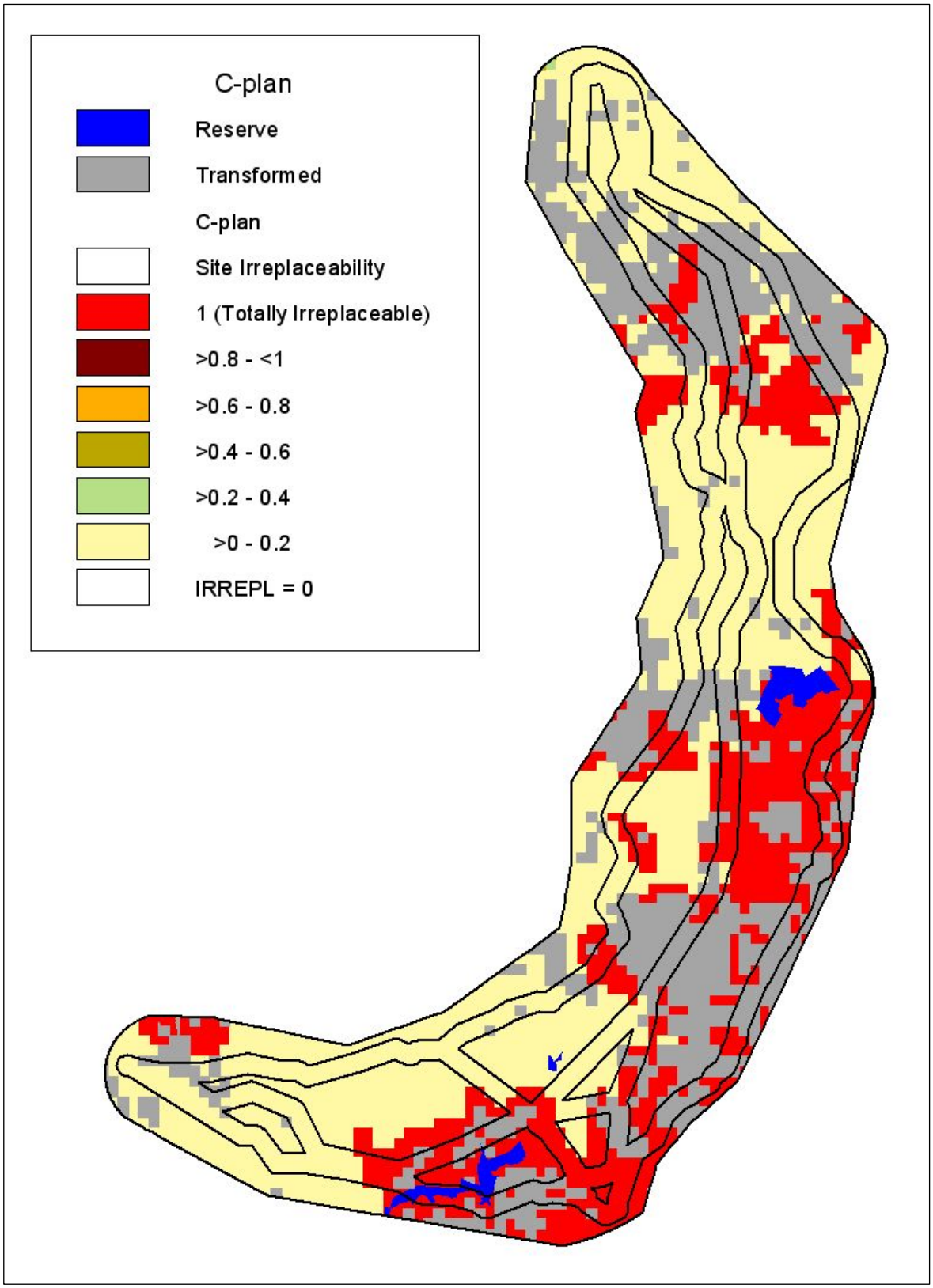


Figure 21 C-Plan's Irreplaceability Index for the study area



In general, trends in the study area show that units with high irreplaceability values are frequently encountered along the western and central alternatives, while they are relatively infrequently encountered along the eastern route. Similarly, the highest degree of transformation tends to occur along eastern alternative, with the central and western alternatives displaying a lower degree of transformation. An important exception to this trend is the large cluster of units with high irreplaceability values around the northern end of Pondoland Centre of Endemism (in the Oribi Gorge area).

Numerous factors are responsible for transformation and degradation of natural vegetation within the study area:

- Commercial and subsistence agriculture, including sugarcane and commercial plantations.
- Urban development.
- Rural homesteads with associated shifting cultivation of surrounding land, grazing of livestock and gully erosion where overstocking and other land use practices are extreme.
- Encroachment of bush into grassland. This trend has led to land-use changes resulting in natural fire regimes being altered, and is particularly noticeable in grassland remnants within sugarcane farms, in shallow catchment basins.
- Introduction of alien invasive plants as a result human activities (agriculture and settlements). Alien invasive shrubs and trees also contribute significantly to grassland loss through bush encroachment, and patches of alien shrubland occur in areas where disturbance is more extensive.

A list of twenty-four (24) plant species of conservation importance (rare/threatened or endemic[24]) (Table 18), which are predicted to occur within each alternative, were obtained from EKZNW's SEA database. In addition to this list of species, it is also possible that other rare/threatened species (and/or protected species) are present in under-collected areas. It is, therefore, important, during the construction phase, that detailed searches for rare/threatened and protected species are made during the appropriate time of year when plants are likely to be visible. Tower sites (and by implication, the power line servitude) can then be selected to avoid these plants, or a plant rescue operation can be launched where no other option exists for tower placement.

It is important to note that, if impacts during construction are minimized within the units with high irreplaceability values identified in the C-Plan, then impacts on plants of conservation importance would also be minimized.

[24] A species which is restricted to a particular geographic region.

Table 18 List of plants of conservation importance identified by EKZNW's SEA database, which are predicated to occur in the study area

Species	Conservation Status (IUCN)	Growth Form	Plant Height (m)	Altitude Range (m)	Habitat	Flowering Time	1:50 000 Topo-map ref
Acalypha sp. nov.	Endangered	Perennial Herb	0.20 to 0.35	*c.* 450	Ngongoni Grassland	Sep to Oct	3030CA south 3030CB south
Alepidea amatymbica	Vulnerable	Perennial Geophyte	0.10 to 2.10	800 to 2000	Ngongoni & Mistbelt Grassland. In bush, at forest margins, along stream banks, or on damp, grassy slopes	Jan to Apr	3030AB north
Asclepias schlechteri	Endangered	Perennial Herb	0.54 to 0.55	to 800	Mistbelt Grassland		2930CD west 2930DC east 2930DC west 3029DB 3030AD 3030AD south 3030BA central 3030CA north 3030CA south
Bowiea volubilis subsp. *volubilis*	Vulnerable	Perennial Geophyte Succulent Climber	0.20 to 10.00	365 to 2135	Savannah & Grassland. Rocky sites in shade or full sun	Oct to Apr	2930CD west 3030AD 3030AD south 3030BA central 3030BA east 3030BC east 3030BC west 3030CA south 3030CB north 3030CB south
Brachystelma kerzneri	Vulnerable	Perennial Geophyte Succulent		to 50	Coastal Grassland		3030BC east 3030CB south
Bulbine inflata	Least Concern	Perennial Herb Succulent Geophyte	0.49 to 0.60	220 to 1705	Mistbelt & Ngongoni Grassland. In seepages in rock outcrops & vleis		2930CB 2930CD east 2930CD west 3029DB 3030AB north 3030AD

Species	Conservation Status (IUCN)	Growth Form	Plant Height (m)	Altitude Range (m)	Habitat	Flowering Time	1:50 000 Topo-map ref
							3030AD south 3030BA east 3030BC west 3030CA north 3030CA south 3030CB north 3030CB south
Craterostigma plantagineum	Least Concern	Perennial Herb Succulent	0.03 to 0.10	305 to 1560	Coastal & Pondoland Coastal Grassland. Rock outcrops	Dec to Mar	3030AD 3030AD south 3030BA central 3030BA east 3030BC west 3030CB north 3030CB south
Dahlgrenodendron natalense	Endangered	Perennial Large tree	3.00 to 15.00	0 to 300	Scarp Forest. Steep slopes along watercourses	Nov to Dec	3030BA east 3030BC east 3030CA south 3030CB north 3030CB south
Diaphananthe millari	Vulnerable	Perennial Epiphyte Orchid	to 0.15	300 to 700	Scarp Forest. Low level epiphyte in kloof forests & dry scrub, most usually in light shade on the underside of branches	Dec to Feb	2930CD west 2930DC east 2930DC west 3030AB north 3030AB south 3030AD 3030AD south 3030BA central 3030BA east 3030BA west 3030BC east 3030BC west 3030CA south 3030CB north 3030CB south 3030DA

Species	Conservation Status (IUCN)	Growth Form	Plant Height (m)	Altitude Range (m)	Habitat	Flowering Time	1:50 000 Topo-map ref
Dierama pumilum	Vulnerable	Perennial Herb Geophyte	0.65 to 1.35	1000 to 1200	Mistbelt Grassland	Dec to Feb	2930CB 2930CD east 2930CD west
Eucomis autumnalis	Declining	Perennial Geophyte	0.12 to 0.60	45 to 2650	Grassland, wetland, or on rocky ridges	Dec to Apr	3030AB north 3030AD
Gerbera aurantiaca	Endangered	Perennial Herb	0.05 to 0.40	800 to 2000	Mistbelt Grassland. Warm, well-drained slopes on shallow soils	Aug to Oct	2930CB 2930CD east 2930CD west
Gladiolus cruentus	Critically Endangered	Perennial Herb, Geophyte	0.50 to 0.70	400 to 700	Scarp Forest. Edges of waterfalls	Feb	2930CD east 2930CD west 2930DC east 2930DC west 3029DB 3030AB north 3030AD 3030AD south 3030BA central 3030BA east 3030CA north 3030CA south 3030CB north 3030CB south
Hesperantha gracilis	Vulnerable	Perennial Herb Geophyte	0.30 to 0.45		Scarp Forest. On dripping wet cliffs		2930CD west
Kniphofia latifolia	Endangered	Perennial Herb	0.47 to 1.10	to 765	Mistbelt Grassland. Grassy slopes, riverbanks, hygrophilous grassland	Oct & Nov	2930CB 2930CD east 2930CD west 3029DB
Leucospermum innovans	Endangered	Lignotuberous Shrub Perennial	0.50 to 1.00	300 to 500	Pondoland Coastal Grassland on shallow sandstone-derived soils	Sep & Oct	3030CA south 3030CB south
Merwilla plumbea	Near Threatened	Perennial Herb geophyte	0.20 to 1.00	300 to 2500	Ngongoni & Mistbelt Grassland. Primarily in bolder strewn grassland on hill slopes	Sep & Oct	2930CB 2930CD east 2930CD west 2930DC east 3029DB

Species	Conservation Status (IUCN)	Growth Form	Plant Height (m)	Altitude Range (m)	Habitat	Flowering Time	1:50 000 Topo-map ref
							3030AB north 3030AD 3030AD south 3030BA east 3030BC west 3030CA north 3030CA south 3030CB north 3030CB south
Satyrium rhodanthum	Critically Endangered	Perennial Herb geophyte	0.25 to 0.40		Mistbelt Grassland. In damp grassland	Oct	2930CD east
Senecio exuberans	Endangered	Perennial Herb	1.20 to 1.50	to 305	Mistbelt Grassland	Dec & Jan	2930CB 2930CD east 2930CD west 3029DB
Siphonochilus aethiopicus	Critically Endangered	Perennial Herb Geophyte Bulbous Plant	0.15 to 0.45	610 to 915	Savanna & Coastal Grassland. Forest ecotone. Extinct in the wild in KZN. Grown around homesteads	Oct to Feb	3030CB south
Sisyranthus fanniniae	Vulnerable	Perennial Herb		1600 to 1800	Montane Grassland		2930CB 2930CD east 2930CD west 3029DB
Stachys comosa	Threatened [25]	Perennial Herb	0.25 to 0.40	400 to 1000	Ngongoni Grassland. Grassy slopes, often among rocks	Spring & early summer	2930CB 2930CD east 2930CD west 2930DC east 2930DC west 3029DB 3030AB north 3030AB south 3030AD 3030AD south 3030BA central

[25] This taxon is likely to be threatened, it's status has however not yet been finalized (SANBI National Red List of South African Plants, 2009).

Species	Conservation Status (IUCN)	Growth Form	Plant Height (m)	Altitude Range (m)	Habitat	Flowering Time	1:50 000 Topo-map ref
							3030BA east 3030BA west 3030BC west 3030CA north 3030CA south 3030CB north 3030CB south
Streptocarpus formosus	Rare	Lithophyte Perennial Herb	0.16 to 0.25	to 120	Scarp Forest	Dec	3030AD 3030AD south 3030BA central 3030BA east 3030BC east 3030BC west 3030CA south 3030CB north 3030CB south
Watsonia canaliculata	Endangered	Perennial Herb geophyte	0.30 to 0.45		Mistbelt Grassland	Nov to Dec	2930CD west

According to SANBI's Land Cover data (2005), some areas in the C-Plan data, which have been assigned high irreplaceability values, were found to contain transformed or degraded areas of vegetation on closer inspection (Figure 22). It is also likely that, since the date when the C-Plan data were collected (2005), further transformation/degradation of natural vegetation has taken place in the study area.

By studying the C-Plan dataset and SANBI dataset in detail (Figure 23), a new list of red flag areas (within the alternative corridors) was established. This assisted in the selection of route segments with the least amount of sensitive vegetation likely to be impacted upon by the proposed development.

Figure 22 KwaZulu-Natal 2005 land cover map with route alternatives superimposed (reproduced from data obtained from SANBI)

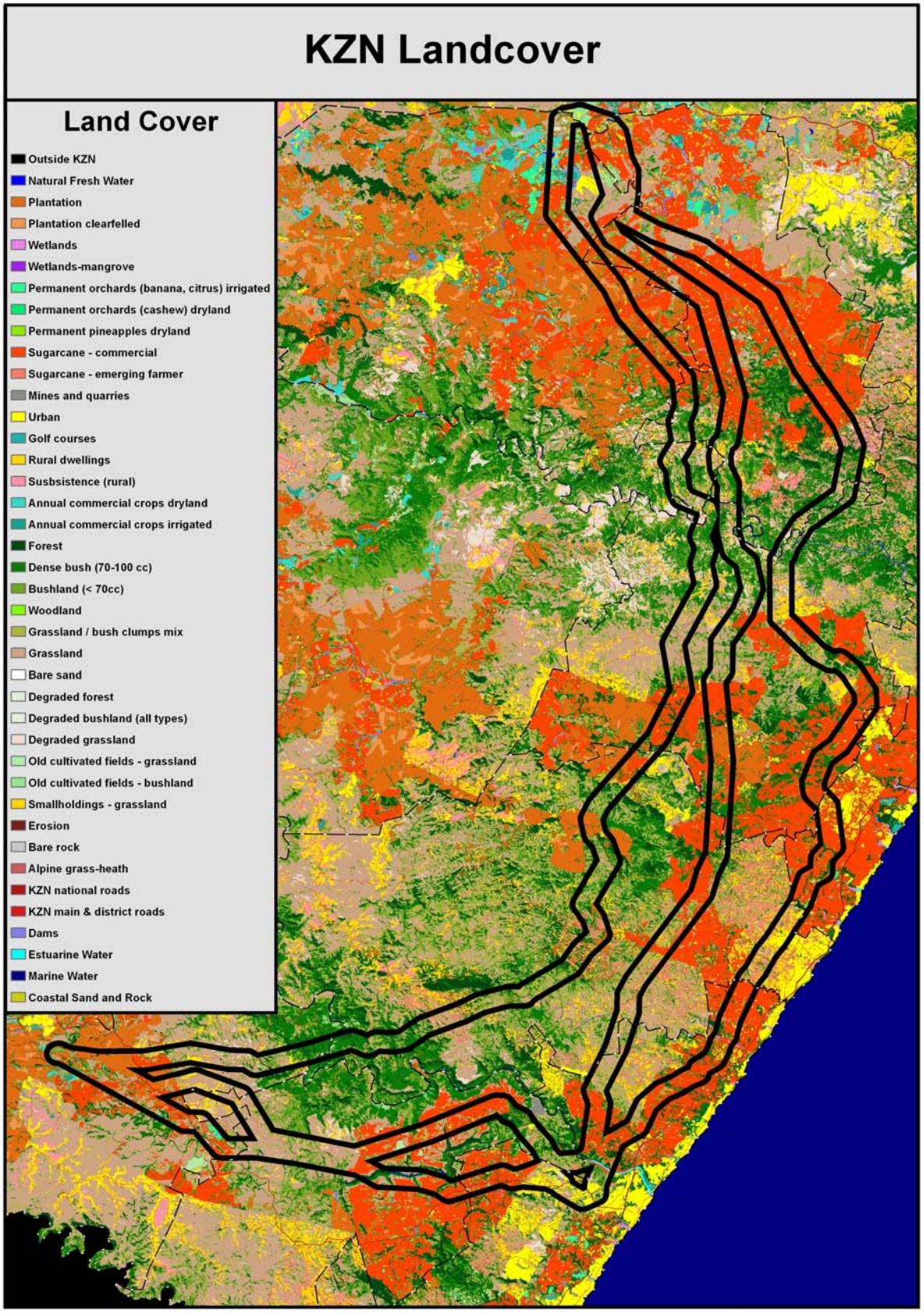
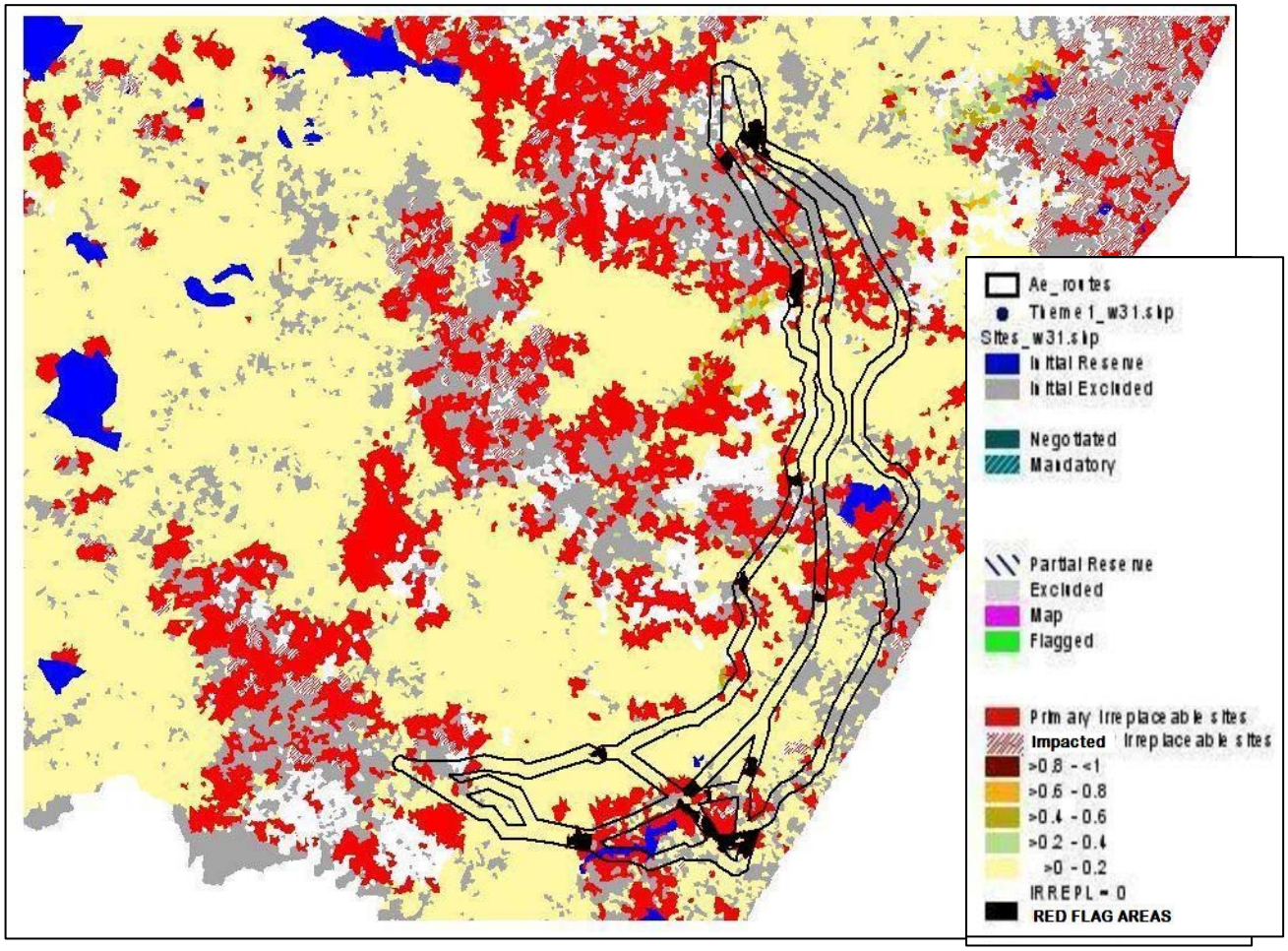


Figure 23 **Distribution of red flag areas (shown in black) that represent areas where transformed land is not available within or adjacent to areas with high irreplaceability values within the 2 km wide route alternatives (reproduced from image obtained from EKZNW)**



6.5.1 Potential impacts on flora

- Habitat degradation.
- Loss of sensitive plant species.
- Loss of sensitive plant communities.
- Pollution of surface water bodies (wetland, rivers and others).
- Impacts on and near surface water bodies (access roads, working areas, etc).
- Management of alien vegetation.
- Plant rescue control.
- Medicinal plants (poaching).
- Loss of groundcover and soil erosion.

6.5.2 Recommendations for mitigation

- Once a preferred corridor has been selected, and prior to the construction of towers, input must be obtained from a flora specialist on the final location of towers within the 2 km wide corridor, avoiding sensitive areas of vegetation (including tower sites, access routes, the 8 m wide centre line required for stringing and the 55 m wide servitude, where relevant).
- Sensitive areas of vegetation can be avoided firstly by routing the transmission line around sensitive vegetation or secondly routing over sensitive vegetation. This will require placement of towers within transformed land, i.e. either within areas of agriculture or degraded natural vegetation.
- Placement of towers in wetlands should be considered a fatal flaw in the tower site selection process and alternative sites should be considered.
- Where sensitive vegetation is found within the 55 m wide servitude, stringing of the conductors should be done via helicopter, or shot over the sensitive vegetation (irrespective of topography), where significance of impacts associated with vehicular movement between towers will be high. In these situations, maintenance will also need to be done via helicopter to avoid impacts associated with vehicular movement in the servitude between towers.
- Where construction occurs close to any sensitive areas of natural vegetation or any rare/threatened or protected species, these must be suitably and visibly demarcated and cordoned off prior to and during the construction phase.
- The construction footprint should be kept to a minimum and no works should occur outside of the negotiated servitude.
- Stockpile and lay down areas for tower assembly are to be kept away from areas of sensitive natural vegetation.
- A Vegetation Management Plan including a Plant Rescue Plan, Alien Plant and Bush Encroachment Control Programme must be put in place prior to construction where protected or rare/threatened species will be impacted by construction and operation activities. These plans should be implemented by contractors under the guidance of the ECO.
- Where construction/operation may impact on plants designated as specially protected under the Natal Nature Conservation Ordinance (No. 15 of 1974), an application must be submitted to EKZNW to clear or translocate these plants as part of the plant rescue operation.

