ESKOM TRANSMISSION

EIA for the Proposed Thyspunt Transmission Lines Integration Project

Biodiversity Impact Assessment (Northern Corridor)

Issue Date: 8th June 2011
Revision No.: 1
Project No.: 9520

Date:	8th June 2011
Document Title:	EIA for the Proposed Thyspunt Transmission Lines Integration Project: Biodiversity Impact Assessment (Northern Corridor)
Author:	Faith Kalibbala
Revision Number:	1
Checked by:	Liesl Koch
Approved:	Liesl Koch
Signature:	
For:	ESKOM TRANSMISSION

ESKOM TRANSMISSION

PROPOSED THYSPUNT TRANSMISSION LINES

BIODIVERSITY IMPACT ASSESSMENT - NC

Contents **Page**

List of Figures

List of Tables

Appendices

Appendix A: EIA Phase Flora Report by Coastec, 2010
Appendix B: CBA Maps
Appendix C: Large Biodiversity Maps

ESKOM TRANSMISSION

PROPOSED THYSPUNT TRANSMISSION LINES

BIODIVERSITY IMPACT ASSESSMENT - NC

1 INTRODUCTION

1.1 Background

SiVEST have been appointed by Eskom to undertake a specialist Biodiversity Assessment for the proposed Eskom Transmission lines and substation in the Eastern Cape associated with the Thyspunt Nuclear 1 power station. These studies form part of a wider Environmental Impact Assessment that needs to be undertaken by the project proponent to identify and assess all the potential environmental impacts associated with the proposed project. The Scoping phase has been completed and this report presents the EIA phase Biodiversity studies.

Two corridors, each with various routing options have been suggested in the study. Separate reports have been prepared for the project as three separate applications have been submitted to the Department of Environmental Affairs (DEA) (formally known as Department of Environmental Affairs and Tourism (DEAT)). Reports have been submitted for the Southern and Northern Corridors whilst the New Transmission Substation has been included within the Southern Corridor assessment as the site falls within this corridor (Figure 1).

This report identifies and addresses possible biodiversity (floral and faunal) impacts and therefore informs the preferred route alignment for the Northern Corridor. The study also aims to identify sensitive areas from a biodiversity perspective and identify the potential presence of Red Data species.

The study area is located within the Cape Floristic Region (CFR). The CFR, the richest floristic region in Africa, is exceptionally rich in species diversity, with up to 9,600 species of vascular plants, over 6,200 i.e. 69% of which are found nowhere else (Conservation International- www.biodiversityhotspots.org, 2009). The CFR is characterised by a diverse variety of fynbos vegetation which includes restios, ericas and proteas. Non-fynbos species are also present of which Renosterveld is the most extensive. Renosterveld is characterised by a low shrub layer which is usually dominated by the renosterbos (*Elytropappus rhinocerotis*).

The study area also falls within the boundaries of the Subtropical Thicket Ecosystem Planning (STEP) area. STEP is a bioregional programme for the part of South Africa where thicket is the most common natural vegetation. STEP covers areas stretching from Riversdale in the Western Cape to the Kei River in the Eastern Cape. STEP was established to promote the sustainable management of the unique and diverse biodiversity of this area (Pierce & Mader, 2006).

According to the STEP Programme (Cowling *et al* 2003), the fauna of the STEP planning domain, although diverse, does not demonstrate the level of endemism as shown by the flora. Biodiversity within the study area is threatened by:

- Crop farming
- Livestock farming (especially dairy)
- Commercial plantation forestry
- Alien plant invasion
- Urban development
- Resort development

The study area is dominated by the thicket biome. Several faunal species still inhabit the areas covered by the study although it is mainly small animals which contribute to animal diversity as many larger animals no longer survive outside protected areas (Pierce & Mader, 2006).

An important goal of the STEP programme is to maintain movement areas i.e. corridors between high biodiversity areas and especially protected areas. Two major corridor systems which have been proposed fall within the study area; the Baviaanskloof Megareserve and the Addo – Camdeboo Corridor. The Baviaanskloof has been identified as a priority area in the Cape Floristic Region (CFR) by the Cape Action for People and the Environment (CAPE) as suitable for the establishment of a megareserve (Skowno, 2008).

1.2 Project Description

1.2.1 Technical Project Description

Two corridors have been proposed for the Transmission lines (Figure 1). Each corridor is unique, the details of which is described below:

- **Proposed Northern Corridor:** 3 x 400kV Transmission power lines

- 3x 400kV Transmission power line from Thyspunt past Uitenhage to Eskom's existing Grassridge Transmission Substation
- 2x 400kV Transmission power lines from the Grassridge Substation to the Dedisa Transmission Substation

- **Proposed Southern Corridor:** 2 x 400kV Transmission power lines
- 2x 400kV Transmission power lines from Thyspunt to the newly proposed Port Elizabeth Transmission Substation
- 2x 400kV Transmission power lines from the newly proposed Port Elizabeth Transmission Substation to Eskom's existing Grassridge Transmission Substation

- Proposed new Port Elizabeth Transmission Substation location
- Two sites for the new PE Substation are proposed; in the Fitches Corner Area and in the area between Despatch and KwaNobuhle.
- The minimum size (footprint) of the proposed Port Elizabeth Transmission Substation site is 320m x 230m, which needs to accommodate:
- Four (4) 400kV Transmission power lines exiting the proposed substation
- Three (3) 400/132kV transformer bays; and
- Eight (8) 132kV feeder bays.

- Proposed upgrade of Eskom's existing Grassridge and Dedisa Transmission Substations
- These upgrades include the associated infrastructure required to integrate the proposed new substation into Eskom's Electricity Transmission grid (including the construction of service/access roads, the construction of a communication tower at the substation sites, etc).
- Additional feeder bays to accommodate additional lines.