- Where construction/operation may impact on natural forests or individual trees protected in terms of the National Forests Act, 1998, an application must be submitted to the National Department of Agriculture, Forestry and Fisheries (DAFF).
- Where construction/operation may impact on plants listed as threatened or protected species under the National Environmental Management Act: Biodiversity Act, 2004 (10 of 2004), an application must be submitted to the DEA (National Department of Environmental Affairs) or DAEARD (Provincial Department of Agriculture, Environmental Affairs and Rural Development) to translocate these plants as part of the plant rescue operation.
- Where clearance of woody vegetation is required to string conductors, it is recommended that no groundcover be removed (i.e. grasses and forbs). Trimming of trees and shrubs is preferable to clearance. Where clearance of trees and shrubs is unavoidable, it is recommended that:
  - Clearance is kept to a minimum and the vehicle access ways are routed through stands of alien plants where this is an option.
  - Clearance is done by hand and not with a bulldozer or other earth working machinery as this will exacerbate soil erosion. No de-stumping or uprooting should be permitted.
  - Cleared areas are brush-packed to reduce soil erosion, using cut branches which are placed parallel to the contour of the slope.
  - Clearance in riparian forest/thicket be done by hand and limited to the minimum necessary to allow for the passage of the pilot-cables. Clearance for formation of a vehicle access way through riparian forest/thicket should not be permitted. Vehicular access across streams should be done at existing crossing points wherever possible. Where new crossing points are required, these should be sited in transformed/degraded vegetation away from areas of riparian forest/thicket.
- Clearance of indigenous forest/thicket across ravines and gullies should not be permitted, as these areas will very rarely interfere with minimum conductor clearance requirements.
- Existing tracks are used to access tower sites. Soil compaction should be minimized by keeping vehicle and construction plant access ways and parking areas to a minimum, and making use of existing compacted/hardened surfaces wherever possible.
- Where new tracks are required to access tower sites, input from a flora specialist is to be obtained, and sensitive areas of vegetation and wetlands are to be avoided. Wherever possible, the blading of new tracks with a grader is to be avoided where not necessary, and a new vehicle track is to be created by simply driving over the grass cover without removing grass cover/topsoil.
- The same track is to be used to access each tower and widening and creating alternative or parallel tracks must not be allowed. Likewise, the same vehicle turning areas are to be used at tower sites (for both construction and maintenance).
- Where new gravel access roads need to be constructed, adequate drainage and soil erosion controls must be installed and maintained. As far as possible, access roads must follow the contour on steep slopes, rather than being aligned directly down steep slopes.

- Where new roads are constructed and foundations are excavated, the original topsoil (the upper most 300 mm of soil, together with plant roots and organic matter) must be stripped and stockpiled separately for the minimum possible period of time. Topsoil stockpiles should not be handled/moved, and should be kept free of alien invasive plants. During rehabilitation, topsoil must be reinstated to ensure rapid re-establishment of groundcover on bare areas. This must be done where translocation of sections of sensitive grassland is not required, and after any rare/threatened or protected species have been translocated.
- The control of soil erosion and siltation associated with construction and operation is important at all locations on site, and particularly adjacent to drainage lines, streams and wetland communities. Both temporary and permanent soil erosion control measures must be used during the construction and operation phases. Any earth-worked areas, which may lay bare for extended periods, should be temporarily grassed.
- Bare surfaces should be grassed as soon as possible after construction to minimise time of exposure. Locally occurring, indigenous runner grasses should be used, for example *Stenotaphrum secundatum, Dactyloctenium australe* and *Cynodon dactylon*. Where runners cannot be locally sourced from natural areas within a 50 km radius, then a sterile variety of Couch Grass (*Cynodon dactylon*) can be commercially sourced and planted. Alien invasive grasses such as *Pennisetum clandestinum* (Kikuyu) must not be used.
- Contractor's camps and any concrete batching sites are to be sited within existing disturbed areas and at least 100 m from areas of sensitive natural vegetation, and away from any ephemeral drainage lines that may lead into wetlands or water bodies.
- The construction team must remain within the construction site boundaries and must not interfere with areas of natural vegetation in any way. All indigenous vegetation not interfering with construction or operation should not be disturbed. Collection of medicinal plants, firewood, building wood and poaching within areas of natural vegetation should be prohibited. There should be no dumping of solid waste within areas of natural vegetation. Ablutions must be provided on-site.
- It is important that pollution spills are prevented at all locations on site, and particularly near drainage lines, streams and wetland communities by strict control/handling of materials such as non-corrosive paints, petrochemicals and any other chemicals to be used on site, and provision of on-site sanitation for labour. Natural water bodies must not be used to wash out construction vehicles, concrete mixers, or for domestic ablutions.

6.6 Heritage Resources

A Heritage Impact Assessment (HIA) was undertaken by eThembeni Cultural Heritage in terms of the National Heritage Resources Act No 25 of 1999. eThembeni conducted a site inspection of the affected environment on 15-16 July 2009. A controlled-exclusive surface survey[26] was also conducted and completed. No foot-intensive survey was conducted due to the size of the receiving environment.

The HIA provides information to inform the selection of a preferred corridor or a combination of corridors. The HIA is does not provide an exhaustive list of heritage resources found with the receiving environment. Rather, its purpose is to identify potential problem areas associated with the three alternative corridors. A more intensive and in-depth investigation will be undertaken along the preferred corridor subsequent the completion of this EIA process.

[26] This is a type of cultural heritage survey where a heritage practitioner has sufficient information about the study area to make an objective and defensible judgment about the siting of archaeological sites.

According to the HIA, a number of heritage resources are likely to be present along the proposed corridor alternatives. A heritage resource is a resource of cultural value and significance and it includes both tangible resources (such as artefacts, buildings and graves) and intangible resources (such as places, landscapes, living heritage, oral traditions and rituals).

6.6.1 Potential impacts

From a heritage perspective, a combination of the Eastern Corridor (Eston Sub-station – Oribi Sub-station) and Western Corridor (Oribi Sub-station – Eros Sub-station) is preferred for the following reasons:

- The greatest impact on landscapes and natural features is created by access roads and other construction and maintenance infrastructure. The Eastern Corridor appears to have the least requirement for new access and maintenance infrastructure.
- The visual and aesthetic character of the receiving environment will be altered least in the case of the Eastern Corridor as the natural landscape is already highly modified by urban and agricultural land uses with the exception is the Oribi Gorge area.
- Large sections of the Central and Western Corridors traverse several Traditional Authorities, where impacts on living heritage, scattered homesteads and settlements could be a significant limitation to defining a suitable power line corridor.

6.6.2 Recommendations for mitigation

The recommended mitigation measures are as follows:

- A heritage practitioner must be appointed to conduct a 'walk-through' and provide monitoring requirements of the final selected power line servitude and all other activity areas (access roads, construction camps, etc.) prior to the start of any construction activities.
- The exact power line servitude should be chosen to minimise the requirements for new infrastructure.
- As far as possible, the recommendations of the Visual Impact Assessment should be implemented to minimise the visual impact on the receiving landscape.

6.7 Social

The approach to the study entailed the gathering of largely qualitative data and to a lesser degree quantitative data. This involved the following methods:

- A field inspection site visit to gain an understanding of the receiving environment.
- An in-depth desktop study, including the analysis of maps, aerial photographs, existing literature on the area (e.g. Integrated Development Plans), information obtained from project personnel, public involvement/participation data (observations and interactions from/with I&APs), personal observations, statistical, surveys, and other written data.
- Continuous communication with other specialist study personnel.
- Key informant interviews, both formal and informal, to gain an in-depth understanding of the issues associated with the development.
- Profiling of the study area environment (i.e. documenting the social environment).

The above methodologies focused largely on impacts likely to occur during the construction and operational phases of the development.

The study focused on three main components:

- Baseline information (the gathering of data on the social and socio-economic environment).
- To identify social change processes[27] (i.e. those processes that can lead to social impacts, for example, in-migration of job seekers or the resettlement of settlements).
- To assess social impacts.

Summary of baseline information

The study undertook an in-depth analysis of the socio-economic factors in each district and local municipality. For the purpose of this chapter, a summary of findings of district municipalities (uMgungundlovu and Ugu) are provided (Tables 19 and 20). Findings on local municipalities can be read in the SIA Report (Appendix 6).

Table 19 A summary of baseline information with respect to the uMgungundlovu District

- The transmission lines will traverse the uMgungundlovu District Municipality including the Richmond, Mkhambathini and Msunduzi Local Municipalities.
- uMgungundlovu is a diverse District in terms of types of settlements, ranging from the well-developed urban centre of Pietermaritzburg, to commercial agriculture, to impoverished rural and informal settlements. The corridor corridors all impact on the agricultural and potentially informal settlements within the affected municipalities.
- There is a low population growth rate in the District, even declining in some Local Municipalities, which is indicative of the high provincial mortality rate associated with the HIV/AIDS epidemic.
- The election of Pietermaritzburg as the provincial capital of KwaZulu-Natal has contributed to the economic growth of the District, particularly in the community services sector. Manufacturing is a major contributor to the economy in urban areas, however, agriculture remains the main economic activity in rural areas.
- Although the District has experienced economic growth, there has been a decline in the number of jobs created and an increase in the number of unemployed people (2000 to 2007 figures). This project will create a limited number of semi and unskilled jobs during the construction phase.
- The District has an illiteracy rate of 14.78%.
- The number of people living with HIV/Aids in the District is approximately 15.89% of the District's total population.
- Bulk services are generally provided in urban centres, however, are generally lacking to non-existent in rural areas. The supply of electricity to the district will improve various services in both the urban and rural areas.
- The N3 is the main transport route and national, primary provincial development corridor bisecting the District.

[27] Social change processes focussed on: Demographic Processes, Economic Processes, Geographic Processes, Institutional and Legal Processes, Emancipatory and Empowerment Processes, and Socio-cultural Processes.

Table 20 A summary of baseline information with respect to the Ugu District

- Ugu District Municipality is located at the southern most tip of the KwaZulu-Natal coastline, bordered to the south by the Eastern Cape and to the north by eThekwini Municipality.
- The District comprises six Local Municipalities, all potentially affected by the project.
- The Municipality is approximately 5,866 km^2 in extent and has an average population density of 142 people/ km^2, which is higher than the average for KwaZulu-Natal at 104 people/ km^2.
- The Hibiscus Coast and uMdoni Local Municipalities are the most densely populated, while the Hibiscus Coast and uMzumbe Local Municipalities have the largest populations.
- Approximately 86% of the population of the District reside in rural areas. The upgrade of the distribution network means that the majority of the population residing in rural areas could receive electricity.
- Ribbon development has occurred along the coastline, with the fastest growing economic sectors being finance, business services and construction.
- There is a high level of poverty throughout the District and unemployment is estimated at approximately 44.8% of the population, which is very high compared to the province at 29.9% and the national figure of 25.6%. A limited amount of semi and unskilled jobs will be created through this project, having a marginal impact on alleviating poverty.
- In terms of education, approximately 23% of children of school going age do not attend school, which potentially has negative impacts in the development of the District into the future.
- Access to many schools is problematic due to poor road conditions and river crossings that become dangerous and at times impassable during the rainy season.
- In terms of safety and security, Ugu District Municipality has 16 police stations, with a ratio of one policeperson per 525 people, which is extremely high and negatively impacts the crime rate.
- The District has seven hospitals, two of which are private, 47 clinics and 15 mobile clinics.
- Approximately 13% (2004) of the population are infected with HIV/AIDS, which is slightly less than the average for the province of 15%.
- The Municipality is implementing a free basic water and sanitation provision policy that targets poorer households.
- There is a backlog in the provision of electricity, which varies from one Local Municipality to the next and is likely to be further negatively impacted by Eskom's capacity challenge. This project is aimed at addressing these backlogs and distributing electricity to all the affected local municipalities.

The identification of social change process

Social change processes have been divided into four categories:

- Social change processes associated with the pre-construction phase.
- Social change processes associated with the construction phase.
- Social change processes associated with the operational phase.
- Social change processes associated with the decommissioning phase (this phase is considered unlikely into the foreseeable future).

The study then focused on each social change processes[28] and found the following:

Demographic Processes

Demographic processes (Table 21) are processes relating to the movement and composition of people in the region affected by the proposed project.

[28] Social change processes focussed on: Demographic Processes, Economic Processes, Geographic Processes, Institutional and Legal Processes, Emancipatory and Empowerment Processes, and Socio-cultural Processes.

Table 21 A summary of demographic processes

Process	Phase at which the Demographic Process is relevant			
	Prior to Construction	Construction	Operation	Decommission
In-migration of job seekers and temporary workers	✓	✓	x	x
Out-migration	X	x	x	x
Presence of seasonal residents	X	x	x	x
Presence of weekenders	X	x	x	x
Presence of tourists/day trippers	X	x	x	x
Displacement/disposition	X	✓	x	x
Rural to urban migration	X	x	x	x
Urban to rural migration	X	x	x	x
Resettlement	✓	x	x	x

Economic Processes

Economic processes (Table 22) affect economic activity in the region, including the way in which people make a living as well as macro-economic factors that affect society as a whole. It is anticipated that waged labour will have an impact on the communities within the study area during the construction phase.

Table 22 A summary of economic processes

Process	Phase at which the Economic Process is relevant			
	Prior to Construction	Construction	Operation	Decommission
Waged labour	X	✓	x	x
Conversion & diversification of economic activities	X	X	x	x
Impoverishment	X	X	x	x
Inflation	X	X	x	x
Currency exchange devaluation	X	X	x	x
Concentration of economic activity	X	X	x	x
Economic globalisation	X	X	x	x

Geographic Processes

Geographic processes (Table 23) affect the land use patterns of a society. The construction of a new transmission power line may lead to the diversification or splintering of these current land uses.

Land reform projects also need to be taken into consideration, in particular, those that have a settlement focus. The Eastern and Central alternatives will potentially impact on a variety of land reform projects that involve settlement, cash crops and food production.

Table 23 A summary of geographic processes

Process	Phase at which the Geographic Process is relevant			
	Prior to Construction	Construction	Operation	Decommission
Conversion and diversification of land use	X	✓	x	x
Urban sprawl	X	X	x	x
Urbanisation	X	X	x	x
Gentrification[29]	X	X	x	x
Currency exchange devaluation	X	X	x	x
Enhanced transportation and rural accessibility	X	X	x	x
Physical splintering	X	✓	✓	x

Institutional and Legal Processes

Institutional and legal processes are those processes that affect the efficiency and effectiveness of various organisations that are responsible for the supply of the goods and services on which people depend. These organisations include government agencies, non-government organisations and the business sector.

For this project, it is not anticipated that any of these processes will be greatly affected. However, the fact that the transmission power line will potentially transverse areas where people have limited or no access to electricity must be considered, particularly in large areas of the Central or Western alternatives.

Emancipatory and Empowerment Processes

Emancipatory and empowerment processes (Table 24) are those that lead to an increase in the ability of local people to contribute to the decision-making that affects their lives.

Table 24 A summary of emancipatory and empowerment processes

Process	Phase at which the Emancipatory and empowerment Process is relevant			
	Prior to Construction	Construction	Operation	Decommission
Democratisation	X	X	x	x
Marginalisation and exclusion	X	X	✓	x
Capacity building	X	✓	x	x

Socio-cultural Processes

Socio-cultural processes (Table 25) are those that affect the culture of a society, including all aspects of the way that people live together.

[29] The restoration and upgrading of deteriorated urban property by middle-class or affluent people, often resulting in displacement.

Table 25 A summary of socio-cultural processes

Process	Phase at which the Socio-cultural processes are relevant			
	Prior to Construction	Construction	Operation	Decommission
Social globalisation	X	X	x	x
Segregation	✓	X	x	x
Social disintegration	X	X	x	x
Deviant social behaviours	X	✓	x	x

6.7.1 Potential impacts

- Impacts on health and social well-being.
- Impacts on the quality of life (the living environment).
- Impacts on the economy and material well-being.
- Impacts on cultural aspects.
- Impacts on family and community aspects.
- Impacts on institutional, legal, political and equity aspects.
- Impacts on gender aspects.

6.7.2 Recommendations for mitigation

- A Community Management and Monitoring Committee (CMMC) must be established to monitor the process according to a set of relevant monitoring indicators. This committee would serve as a communication channel between the community and Eskom. Members of the committee should be representative of all sectors within the affected environment.
- An Environmental Control Officer must be appointed to ensure contractors conduct themselves in an appropriate way. A fining system for non-compliance, under the custody of the CMMC, could be put in place.
- Labour should, as far as possible, be sourced locally during the construction and operation of the project. This will minimise the risk of conflict among local residents and newcomers, and obviate the need for developing temporary housing for construction workers.
- Large projects such as the construction of transmission power lines often raise the expectations of local people that large amounts of jobs will be created. It is recommended that Eskom should declare their intentions, in terms of the amount of jobs that will be created, at their soonest possible convenience to dispel any unrealistic expectations.
- Construction materials should be locally sourced as far as possible.
- It is recommended that the Traditional Authorities in the study area should be consulted during the construction of the transmission power line.
- Resettlement is a sensitive issue and must be treated as such. First and foremost, settlements should be avoided. If resettlement is necessary, then the affected parties should have a strong say in where they are to be relocated, and what resettlement conditions should be met in the process. According to reports, Eskom has a well-structured resettlement policy, which is based on the principle that the resettled entity should be better off after resettlement than prior to it. However, a detailed and

structured Resettlement Action Plan (RAP) should be compiled prior to the advent of construction, in accordance with Eskom's policy, but also in line with world's best practice, such as the International Finance Corporation's Safeguard Policies. This RAP should be developed, implemented, and people resettled, before construction starts in the vicinity of their original homesteads.

- Eskom should review the policy on sugarcane-free servitudes, the subsequent cost to the local economy and sustainability of the South Coast sugar industry against the cost of allowing servitudes with sugarcane and Eskom incurring the costs of transmission line maintenance.
- The possibility of crime escalating in the study area is a concern. All sectors of the community must be encouraged to become involved in community policing. The Tribal Authorities, along with Local Authorities and Ward Councillors should be made aware of the impact that the influx of new people can have on services, such as the police in the area.
- Eskom must liaise with the farmers' associations and a protocol for gaining access to farms should be established and distributed to all parties involved. The impact of careless conduct on the side of contractors must be acknowledged and the contractors should receive an induction in terms of the relevant code of conduct to which they should adhere.
- To improve safety during construction activities, construction vehicles should have visible Eskom signage and teams should be clearly identified by wearing uniforms and identification cards that should be exhibited in a visible place on their body.
- It is recommended that Eskom select construction camps with sensitivity to nearby existing communities and ensure construction workers adhere to a responsible code of conduct. Eskom, the Traditional Authorities and local Ward Councillors should consult with each other in deciding whether the erection of construction camps will be allowed within or close to the local villages.
- The cumulative impacts of linear developments in the area must be taken into account, and other the relevant utilities (Transnet, Telkom and Eskom) should strategise and compile a framework to address relevant issues. Existing infrastructure must be utilised and shared as far as possible. Furthermore, all parties must refrain from abusing the existing infrastructure of the affected communities.

6.8 Town and Regional Planning (Overview)

The study focused on the following planning aspects:

- A description of present land use.
- Analysis of Spatial Development Frameworks (SDFs) and Integrated Development Plans (IDPs) of affected municipalities.
- Mapping and analysis of present and future-proposed land reform programmes.

6.8.1 Description of present land

EASTERN ALTERNATIVE

For most of its length in the northern section, this alternative primarily crosses over commercial agriculture orientated areas with a moderate amount of physical infrastructure, including/notably commercial farm homesteads, commercial chicken farms and the Eston Sugar Mill. Agriculture and, in particular sugarcane plantations, dominates largely due to the good climate, fertile soils and flatter landscape, making large farms viable and highly productive. In areas where the topography of the landscape is steeper and access more

difficult (mostly within the lower catchment areas of the larger rivers), these areas have remained under jurisdiction of the Traditional Authorities and comprise small, mostly subsistence farms and scattered homesteads. In the Oribi Sub-station area (Port Shepstone, Boboyi and Murchison), the landscape is more densely populated and infrastructure more prevalent. The Eastern Minor Alternatives (E1 and E2) are centred in this area as potential routes to avoid these settlements. Continuing westward, the corridor transects a portion of the Oribi Gorge Nature Reserve and areas of intensive commercial agriculture (the Oribi Flats, Plains and Paddock) en route to the Eros Sub-station.

CENTRAL ALTERNATIVE

This alternative follows a more westward inland route crossing sects of commercial agriculture, and to a larger degree, traditional authority areas where the topography is marginally more rugged. This corridor bypasses the urban area in the vicinity of Port Shepstone and bypasses the Oribi Gorge area en route to the Eston Sub-station. The Eastern Minor Alternatives (C1, C2 and C3) provide options to bypass the Oribi Gorge Nature Reserve and potentially minimise the impact on commercial agricultural land (C3) by joining with the Western Alternative.

WESTERN ALTERNATIVE

This alternative commences by traversing areas of commercial agriculture and forestry until the Mid-Illovo region where it moves into mostly Tribal Authority areas and traverses, for the most part rural, small-scale and subsistence agricultural lands with a more rugged topography, further inland from the coast. This corridor passes few areas of key physical infrastructure, and traverses a generally more rugged route.

6.8.2 Analysis of Spatial Development Frameworks (SDFs) and Integrated Development Plans (IDPs) of affected municipalities

Municipalities are mandated with the responsibility of coordinating development and planning activities within their local municipal boundaries, and are supported by Provincial and National Government. Integrated Development Plans and, more specifically, the Spatial Development Frameworks are prepared by municipalities to reflect all levels of planning within their sphere of authority and be representative of planning at a provincial and national level.

Two District Municipalities and Nine Local Municipalities fall within the study area. Table 26 indicates the affected municipalities including key towns and traditional authorities (per Corridor Alternative). Table 27 lists the Integrated Development Plans (IDPs) and associated Spatial Development Frameworks (SDFs) for the affected municipalities.

In order to assess the impact of each alternative corridor on each municipal area and the level of incompatibility thereof, the IDP and SDF reports of the affected local municipalities were reviewed. Each SDF map is comprised of a variety of key components, including a hierarchy of activity nodes, movement/transport systems/corridors, and environmental systems, which are generic to all the affected municipalities. A variety of additional key components that vary in description and use between the various local municipalities (non-generic) are also identified. Table 28 provides a summarised list of the various key components as used on the SDF maps.

The three alternative corridors were superimposed on the municipal SDFs for analysis. The results revealed that the level of incompatibility between the receiving environment (that is, the planning environment) and the three corridor alternatives vary in intensity (Tables 29, 30 and 31). Figure 24 indicates the areas of greater incompatibility (red flag areas) in respect of the alternative corridors.