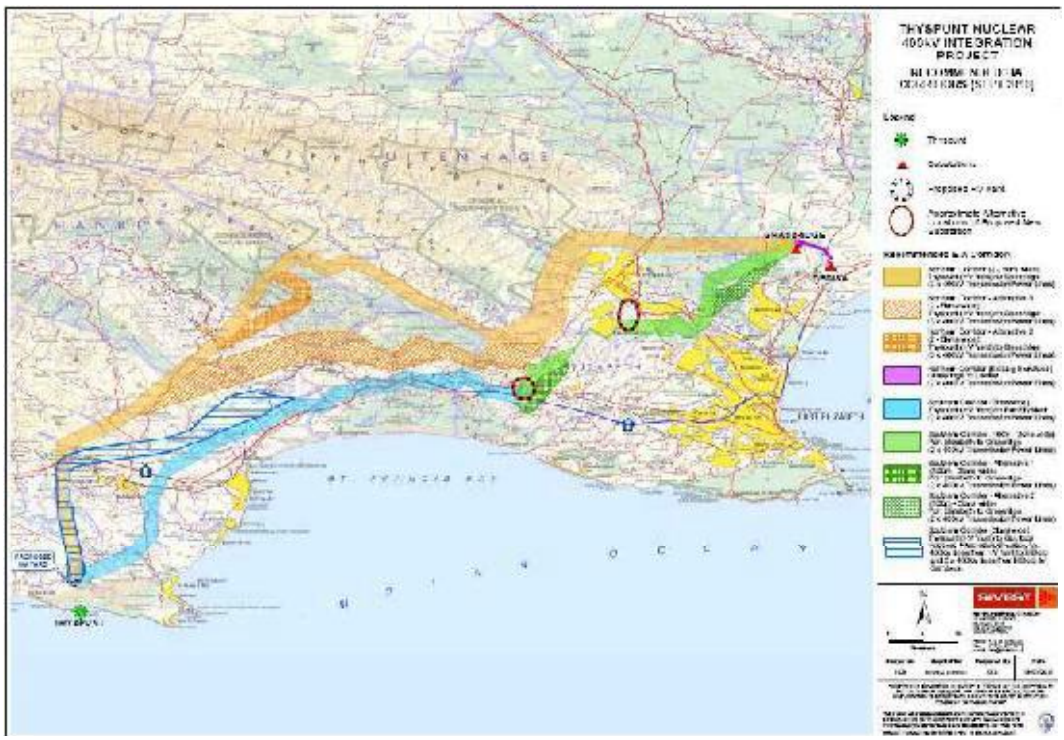

Figure 1: Locality Map- Northern and Southern Corridors and Substation

*** Please note that all maps have been included in larger format in Appendix D**

It is important to note that these corridors (Northern and Southern) are not alternatives to each other, as both are anticipated to be utilised by Eskom to carry a total of 5 X 400kV lines from the proposed nuclear power station. Rather, the corridors will provide adequate space for a number of potential alternative alignments to be located within them. There are certain points along the corridors where the corridors have been narrowed to 100m and to 2km to avoide sensitive areas. In other areas it has been widened to 5km to facilitate alternative route alignment. In a section of the Northern Corridor two alternatives exist. There are also three sections along the Southern Corridor with alternatives.

Two separate and independently operated transmission line corridors are proposed as a risk aversion factor, i.e. in order to guarantee the electricity supply from the proposed Thyspunt Nuclear Power Station should the transmission lines in one of the corridors become non-operational, the electricity supply from the proposed power station would be guaranteed.

- The proposed corridors in which proposed route alternatives were identified during the EIA phase are between 100m and 5km wide. During the EIA phase potential negative and/or positive biodiversity, social and socio-economic impacts were assessed.

- In terms of Eskom standards, a single 400kV line will require a servitude of 55m in width.
- Assuming the Northern Corridor has 3 lines in it – this will be a total of 165m wide.
- Assuming the Southern Corridor has 2 lines in it – this will be a total of 110m wide.
- The study area (as indicated in Figure 1 above) indicates the boundary for the identification of stakeholders and for specialists to undertake their environmental studies for this proposed TTLIP.
- Currently it is proposed (but not finalized) that the Guyed Suspension type tower will be used (Figure 2). This tower is approximately 50m in height. The total footprint area required for each tower is 80m x 50m. A diagram of the proposed tower is indicated below.
- Strain towers will also be used (A strain tower is a larger tower utilised in bends and where reinforcement is required with regards to tower stability).

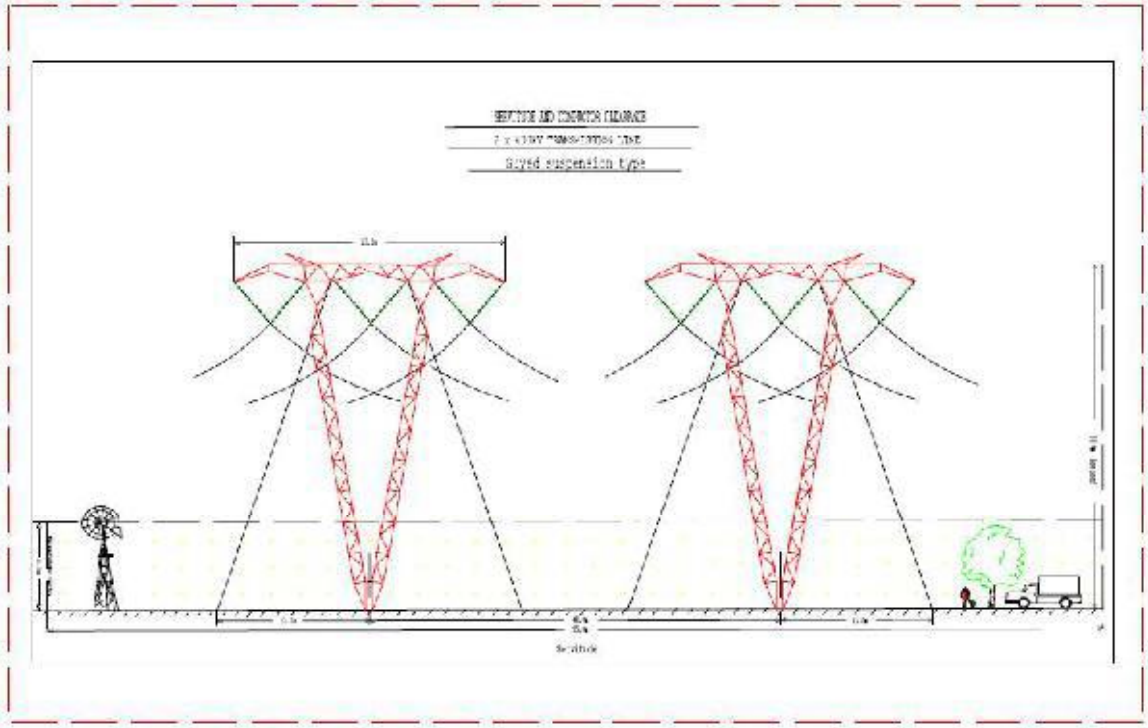

Figure 2: Diagram of Guyed Suspension Type Tower

- In most cases the land beneath the overhead lines can be used, as normal, by the landowners. Eskom, however, require that no dwellings or vegetation/crops higher than 4m be established within the servitude.
- Minimum servitude width for each line will be 55m.

1.2.2 Route Description (Northern Corridor)

The Northern Corridor exits the High Voltage (HV) yard associated with the proposed Thyspunt Power Station to the north of the transverse dunes and moves in a northerly direction towards Humansdorp. The corridor crosses the unsurfaced road between Oyster Bay and Humansdorp in the vicinity of the Farm Kleinrivier. The corridor crosses the steeply incised Krom River Valley at the Farm Elandsjagt (downstream of the Impofu Dam) and then crosses the Geelhoutboom River at the Farm Platjesdrift. The corridor crosses R102 and then the Seekoei River and in the vicinity of the farm Geelhoutboom and a small portion of the farm Platjesdrift to the west of Humansdorp. The corridor continues in a northerly direction further traversing the farm Geelhoutboom and across N2 and some hilly terrain to the north of the highway on the farm Pampoensland Rivier. At the farm Pampoensland Rivier, the Corridor turns in a north-easterly direction crossing R332 and some hilly ground at the farm Honeyville. From this section (around Honeyville farm) up to the area around Rocklands, there are three alternatives within the Northern Corridor:

- Alternative 1 – This alternative splits from Alternative 3 in the area of farms Weltevreden and Zuurbron. Alternative 1 traverses the R330 Provincial Road on the farm Weltevreden. It continues through the farm Zuurbron where it crosses the upper reaches of the Kabeljous River. The route alternative then traverses the Gamtoos River Valley in the vicinity of the farms Rooidraai, Bosch Bok Hoek and Spitsbak Estate. It continues in an easterly direction through hilly incised terrain on farms Buffels Hoek and Loerie River where it crosses the R331 Provincial Road. The alternative then traverses the area around Loerie Dam and the Loerie Dam Nature Reserve to the north of the town of Loerie, crossing the farms Loerie River, Geelhoutboom and Jagersfontein. Most of this portion of the route runs to the south of the boundary of Otterford State Forest and the Longmore State Forest, traversing the Longmore Forest offices, housing and saw mill (the Longmore Forest Station). To the east the alternative crosses the farms Platberg, Klaarefontein and before entering the Longmore State Forest to the north of the Van Stadens River Mountains. The corridor traverses forestry land (plantations) through this section, crossing the Van Stadens River. The alternative exits the Longmore area to the north of Van Stadensberg Natural Heritage Site Nature Reserve through the farm Boschfontein where it reconnects to Northern Corridor - Thyspunt (HV Yard) to Grassridge alternative 3 (described below).

- Alternative 2 - *(Please note – Alternative 2 is a deviation off Alternative 3).* This alternative splits from Alternative 3 south-east of the town of Hankey. The route alternative continues in a north-easterly direction traversing the R331 on the farm Roodefontein and continuing through very hilly, natural terrain on the forms Limebank and Klein Rivier, running parallel with the valley of the Klein River. In the vicinity of the Otterford and Forest Reserve (to the west of the old Otterford Forest Station), the route

curves towards the northwest through a very steeply incised area. It continues north-westwards through plantations until it re-joins Alternative 3.