Table 26 Affected municipalities, towns and traditional authorities

Alternative	District Municipality	Local Municipality	Towns & Trading Centres[30]	Tribal Authorities[31]
Eastern (Major Alternative)	uMgungundlovu	The Msunduzi	Thornville	
		Mkhambathini	Eston	Makhanya/ Sobonakhona
				Embo/Timuni
		Richmond		
	Ugu	Vulamehlo	Dududu	Embo/ Nkasa Isimahla
				Qiko
				Zembeni
		uMdoni		
		uMzumbe		Thulini
		Hibiscus Coast	Marburg	Lushaba
			Boboyi	Nsimbini
			Murchison	
		Ezingoleni		
		uMuziwabantu		Nyuswa/ Qiniselani Manyuswa
Eastern (Minor Alternative) E1	Ugu	Hibiscus Coast	Boboyi	Nsimbini
			Murchison	
Eastern (Minor Alternative) E2	Ugu	Ezingoleni	Murchison	Nsimbini
Central (Major Alternative)	uMgungundlovu	The Msunduzi	Thornville	-
		Mkhambathini	Mid-Illovo	Embo/ Nkasa Isimahla
				Embo/Timuni
		Richmond	-	Embo/ VumuKwenza
	Ugu	Vulamehlo	-	Mbhele
				Qiko
				Zembeni
		uMzumbe	Msinsi	Qoloqolo
				Qwabe
				Thulini
				Hlongwa
		Hibiscus Coast	-	Madlala
		Ezingoleni	Murchison	Nyuswa/ Qiniselani Manyuswa
		uMuziwabantu	-	-
Central (Minor Alternative) C1	Ugu	uMzumbe	-	Qwabe
		Hibiscus Coast	-	Lushaba
		Ezingoleni	-	-
Central (Minor Alternative) C2	Ugu	Hibiscus Coast	-	Lushaba
		Ezingoleni	-	-

[30] Only towns and trading centres within the 2 km corridor of each alignment are listed here.
[31] Only tribal authorities directly traversed by the 2 km corridor are listed here.

Alternative	District Municipality	Local Municipality	Towns & Trading Centres[30]	Tribal Authorities[31]
Central (Minor Alternative) C3	Ugu	Ezingoleni	-	-
		uMzumbe	-	-
Western (Major Alternative)	uMgungundlovu	Richmond	-	Embo/ VumuKwenza
		Mkhambathini	-	Embo/ Nkasa Isimahla
	Ugu	Vulamehlo	-	Mbhele
		uMzumbe	-	Nyavini,
				Cele
		uMuziwabantu		Mbotho/ Mambotho
				Shwawu/ Jabulani Beshwayo

Table 27 Integrated Development Plans (IDPs) and associated Spatial Development Frameworks (SDFs) and SDF maps

Municipal Area	Integrated Development Plan	Spatial Development Framework
uMgungundlovu District Municipality (DC22)	IDP Review (2008/09)	SDF REVIEW (2007)
Msunduze Local Municipality (KZ225)	IDP Review (2007/08)	SDF Review (2009)
Richmond Local Municipality (KZ227)	IDP Review 2008-09	Umgungudlovu SDF REVIEW (2007)
Mkhambathini Local Municipality (KZ226)	IDP Review (2006-07)	SDF Review (2007/08)
Ugu District Municipality (DC21),	IDP (2007/08–2011/12)	SDF (2007-12)
Vulamehlo Local Municipality (KZ211)	IDP (2008-09)	SDF (2008-09)
uMdoni Local Municipality (KZ212)	IDP (2008-09)	SDF (2007-12)
uMzumbe Local Municipality (KZ213)	IDP (2008-09)	SDF (2008-09)
uMuziwabantu Local Municipality (KZ214)	IDP (2008-09)	SDF (2008-09)
Ezingoleni Local Municipality (KZ215)	IDP (2007/08–2011/12)	SDF (2007-12)
Hibiscus Coast Local Municipality (KZ216)	IDP (2008-09)	SDF (2008-09)

Table 28 Key components of SDFs[32]

Key Components	Description and examples
Generic key Components	
HIERARCHY OF MOVEMENT/TRANSPORT SYSTEMS/CORRIDORS	
National and Provincial Access (National Highways & Provincial Roads)	Consisting of the N2 located mostly within the coastal belt of the Ugu District and the R56 located to the west and outside of the district. The two roads are considered access corridors of regional and national importance. The N2 is not considered a development corridor, however its access points offer significant opportunities for development requiring high levels of accessibility and visibility.
Primary Corridors (Provincial & District Roads)	Representing the primary development and investment network, the primary development corridors provide, outside of the N2, the highest district level of access and linkage. Activities and developments requiring a high level of visibility and accessibility are, therefore, primarily located within these corridors. High levels of accessibility and visibility occur at the intersection of such corridors, being ideally the location of primary and secondary nodes. Primary corridors provide linkages from the N2 and the R56 into the various parts of the district, running mostly in an east-west direction e.g. the R624 and R612. It is suggested that an additional north-south primary corridor inland from the N2 be developed providing a linkage between existing roads and creating an additional series of interceptory points potentially increasing threshold levels and development opportunities. The envisaged north-south primary corridor would, thus, interlink existing centres such as Umzinto, Turton, Qoloqolo, Msinsini, Morrisons Post, Assisi, Ezinqoleni etc.
Secondary Corridors	A secondary system of development, access and investment corridors consists of existing access roads linking tertiary roads and local communities into the primary corridor system. Development and activities relating to a series of local communities are/should be located within these corridors particularly at relevant interceptory points.
	Within the Ugu District the secondary corridor system consists on the one hand of the existing roads providing access to the coastal areas and settlements, and on the other hand establishing a north-south linkage into the westerly hinterland areas of the district. The north-south linkages create improved cross linkages into the hinterland areas facilitating economic development and creating opportunities for inland tourism. A series of new secondary corridors are proposed that will interlink existing centres such as Dududu, Kenterton, Umgayi, St. Faiths and Harding.
Tertiary Corridors	These corridors link local access roads and individual communities into the secondary corridor system and to the relevant centres of activity. Development located within these corridors primarily addresses local requirements and opportunities.
ACTIVITY NODES (These include municipal infrastructure, towns and settlement)	
District Nodes	District nodes are important for providing central district administrative and service functions, as well as the major central economic functions of the district. No district nodes are situated wholly within the study area, however the western portion of Port Shepstone (a district node) falls within the study area.
Primary Nodes	Primary nodes consist primarily of the major local municipality nodes (towns), providing the central functions and activities for a local municipality. The nodes are located at interceptory points of the primary and secondary development corridors and accommodate some urban settlement e.g. Dududu, Turton, Umgayi and Ezinqoleni.
Secondary Nodes	Secondary Nodes provide services and activities addressing a series of communities and the areas local level needs e.g. Eston, Umzinto, Kenterton, and Morrisons Post.

[32] Please note that certain key components present on the SDF maps but not affected by the study area e.g. reefs, are not included in this table and analysis.

Key Components	Description and examples
Tertiary Nodes	Tertiary nodes consist mostly of existing small centres providing strictly local level community activities and services e.g. Mid-Illovo, Tilongo, Sawoti and Msinsini.
ENVIRONMENTAL SYSTEMS	
Major River Systems/ Corridors	From north to south the study area passes over a range of major river systems including: the Lovu; Mkomazi; Mpambanyoni; Mzinto; Fafa; Mtwalume; Mzumbe and Mzimkhulu; Rivers. Although these river systems can pose a barrier to developments, they accommodate significant areas of indigenous vegetation and habitats, as well as being of scenic beauty and providing a range of recreational and tourism opportunities. Appropriate smaller tributaries are to be utilised for providing natural linkages between the major valley systems.
Natural Vegetation	Areas where the natural vegetation commonly occurring in this area still remains, including grassland, bush, riverine forest and scarp forest.
Beach and Coastline	The entire eastern border of the Ugu District is beach and coastline and accommodates a great variety of recreational and tourism activities, sensitive maritime environments and urban developments. The Ariadne-Eros study area is approximately 3 km from the coast at its closest point.
River/Coastal Interface	As described above there are many rivers that flow through the study area and flow into the sea at the coast. These river mouths are unique and sensitive natural habitats providing a range of specific opportunities for appropriate recreation and tourism e.g. Fafa River mouth.
Non-Generic Key Components	
ACTIVITY NODES	
External Node	External nodes are the smallest nodes identified by having community facilities such as a secondary school, a primary school, a clinic and/or a community centre.
Light Industrial Node	These are areas where there is an established industry, such as the Simuma Cement Quarry and Works within the Ezingoleni Municipality.
TOURISM	
Tourism Node	A tourism node is an established or potential area that attracts tourists for a natural and /or cultural experience.
Tourism Corridor (route)	These corridors are existing or potential scenic routes that provide tourism opportunities and should be punctuated with tourist information, as well as viewing points e.g. the proposed Eco-adventure Tourism Route proposed for the Mkambathini and uMuziwabantu Local Municipalities.
DOMINANT LAND USES	
Commercial Agriculture	This ranges from intensive forms of agriculture, such as sugarcane, which is the predominant form of commercial agriculture in the area, and commercial afforestation (forestry).
Traditional Agriculture	This ranges from subsistence farming, to keeping of livestock, and is prevalent throughout the study area especially in the traditional authority areas.
CONSERVATION	
Areas of Conservation Significance	Areas of Conservation Significance consists of both private and communal land which have important water and nature conservation values, but do not enjoy formal legal protection. These areas contain natural communities of high nature-conservation value, and also important grazing resources e.g. Montezuma Ranch, Lake Eland Game Reserve and Tala Game Reserve.
Formal Conservation	This includes existing nature and game reserves that are protected and appropriately managed by EKZNW and private land owners e.g. Oribi Gorge and Vernon Crookes Nature Reserve.
DEVELOPMENTS	
Agricultural Development	Areas identified as having potential for agricultural development.

Key Components	Description and examples
Tourism Development	These are areas that have the potential for tourism developments.
Local Economic Development	A combination of various development potentials can initiate a variety of locally driven initiatives. Developing nodes and corridors serve as essential promotion points for initiatives such as small businesses and trade.
Rural Housing Development	This refers to housing development schemes e.g. the Gorge Project in the uMuziwabantu Local Municipality.
Future Housing Development	Areas earmarked by Local Municipalities as being suitable for future housing e.g. Umzinto area within the uMdoni Local Municipality and the Hibiscus Coast Marina and Eco Estate.
Land Reform Projects	Land Reform is seen as a priority in the majority of the study area. Projects within the study area range from commercial sugarcane, livestock, cash crops and settlement.

Table 29 Areas and/or points of incompatibility (Red Flags) within the Eastern Alternatives

Local Municipality	Red Flags per corridor (EA RF No.)	Areas/points of incompatibility	Reason
Eastern Alternative			
Mkhambathini	EA RF 1	Agri-Eco Tourism (Tala Game Reserve)	The corridor passes over a portion of the game reserve, however it is possible that the servitude can avoid the property within the corridor.
	EA RF 2	Land redistribution project (Inglebrook Farm)	The corridor passes through this entire project that has sugarcane as part of its product/land use.
	EA RF 3	Secondary node (Eston)	Limited area for placement of corridor between Eston town and Angels Way Airstrip and the fire bomber refuelling station and interference to airfield radio communications and landing and take off paths.
	EA RF 4	Primary corridor (R603)	A visual impact on this corridor that serves as a tourism link. Development along this corridor should be safe and attractive to enhance tourist appreciation.
	EA RF 5	Eco adventure tourism route	A visual impact on this tourism route, which links Eston with the Embo-timuni tribal areas and ultimately the Umkomaas River and into Vulamehlo Municipality.
	EA RF 6	Tertiary node (Ezimwini)	A settlement of moderate density, where resettlement is likely.
Vulamehlo	EA RF 7	Tertiary node (Ntsherkombo)	A settlement of moderate density, where resettlement is likely.
	EA RF 8, 9, 10	Land redistribution projects (Cedars Farm, Equeefa Small Scale Farmers and Beneeva Farm)	The corridor passes through all of these projects that have sugarcane as their products/land use.
uMdoni	EA RF 11	Settlement (Amangamazi)	The corridor passes through settlement of low intensity however resettlement may be necessary.
uMzumbe	EA RF 12	Settlement clusters (Turton area)	This corridor passes through settlement of moderate intensity, where resettlement will be necessary.
Hibiscus Coast	EA RF 13 & 14	Land redistribution projects (Mkholombe & Marburg)	The corridor passes through these projects with cash crops & settlement as their products.
	EA RF 15 & 16	District node (greater Port Shepstone area and Marburg)	The corridor passes through areas of moderate to high-density settlement (Boboyi and Murchison settlements) where resettlement will be necessary.
Ezingoleni	EA RF 17	Formal conservation (Oribi Gorge nature Reserve	The corridor will alter the visual aesthetics of this formal conservation area.
uMuziwabantu	EA RF 18	National Provincial Linkage (N2)	The corridor will impact on the visual aesthetics of this potential tourism route.
E1 Minor Eastern Alternative			
Hibiscus Coast	EA RF 19	Settlement (Murchison)	The corridor passes through settlement of moderate intensity, where resettlement may be necessary.
E2 Minor Eastern Alternative			
Hibiscus Coast & Ezingoleni	None	None	None.

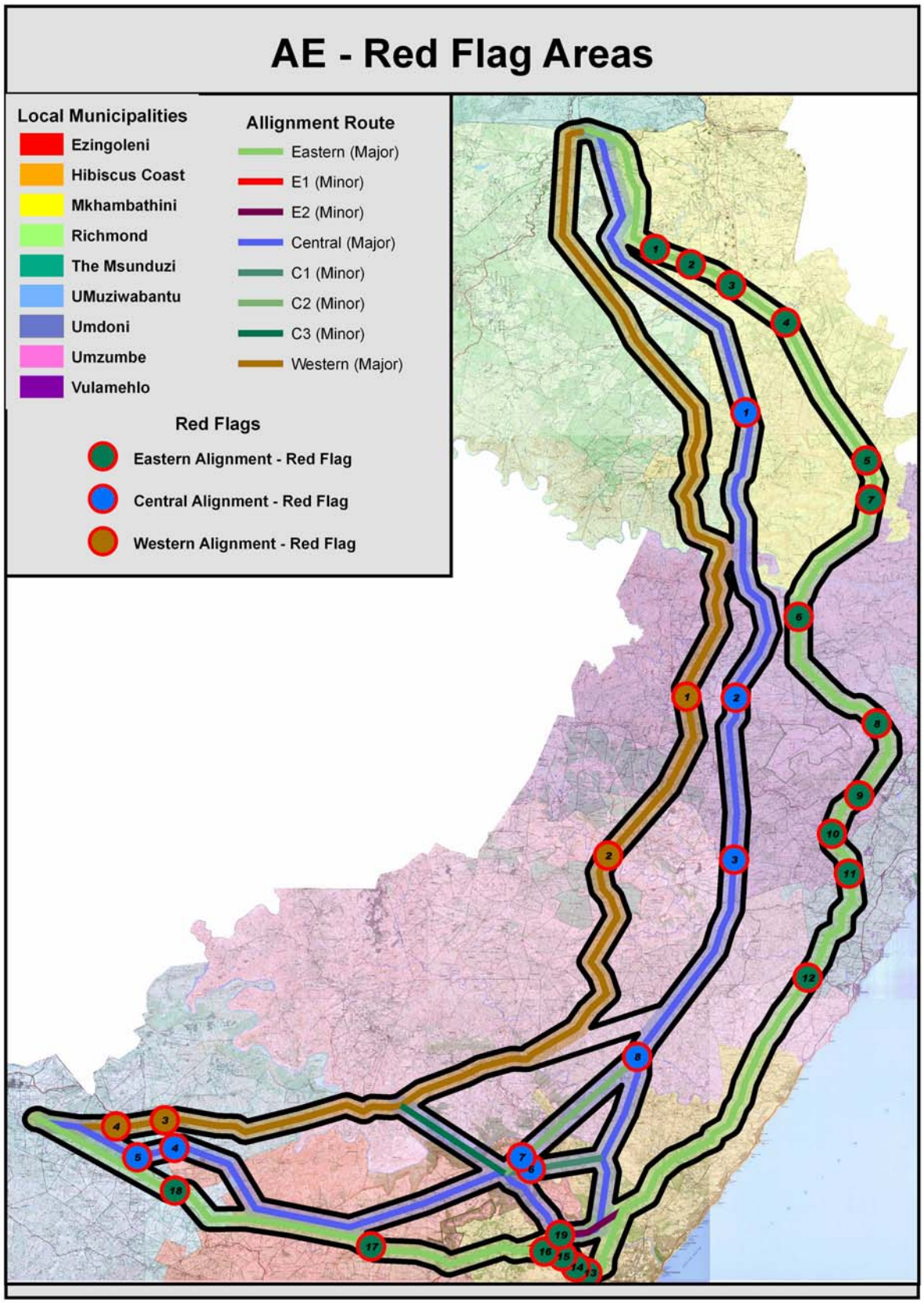
Table 30 Areas and/or points of incompatibility (Red Flags) within the Central Alternative

Municipality	Red Flags per corridor (EA RF No.)	Areas/points of incompatibility	Reason
Central Alternative			
Mkhambathini	CA RF 1	Eco adventure tourism route	A visual impact on this route, which links Eston with the Embo-timuni tribal areas and ultimately the Umkomaas River and into Vulamehlo Municipality.
Vulamehlo	CA RF 2	Site of conservation significance (Montezuma Ranch)	The corridor will impact on the visual aesthetics of this ranch.
	CA RF 3	Land redistribution projects (Mgayi Project)	The corridor passes through these projects that have food safety and settlement as their product/land use.
	CA RF 4	Rural housing development	The corridor passes through an area identified for rural housing development.
	CA RF 5	National provincial linkage (N2)	The corridor will impact on the visual aesthetics of this potential tourism route.
C1 Minor Central Alternative			
Ezingoleni	CA RF 6	Light industrial node (Simuma Limestone Quarry)	The corridor passes over the Simuma Limestone Quarry.
C2 Minor Central Alternative			
uMzumbe	CA RF 7	Tertiary node (Assisi)	The corridor passes through settlement of moderate intensity, where resettlement would be necessary.
	CA RF 8	Secondary node (Morrisons Post)	The corridor passes through settlement of moderate to low intensity, where resettlement may be necessary.
C3 Minor Central Alternative			
uMzumbe & Ezingoleni	None	None	None.

Table 31 Areas and/or points of incompatibility (Red Flags) within the Western Alternative

Municipality	Red Flags per corridor (EA RF No.)	Areas/points of incompatibility	Reason
Western Alternative			
Vulamehlo	WA RF1	Site of conservation significance (Montezuma Ranch)	The corridor will impact on the visual aesthetics of this ranch.
uMzumbe	WA RF 2	Tourism (potential)	The corridor will impact on the visual aesthetics of this potential tourism area.
uMuziwabantu	WA RF 3	Land reform project (The Gorge Project)	The corridor passes through this projects that have settlement and rural housing development as its product/land use.
	WA RF 4	National provincial linkage (N2)	The corridor will impact on the visual aesthetics of this potential tourism route.

Figure 24 Red flags within the alternative corridors



The Eastern Alternative (major) passes through a portion of the study area where existing and future developments are more likely to be affected by the presence of the corridor. This is largely due to the positioning of the corridor in relation to the more developed coastal areas. The Eastern Minor Alternatives offer alternatives to avoid established settlements within the developed Port Shepstone area.

The Central Alternative (major) has a moderate impact on areas with existing and future developments, however due to its more inland position, fewer areas are affected. The Central Alternatives (Minors) offer alternatives to avoid the greater Port Shepstone area and Oribi Gorge Nature Reserve and have a minimal impact on these areas.

The Western Alternative, due to its placement within the inland portion of the study area, has the least impact on areas of present and future developments. This is largely due to the lack of established infrastructure and the more rural nature of this portion of the study area.

6.8.3 Mapping and analysis of present and future-proposed land reform programmes

Land reform as a key initiative to redress unequal patterns of resource (land) distribution. In broad terms, the South African land reform policy has three components:

- Land Restitution is designed to restore land ownership (or provide compensation) to those who were dispossessed without adequate compensation by racially discriminatory practices after 1913 (Department of Land Affairs (DLA), 1997). The institutional machinery to implement the programme includes provincially based restitution commissions and the Land Claims Court that acts as final arbiter in restitution cases.
- Land Redistribution is aimed at providing the disadvantaged and the poor with access to land for residential and productive purposes (DLA, 1997). It is also designed to deal with the past injustices of land dispossession, to ensure equitable distribution of land ownership and to reduce poverty and contribute to economic growth. It makes it possible for the poor and the disadvantaged to purchase land with the help of a Settlement Land Acquisition Grant. According to the Redistribution Implementation System (RIS), five products are the outcome of a land redistribution process:
  - Land redistribution for agricultural development (LRAD) - this programme is a joint venture with the Department of Agriculture. Through this programme qualifying beneficiaries may acquire land for agricultural purposes.
  - Commonages - the commonage product aims at improving people's access to municipal and tribal land for grazing purposes. There are two types: Municipal and Tribal commonages.
  - Farm Equity Schemes - this is an arrangement where participants purchase equity in the form of shares in land-based enterprise. Participants receive returns in the form of dividends and capital growth.
  - Settlement Products - this product provides people with land for settlement purposes. The settlement product provides grants to assist the landless people living under insecure tenure conditions to acquire secure tenure.
  - Non-Agricultural Products - RIS is in a process of developing non-agricultural products.

- Land Tenure Reform designed to provide security to all South Africans under diverse forms of locally appropriate tenure (DLA, 1997). This reform includes an initiative to provide legal recognition and to formalise communal land rights in rural areas, and a recently legislated programme to strengthen the rights of tenants on mainly white-owned farms.

In order to identify the geographic areas where the corridor alternatives potentially impact on the Land Reform Programme, data was obtained from the DLA and the Land Claims Commission (Table 32). These data were then superimposed on alternative corridors (Figures 25 and 26). Table 33 indicates the number of unsettled land restitution claims per alternative corridor.

It is evident that a large amount of land traversed by the corridors is registered with the Land Claims Commission and the various land restitution claims are at different stages of the restitution processes, being either settled or unsettled. The vast majority of these land restitution claims are on large commercial farms where sugarcane is the dominant land use type. The introduction of the proposed transmission line could potentially impact on these farms and the restitution processes, in particular unsettled land restitution claims in the following ways:

- Reduction of property values – the requirement for sugarcane- and timber-free servitudes could potentially result in the loss of productive agricultural land and the potential reduction of property values.
- Current landowner – landowners may welcome the development of the transmission line on the farm and receive compensation from Eskom for a servitude, even if the servitude threatens the viability of the farm under a specific land use, particularly commercial sugarcane or timber.
- Claimant – the claimants' future agricultural plans could be jeopardised by the present landowner's decision to register a servitude for powerlines on the property.

Table 32 The number of Land Redistribution Projects per corridor

Corridor Alternative (within 2 km corridor)								
	Eastern	**E1**	**E2**	**Central**	**C1**	**C2**	**C3**	**Western**
TOTAL	7	0	0	4	0	0	0	3

Table 33 The number of unsettled land restitution claims per corridor

Corridor Alternative								
	Eastern	**E1**	**E2**	**Central**	**C1**	**C2**	**C3**	**Western**
TOTAL	29	1	1	19	2	2	3	7

Figure 25 Land restitution claims in relation to the AE Corridor Alternatives

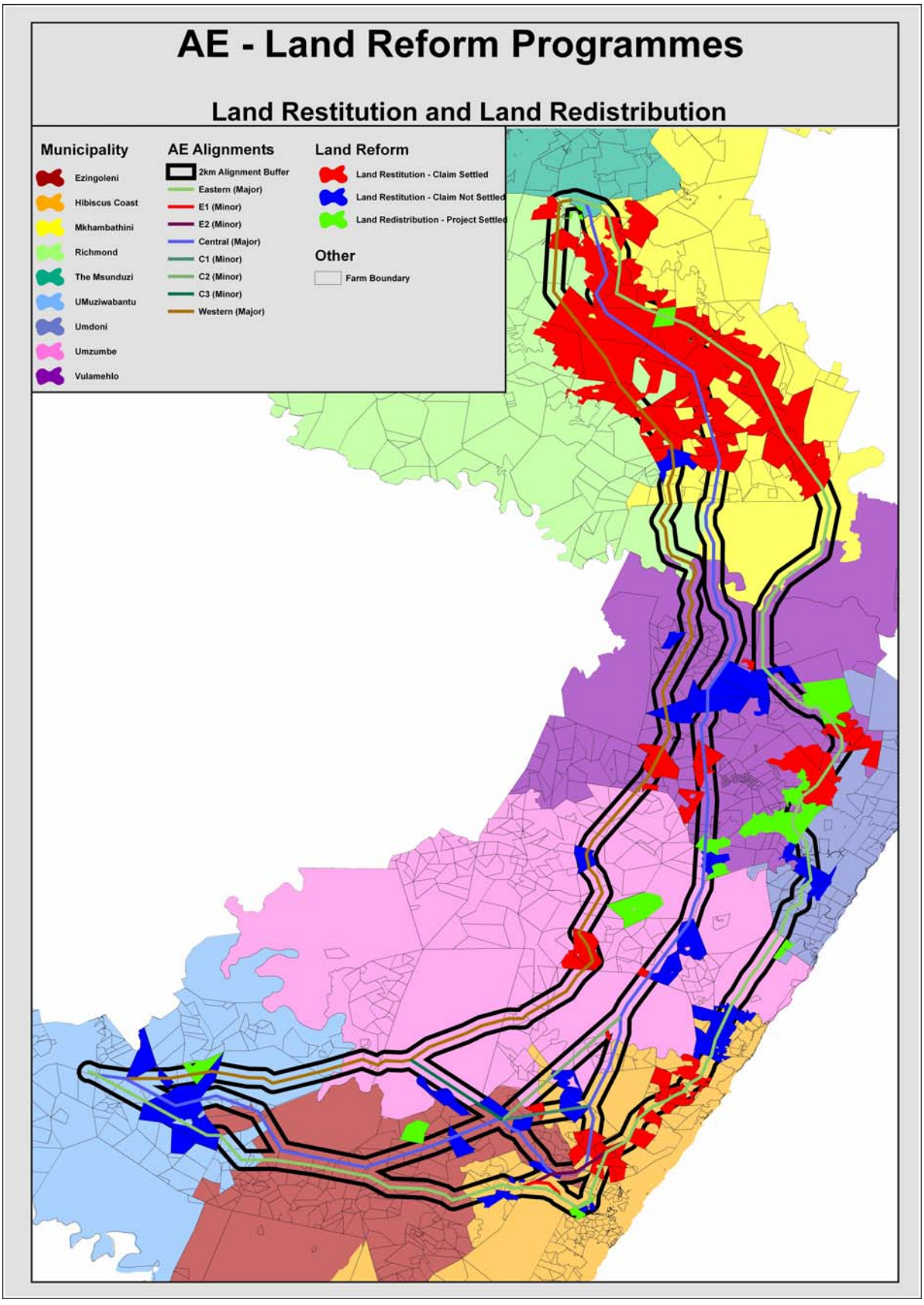
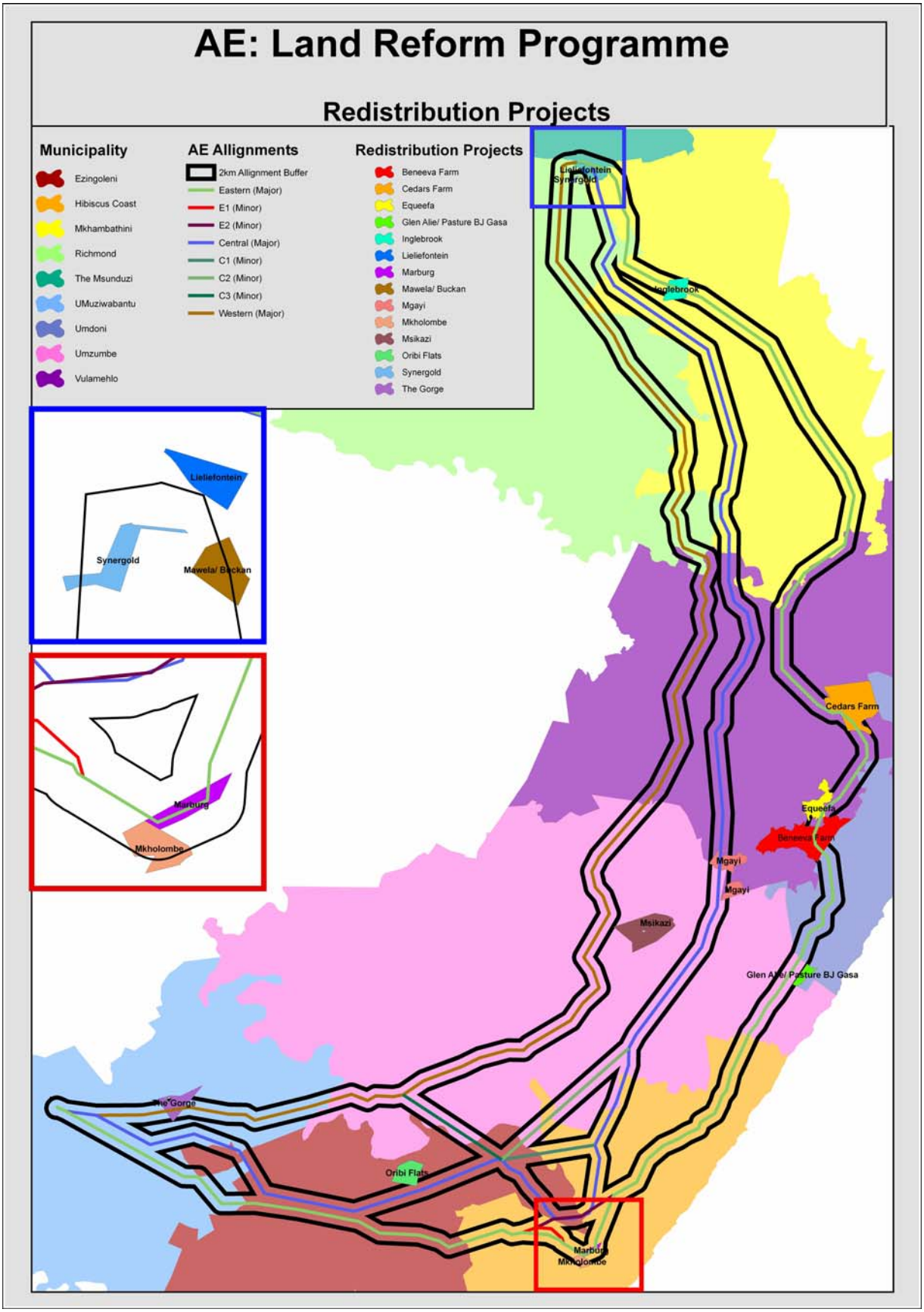


Figure 26 Land redistribution projects in relation to the AE Corridor Alternatives



Based on the above analysis, it is evident that the development proposal could have negative impacts on present and future land reform programmes. This could result in (i) the disruption of an established or future proposed settlement and (ii) the disruption of present or future agricultural activity and/or project. This could eventually jeopardise the goal of the specific programme/s and thus disrupt the present and future livelihoods of vulnerable socio-economic groups. In addition, the South African Government, (through Settlement Land Acquisition Grants, the development of business plans and by assisting individual households or communities to purchase and own land), has invested a significant amount of money into the Land Reform Programme.

6.8.4 Potential impacts

- Impact on agricultural land use (loss of productive agricultural land).
- Impact on agricultural irrigation systems or schemes (centre pivots).
- Interference with the financial sustainability [economic viability] of farms.
- Impact on future land use (incompatibly with SDF and IDP reports).
- Impact on areas of formal conservation and areas of conservation significance.
- Impact on settlements.
- Resettlement of homesteads and settlements.
- Impact on land reform programmes.
- Interference with transport networks (roads, airfields and airstrips).
- Impact on the visual character of the environment.

6.8.5 Recommendations for mitigation

- Eskom must communicate with the Department of Transport (KZN DOT) regarding the placement of transmission infrastructure with regards to the current location of corridors/roads.
- Corridor servitudes in relation to the corridors/roads are to be placed according to Eskom's regulations so as not to interfere with road infrastructure and road users.
- Eskom should plan their corridors with future corridors/roads in mind so as not to conflict with KZN DOT's improvement of future road networks in the study area (in particular the proposed new north-south primary corridor, the proposed new secondary corridors, and any potential new tertiary corridors).
- Avoid airfields and airstrips within the corridor or by realigning the corridors to within a safe distance, so as not to interfere with light aircraft communication systems and takeoff and landing distance requirements.
- Improved electricity supply to IDP/SDF nodes and settlement will act as a catalyst for economic development, improve livelihoods and improve local services e.g. municipal services including: lighting, potable water supply, education and medical facilities.
- Eskom to position transmission infrastructure within the corridor to avoid IDP/SDF nodal developments and associated infrastructure and if necessary, to consider realignment, if it's the only option of avoidance.
- Eskom should communicate with Local Municipalities' Town Planning Departments regarding the positioning of the corridors in relation to future municipal nodal planning objectives.
- In areas where there is dense settlement, that cannot be avoided, resettlement of households out of the servitude area is the only option.

- The corridor must take into consideration areas earmarked by municipalities for future housing developments and discuss with local municipalities regarding the implications of the servitudes passing through these areas and possible re-alignment. In the case of housing developments that are relying on a visually appealing aesthetic environment, the presence of transmission lines will alter the surrounding views from these developments, and thus pose a visual impact, potentially detracting from the value of these developments (the VIA report covers this in more detail).
- In areas where tourism facilities are established, the corridors should be positioned so as not to devalue from the visual aesthetics in these areas. Future tourism developments/planning should also be taken into consideration (the VIA report covers this in more detail).
- Avoid areas of formal conservation and areas of conservation significance as zoned by local municipalities.
- Future conservation/planning within local municipalities should be taken into consideration.
- The corridors will undoubtedly impact on areas the fauna and flora within the study area (specific mitigation measures as well as recommendations regarding these impacts can be found in the Vegetation, Fauna and Avi-fauna Impact Assessment Reports).
- Avoid current irrigation systems and schemes by altering the corridor within the 2 km corridor.
- Avoid vulnerable farms[33] within the corridor.
- Investigate alternate crop types that can be grown within the servitude.
- Avoid established farm infrastructure within the 2 km corridor or by realignment of the servitude.
- Avoid human settlement within the 2 km corridor by realignment of the servitude.

6.9 Visual Impact Assessment

The following methodology was used to address the objectives of the study:

- Determine the setting, visual character and land use of the area surrounding the study area, and the *Genius Loci* (sense of place).
- Discussions and meetings with the specialist consultant team to identify specific aspects of the construction and development which would affect the visual quality of a setting.
- Define the extent of the affected visual environment, the viewing distance and the critical views.
- Evaluation of the landscape characteristics.
- Determine the viewshed (that is, the area within which the proposed project can be visible) using a digital terrain model (DTM) using digital topographic maps analysed by the Geographic Information System (GIS) algorithms available in the ArcView Software Suite.
- The visual impact assessment statements in this report are based on the expert opinion of the specialist and attitudes that are generally accepted worldwide.
- Ground-truth and field inspections (15 and 16 July 2009).

[33] Vulnerable farms are those that could become potentially unviable if the alignment were to traverse the property and minimise land for a specific type of agriculture.

Although the terms of reference called for an assessment of corridors through the study area, it was necessary, for the purposes of the visual impact assessment, to assume the centre of the corridor as the centre line of the viewsheds in order that a viewshed analysis could be undertaken as a viewshed of the corridors would have been too broad to be effective.

The natural physical elements of the study area were described accordingly to broad topographical regions or types rather than using political boundaries (Figure 27). These landscape types[34] correlate closely with the vegetation types as described by Low and Rebelo (1996). The landscape types are:

- Valley Thicket.
- Coastal Bushveld/Grassland.
- Coast Hinterland Bushveld.
- Moist Upland Grassland.

The extent of the visual impact[35] of the development proposal will depend on the following characteristics of the receiving environment:

- Topography.
  Topography describes the landform that gives rise to the physical setting.

- Vegetation cover.
  Vegetation refers to the vegetation cover in terms of visual diversity and not in terms of botanical characteristics.

- Land use.
  Land use is described in terms of the visual mix of land uses that is a function of land diversity and character.

- Landscape diversity.
  Landscape diversity is a function of topography, vegetation and land use. The greater the diversity, the greater is the potential for the proposed development to blend with the surrounding landscape.

- Landscape character.
  The spirit, or sense of place, is that quality imparted by the aspects of scale, colour, texture, landform, enclosure, and in particular, the land use. According to K. Lynch (1992) 'it is the extent to which a person can recognise or recall a place as being distinct from other places as having a vivid, or unique, or at least a particular character of its own'.

  The quality of *Genius Loci* is a function of attributes such as the scenic beauty or uniqueness and distinctive character of the built and cultural landscape.

- Visibility.
  The visual quality is the visual significance given to a landscape determined by cultural values and the landscape's intrinsic physical properties (Smardon, *et al.*, 1986). While many factors contribute to a landscape's visual quality, they can ultimately be grouped under three headings: vividness, intactness and unity.

Tables 34 -37 provide a summary description of the aforesaid landscape types.

[34] These landscape types have been used solely for the purposes of defining the landscape components and is not intended to refer to the flora studies.

[35] The study area focuses on a 10-km radius around each of the alternative route alignments.

Figure 27 Landscape types

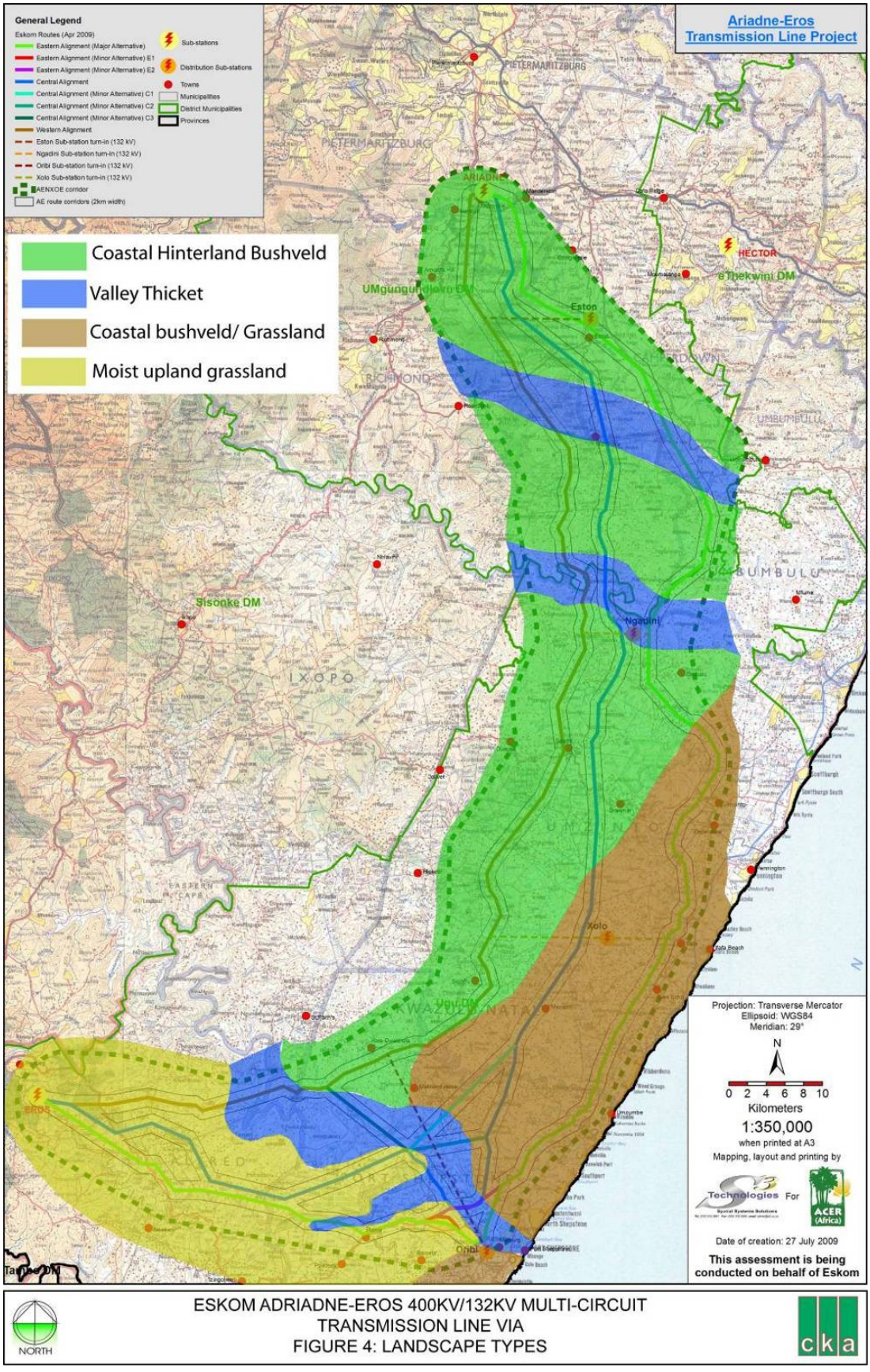


Table 34 Description of the study area: Valley Thicket landscape type

Valley Thicket	
Topography	❑ The Valley Thicket landscape type occurs in the river valleys that run generally in an east-west direction. The main river valleys include the Mkomazi, uMzimkhulu, Illovo and uMlazi river catchments. ❑ The valleys are usually fairly steep sided and deeply incised.
Vegetation Cover	❑ The vegetation cover is mixed, often with a closed canopy up to 6 m in height with woody species dominant.
Landscape Diversity	❑ The landscape diversity of the river valleys is considered to be high due to the diversity of the valley topography as well as the diversity of the vegetation.
Landscape Character	❑ The incised valleys and the high visual diversity impart a rugged and pleasing character with a high scenic value. The river valleys have the highest scenic value of all the landscape types affected. ❑ Scattered villages and homesteads are dotted across the side slopes of the broader valleys through the communal areas. ❑ The mix of visual diversity which includes the dramatic landscape forms, created by the incision by the east flowing river, exhibits a high visual quality and visual sensitivity. The Oribi Gorge bears testament to this statement.
Visibility	❑ The views are generally east and west along the valleys. The most prominent viewpoint is the point where the line begins to descend into the valley. It is necessary for a strain tower to be positioned on the edge which leaves it standing proud and prominent and viewed in silhouette, especially from within the valley. ❑ The visibility is contained within the valley by the valley slopes, but can extend up and down the valley for several kilometres. All the alternatives need to cross these valleys at some point.
Implications for the AE Transmission Line project ❑ The steep slopes will require that the heavier strain towers be used that are generally more visible in the landscape due to the extra steel used in the structure than cross-rope suspension or guyed-V towers. ❑ The change in elevation as the line crosses the valley results in a variety of possible views, some of which will be read in silhouette, especially at the point where the line begins to descend into the valley from either side. Once inside the valley the lines are read against the back drop of the valley side slopes which tends to blend the lines visually with the landscape. ❑ The mixed vegetation and closed canopy up to 6 m high assist in creating a visually diverse landscape which can help blend the line with the landscape (should the servitude not be cleared). ❑ The line is often viewed with the valley side slope as a visual background which helps to screen the line from being viewed in silhouette, except where the line will cross over the top of the valley edge. The diversity in landscape helps to break up the visibility of the lines as they move through shadow and exposed areas. ❑ Most of the river crossings through the Valley Thicket land type are scenic. Some of these are relatively unspoilt such as the Oribi Gorge and the associated tourism enterprises. ❑ Some of the larger valleys such as the Mkomazi River and the Illovo valley are populated with scattered homesteads dotted across the landscape. Although the visual diversity is high within these valleys which allow the line to blend in visually with the landscape, the scenic quality is dependent on this resource, especially in the Oribi Gorge area. ❑ Although the critical views are generally limited to within the confines of the valley some of the valleys are utilised for their aesthetic appeal and quality. This is especially so through the Oribi Gorge area where a transmission line will certainly compromise the high aesthetic integrity of the area.	

Table 35 Description of the study area: Coastal Bushveld/Grassland landscape type

Coastal Bushveld/Grassland	
Topography	❑ This landscape type runs parallel with the coast and varies from approximately 12 to 20 km wide. The topography is gently rolling and undulating with low hills and valleys such as around the Umzinto area.
Vegetation Cover	❑ Much of the vegetation has been transformed by sugarcane farming practices as well as timber near the Eros Sub-station. These areas are planted with single species which present little visual diversity. Patches of indigenous vegetation remain in the more inaccessible areas such as along the drainage ways and minor valleys.
Landscape Diversity	❑ The landscape through which much of the Eastern Alternative passes, consists predominantly of large areas of uniform vegetation in the form of sugarcane. A section of the Central Alternative also falls within this landscape type. The section is approximately in line with Ifafa extending south towards the Oribi Gorge area. The topography is gently rolling with low hills resulting in a relatively low visual diversity. Many of the drainage ways and rivers are edged with trees and the agricultural areas are dotted sparsely with farmsteads and other buildings.
Landscape Character	❑ The landscape is typically rural agriculture in nature. This rural agricultural setting exhibits a medium visual quality due to the lush green rolling fields of sugarcane. The sense of place is linked to the wide open sugarcane fields which are closely linked to the ambience of the South Coast.
Visibility	❑ Visibility is generally confined to approximately 5 km to the east of the Eastern Alternative up to the coastline and in patches up to 15 km to the west. The Central Alternative within this land type is mostly visible within the 2.5 km zone with patches spreading either side of the corridor up to approximately 10 km. ❑ Critical views are views from the N2 where views up the valleys are possible, most of the towns and valleys from Scottburgh to Port Shepstone as well as the Hibiscus Coast Marina and Development. Also included are the villages of Mid-Illovo and Eston.
Implications for the AE Transmission Line project ❑ A large section of the eastern route from the Oribi Sub-station to a few kilometres north of Umzinto is located within this landscape type. The relatively open landscape with low hills allows for extended views and will result in the line and towers being viewed in silhouette as there is no topographical background against which the line can be placed. ❑ The open vegetation, often as a visually monotonous mono-culture, does not assist in screening the line nor does it assist in visually absorbing the line. The line will contrast significantly with the landscape, especially if the intention is to clear cut the servitude through the sugarcane fields. ❑ The combination of the uniform vegetation, the gently undulating topography and the relative lack of indigenous and diverse vegetation as well as the scattered building structures results in a relatively low visual diversity. This landscape will have difficulty in being able to accept visual change readily and will result in the line being more visible due to the high visual contrast, especially if the servitude is to be cleared. ❑ The industrial nature of the transmission line together with the visually dominant open servitude will cut across the landscape and will contrast with the existing sense of place that currently is exhibited. ❑ Although visibility is generally restricted to between 2.5 and 5 km within this landscape, the lines will be highly visible as the visual diversity is low and the servitudes are to be cleared through the sugarcane areas which forms a large component of the current land uses in the area. ❑ The Eastern Alternative is visible from a long stretch along the coastline which affects the critical viewpoints such as the N2, the R102 and the towns from Park Rynie to Port Shepstone.	