- Alternative 3 – this alternative splits from Alternative 1 in the vicinity of the R332 Provincial Road and the Diep River at the farms Honeyville, Weltevreden and Zuurbron. To the east of this point the alternative runs roughly parallel to the R330 provincial road down the Hankey Pass into the Gamtoos River Valley. The alternative crosses the Gamtoos Valley to the south of the hamlet of Weston, traversing the farms Rooidraai, Gamtous Riviers and Wagendrift. The alternative passes to the east of Hankey, continuing in a north-easterly direction traversing the R331 Provincial Road. The alternative crosses hilly, incised terrain crossing the Klein River valley on the farms Klein Rivier and Kleinfontein. The alternative continues across very hilly, incised terrain across a portion of the Stinkhoutberg Nature Reserve, entering the Otterford Forest as the route curves to the south-east through a very steep area within Otterford State Forest, crossing the Hankey Forest reserve and the farm Sand River Heights. The alternative crosses the Sand River upstream of the Sand River Dam through forestry land. The alternative continues in a south-easterly direction, following the southern side of the Elands River valley across the farms Palmiet River and Peneheale, and running parallel to the Elands River Road. The alternative enters the Longmore State Forest, crossing the Bulk River Dam and running through the farm Uplands before linking up with Alternative 1 in the vicinity of the farm Boschfontein.

From the point at which Alternative 1 and 3 join, the corridor runs in a north-easterly direction, crossing the farms Boschfontein, Brakkefontein, Ruigteveli and Burghley Hills through an un-inhabited hilly area to the north of Rocklands. The corridor heads north-eastwards along the eastern boundary of Groendal Wilderness Area, traversing the Elands River valley through the Wincanton Estate, Kruisrivier and Mimosadale West. The Corridor then crosses the Swartkops River in the Kruisrivier area west of Uitenhage, crossing a number of small farms in the valley. The corridor then climbs into uninhabited land to the west and north of Rosedale, turning to the east. The Corridor traverses uninhabited farm land to the north of Uitenhage, crossing a minor road as well as the R75 Provincial Road, running between Levydale and the Springs Nature Reserve and Resort. To the east of the R75, the corridor then crosses farming land on the farms Sandfontein, Gras Rug, Longwood, Rietheuwel and Papenkuils Vley. The corridor crosses the farm Welbedachsfontein, crossing the R335 provincial road before feeding into the Grassridge Substation.

East of the Grassridge Substation the Northern Corridor (existing Servitude) Grassridge to Dedisa runs eastwards across largely natural thicket vegetation on the farm Brak River, then south-eastwards and finally southwards until it terminates at the Dedisa Substation which is located to the north of the R334 and R102.

1.3 Policy and Legislation

1.3.1 National Environmental Management: Biodiversity Act

The National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) operates in conjunction with the National Environmental Management: Protected Areas Act No. 57 of 2003. Both Acts emerge from the recommendations of the White Paper on the Conservation and Sustainable Use of South Africa's Biodiversity (1998) and were originally conceived of as one Act.

The objectives of the Act are:

- within the framework of the National Environmental Management Act, to provide for:
- the management and conservation of biological diversity within the Republic and of the components of such biological diversity;
- the use of indigenous biological resources in a sustainable manner; and
- the fair and equitable sharing among stakeholders of benefits arising from bioprospecting involving indigenous biological resources;
- to give effect to ratified international agreements relating to biodiversity which are binding on the Republic;
- to provide for co-operative governance in biodiversity management and conservation; and to provide for a South African National Biodiversity Institute (SANBI) to assist in achieving the objectives of the Act.

The Act provides specifically for the issuing of permits. Before issuing a permit, the issuing authority may in writing require the applicant to furnish it, at the applicant's expense, with such independent risk assessment or expert evidence as the issuing authority may determine. Regulations may be made pertaining to various matters regulated by the Act, offences and penalties are provided for, and consultation processes are prescribed. Should Red Data species be directly affected by the proposed lines or substation site, then the necessary permits will be required to be applied for.

1.3.2 Nature Conservation Ordinance

These are developed to protect both animal and plant species within the various provinces of the country which warrant protection. These may be species which are under threat or which are

already considered to be endangered. The provincial environmental authorities are responsible for the issuing of permits in terms of this legislation. The Nature and Environmental Conservation Ordinance, 1974 (Ordinance 19 of 1974) is the ordinance of relevance in the Eastern Cape.