Table 36 Description of the study area: Coast Hinterland Bushveld landscape type

Coast-Hinterland Bushveld	
Topography	❑ The landscape is at a higher elevation than that of the Coastal Bushveld/Grassland landscape type. The topography is rolling and undulating with steeply incised valleys as well as some higher ridges on which are many settlements in the Tribal areas. The steeper and more rugged landscape of the central area gives way to a more open and gently rolling landscape north of the Mkomazi River towards Eston and Pietermaritzburg, and in the Sawoti and Dumisa areas. ❑ This landscape type is the largest component and accommodates almost the entire Western Alternative as well as a large section of the northern portion of the Central Alternative.
Vegetation Cover	❑ The vegetation within this landscape type varies considerably from natural grasslands, to open *Acacia karroo* Savanna, to timber plantations and to sugarcane in the north. The vegetation diversity is relatively high in the natural areas, but become monotonous and uniform in the timber and sugarcane areas.
Landscape Diversity	❑ The landscape diversity can be regarded as medium to high south of the Mkomazi Valley. This is due to the steeper and incised topography and diverse vegetation mixed with the settlements of the tribal areas. The landscape diversity north of the Mkomazi Valley can be regarded as medium to low due to the more gentle rolling topography and the shorter grasslands and monoculture farming practices. Patches of rolling hills of sugarcane occur in the central area.
Landscape Character	❑ The landscape character changes from north to south and is often directly related to the topography which in turn was an effect on the type of land uses that occur along the corridors. ❑ The area north of the Mkomazi Valley exhibits a wide open and expansive character that is rural in nature, but not strikingly scenic. The area south of the Mkomazi Valley, including the valley, exhibits a more intense character with views that are truncated by the many hills and valleys. Many of the steep sided valleys and ridges are spectacular, but due to the fact that they have already been modified by human intervention, the visual quality is not very sensitive. ❑ Large sugarcane farms occur on the rolling hills in the Sawoti-Dumisa area. Timber plantations are further north, south and west of Eston. Views of the Central and Western corridor project intermittently towards the Vernon Crookes Nature Reserve.
Visibility	❑ Visibility extends for approximately 2.5 km either side of the Eastern Alternative with patches extending to about 10 km. The northern section around Eston extends to about 5 km with patches extending to about 15 km due to the relatively flat and open landscape. ❑ The visibility of the Western Alternative, as with the Central Alternative, is contained to approximately 2.5 km with patches visible up to 10 km away. The fairly restricted extent of visibility is a direct result of the screening ability of the diverse topography. ❑ Critical viewpoints are essentially from the main roads such as the R603, the R624, the R612, lodge facilities such as Lake Eland and intermittent views to the Vernon Crookes Nature Reserve.

Table 36 continued

Implications for the AE Transmission Line project

- The steeper topography which continues to rise up in the west will often leave some of the towers to be seen in silhouette against the skyline. It will be necessary to place these towers in gaps and necks through the landforms rather than directly over them. The same relief also allows the lines to be viewed with the rising landforms behind them which allow them to visually blend in with the landscape.
- The varied relief assists in the landscape being able to visually accommodate the lines to a certain extent in those areas where the lines are below the ridges and high points.
- The uniform pattern and height of the timber and sugarcane areas will leave the transmission lines visually exposed and highly visible where the servitude cut through these land uses. However, where the lines pass through the more diverse natural areas, the lines become less visible due to the blending effect of the diversity.
- In the areas with a medium to high visual diversity the lines tend to blend more readily with the landscape reducing their visibility. In the areas with a medium to low visual diversity the landscape has less potential to absorb the visual change. Any structure of large bulk or height will contrast markedly with the surrounding landform and will be highly visible due to the lack of screening. This is especially so where the transmission line servitudes will have to be cleared.
- The landscape character north of the Mkomazi Valley will be more sensitive to visual change due to the open and expansive rural sense of place. Although transmission lines will appear out of place within the more scenic southern section, the area has already been modified by the scattered homesteads and patches of subsistence farming. This, together with the higher diversity, reduces the significance of introducing a transmission line to this area.
- Visibility for all three corridors responds similarly and is generally contained to 2.5 km. Visibility in the north is up to 5 km due to the open landscape.
- However, it must be borne in mind that the visibility of an object diminishes at an exponential rate as one move away from the object being viewed. It is considered that for the most part, the significance of the visual impact becomes insignificant beyond 10 to 15 km.
- The open landscape and great height of the towers to the north do not allow for significant mitigation measures due to the lack of existing screening.
- Topography tends to contain the views to no more than 10 km. Beyond this distance the impact becomes minimal.
- Views are open and extended on the flatter areas due to the low vegetation cover. However, viewing distance is reduced due to the undulating topography and steeper valleys.
- The low diversity on the flatter open areas will result in a visual contrast and increased visibility should a transmission line be placed upon it. The areas below the ridge lines and where the topography becomes more undulating will be able to more readily accommodate visually a transmission line due to the topographical backdrop and the ability of the diversity to blend the line with the landscape.
- A transmission line on the more flatter and open areas will be highly visible due to the high contrast, lack of visual diversity and lack of screening. The lines will be less visible in the more undulating areas where the visual diversity is higher and where the topography presents a visual backdrop.
- A transmission line within the Oribi Gorge area, however, will seriously compromise the high scenic and visual quality of this area. The area has a high potential for eco-tourism that would be negatively influenced by the introduction of a transmission line through this area. Already, there is an existing line on the south-western edge of the area which visually intrudes in the area. A second line will further exacerbate the situation.
- Although visibility is largely restricted to 5 km, the Eastern and Central Alternatives run through visually sensitive areas such as the Oribi Gorge area where a transmission line will certainly compromise the high aesthetic integrity of the area.

Table 37 Description of the study area: Moist Upland Grassland landscape type

Moist Upland Grassland	
Topography	❑ This landscape type is mostly located south of the Oribi Gorge, the Mzimkulwana and Mzimkulu Rivers. The topography is generally open to the north and more rugged to the south. The undulating relief appears to contain the visual exposure to not much beyond 7.5 km and 10 km for both the Eastern and Central Alternatives. Both these corridors run through this landscape type.
Vegetation Cover	❑ The vegetation is generally short grassland with trees and shrubs occurring on sheltered sites, rocky hills, valleys and ridges. The flatter open areas are often disturbed by crop farming and forestry.
Landscape Diversity	❑ The landscape diversity can be regarded as medium in general due to the open grasslands mixed with crop farming and a varied topographical landscape. The diversity reduces on the upper open and flatter tops of ridges where the views are more open and uninterrupted. Quarrying to the north-east of the Oribi Gorge occurs which has created considerable visual scarring.
Landscape Character	❑ The character of this landscape type is a combination of rural agriculture and natural bushveld. The rural agriculture extends from the Oribi Sub-station to Harding with the natural bushveld areas occurring within the Oribi Gorge area and the surrounding hills and valleys that edge the Mzimkulwana River. The Oribi Gorge Nature Reserve and the surrounding areas have a distinctive character separate to the rest of the landscape type. ❑ The visual quality in this area is regarded as high while the remaining area is regarded as medium. The Central Alternative traverses a large section of the Lake Eland Nature Reserve on the northern side of the Oribii Gorge. ❑ Areas to the north of the N2 are fairly sparsely populated with farmstead scattered throughout. Houses and settlements are more concentrated south of the N2 and in the vicinity of the higher populated areas near Port Shepstone, Harding, Quebela and Izingoweni.
Visibility	❑ The visibility of the transmission lines is generally restricted to 2.5 to 5 km by the undulating topography. Patches of extended views are up to 10 km for both the Eastern and Central Alternatives. ❑ Critical views are from the N2, the surrounding farmsteads, the tourism enterprises such as Lake Eland, the settlements and semi-urban areas around Harding, Quebela, Port Shepstone and Izingoweni and especially the scenic areas around the Oribi Gorge area.

Table 37 continued

Implications for the AE Transmission Line project

- Topography tends to contain the views to no more than 10 km. Beyond this distance the impact becomes minimal.
- Views are open and extended on the flatter areas due to the low vegetation cover. However, viewing distance is reduced due to the undulating topography and steeper valleys.
- The low diversity on the flatter open areas will result in a visual contrast and increased visibility should a transmission line be placed upon it. The areas below the ridge lines and where the topography becomes more undulating will be able to more readily accommodate visually a transmission line due to the topographical backdrop and the ability of the diversity to blend the line with the landscape.
- A transmission line on the more flatter and open areas will be highly visible due to the high contrast, lack of visual diversity and lack of screening. The lines will be less visible in the more undulating areas where the visual diversity is higher and where the topography presents a visual backdrop.
- A transmission line within the Oribi Gorge area, however, will seriously compromise the high scenic and visual quality of this area. The area has a high potential for eco-tourism that would be negatively influenced by the introduction of a transmission line through this area. Already, there is an existing line on the south-western edge of the area which visually intrudes in the area. A second line will further exacerbate the situation.
- Although visibility is largely restricted to 5 km, the Eastern and Central Alternatives run through visually sensitive areas such as the Oribi Gorge area where a transmission line will certainly compromise the high aesthetic integrity of the area.

6.9.1 Potential risks

Subsequent to the description of landscape types, the study focused attention on the identification of potential risk sources associated with the development proposal (both for construction and operation). The following general negative and positive risks were identified.

CONSTRUCTION

Potential negative risks

- Increased visibility if servitude is to be cleared of vegetation through sugarcane and timber areas.
- Excessive cleaning and stripping of topsoil for site offices and construction camps if required, servitudes and temporary access roads.
- The relatively random and disorganised lay down of building materials, vehicles and offices.
- Cut and fill slopes of access roads become highly visible if not re-vegetated and shaped to blend in with the existing topography.
- Dust from construction activities should access roads be built. However, where ever possible, existing roads and tracks will be used.
- Open and un-rehabilitated landscape scarring.
- High seed bank of alien species in the topsoil can lead to the uncontrolled spread of exotic invader plant species along the edge of the distribution line servitude. This could create a vegetated strip that is visually contrary to the surrounding landscape.

Potential positive risks

- Image of construction activity could lead to a perceived view of progress and benefit to the community.

OPERATION

Potential negative risks

- Site engineering such as cuts and fills, could remain aesthetically incompatible with surrounding landscape if mitigation measures are not implemented. Edges may not blend in with the landscape or cut slopes may be too steep to be adequately re-vegetated.
- The need to keep servitudes clear of vegetation will result in visual scarring.
- New permanent access roads, if required, leave permanent visual scarring although, for the most part, existing roads and tracks will be used.
- Views of the transmission line from existing roads. This will magnify the visual intrusion of the line in the landscape, especially if the line follows the road rather than just crosses it.
- The degradation of areas of particular visual character, such as ridges, valleys and drainage ways if the line is placed too close by.
- Areas and/or specific sites of high aesthetic value may be disfigured by the introduction of large scale industrial type components within the viewshed resulting in a permanent change to the existing visual quality of visually sensitive areas.

Potential positive risks

- The development could be the visual affirmation of progress and prosperity for the region. Localised visual perceptions of the economically depressed communities of the population have not been tested as these may be influenced rather by the economic and job opportunities that could exist rather than the direct visual perception of the project.

6.9.2 Visual analysis (determining the intensity of the visual impact of the development proposal)

The criteria to determine the intensity of the visual impact includes: the viewshed[36] of the study area (this is the extent of area from which the project can be seen), the viewing distance[37], the capacity of the landscape to absorb the project and the appearance of the project from important or critical points[38].

[36] The viewshed is a topographically defined area which includes all possible observation sites from which the project will be visible. The boundary of the viewshed, which connects high points in the landscape, is the boundary of possible visual impact (Alonso, *et al.*, 1986). Local variations in topography and man-made structures would cause local obstruction of views. The viewshed, based on the GIS assessment and fieldwork, extends for the main part and varies from less than 1 km to greater than 20 km in several areas.

[37] The visual impact of an object in the landscape diminishes at an exponential rate as the distance between the observer and the object increases (Hull and Bishop, 1988). Thus, the visual impact at 1 km would be approximately a quarter of the impact as viewed from 500 m. Consequently, at 2 km it would be one sixteenth of the impact at 500 m. The view of the project components would appear so small from a distance of 5 km or more that the visual impact at this distance is insignificant. On the other hand the visual impact of the project components from a distance of 500 m or less would be at its maximum.

[38] Important and critical views have been discussed above as part of 'Landscape Types' section.

In summary, the visual analysis has revealed the following for each alternative corridor.

Eastern Alternative (least preferred option)
The significance of the visual impact is considered **medium to high** during construction and operation through the Coastal Bushveld/Grassland area as the transmission line will have a significant impact on the coastal region and the tourism estate near Hibberdene, as well as through the Valley Thicket due to the high scenic value of these areas and the Coast-Hinterland areas, especially in the north.

The Moist Upland Grassland will have a **medium to low** impact with the exception of the Oribi Gorge area where the significance is considered high.

Central Alternative
The significance during construction and operation is considered to be **medium to high** through the Valley Thicket landscape type, to be **medium** through the Coast Hinterland Bushveld and to be **medium to low** through the Moist Upland Grassland landscape type.

Western Alternative (most preferred option)
The significance during construction and operation is considered to be **medium to high** through the Valley Thicket landscape type, to be **medium** through the Coast-Hinterland Grassland type and to be **medium to low** through the Moist Upland Grassland landscape type.

6.9.3 Potential impacts

The proposed transmission line will exert a negative influence on the visual environment. This is largely due to:

- Impact on selected critical views.
- Impact on the visual quality and the sense of place.
- High visibility of transmission line and towers.
- The height and scale of the towers could be dominant in the landscape.
- High visibility of construction and operation activity within large areas of uniform visual pattern and flat topography.

6.9.4 Recommendations for mitigation

- During construction, the visual impact will have a medium significance and not much can be done about reducing the effect since the works cannot be screened.
- Compile an Environmental Management Plan to address effective rehabilitation of the construction areas and work sites.
- Galvanise pylons should be allowed to weather to a matt grey finish rather than be painted silver, as is often the case. This allows the structures to blend in with the existing environmental colours more readily than the silver which is highly reflective especially early morning and late afternoon. Should it be necessary to paint, it is recommended that a neutral matt finish be used.
- Blend in with the natural topographic profile by sculpturing or shaping the cut and fill slopes of access roads to angles and forms that are reflected in the adjacent landscape can reduce the visual impact.
- Avoid straight edges and corridors for access/service roads and servitudes. These lines should complement the landscape through which they pass.

- Keep the development footprint to a minimum. Do not make these servitudes wider than necessary and access roads built to a higher engineering specification than required for a single lane 4x4 maintenance vehicle track.
- Vegetation stripping of servitude corridors should be done in a manner where the edges are organic (non-geometric) or curvilinear rather than straight or sharp edged as viewers tend to form positive visual impressions such as “gentleness” and “delicacy” and tend to object to negative visual impressions such as “rough”, “rugged” or “violent”. When disturbances in the landscape are viewed from a distance, those with irregular lines, rather than straight lines appear to blend in with the natural configuration and lines in the landscape.
- All disturbed areas must be suitably topsoiled and vegetated as soon as is possible after final shaping. The progressive rehabilitation measures will allow the maximum growth period before the completion of the project. Disturbed areas include on-site areas (permanent access roads, pylon assembly areas) and areas beyond the works area such as temporary access roads, construction campsites, workers campsites, borrow pits, laydown areas, etc. Borrow pits and spoil dumps should be assessed during the design stage.
- All existing large trees that fall outside the working area must be retained. These will assist in softening the forms of the structures and obscure views to them.
- Dust generated by construction activity and the haulage of materials and equipment will need to be suppressed by regular wetting. The importance of suppressing the visual aspects of dust cannot be over-stressed since the visibility will generate the impression of a polluting industry.

6.10 Summary of specialists findings (with respect to the four additional alternatives[39])

6.10.1 Agricultural Potential and Economics

The findings are summarised as follows:

- Alternatives E3 and W2 will have the lowest impact on commercial agriculture (sugarcane and forestry) as compared to the Western, Central and Eastern Alternatives. In addition, a combination of Alternatives E3, W2 and the Western Alternative would result in sterilisation of approximately 156 ha of sugarcane land and 83.6 ha forestry plantations (a total loss of about 240 ha), which in turn equates to R 2,207 million of lost production revenue per annum (2009 prices) or R 2,053 million of lost GVA per annum (2009 prices). This is the most preferred option from an agricultural point of view.
- The second preferred option is a combination of Alternative W2 and the Western Alternative. This would involve the sterilisation of approximately 126 ha of sugarcane land and 129.2 ha forestry plantations (a total loss of about 256 ha) and would result in a total loss of about R 2,066 million of GVA per annum (2009 prices).
- The third preferred option is a combination of Alternative E3 and the Western Alternative. This would sterilise 165 ha of sugarcane land and 129.2 ha forestry plantations areas (a total loss of about 294 ha) and could potentially result in the loss of R 2,422 million of GVA per annum (2009 prices).

[39] Refer to Section 3.2.4 for details on the additional alternatives.

POTENTIAL IMPACTS

- Positive impacts.
  - The creation of employment opportunities.
  - The provision of a reliable and quality supply of electricity.
  - Electrification of households[40].
  - Capital expenditure resulting in a positive contribution to the GDP of the region and a positive stimulus in the economy.

- Negative impacts.
  - The loss of use of productive agricultural land (mainly sugarcane and forestry).
  - The loss of agricultural potential due to the location of the construction camp sites.
  - The long-term loss of agricultural potential due to the location of towers.
  - The long-term loss of agricultural potential due to the location of the servitude.
  - The closure of farms due to them becoming unviable.
  - Loss of agricultural production due to workers' movement.
  - Negative impacts on mills (due to loss in agricultural output at farms).
  - In-migration of job seekers and contractors.
  - Safety and security.
  - Negative contribution to the GDP (due to reduced agricultural activity).
  - Negative impact on subsistence farming.
  - Negative impact on tourism.

RECOMMENDATIONS FOR MITIGATION

These are the same as described Section 6.1.4.

6.10.2 Avi-fauna

The findings are summarised as follows:

Alternative E3: The upper section of this alternative follows existing power lines (Georgedale-Venus and Georgedale-Illovo) for approximately 40 km. By running in parallel to an existing line, negative impacts of birds are can be minimised. However, this new alternative also traverses the Mkomazi River (Joint E and F), an area that has been classified as medium-high sensitivity in terms of avi-fauna (Figure 28).

Alternative W1: This alternative is also not a preferred alternative as it crosses the Oribi Gorge area, an area that has been classified as high sensitivity for avi-fauna. Sections of this alternative traverse high sensitivity zones and, therefore, must be seen as a No-Go and must be avoided.

Alternative C3: This alternative follows a similar route to Alternative W1 and also crosses the Oribi Gorge area. Therefore, due to the occurrence of high sensitivity zones, this alternative is not preferred and should be avoided.

Alternative W2: This alternative is approximately 20 km in length and traverses an area identified as high avi-faunal sensitivity for Blue Swallows, a critically endangered bird species. Therefore, from an avi-faunal perspective, it is not a preferred option, with a corresponding recommendation of No-Go.

[40] However, in order to realise the benefits of electricity to communities, Eskom Distribution and the local municipalities will need to develop and implement a macro-plan for the connection of new consumers.

POTENTIAL IMPACTS

As indicated in 6.2.1, the following avi-faunal impacts can be anticipated:

- Electrocutions.
- Collisions.
- Loss and disturbance of habitat during construction and operation.
- Nesting on towers.
- Impact on quality and reliability of supply (as a result of bird streamers and bird excreta).

RECOMMENDATIONS FOR MITIGATION

It is recommended that a walk-through must be conducted by a qualified avi-faunal specialist once the final route and siting of steel towers has been completed.

6.10.3 Social

The approach to the study entailed the following:

- A field inspection site visit.
- A desktop study, including the analysis of maps, aerial photographs, existing literature on the area (e.g. Integrated Development Plans), and information obtained from project personnel, public involvement/participation data, personal observations, statistical, surveys, and other written data.
- Profiling of the study area environment (i.e. documenting the social environment).

Similar to the original social impact assessment study (Appendix 6), this study has three main components:

- Baseline information (the gathering of data on the social and socio-economic environment).
- To identify social change processes[41] (i.e. those processes that can lead to social impacts, for example, in-migration of job seekers or the resettlement of settlements).
- To assess social impacts.

The analysis of the social environment was done for each affected district and local municipality. The latter includes eThekweni Metropolitan Municipality and Sisonke District Municipality: uMzimkhulu Local Municipality. The findings of the study can be summarised as follows:

- Alternative E3 falls within the Ugu District Municipality: Richmond, Mkhambathini and Vulamehlo Local Municipalities, and eThekwini Metropolitan Municipality.
- Alternative W1 falls within the Ugu District Municipality: uMzumbe Local Municipality.
- Alternative W1 falls within the Ugu District Municipality: uMzumbe and Ezinqoleni Local Municipalities.
- Alternative W2 falls within the Ugu District Municipality: Ezinqoleni and uMuziwabantu Local Municipalities, and Sisonke District Municipality: uMzimkhulu Local Municipality.

[41] Social change processes focussed on: Demographic Processes, Economic Processes, Geographic Processes, Institutional and Legal Processes, Emancipatory and Empowerment Processes, and Socio-Cultural Processes.

Below is summary of the findings of this study. To avoid repetition, this summary only deals with municipalities that were not previously described in Section 6.7.

With respect to the Richmond and Mkhambathini Local Municipalities, the establishment of the power line infrastructure will potentially improve basic services at a domestic and municipal level. A limited amount of semi- and un-skilled jobs will be created during the construction phase of the project. The agricultural sector, which is made up predominantly of sugarcane within these municipalities, is likely to incur the biggest impact due to Eskom's policy of sugarcane-free servitudes. Increased usage of roads, especially those in poor condition, could result in increased deterioration of certain roads.

With respect to the eThekwini Metropolitan Municipality, the affected area is relatively small (3 km in extent) and falls within the boundaries of rural settlements of Langa, Embo-Isimahla and Sobonakona-Makhanya Traditional Authorities. Settlements patterns within these areas are scattered and, therefore, provide space for a power line servitude. Nonetheless, the final placement of a power line servitude could result in the resettlement of homesteads.

Within the uMzimkhulu Local Municipality (Sisonke District Municipality), Alternative W2 extends for a short distance (6 km) along the southern boundary of the municipal area. The municipality is predominantly rural in nature with the majority of its inhabitants living in rural areas. To a large degree, settlements and homesteads are scattered and are associated with subsistence agriculture.

Land reform projects occurring within the new corridor alternatives also need to be taken into consideration, particularly projects that have a settlement and agricultural focus.

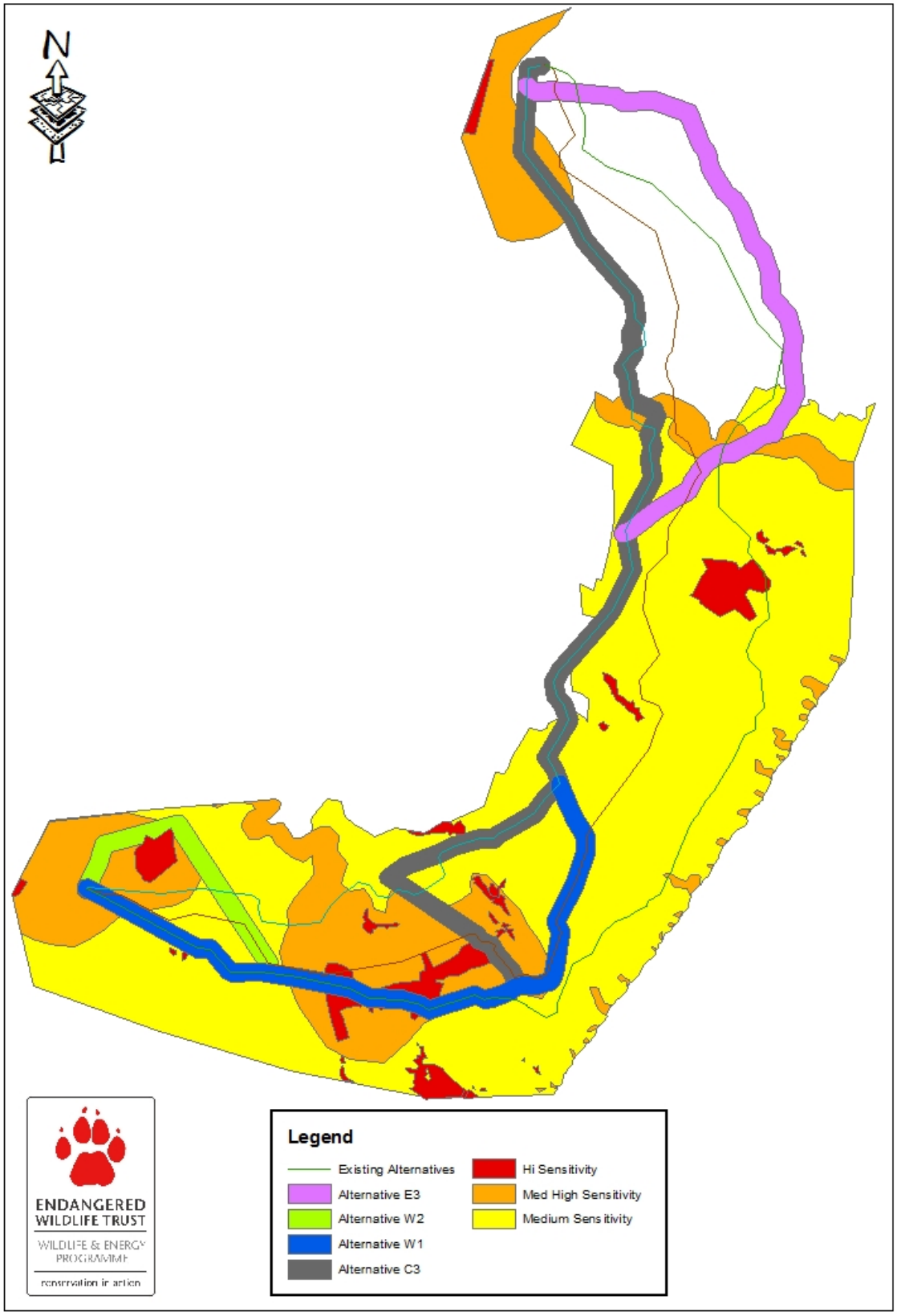
POTENTIAL IMPACTS

- Impacts on health and social well-being.
- Impacts on the quality of life (the living environment).
- Impacts on the economy and material well-being.
- Impacts on cultural aspects.
- Impacts on families and the community.
- Impacts on institutional, legal, political and equity aspects.
- Gender impacts.

RECOMMENDATIONS FOR MITIGATION

These are the same as described in Section 6.7.2.

Figure 28 Avi-fauna sensitivity in relation to Alternatives E3, W1, C3 and W2



7. INTEGRATED DESCRIPTION OF ENVIRONMENTAL ISSUES AND POTENTIAL IMPACTS

The key issues identified during Scoping and carried through to the Impact Assessment phase have been formulated as ten main questions:

- What economic and socio-economic benefits will the transmission line have (locally and regionally)?
- What effects will the proposed transmission line have on existing residential settlements and infrastructure, including telecommunication structures?
- Will the transmission line result in the loss of use of productive agricultural land (commercial and subsistence) and associated economic opportunities?
- How will the visual changes to the landscape affect the social and socio-economic environment?
- Are the proposed route corridors compatible with town planning initiatives (Integrated Development Plans, Spatial Development Plans and other initiatives)?
- What effects will the transmission line have on the natural environment (flora and fauna) and natural areas worthy of protection and conservation?
- What effects will the transmission line have on avi-fauna (birds)?
- What effects will the transmission line have on cultural and heritage resources?
- What technical constraints will the biophysical environment place on the routing, construction and operation of the transmission line?
- Can the transmission line be detrimental to the health and safety of local communities (with specific reference to a) Electro-magnetic Fields, b) safety aspects associated with construction, and c) cumulative impacts of an additional power line)?

Potentially significant impacts associated with each of the above issues are discussed in the sections below. The assignment of significance ratings to impacts, according to the assessment conventions, is provided in Chapter 8.

7.1 What economic and socio-economic benefits will the transmission line have (locally and regionally)?

RELIABILITY AND QUALITY OF ELECTRICITY SUPPLY

To improve the reliability and capacity of the electricity network in the southern part of KZN, Eskom proposes to construct a second 400 kV transmission line[42] running from Ariadne Sub-station to the vicinity of the Oribi Sub-station and on to the Eros Sub-station. This will create a circuit linking the existing inland 400 kV transmission line with the proposed coastal 400 kV transmission line. This will mean that in the event of a supply problem on the one power line (for instance, the existing inland power line), Eskom will be able to continue to supply power to sub-stations using the coastal power line. In essence, Eskom will maintain electricity supply to consumers whilst repairs and/or maintenance are carried out on a part of the network.

In addition, Eskom proposes to run a new 132 kV distribution line in the same servitude and on the same tower infrastructure to be used for the 400 kV line, between Ariadne and Oribi Sub-stations. The 132 kV line will be used by Eskom Distribution to extend its supply coverage to consumers along the south coast and its hinterland, where many communities currently do not have access to electricity.

[42] The existing 400 kV inland transmission line is located inland between Ariadne and Eros Sub-stations. It follows the Ixopo Road (R56) between Harding/Kokstad and Richmond/Pietermaritzburg.

ENHANCEMENT IN QUALITY OF LIFE

Electrification has significant positive benefits from a socio-economic and ecological perspective.

From a socio-economic perspective, the availability of electricity leads to a number of positive social benefits for organs of state, communities and individuals, including:

For organs of state:

During construction:

- Capital expenditure resulting in a positive contribution to the GDP of the region and a positive stimulus in the economy.

During operation:

- Electrification of educational and training facilities.
- Electrification of health facilities.
- Electrification of security facilities (police stations, foster homes, court offices and the like).
- Electrification for the provision of essential services (water supply pumps and the like).
- Electrification of religious and cultural facilities.
- Enables rural and semi-urban development.
- Enables the provision of lightning, thereby vastly improving the safety and security of communities.

For communities and individuals:

During construction:

- The creation of employment opportunities during the construction phase of the project.

During operation:

- The provision of a reliable and quality supply of electricity.
- Electrification of homes through new connections and greatly improving the quality of life of communities.
- Encourages small and medium enterprise development, and as a result, contributes to a rise in disposable income.

From an ecological perspective, the availability of electricity can lead to a decrease in the harvesting of firewood with resultant biodiversity benefits. This also leads to a decrease in respiratory disease due to a reduction of biomass burning. The relative efficiency of using electricity will reduce overall air emissions and can lead to an improved quality of life.

7.2 What effects will the proposed transmission line have on existing residential settlements and infrastructure including telecommunication structures?

EXISTING RESIDENTIAL SETTLEMENTS

From a land use perspective, the study area has mixed settlement types and varied land uses. A large part of the study area is covered by traditional authorities. It is estimated that about 200,000 people reside on this land comprising about 39,000 households. The proposed transmission line transverses urban (Port Shepstone, Murchison), semi-urban (comprising small-holdings and commercial farmland) and rural settlements/tribal homesteads (Ingonyama Trust land).

In accordance with international and national safety and health provisions, permanent residence is not allowed within the servitude of the transmission line. Even so, it is likely that the final route corridor will impact one or more houses, in particular, in rural settlements where the homesteads tend to be scattered on the landscape, with an average density of 56 households per km^2. In the event that a homestead will require resettlement, Eskom will negotiate with the affected homeowner and, as standard practice, Eskom will ensure that affected homeowners are not worse off and, preferably, are better off than prior to resettlement.

With regard to parts of the study area, great care will need to be exercised when undertaking resettlement. This is because some homesteads appear abandoned, possibly as a consequence of the HIV/AIDS pandemic. This could mean that there are households headed either by elderly citizens, by children or by ill citizens. Extra effort will be required to support these vulnerable individuals and groups.

EXISTING INFRASTRUCTURE

Typical impacts on infrastructure are mainly related to access to transmission lines during construction and operation/maintenance activities (by both vehicles and helicopter). For the most part, telecommunications infrastructure can co-exist with transmission lines, usually with minor realignment of the transmission line. With respect to the crossing of roads, the standard requirement is that the crossing must be at a right angle, with scaffolding used so that the road can continue to be used while the transmission line infrastructure is constructed. Overall, the impact on infrastructure is anticipated to be relatively low.

7.3 Will the transmission line result in the loss of use of productive agricultural land (commercial and subsistence) and associated economic opportunities?

AGRICULTURAL CROPS THAT WILL BE NEGATIVELY AFFECTED

The proposed transmission line will transverse commercial agricultural areas such as Eston, Mid-Illovo, Sawoti, Braemer, Hibberdene, Plains, Paddock, Oribi Flats and Harding. Sugarcane, forestry plantations and bananas are the dominant land use in these areas. The transmission line also transverse small-scale, communal sugarcane farmland and subsistence agricultural land in rural areas (this is mainly within tribal land). Many of the rural households engage in and derive their sole source of income or food from subsistence farming.

The proposed transmission line requires a sugarcane- and forestry-free servitude. This could result in the loss of use of productive agricultural land and, therefore, could negatively affect the income of farms and livelihoods of landowners and farm workers. Indirect negative impacts include a reduction of sugarcane and timber tonnage for the mills, and this could threaten the economic viability of the mills and job security for mill employees.

AGRICULTURAL CROPS THAT WILL NOT BE AFFECTED

Apart from timber, others crops such as macadamias, citrus, bananas and vegetables, are allowed within the servitude of the transmission line. There is, however, a crop and tree height restriction of 4.3 m within the servitude.

Eskom is ultimately responsible for the maintenance of the servitude with respect to maintenance of the centre line track and the pruning of vegetation and crops. This responsibility can, however, be contracted out to landowners subject to negotiations between Eskom and landowners.

IRRIGATION

A transmission line of this size impacts on irrigation systems, in particular, centre pivots, and limits the potential for future development of farms (irrigation and other infrastructure). Compensation is of concern particularly in areas where the cumulative impact of the proposed transmission line with existing infrastructure would affect large sections of cultivated or grazing land.

7.4 How will the visual changes to the landscape affect the social and socio-economic environment?

VISUAL AND AESTHETICS

Visual impacts are arguably one of the most significant impacts that are associated with transmission lines. For this study area, this is mainly due to factors such as:

- The rugged, hilly terrain of the receiving environment.
- The sensitivity of the receiving environment.
- The high visibility of transmission line infrastructure (towers, conductors, etc).

From an eco-tourism perspective, a number of eco-tourist attractions occur within the study area, namely (but not limited to):

- Oribi Gorge Nature Reserve (a scenic landscape and conservation area).
- Oribi Gorge Hotel and surrounds (a scenic landscape).
- Oribi Plains (a scenic landscape).
- Oribi Flats (a scenic landscape).
- Mzimkulwana River (a scenic landscape and conservation area).
- Mzimkulu River (a scenic landscape).
- Mkomazi River (a scenic landscape).
- Mid Illovo Hills (a scenic landscape dotted with private nature and game reserves).
- Vernon Crookes Nature Reserve (a scenic landscape and conservation area).
- Lake Eland Game Reserve.
- Durban Skydive Centre at Angel's Way Farm.
- Kinroy and Invernettie Estate.
- Phoenix Wattle Farm.
- Bellavista Country House.

From an ecological and socio-economic perspective, the above attractions contribute towards the conservation of flora and fauna species (some of which are threatened and endangered), and the economy of the region, respectively. Therefore, the visual qualities of these attractions need to be preserved as far as is practically possible. This can be done through the careful placement of towers and power lines against the landscape, avoiding mountain tops, and using valley bottoms.

From the point of view of receptors (local communities and visitors), the presence of a transmission line may negatively affect the sense of place of natural areas, potentially negatively affecting scenic beauty and tranquillity of the environment. This could lead to indirect negative socio-economic impacts such loss of revenue for eco-business enterprises, loss of employment and reduced economic contributions to economy of the region.

7.5 Are the proposed route corridors compatible with town planning initiatives (Integrated Development Plans, Spatial Development Plans and other initiatives)

TOWN AND REGIONAL PLANNING INITIATIVES

The proposed transmission line is likely to be incompatible with existing and future land uses in the study area. The findings of the town planning specialist study have highlighted the following concerns:

- Compatibility with land use planning tools, instruments and initiatives (i.e. IDPs and SDFs).
- Compatibility with land reform initiatives (settlement development and agricultural projects).

The aims and objections of these initiatives could be jeopardised if the development proposal does not take them account. In addition, the South African Government has invested a large amount of money into land and social development projects such as the Land Reform Programme.

However, it is important to note that the strengthening of the supply of electricity to the region and the provision of a distribution supply for onward connection to consumers in the hinterland of southern KwaZulu-Natal are required in order that current development plans can be realised (indeed, without electricity many plans are unlikely to come to fruition).

7.6 What effects will the transmission line have on the natural environment (flora and fauna) and natural areas worthy of protection and conservation?

FLORA

The study area is rich in biodiversity, with numerous ecosystems, vegetation units, vegetation types, habitat types and topographical features. A total of nine vegetation units occur within the study area, three are listed by as Endangered (SANBI listing), three are listed as Vulnerable (SANBI listing) and three are listed as Least Threatened (SANBI listing).

In terms of the EKZNW Terrestrial Systematic Conservation Plan (C-Plan), the general trend in the study area shows that areas (planning units) with high irreplaceability values (i.e. of higher biodiversity concern) are frequently encountered along the western and central alternatives, while they are relatively infrequently encountered along the eastern route.

The largest impact on flora species will result from construction activities associated with the establishment of access roads, the centre line track, towers and power line stringing due to the clearing and cutting of vegetation. The siting of construction camps can also lead to the loss of flora and, therefore, their siting requires careful consideration. Other major issues include the potential for the poaching of plants and occasional veld fires, particularly in rural areas where there are many scattered homesteads.

During operations, the largest effect on floral habitat and flora is likely to be that of the access roads. The maintenance of the servitude (centre line track) may also result in the creation of a vegetation structure and composition, which differs from the surrounding landscape. This is because maintenance activities may influence the re-establishment of certain species over others. In this regard, particular care will need to be taken to prevent the colonisation of alien invasive plants.

FAUNA

The biodiversity of fauna species (mammals, reptiles and amphibians) within the study area is varied. Irreversible habitat destruction associated with construction activities (access roads, tower feet positions and the clearing of vegetation for conductor stringing) is the largest source of risk to faunal communities (a number of these fauna species are listed threatened and endangered). Potential negative could result from the following project activities:

During construction:

- Soil erosion.
- Fragmentation and/or loss of habitat (grasslands, wetlands and rocky areas).
- Surface and groundwater pollution.
- Accidental injury or fatality to wildlife, game and livestock.
- Accidental veld fires.
- Poaching.
- Introduction of flora and fauna alien species.

During operation:

- Disturbance to habitats.
- Accidental injury or fatality to wildlife, game and livestock.
- Accidental veld fires.

Another potential impact relates to the use of helicopters during construction and operation (routine inspections and maintenance). This is likely to negatively affect livestock and wildlife, causing panic amongst animals, possibly resulting in injury or death. Therefore, general care is required when flying helicopters in areas where there are animals.

CONSERVATION-WORTHY AREAS

A number of conservation areas (both public and privately-owned) occur within the study area. Two formal, public-owned protected areas occur within the study, namely: Oribi Gorge and Vernon Crookes Nature Reserve. With respect to Vernon Crookes Nature Reserve, all three alternative corridors (Eastern, Central and Western) run outside the reserve. At Oribi Gorge Nature Reserve, all but the Eastern Alternative runs outside the reserve.

A potential negative impact on the above areas relates to the use of helicopters during construction and operation (routine inspections and maintenance). Apart from the noise from helicopters, as discussed above, animals may become frightened and panic, running into fences injuring or even killing themselves.

7.7 What effects will the transmission line have on avi-fauna?

A number of important bird areas occur within the study area including several bird species protected internationally under the Bonn Convention. In general, a high density of Red Data species is expected to be found higher-lying, inland areas within the study area. Due to their habitants and resulting distribution in, these species are vulnerable to collisions with the earth wire of transmission lines and the earth wire and conductors of smaller distribution lines.

Infrastructure associated with transmission lines constitutes an important interface between wildlife and man. Negative interactions between wildlife and electricity infrastructure take many forms, but common problems in Southern Africa are birth fatalities as a result of the following:

- Collisions with the earth wires on a transmission line.
- Electrocutions (through birds causing short circuits) on smaller distribution lines.

Collisions are the biggest single threat posed by electrical infrastructure to birds in Southern Africa. Most heavily impacted upon are cranes and various species of water birds. These species are mostly heavy-bodied birds with limited manoeuvrability, which makes it difficult for them to take the necessary evasive action to avoid colliding with power lines. Many of these heavy-bodied, long-living and slow reproducing species are threatened in southern Africa.

Electrocution occurs when a bird attempts to perch on an electrical structure and causes an electrical short circuit by bridging the gap between live components (called phases). Birds commonly use transmission towers and sub-stations for perching, roosting and hunting. Birds could be at electrocution risk on smaller power lines (such distribution lines where the voltage ranges from 132 kV – 33 kV) and in sub-stations where the electric phases are closer together, rather than on larger transmission structures (voltage range: 220 kV – 765 kV) where they are further apart. A bird is at electrocution risk if it contacts two energized components or an energized component and a grounded component (EWT, 2006).

Other impacts associated with power lines include (EWT, 2006):

- Electrical faults caused by bird excreta when roosting or nesting on electrical infrastructure.
- Loss or disturbance of avi-fauna micro-habitats[43] during construction and operation (maintenance) activities (EWT, 2006).

7.8 What effects will the transmission line have on cultural and heritage resources?

It is likely that the transmission line could have impacts on heritage and cultural resources in the study area. A heritage resource is defined in the National Heritage Resources Act (Act 25 of 1999) and includes places and objects such as buildings, settlements, landscapes, townscapes, geological sites, archaeological sites, graves and burial grounds, battlefields and objects of art.

Findings of the specialist heritage study revealed that a number of heritage resources are likely to be present along the three alternative corridors. The study also found that the greatest impact on landscapes and natural features will be created by access roads and other construction and maintenance infrastructure. In general, the Eastern Corridor is highly modified by urban and agricultural land uses (with the exception is the Oribi Gorge area) and, thus, will have the least requirement for new access and maintenance infrastructure as compared to the other alternatives. Large areas of the Central and Western Corridors traverse several traditional authorities, where impacts on living heritage, scattered homesteads and settlements could be a significant limitation to defining a suitable power line servitude.

Construction phase activities could cause damage to buildings and infrastructure (for example, structural damage to a historic church building by a construction vehicle, the looting of a heritage resource by construction personnel, and similar instances). These impacts can be avoided through final route corridor, the micro-positioning of towers and the careful siting of construction camps.

[43] The avi-faunal study revealed a number of bird micro-habitats in study area: agricultural lands, wetlands, rivers, dams and exotic plantations.

Impacts from operational activities are anticipated to be lower by comparison, however, great care is still required during operational and maintenance activities.

7.9 What technical constraints will the biophysical environment place on the routing, construction and operation of the transmission line?

Eskom Transmission considered the following aspects in determining the preferred transmission line corridors, including the preliminary mapping of the three alternative options (East, Central and West corridors):

- Technical feasibility (accessibility and linkages with Distribution sub-stations).
- Environmental feasibility (topography, soils, geology, conservation areas, sensitive areas (rivers, wetlands, dams) and built-up areas (settlements, mines, industry, towns)).

It is important to note that the above aspects will influence the final route selection with respect to:

- Tower spacing.
- Tower type.
- Access, including the establishment of the centre line track.
- Siting of construction camps.
- Proximity to municipal services (waste disposal sites, sanitation and potable water).
- Proximity to other key services (such as fuel depots).
- Side-slope considerations (in certain areas, mountain slope steepness will influence the placement of the servitude, either up-slope or down-slope placement).
- Valley-cliff considerations.
- Weather and climate considerations (extreme weather conditions such as snow and strong winds will require Eskom to use stronger tower which use more steel and are more visible to the surrounding environment. Snow is known to fall in the Harding area and surrounds).

7.10 Can the transmission line be detrimental to the health and safety of local communities?

HEALTH ASPECTS AND ELECTRO-MAGNETIC FIELDS (EMF)

An EMF is the electric field generated around conductors through which alternating electric current is flowing. The field is at its maximum closest to the conductor and the intensity drops away with distance from the conductor. Apart from the magnitude of the voltage and current applied to a conductor, the intensity of an EMF depends on the height of the conductors above ground and the spacing between the conductors.

Eskom is guided by exposure guidelines for electric and magnetic fields as given by the International Commission on Non-Ionising Radiation Protection. Furthermore, transmission lines are designed in accordance with standards of the International Radioactive Protection Agency. Added to this, Eskom adopts the precautionary principle in the control and restriction of activities taking place within the transmission servitude, in particular, no permanent residence is allowed within the servitude.

A number of concerns exist regarding the impact of exposure of humans and animals to EMFs from electrical equipment. In this regard, EMFs are perceived as a threat to humans and animals. A number of studies have been undertaken internationally on the biological impact of EMF fields. To date, no conclusive evidence of any health-related impacts has been advanced.

After more than 20 years of research undertaken by Eskom, it has not been conclusively demonstrated that detrimental human and animal health effects exist with the exposure to EMFs. Studies on the effects of EMFs on farm animals have also concluded that they have no influence on the reproduction, meat, milk and egg production or the development of offspring. This has been verified by an independent research study commissioned by Eskom and internationally peer reviewed.

SAFETY ASPECTS

The presence of construction personnel, the establishment of new access roads and the centre line track during construction could invite criminal elements into an area, and also open up an area for plant and animal poaching. Other safety aspects include the in-migration of people during construction and the potential increase in the spread of diseases (HIV/AIDS is of particular concern).

7.11 Cumulative impacts

Cumulative impacts[44] can be both positive and negative. These impacts can also be both temporary[45] and permanent[46] in nature.