1.3.3 National Forest Act, 1998 (Act No. 84 of 1998)

The National Forest Act, 1998 (Act No. 84 of 1998) was promulgated to provide for the sustainable management and development of forests for the benefit of all and to promote the sustainable use of these forests. In addition to this function the Act also provides for the protection of trees which are threatened. A protected tree list was published in GN 32731 of 27 November 2009 and will need to be consulted during the walk down if trees are to be removed for the proposed power lines.

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

The National Water Act, 1998 (Act No. 36 of 1998) hereafter referred to as the Act was created in order to ensure the protection and sustainable use of water resources in South Africa. The Act recognises that the ultimate aim of water resource management is to achieve the sustainable use of water for the benefit of all users. Bearing these principles in mind there are a number of stipulations of the Act that are relevant to the protection and current state and impacts upon surface water resources in the study area.

Firstly, it is important to discuss the type of surface water resource protected under the Act; under the Act a water resource includes a watercourse, surface water, estuary, or aquifer. A 'watercourse' is defined as (inter alia):

- a river or spring;
- a natural channel in which water flows regularly or intermittently;
- a wetland, lake or dam into which, or from which, water flows;
- In this context it is important to note that reference to a watercourse includes, where relevant, its bed and banks.

It is important to note that water resources, including wetlands and other watercourses are protected under the National Water Act. 'Protection' of a water resource, as defined in the Act entails:

- Maintenance of the quality of the water resource to the extent that the water use may be used in a sustainable way;
- Prevention of degradation of the water resource
- The rehabilitation of the water resource

In the context of rehabilitation projects and the identification of the impacts on surface water resources, the definition of pollution and pollution prevention contained within the Act is relevant. 'Pollution', as described by the Act is the direct or indirect alteration of the physical, chemical or biological properties of a water resource, so as to make it (inter alia):

- less fit for any beneficial purpose for which it may reasonably be expected to be used; or
- harmful or potentially harmful to the welfare or human beings, to any aquatic or non-aquatic organisms, or to the resource quality.

The inclusion of physical properties of a water resource within the definition of pollution entails that any physical alterations to a water body, for example the excavation of a wetland or changes to the morphology of a water body can be considered to be pollution. Activities which cause alteration of the biological properties of a watercourse, i.e. the fauna and flora contained within that watercourse are also considered pollution.

In terms of section 19 of the Act owners / managers / people occupying land on which any activity or process undertaken which causes, or is likely to cause pollution of a water resource must take all reasonable measures to prevent any such pollution from occurring, continuing or recurring. These measures may include measures to (inter alia):

- cease, modify, or control any act or process causing the pollution;
- comply with any prescribed waste standard or management practice;
- contain or prevent the movement of pollutants;
- remedy the effects of the pollution; and
- remedy the effects of any disturbance to the bed and banks of a watercourse.

The above stipulations of the Act have implications for the management, protection, and rehabilitation of surface water resources in the study area, in the light of threats acting on, and current impacts on surface water resources as discussed below.

The Act has implications for the management and protection of wetlands and other surface water resources within the study area. The Act provides a number of duties to landowners and managers in terms of the sustainable and responsible management of wetlands, as detailed above. Importantly there is also a duty for the reversal or remediation of any degradation to wetlands.

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

The Act provides for the regulation of control over the utilization of the natural agricultural resources in order to promote the conservation of soil, water resources and vegetation (including wetlands). This Act has determined the various categories of alien plant species which are present in South Africa based on their ability to colonise i.e. how invasive they are. Several alien species of concern are present within the study area and these require management.

2 METHODOLOGY

2.1 Field and Desk top Assessments

2.1.1 Approach

A detailed floral inventory has been undertaken for the project which documents the floral diversity across the project. Documenting the faunal species on the same level across such a large area would take a significant amount of time and resources. The approach for assessing faunal populations is thus based on the presence of suitable habitat and the level of transformation that is present in an area.

The approach to the study was thus to divide the study area into sections and strategically assess the route in terms of vegetation present, available habitat for faunal species, the present of Critical Biodiversity Areas (CBA's) and ultimately what the implications of the project would be on this area. The floral study findings are drawn on this greater report and the stand alone reports are included in Appendix A. Please refer to the detailed route assessment for the detailed approach to the study in terms of the sections.