Potential positive or beneficial cumulative impacts to the environment include:

- Positive economic and financial impacts during operation. Access to electricity is generally a catalyst for social and economic development, and growth.
- Income derived from new and existing business enterprises.
- Improved and better community security (lighting).
- Improved basic services (water provision and sanitation).
- Improved social infrastructure and services (schools, clinics)

Potential negative cumulative impacts include:

- Urban sprawl and urbanisation.
- Loss of use of agricultural land.
- Closure of farms (as a result of a loss of farm income).
- Closure of sugarcane and timber mills (as a result of low cane and timber products outputs).
- An increase in unemployment (as a result of loss of farm and mill jobs), creating a financial and emotional strain of families.
- The displacement and/or loss of wildlife.

[44] A cumulative impact is an incremental impact on the environment that results from the impact of a proposed action when added to existing, and reasonably foreseeable future actions.
[45] Restricted to the construction phase of a project life-cycle.
[46] Occurring in both the construction and operation phases of a project life-cycle.

- Damage and/or loss of conservation-worthy plants.
- Erosion and pollution.
- The transformation of sensitive areas (rivers, wetlands and streams).
- An increase in the spread of human-related illnesses and diseases (STDs, in particular, HIV/AIDS).

8. ASSESSMENT OF POTENTIALLY SIGNIFICANT IMPACTS

8.1 Assessment

This Chapter deals with the assessment of the potential impacts, both with and without management measures (mitigation). Impact tables, as applicable, are provided in Tables 38 – 47 that follow.

Table 38	What economic and socio-economic benefits will the transmission line have (locally and regionally)?
Table 39	What effects will the proposed transmission line have on existing residential settlements and infrastructure including telecommunication structures?
Table 40	Will the transmission line result in the loss of use of productive agricultural land (commercial and subsistence) and associated economic opportunities?
Table 41	will the visual changes to the landscape affect the social and socio-economic environment?
Table 42	Are the proposed route corridors compatible with town planning initiatives (Integrated Development Plans, Spatial Development Plans and other initiatives)?
Table 43	What effects will the transmission line have on the natural environment (flora species) and natural areas worthy of protection and conservation?
Table 44	What effects will the transmission line have on the natural environment (faunal species) and natural areas worthy of protection and conservation?
Table 45	What effects will the transmission line have on avi-fauna (birds)?
Table 46	What effects will the transmission line have on cultural and heritage resources?
Table 47	What are the cumulative impacts associated with the transmission line?

Table 38 What economic and socio-economic benefits will the transmission line have (locally and regionally)?

Impact	Mitigation	Assessment (without and with mitigation)						
		Nature	Extent	Duration	Intensity	Probability	Significance	Confidence
Improved road access (as a result of the project)	Without	Positive	Local	Permanent	Medium	Definite	High	High
	With	Positive	Local	Permanent	High	Definite	High	High
Capital expenditure	Without	Positive	National	Short-Term	Medium	Definite	High	High
	With	Positive	National	Short-Term	High	Definite	High	High
Enhancement of the quality of life and social services	Without	Positive	Regional	Permanent	Medium	Definite	Medium	High
	With	Positive	Regional	Permanent	High	Definite	High	High
Improved electricity supply to the region	Without	Positive	Regional	Permanent	Medium	Definite	Medium	High
	With	Positive	Regional	Permanent	High	Definite	High	High
Creation of employment opportunities	Without	Positive	Local	Short-Term	Medium	Definite	Medium	High
	With	Positive	Local	Short-Term	High	Definite	Medium	High
Ecological and Biodiversity benefits (due to less fossil fuels burned for household energy needs such a cooking)	Without	Positive	Regional	Long-Term	Medium	Probable	Medium	High
	With	Positive	Regional	Long-Term	High	Probable	Medium-High	High
Costumer connections (resulting from Eskom Distribution being able to connect its new and/or existing substations to the new 400/132 kV power line)	Without	Positive	Regional	Permanent	Medium	Highly Probable	Medium	Medium
	With	Positive	Regional	Permanent	High	Highly Probable	High	High
Provision of electricity (in order to realise planning and land reform initiatives)	Without	Positive	Regional	Permanent	Medium	Highly Probable	High	Medium
	With	Positive	Regional	Permanent	High	Definite	High	Medium

Proposed mitigation measures and/or management actions are as follows:

- The maintenance and continued running of new access roads should be addressed by Eskom Transmission, affected local municipalities and landowners. New access roads should also benefit the movement of local people as much as possible.
- Encourage and allow local businesses to provide products and services such as sanitation and catering.
- To realise benefits of electricity to many communities, Eskom Distribution will need to develop and implement a macro plan for the connection of new consumers (individuals and municipal services).

Table 39 What effects will the proposed transmission line have on existing residential settlements and infrastructure including telecommunication structures?

Impact	Mitigation	Assessment (without and with mitigation)						
		Nature	Extent	Duration	Intensity	Probability	Significance	Confidence
Resettlement of homesteads (Eastern Alternative)	Without	Negative	Local	Permanent	High	Probable	High	High
	With	Negative	Local	Permanent	Medium	Probable	Medium	High
Resettlement of homesteads (Central Alternative)	Without	Negative	Local	Permanent	High	Probable	High	High
	With	Negative	Local	Permanent	Medium	Probable	Medium	High
Resettlement of homesteads (Western Alternative)	Without	Negative	Local	Permanent	High	Probable	High	High
	With	Negative	Local	Permanent	Medium	Probable	Medium	High
Resettlement of homesteads (Alternative E3)	Without	Negative	Local	Permanent	High	Probable	High	High
	With	Negative	Local	Permanent	Medium	Probable	Medium	High
Resettlement of homesteads (Alternative W1)	Without	Negative	Local	Permanent	High	Probable	High	High
	With	Negative	Local	Permanent	Medium	Probable	Medium	High
Resettlement of homesteads (Alternative C3)	Without	Negative	Local	Permanent	High	Probable	High	High
	With	Negative	Local	Permanent	Medium	Probable	Medium	High
Resettlement of homesteads (Alternative W2)	Without	Negative	Local	Permanent	High	Probable	Medium	High
	With	Negative	Local	Permanent	Medium	Probable	Medium-Low	High
Interference with existing infrastructure (roads)	Without	Negative	Local	Short-Term	Medium	Improbable	Medium	High
	With	Negative	Local	Short-Term	Low	Improbable	Low	High
Interference with existing infrastructure (telecommunications)	Without	Negative	Local	Short-Term	Medium	Improbable	Medium	High
	With	Negative	Local	Short-Term	Low	Improbable	Low	High

Impact of vulnerable groups and individuals (such as households headed by the elderly or children)	Without	Negative	Local	Long-Term	High	Probable	Medium	Medium
	With	Negative	Local	Long-Term	Medium	Probable	Low	Medium
Improved road access (as a result of the project)	Without	Positive	Local	Permanent	Medium	Definite	High	High
	With	Positive	Local	Permanent	High	Definite	High	High

Proposed mitigation measures and/or management actions are as follows:

- Deal with vulnerable groups and individuals with great sensitivity where their homesteads are likely to be relocated.
- Consult with the roads department of the affected local authority in order address the traversing of power lines along or over roads.
- Consult with the affected telecommunications sector in order to address the traversing of power lines along or over masts and similar structures.
- The maintenance and continued running of new access roads should be addressed by Eskom Transmission and affected local municipalities. New access roads should also benefit the movement of local people as much as possible.

All mitigations of the town and regional planning specialist apply (Section 6.8.5).

Table 40 Will the transmission line result in the loss of use of productive agricultural land (commercial and subsistence) and associated economic opportunities?

Impact	Mitigation	Assessment (without and with mitigation)						
		Nature	Extent	Duration	Intensity	Probability	Significance	Confidence
		Agricultural Potential						
Loss of use of productive agricultural land (mainly sugarcane and timber) (Eastern Alternative)	Without	Negative	Regional	Permanent	High	Definite	High	High
	With	Negative	Regional	Permanent	Medium-Low	Definite	Medium	High
Loss of use of productive agricultural land (mainly sugarcane and timber) (Central Alternative)	Without	Negative	Regional	Permanent	High	Definite	High	High
	With	Negative	Regional	Permanent	Medium-Low	Definite	Medium	High
Loss of use of productive agricultural land (mainly sugarcane and timber) (Western Alternative)	Without	Negative	Regional	Permanent	Medium	Definite	Medium	High
	With	Negative	Regional	Permanent	Low	Definite	Low	High
Loss of use of productive agricultural land (mainly sugarcane and timber) (Alternative E3)	Without	Negative	Regional	Permanent	Medium	Definite	High	High
	With	Negative	Regional	Permanent	Low	Definite	Medium	High
Loss of use of productive agricultural land (mainly sugarcane and timber) (Alternative W1)	Without	Negative	Regional	Permanent	Medium	Definite	High	High
	With	Negative	Regional	Permanent	Low	Definite	Medium	High
Loss of use of productive agricultural land (mainly sugarcane and timber) (Alternative C3)	Without	Negative	Regional	Permanent	Medium	Definite	High	High
	With	Negative	Regional	Permanent	Low	Definite	Medium	High
Loss of use of productive agricultural land (mainly sugarcane and timber) (Alternative W2)	Without	Negative	Regional	Permanent	Medium-Low	Definite	Medium-Low	High
	With	Negative	Regional	Permanent	Low	Definite	Low	High

Closure of farms (as a result of a decrease in agricultural output and a reduction of operating revenue) (mainly sugarcane and timber)	Without	Negative	Local	Permanent	High	Probable	Medium-High	High
	With	Negative	Local	Permanent	Medium-Low	Probable	Medium	High
Closure of mills (as a result of a decrease in agricultural output and a reduction of operating revenue) (mainly sugarcane and timber)	Without	Negative	Regional	Permanent	High	Definite	High	High
	With	Negative	Regional	Permanent	Medium	Definite	Medium	High
Damage to agricultural crops during construction activities (including the siting of construction sites)	Without	Negative	Local	Short-term	High	Probable	High	High
	With	Negative	Local	Short-term	Low	Probable	Low	High
Impact on irrigation system (the presence of the power line is likely to limit the future growth of a farm) (mainly sugarcane and timber)	Without	Negative	Regional	Permanent	Medium-High	Definite	High	High
	With	Negative	Regional	Permanent	Medium	Definite	Medium	High
Macro-Economic Assessment (without and with mitigation)								
	Mitigation	**Nature**	**Extent**	**Duration**	**Intensity**	**Probability**	**Significance**	**Confidence**
Capital expenditure	Without	Positive	National	Short-Term	Medium	Definite	High	High
	With	Positive	National	Short-Term	High	Definite	High	High
Enhancement of the quality of life and social services	Without	Positive	Regional	Permanent	Medium	Definite	Medium	High
	With	Positive	Regional	Permanent	High	Definite	High	High
Improved electricity supply to the region	Without	Positive	Regional	Permanent	Medium	Definite	Medium	High
	With	Positive	Regional	Permanent	High	Definite	High	High
Creation of employment opportunities	Without	Positive	Local	Short-Term	Medium	Definite	Medium	High
	With	Positive	Local	Short-Term	High	Definite	Medium	High

Ecological and Biodiversity benefits (due to less fossil fuels burned for household energy needs such a cooking)	Without	Positive	Regional	Long-Term	Medium	Probable	Medium	High
	With	Positive	Regional	Long-Term	High	Probable	Medium-High	High
Costumer connections (resulting from Eskom Distribution being able to connect its new and/or existing substations to the new 400/132 kV power line)	Without	Positive	Regional	Permanent	Medium	Highly Probable	Medium	Medium
	With	Positive	Regional	Permanent	High	Highly Probable	High	High

Proposed mitigation measures and/or management actions are as follows:

AGRICULTURAL IMPACTS

- If feasible, construction should take place outside the critical phases of agriculture, in particular during the final stages of pre-harvesting and during harvesting.
- Avoid agricultural land and preserve agricultural output by running the power line on low potential agricultural land and/or on boundaries of farms.
- Where possible, the servitude should be adjusted to avoid impacts on irrigation systems. If this is not possible, compensation must be paid for the disruption of or loss of use of current and future irrigation systems, including costs incurred in the relocation or re-establishment of systems.
- Eskom should revisit its policy on sugarcane-free servitudes to enable sugarcane farmers to continue with their agricultural enterprises.
- In cases of labour tenants or farm workers who have acquired land rights of a farm, they should be compensated for the impact on their land in the same way as farm owners. Where labour tenants are partly dependent on subsistence agriculture for food security, it is necessary to provide additional financial support following the construction phase (to ensure a complete recovery of agricultural production).
- Compensation for temporary loss of agricultural productivity during construction, including the loss of crops, fruit trees and grazing.
- A clear and efficient communication channel must be established between Eskom and agricultural sector including farm owners (and farm tenants, where relevant), Mills (sugarcane and forestry) and the Regional Agricultural Business Chamber.
- Use degraded, non-agricultural land for the siting of construction sites and construction-related activities (access roads, temporary waste disposal sites and working areas). Where non-agricultural land is unavailable, use low productive agricultural land.

ECONOMICS IMPACTS:

- Encourage and allow local businesses to provide products and services such as sanitation and catering.
- To realise benefits of electricity to many communities, Eskom Distribution will need to develop and implement a macro-plan for the connection of new consumers (individuals and municipal services).

All mitigations of the agricultural specialist apply (Section 6.1.4).

Table 41 How will the visual changes to the landscape affect the social and socio-economic environment?

Impact	Mitigation	Impact (without and with mitigation)						
		Nature	Extent	Duration	Intensity	Probability	Significance	Confidence
Visual intrusion by power lines (resulting in an undesired impact on the visual quality and sense of place of the environment) (Eastern Alternative)	Without	Negative	Regional	Permanent	Valley Thicket (High) Coastal Bushveld (High) Coast Hinterland (Medium) Moist Upland (Medium)	Highly Probable	Valley Thicket (Medium – High) Coastal Bushveld (Medium – High) Coast Hinterland (Medium – High) Moist Upland (Medium – Low)	Medium
	With	Negative	Regional	Permanent	Valley Thicket (High) Coastal Bushveld (High) Coast Hinterland (Medium) Moist Upland (Medium)	Probable	Valley Thicket (Medium – High) Coastal Bushveld (Medium – High) Coast Hinterland (Medium – High) Moist Upland (Medium – Low)	Medium

Visual intrusion by power lines (resulting in an undesired impact on the visual quality and sense of place of the environment) (Central Alternative)	Without	Negative	Regional	Permanent	Valley Thicket (High) Coastal Bushveld (Medium - High) Coast Hinterland (Medium) Moist Upland (Medium - High)	Probable	Valley Thicket (Medium – High) Coastal Bushveld (Medium) Coast Hinterland (Medium) Moist Upland (Medium – Low)	Medium
	With	Negative	Regional	Permanent	Valley Thicket (High) Coastal Bushveld (Medium - High) Coast Hinterland (Medium) Moist Upland (Medium - High)	Probable	Valley Thicket (Medium – High) Coastal Bushveld (Medium) Coast Hinterland (Medium) Moist Upland (Medium – Low)	Medium
Visual intrusion by power lines (resulting in an undesired impact on the visual quality and sense of place of the environment) (Western Alternative)	Without	Negative	Regional	Permanent	Valley Thicket (High) Coastal Bushveld (not applicable) Coast Hinterland (Medium) Moist Upland (Medium)	Probable	Valley Thicket (Medium – High) Coastal Bushveld (not applicable) Coast Hinterland (Medium – High) Moist Upland (Medium – Low)	Medium

	With	Negative	Regional	Permanent	Valley Thicket (High) Coastal Bushveld (not applicable) Coast Hinterland (Medium) Moist Upland (Medium)	Probable	Valley Thicket (Medium – High) Coastal Bushveld (not applicable) Coast Hinterland (Medium) Moist Upland (Medium – Low)	Medium
Visual intrusion caused by the different tower types (the type of colour and the amount of steel used in a tower has directly influence on its texture and visibility)	Without	Negative	Local	Permanent	Medium-high	Definite	High	High
	With	Negative	Local	Permanent	Medium-low	Definite	Medium	High
Loss of tourism-related employment (as a result of a closure of tourism businesses)	Without	Negative	Local	Long-Term	High	Probable	Medium	Medium
	With	Negative	Local	Long-Term	Medium	Probable	Medium	Medium
Reduced GGP from eco-tourism sector	Without	Negative	Regional	Long-Term	Medium	Probable	Medium	Medium
	With	Negative	Regional	Long-Term	Low	Probable	Medium	Medium

Proposed mitigation measures and/or management actions are as follows:

- Keep the construction area to a strict minimum.
- Clearing of the full servitude should be avoided. If stripping is required, then vegetation stripping should be undertaken in a manner where the edges are organic or curvilinear rather than straight or sharp-edged.
- 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.
- With regards to the selection of tower types (viz. strain towers, guyed-V towers and cross-roped towers), particular attention must be paid to conservation, tourism, eco-tourism and associated activities, and potential effects on sense of place. For example, strain towers contain considerably more steel than the cross-rope suspension pylons and are more visible in the landscape.
- Use grey colours on towers to neutralise the colour texture and to blur the form against landscape and sky.

All mitigations of the visual specialist apply (Section 6.9.4).

Table 42 Are the proposed route corridors compatible with town planning initiatives (Integrated Development Plans, Spatial Development Plans and other initiatives)?

Impact	Mitigation	Assessment (without and with mitigation)						
		Nature	Extent	Duration	Intensity	Probability	Significance	Confidence
Incompatibility of planning initiatives (SDFs and IDPs)	Without	Negative	Regional	Permanent	High	Probable	High	Medium
	With	Negative	Regional	Permanent	Medium	Probable	Medium	Medium
Incompatibility of land reform initiatives (settlements and agricultural development)	Without	Negative	National	Permanent	High	Probable	High	Medium
	With	Negative	National	Permanent	Medium	Probable	Medium	Medium
Provision of electricity (in order to realise planning and land reform initiatives)	Without	Positive	Regional	Permanent	High	Highly Probable	High	Medium
	With	Positive	Regional	Permanent	High	Definite	High	Medium

Proposed mitigation measures and/or management actions are as follows:

- 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.
- A clear and efficient communication channel must be established between Eskom and the Department of Land Affairs (provincial and national spheres) in order to address potential incompatibilities with present and future land use.
- To realise benefits of electricity to many communities, Eskom Distribution will need to develop and implement a macro plan for the connection of new consumers (individuals and municipal services).

All mitigation measures from the town and regional planning specialist study apply (Section 6.8.5).

Table 43 What effects will the transmission line have on the natural environment (flora species) and natural areas worthy of protection and conservation?

Impact	Mitigation	Assessment (without and with mitigation)						
		Nature	Extent	Duration	Intensity	Probability	Significance	Confidence
Loss of flora habitat and species (due to the establishment of access roads, construction camps, tower sites and the servitude centre line track)	Without	Negative	Regional	Permanent	High	Definite	High	High
	With	Negative	Regional	Long-Term	Medium	Definite	Medium	High
Poaching	Without	Negative	Local	Short-Term	High-Medium	Probable	High-Medium	Medium
	With	Negative	Local	Short-Term	Medium	Probable	Medium	Medium
Fire	Without	Negative	Local	Short-Term	High-Medium	Probable	High-Medium	Medium
	With	Negative	Local	Short-Term	Medium	Probable	Medium	Medium
Change of vegetation structure	Without	Negative	Local	Long-Term	High-Medium	Highly Probable	High-Medium	Medium
	With	Negative	Local	Long-Term	Medium	Highly Probable	Medium	Medium
Alien infestation	Without	Negative	Local	Long-Term	High-Medium	Probable	High-Medium	High-Medium
	With	Negative	Local	Long-Term	Medium	Probable	Medium	High-Medium
Impact on formal conservation areas (Vernon Crookes)	Without	Negative	Regional	Permanent	Medium	Improbable	Low	High
	With	Negative	Regional	Permanent	Low	Improbable	Low	High
Impact on formal conservation areas (Oribi Gorge)	Without	Negative	Regional	Permanent	High	Definite	High	High
	With	Negative	Regional	Permanent	Medium	Definite	Medium	High

Proposed mitigation measures and/or management actions are as follows:

- Appoint an independent and suitable experienced Environment Control Officer to ensure compliance with the mitigation measures and/or management actions.
- Appoint 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 Floral Specialist Report (Appendix 6).
- If feasible, all construction activities should take place during the drier periods of the year.
- Construction personnel must be inducted on wild animal awareness and safety, including issues such as poaching.
- Develop a Fire Safety and Response Plan to deal with accidental fires and to address training requirements and reporting procedures.
- Where the sensitivity of the environment is high (for example, working near a wetland, river, natural forest or pristine vegetation), consider the environmental footprint of the different tower types and select tower types that have lower environmental footprint such as a Guyed-V and the cross-roped suspension tower.

All mitigation measures from the Floral Specialist Study apply (Section 6.5.2).

Table 44 What effects will the transmission line have on the natural environment (faunal species) and natural areas worthy of protection and conservation?

Impact	Mitigation	Assessment (without and with mitigation)						
		Nature	Extent	Duration	Intensity	Probability	Significance	Confidence
Impact on faunal habitat (habitat disturbance and loss)	Without	Negative	Regional	Long-Term	Medium-High	Highly Probable	High	High
	With	Negative	Regional	Long–Term	Medium	Highly Probable	Medium	High
Direct impacts on faunal species	Without	Negative	Regional	Long–Term	Medium-High	Highly Probable	High	High
	With	Negative	Regional	Long–Term	Medium	Highly Probable	Medium	High
Impact on the natural environment (waste generation and alien species infestation)	Without	Negative	Regional	Long-Term	Medium-High	Probable	High	High
	With	Negative	Regional	Long-Term	Medium	Probable	Medium	High

Proposed mitigation measures and/or management actions are as follows:

- The construction personnel must undergo safety and awareness training on wild animals, including rescue and poaching.
- Where possible, use existing access roads as much as possible.
- 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 day light. 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 timeframe.

All mitigation measures from the faunal specialist study apply (Section 6.4.2).

Table 45 What effects will the transmission line have on avi-fauna (birds)?

Impact	Mitigation	Assessment (without and with mitigation)						
		Nature	Extent	Duration	Intensity	Probability	Significance	Confidence
Collisions	Without	Negative	Local	Permanent	High	Definite	High	High
	With	Negative	Local	Permanent	Medium	Definite	Medium	High
Electrocutions	Without	Negative	Local	Permanent	Medium	Probable	Medium-Low	High
	With	Negative	Local	Permanent	Low	Probable	Low	High
Electrical faults caused by birds interfering with the power line	Without	Negative	Local	Short-Term	High	Probable	High	High
	With	Negative	Local	Short-Term	Low	Improbable	Low	High
Habitat loss	Without	Negative	Local	Permanent	High-Medium	Definite	High	High
	With	Negative	Local	Permanent	Medium	Definite	Medium	High
Avi-faunal impacts (Alternative E3)	Without	Negative	Local	Permanent	Medium	Probable	Medium	High
	With	Negative	Local	Permanent	Low	Probable	Medium-Low	High
Avi-faunal impacts (Alternative W1)	Without	Negative	Local	Permanent	High	Definite	High	High
	With	Negative	Local	Permanent	High-medium	Definite	High-medium	High
Avi-faunal impacts (Alternative C3)	Without	Negative	Local	Permanent	High	Definite	High	High
	With	Negative	Local	Permanent	High-medium	Definite	High-medium	High
Avi-faunal impacts (Alternative W2)	Without	Negative	Local	Permanent	High	Definite	High	High
	With	Negative	Local	Permanent	High-medium	Definite	High-medium	High

Proposed mitigation measures and/or management actions are as follows:

- The construction personnel must undergo safety and awareness training on wild animals, including birds.
- Keep construction activity-related noise and lighting to a minimum.
- Bird flappers and bird guards should be installed in bird sensitive areas, as advised by the avi-faunal specialist.

All mitigation measures from the avi-faunal specialist study apply (Section 6.2.2).

Table 46 What effects will the transmission line have on cultural and heritage resources?

Impact	Mitigation	Assessment (without and with mitigation)						
		Nature	Extent	Duration	Intensity	Probability	Significance	Confidence
Disturbance and/or damage to heritage resources during construction	Without	Negative	Regional	Short-Term	Medium-High	Probable	Medium-High	Medium
	With	Negative	Regional	Short-Term	Medium	Improbable	Medium	Medium
Disturbance and/or damage to heritage resources during operation	Without	Negative	Regional	Long-Term	Medium-High	Probable	Medium-High	Medium
	With	Negative	Regional	Long-Term	Medium	Improbable	Medium	Medium
Visual intrusion of power lines (resulting in negative impacts on the visual and aesthetic character of the environment)	Without	Negative	Regional	Permanent	Medium-High	Definite	High	Medium
	With	Negative	Regional	Permanent	Medium	Definite	Medium	Medium
Resettlement of culturally-sensitive and historically-important homesteads and settlements	Without	Negative	Regional	Permanent	Medium-High	Probable	High	High
	With	Negative	Regional	Permanent	Medium	Probable	Medium	High
Impact on the living heritage	Without	Negative	Regional	Long-Term	Medium-High	Improbable	Medium	Medium
	With	Negative	Regional	Long-Term	Medium	Improbable	Low	Medium

Proposed mitigation measures and/or management actions are as follows:

- Mitigation will vary from sampling, surveying, mapping and excavations to determine the significance of the impact.
- Avoid and/minimise visual impacts on tourism-related cultural heritage sites.
- No disturbance to cemeteries. In cases where human remains are found outside recognised cemetery sites during construction, the heritage authority must be informed immediately, KZN Heritage Authority.
- A management plan will need to be evaluated and approved by the provincial heritage authority, KZN Heritage Authority.
- Due to the limited footprint of transmission line towers, it is mostly possible to avoid disruption of heritage resources by responsible tower placement, thus, spanning the resource or avoiding it through a buffer/no-go area. It is more difficult to avoid landscape heritage resources (such as religious sites), as these can cover much larger areas.

Mitigations provided by the Cultural Heritage specialist also apply (Section 6.6.2).

Table 47 Assessment of cumulative impacts

Impact	Assessment					
	Extent	Duration	Intensity	Probability	Significance	Confidence
Positive						
Positive economic and financial impacts during construction and operation. Access to electricity being a catalyst for social and economic development, and growth	Regional	Long-Term	Medium	Highly Probable	Medium	High
Income derived from new and existing business enterprises	Regional	Long-Term	Low	Probable	Low	Medium
Improved and better community security (lighting)	Regional	Long-Term	Medium	Probable	Medium	Medium
Improved basic services (water provision and sanitation)	Regional	Long-Term	Medium	Probable	Medium	Medium
Improved social infrastructure and services (schools, clinics)	Regional	Long-Term	Medium	Probable	Medium	Medium
Negative						
Urban sprawl and urbanisation	Regional	Long-Term	Medium	Probable	Medium	Low
Loss of use of agricultural land	Regional	Permanent	Medium	Highly Probable	High	Medium
Closure of farms (as a result of a loss of farm income)	Regional	Permanent	High	Improbable	High	Low
Closure of sugarcane and timber mills (as a result of low cane and timber products outputs)	Regional	Permanent	High	Improbable	High	Low
An increase in unemployment (as a result of loss of farm and mill jobs), creating a financial and emotional strain of families	Regional	Permanent	High	Improbable	High	Low
The displacement and/or loss of wildlife	Regional	Short-Term	Medium	Probable	Medium	Medium
Damage and/or loss of conservation-worthy plants	Regional	Short-Term	Medium	Probable	Medium	Medium
Erosion and pollution	Regional	Short-Term	Medium	Highly Probable	High	Medium
The transformation of sensitive areas (rivers, wetlands and streams)	Regional	Permanent	Medium	Probable	High	Medium
An increase in the spread of human-related illnesses and diseases (STDs, in particular, HIV/AIDS)	Regional	Short-Term	High	Highly Probable	High	High

8.2 Summary of the key outcomes of impact assessment and alternative preferences by specialists

The following section provides a summary of key outcomes of the impact assessment and a preferred alternative or a combination of preferred alternatives.

- Agriculture is an important land use within the study area, and is likely to be impacted on by all corridor alternatives. Within the Eastern and Central Alternatives, land use is predominantly agriculture (sugarcane and forestry). The affected towns and settlements include Harding, Nqabeni, Paddock, Plains, uMzumbe, Hibberdene, Ifafa, Sawoti, uMzinto, Scottsburg, Mid-Illovo and Eston areas. In the Harding, Eston and Mid-Illovo areas, all three major corridor alternatives (Western, Central and Eastern) traverse commercial agricultural land. As a result, Alternatives E3 and W2 were included in this environmental assessment.
- Furthermore, sections of the Western Alternative, particularly within Traditional Authority land (uMkomazi and uMzimkhulu Valleys), have a relatively less commercial agricultural land. These areas are largely comprised of rural land with subsistence farming including pockets of sugarcane land and forestry plantations. From an agricultural perspective, a combination of the Western Alternative, Alternative E3 and Alternative W2 is the preferred option. However, the final placement of a powerline and towers should take into consideration, and allow for the continuation of, existing and future proposed agriculture.
- From a macro-economic perspective, the agricultural economics specialist found that the rural hinterland areas of the study area will benefit from the project. This is because of the level of unemployment and electricity needs are higher in these areas.
- Vernon Crookes and Oribi Gorge Nature Reserves are key conservation areas in the area. The avi-faunal and faunal specialists noted that the Eastern and Central Alternatives traverse in close proximity to Vernon Crookes NR and through the Oribi Gorge NR along an existing Eskom distribution powerline. The avi-fauna specialist noted that the proposed transmission powerline will also traverse areas that are recognised as Important Bird Areas (Oribi Gorge) and Sensitive Blue Swallow Areas (The Ridges near Eros Sub-station, and Baynesfield near Ariadne Sub-station). As such, the avi-faunal specialist prefers a combination of the Western Alternative and Alternative E3. Alternative W2 (Joints U-V-W and Eros Sub-station) is not preferred corridor alternative as it traverses a Sensitive Blue Swallow Area.
- From a vegetation (flora) perspective, the level of transformation within the study revealed that high irreplaceability values are frequently encountered along the Western and Central Alternatives, as compared to the Eastern Alternative. On the contrary, the highest degree of landscape transformation tends to occur along Eastern Alternative, where agriculture and urban development (including existing utility servitudes such as roads and power lines) dominate except in the Oribi Gorge area, which as regarded as key ecological component of the provincial-wide conservation plan.
- The heritage specialist noted that the need for and establishment of access roads will have the greatest impact on these resources on the Western Alternative, in particular in the hinterland areas between Ariadne-Oribi Sub-stations. The Eastern Alternative has the least requirement for new access roads and, from a visual quality perspective; a large section of the receiving environment is highly transformed by urban and agricultural land uses. Also, Eskom Distribution has an existing 88 kV power line (running between Eros-Oribi-uMzinto and onto the Illovo area) within this corridor. However, as noted by the visual specialist, the relatively low flat lands within this corridor provide a low visual absorption capacity.

- The heritage specialist furthermore noted that the Central and Western Alternatives traverse large areas under traditional authority administration. This could pose a challenge in finding a suitable servitude.
- The social specialist noted that due to the vulnerable social environment, particularly within the rural regions of the study area, social change processes are likely to have a relatively greater impact in the rural areas. These could include negative impacts such as resettlement, segregation, in-migration of job seekers, deviant social behaviour and health impacts. Some of the positive impacts would include empowerment, capacity building through skilling and training, electrification of homes and the general improvement of living standards. From a social developmental perspective, and from the overwhelmingly positive feedback received from stakeholders within the rural regions, the benefits of the project outweigh the negative impacts, subject to the implementation of the recommended mitigation measures. The social specialist therefore prefers the Western Alternative, Alternative E3 and Alternative W2.
- From a town and regional planning perspective, the Western Alternative was found to have the least potential negative impacts on present and future developmental perspective and is thus seen as the most preferred choice of the three major corridor alternatives. In terms of impacts on settlements, including the possibility of resettlement of homes and homesteads, the Western Alignment (followed by the Central Alignment) has the highest number of settlements. This is likely to influence the placement of the final servitude.
- It was furthermore noted by the town and planning specialist that there is a high number of land claims within the study. This is likely to influence the servitude negotiation process between Eskom Transmission and the affected landowners.
- From a visual and aesthetics perspective, the intensity of the visual impact on the Eastern alignment alternative is considered to be high for both construction and operation due to the relatively flat and open landscape that provide a low visual absorption capacity. The hinterland areas (Western alternative, and to lesser extent on the Central alternative) are characterised by varied topography with deep valleys and more prominent rolling hills. This provides a high visual absorption capacity for transmission line infrastructure.

Table 48 provides a summary of the outcomes of the impact assessment and the significance of key impacts.

Subject to the implementation of mitigation measures (Chapters 6 and 8), the preferred corridor alternative is a combination of the following alternatives (Figure 29):

- **Alternative E3 (Ariadne Sub-station and Joints A-B-C-D-E-F-G).**
- **Western Alternative (Joints G-H-Q-U-X and Eros Sub-station).**

However, it is important to note the following concerns that were raised by the floral and heritage specialists with respect to the above-mentioned preferred alignment alternative:

- The floral and heritage specialists prefer a combination of the Eastern Alternative (Ariadne Sub-station and Joints C-E-L-K), Central Alternative (Joints K-N-P-Q) and Western Alternative (Joints Q-U-X and Eros Sub-station).
    - From a flora perspective, the level of transformation within the study area revealed that high irreplaceability values are frequently encountered along the Western and Central Alignments, in particular along and near coastline.

- From a heritage perspective, the Eastern Alternative has the least requirement for new access roads and, from a visual quality perspective; a large section of the receiving environment is highly transformed by urban and agricultural land uses.

The careful finalisation of the servitude within the Western Alternative and Alternative E3 would minimise the negative consequences of the project. By running the servitude within transformed/disturbed land and suitable agricultural areas (where powerlines will have low or no negative effects on agriculture) and the micro-positioning or micro-siting[47] of towers, this can address most concerns raised by the floral and heritage specialists.

The above-mentioned preferred alignment alternative will be motivated for environmental authorisation by DEA.

[47] During micro-siting, a number of aspects are taken into consideration including geotechnical feasibility, site accessibility, tower assembly, land use and proximity to existing infrastructure and developments.

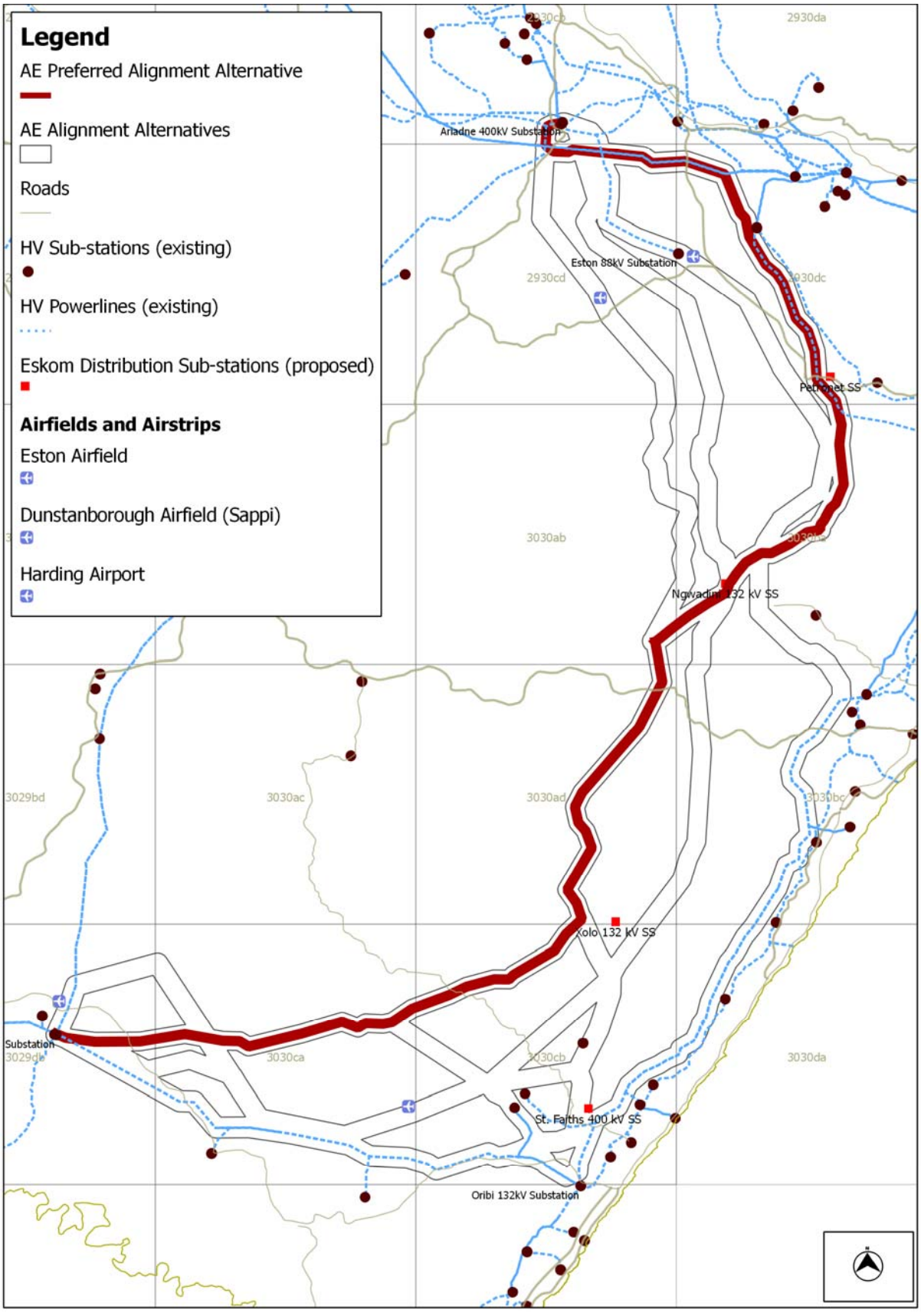
Table 48 Preference of alignment alternatives by specialists

Specialist	Major Alignment Alternatives			Minor Alignment Alternatives							
	Western	Central	Eastern	W1	W2	C1	C2	C3	E1	E2	E3
Agricultural Economics	■				■						■
Avi-fauna	■				**'No-go'**						■
Fauna	■										
Flora[48]	■										
Heritage[49]	■										
Social	■				■						■
Town and Regional Planning	■										
Visual	■										

[48] The floral and heritage specialists both recommended a combination of the Eastern and Western Corridor Alternatives (Section 8.2). However, through the careful selection and mapping of the final servitude, significant negative impacts would be reduced. This includes the running the servitude within transformed land and suitable agricultural land (where powerlines will have less or no negative effects on agriculture) and the micro-positioning or micro-sitting.

[49] Same as above.

Figure 29 A map illustrating the configutation of preferred corrdifor alternative



9. ENVIRONMENTAL IMPACT STATEMENT

The Environmental Impact Assessment undertaken for the proposed Ariadne-Eros Transmission Line project has fulfilled the NEMA regulatory requirements, with great steps having been taken to provide all interested and affected parties the opportunity to participate in the identification of project alternatives and issues that require investigation.

Key issues identified in Scoping (**Chapter 7**) informed the specialist studies (**Chapter 6**) from which project alternatives (**Chapter 3**) and potential impacts were investigated and mitigation measures recommended (**Chapter 8**).

By their nature, the construction and operation of transmission lines will have a negative effect on the environment. However, when appropriate mitigation measures are implemented, the intensity of impacts is reduced. Taking due cognisance of the three primary dimensions that constitute the environment (viz. the biophysical, social and economic dimensions), the preferred corridor alternative is a combination of the Western Alternative and Alternative E3.

The impact of the proposed power line on the Eastern and Central alignment alternatives has been shown to be of medium and medium-high significance in certain areas. The latter includes ecologically-sensitive areas such the Oribi Gorge Nature Reserve. Other key factors which were taken into consideration during the comparative assessment of alternatives include: the resettlement of homesteads, the loss of use of productive agricultural land (mainly sugarcane and forestry due to serviture requirements), the resulting consequences from the loss of agricultural production (job losses and the possible closure of mills), the visibility of the power lines, socio-economic benefits of electricity and the justification for a new transmission power line in the region. The probability for a reduction of agricultural production is a major concern on all three major alternatives (Eastern, Central and Western). However, by comparison, the intensity of the impact on the Western Alternative and Alternative E3 will be lower as the percentage of land use classified or classed as agriculture is lower.

In particular, a number of stakeholders raised concerns about the loss of the use of productive agricultural land within commercial farming areas (Eston, Mid Illovo, Sawoti, Harding and others) and the potential impacts on mills. Although it is Eskom Transmission's present policy to establish sugarcane-free servitudes, it is recommended that, where feasible, sugarcane cultivation is allowed to continue subject to agreement with Eskom. This will require cane farmers to green-trash instead of burning. However, given that green-trashing is not feasible throughout the study area, an alternative would be for Eskom to reconfigure tower placement (closer together) or tower height (higher) to enable cane farmers to burn underneath the transmission lines.

Eskom Transmission is open to green-trashing and has been in discussion with cane growers. An important aspect with regard to continued cultivation of sugarcane under transmission lines is that where green-trashing is practiced, landowners (cane growers) must play their part by not burning sugarcane under the lines, which puts the security of supply at risk and damages infrastructure.

ACER, therefore, recommends environmental authorisation for the construction of the multi-circuit transmission line within the Western Alignment and Alternative E3, and associated activities, with the following conditions:

- Deal with vulnerable groups and individuals with great sensitivity where their homesteads are likely to be relocated.
- Consult with the roads department of the affected local authority in order address the traversing of the transmission lines along or over roads.
- Consult with the affected telecommunications sector in order to address the traversing of transmission lines along or over masts and similar structures.
- The maintenance and continued running of new access roads should be addressed by Eskom Transmission and affected local municipalities. New access roads should also benefit the movement of local people as much as possible.
- If feasible, construction should take place outside the critical phases of agriculture, in particular, during the final stages of pre-harvesting and during harvesting.
- Avoid agricultural land and preserve agricultural output by running the transmission line on low potential agricultural land and/or on boundaries of farms.
- Where possible, the servitude should be adjusted to avoid impacts on irrigation systems. If this is not possible, compensation must be paid for the disruption of or loss of use of current and future irrigation systems, including costs incurred in the relocation or re-establishment of systems.
- Eskom should revisit its policy on sugarcane-free servitudes to enable sugarcane farmers to continue with their agricultural enterprises.
- In cases of labour tenants or farm workers who have acquired land rights of a farm, they should be compensated for the impact on their land in the same way as farm owners. Where labour tenants are partly dependent on subsistence agriculture for food security, it is necessary to provide additional financial support following construction (to ensure a complete recovery of agricultural production).
- Compensation for temporary loss of agricultural productivity during construction, including the loss of crops, fruit trees and grazing.
- A clear and efficient communication channel must be established between Eskom and agricultural sector including farm owners (and farm tenants, where relevant), Mills (sugarcane and forestry) and representative agriculture for the region.
- Encourage and allow local businesses to provide products and services such as sanitation, catering and goods and services.
- To realise benefits of electricity to many communities, Eskom Distribution will need to develop and implement a macro plan for the connection of new consumers (individuals and municipal services).
- Keep the construction area to a strict minimum.
- Clearing of the full servitude should be avoided. If stripping is required, then vegetation stripping should be undertaken in a manner where the edges are organic or curvilinear rather than straight or sharp-edged.
- 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.

- A clear and efficient communication channel must be established between Eskom and the Department of Land Affairs (provincial and national spheres) in order to address potential incompatibilities with present and future land use (as applicable under the Land Reform Programme).
- To realise benefits of electricity to many communities, Eskom Distribution will need to develop and implement a macro plan for the connection of new consumers (individuals and municipal services).
- Avoid bird sensitive areas and, where the need is indicated, use bird flappers and bird guards on conductors and towers, respectively.
- Appoint an independent and suitable experienced Environment Control Officer to ensure compliance with the mitigation measures and/or management actions.
- Appoint 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.
- If feasible, all construction activities should take place during the drier periods of the year.
- Construction personnel must be inducted on wild animal awareness and safety, including issues such as poaching.
- Develop a Fire Safety and Response Plan to deal with accidental fires and to address training requirements and reporting procedures.
- The construction personnel must undergo safety and awareness training on wild animals, including rescue and poaching.
- Where possible, use existing access roads as much as possible.
- 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 day light. 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 timeframe.
- Keep construction activity-related noise and lighting to a minimum.
- For cultural heritage resources, mitigation will vary from sampling, surveying, mapping and excavations to determine the significance of the impact.
- Avoid and/minimise visual impacts on tourism-related cultural heritage sites.
- No disturbance to cemeteries. In cases where human remains are found outside recognised cemetery sites during construction, the heritage authority must be informed immediately, KZN Heritage Authority.
- A management plan will need to be evaluated and approved by the provincial heritage authority, KZN Heritage Authority.

All mitigation measures as recommended by specialists apply (**Chapters 6 and 8**).

10. OPINION ON ACTIVITY AUTHORISATION AND ASSOCIATED CONDITIONS

It is the opinion of the EAP that the proposed transmission line and associated components (turn-ins, and upgrading and expansion of the Ariadne and Eros Sub-stations) should be authorised based on a thorough environmental impact assessment process which included comprehensive public participation and detailed specialist studies.

The following conditions form part of this opinion:

- All recommended mitigation measures and/or management actions contained in Chapters 6 and 8 are carried forward in the implementation of the project.
- A comprehensive servitude negotiation process be carried out by the applicant following this environmental process. With respect to individual farms, this negotiation process should involve both the affected landowners and farm labourers or tenants (where relevant, and as guided by existing legislation, for example, legislation dealing with land tenure and restitution).

All comments and additional information received during the comment period on the Draft[50] and Revised Draft[51] EIA Reports have been included into a Final Environmental Impact Report which will be submitted to the competent authority, DEA, and the provincial environmental authority, DEARD (as commenting authority in this instance), for review and final decision-making.

[50] The commeting period on the Draft EIAR extended from 06 March 2010 to 23 April 2010.
[51] The commeting period on the Revised Draft EIAR extended from 29 October 2010 to 29 November 2010.

11. REFERENCES

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APPENDIX 1: EIA APPLICATION

APPENDIX 2: PUBLIC PARTICIPATION DOCUMENTATION

APPENDIX 3: ISSUES AND RESPONSE REPORT

APPENDIX 4: STAKEHOLDER DATABASE

APPENDIX 5: PLATES

APPENDIX 6: SPECIALIST STUDIES

APPENDIX 7: ADDENDA TO SPECIALIST STUDIES

APPENDIX 8: DRAFT ENVIRONMENTAL MANAGEMENT PLAN

APPENDIX 9: AE LOCALITY MAP