2.1.2 Flora Assessments

- Assessment
    - *Desktop:* based on the above, vegetation types were assessed for extent transformed, rarity, sensitivity, fragmentation and conservation status. Recommendations for amendments to the routes were made, based upon the desktop assessment and observations during the two field trips.
    - *Fieldwork:* where possible, flora was sampled along, or where access was difficult and therefore time-consuming, adjacent to the proposed routing, ensuring that in the latter case vegetation was the same in terms of general habitat. Detailed plant species lists were made of random 0.1 ha plots in vegetation representative of that occurring along the route in a particular area.

- Analysis

Species data were analysed for similarity using the PRIMER statistical package (Clarke and Warwick, 1994). Degree of site distinctiveness was determined from degree of similarity with sites showing less than 50% similarity with the same vegetation type being regarded as distinctive. High distinctiveness correlated with high rarity.

2.1.3 Fauna Assessments

A site visit was undertaken at various intervals to assess the available habitat across the study area. Field works was undertaken in

- July 2008
- December 2009
- December 2010
- January 2010
- January 2011

The corridor was driven and areas conducive to faunal habitation identified. Similarly areas which were heavily transformed were also identified.

In addition the availability of habitat has been assessed as per the above mentioned sections.

This report concentrates on habitat provision of the following faunal groupings:

- Mammals
- Amphibians
- Reptiles
- Invertebrates
- Fish

Where data was available a broad level probability analysis was undertaken to determine the probability of a species being present in the study area. This method utilises two criteria; namely habitat availability and food availability. These two criteria were assessed making use of the transformation map that was compiled for the study. It must be remembered that this probability analysis has been utilised as a tool to highlight the importance of Red Data species within the study area and is by no means a definitive indicator of the presence of these species. Each criteria is provided with a percentage out of 100% which then calculates the probability of occurrence within the site in question. This method has only been used for faunal groupings where enough data is available in order to meet each criteria.

Avi-fauna is addressed in a separate specialist report conducted by the Endangered Wildlife Trust (EWT).

Information received through the public participation process has also been included in this report.

Potential species lists have been compiled with attention given to protected and endangered species in terms of the IUCN Red Data List. A transformation layer based on the Environmental Potential Atlas (ENPAT) data was compiled during the scoping phase to identify areas that are likely to provide habitat for faunal species. The ENPAT data was supplemented by in house verification using 1:50 000 topographical maps and high resolution Google Earth Pro images. The assessment of transformation is explored at length in the route assessment which identifies areas which provide intact habitat as well as areas that have been transformed in some way.

Furthermore, shapefiles of the numerous CBAs (Critical Biodiversity Areas) in the study area were provided by Andrew Skowno. CBAs are terrestrial and aquatic features in the landscape that are critical for conserving biodiversity and maintaining ecosystem functioning (SANBI 2007).

2.2 Impact Assessment

The EIA Methodology assists in evaluating the overall effect of a proposed activity on the environment. The determination of the effect of an environmental impact on an environmental parameter is determined through a systematic analysis of the various components of the impact. This is undertaken using information that is available to the environmental practitioner through the process of the environmental impact assessment. The impact evaluation of predicted impacts was undertaken through an assessment of the significance of the impacts.

2.2.1 Determination of Significance of Impacts

Significance is determined through a synthesis of impact characteristics which include context and intensity of an impact. Context refers to the geographical scale i.e. site, local, national or global whereas Intensity is defined by the severity of the impact e.g. the magnitude of deviation from background conditions, the size of the area affected, the duration of the impact and the overall probability of occurrence. Significance is calculated as shown in Table 2.

Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The total number of points scored for each impact indicates the level of significance of the impact.

2.2.2 Impact Rating System

Impact assessment must take account of the nature, scale and duration of effects on the environment whether such effects are positive (beneficial) or negative (detrimental). Each issue / impact is also assessed according to the project stages:

- planning
- construction
- operation

Where necessary, the proposal for mitigation or optimisation of an impact should be detailed. A brief discussion of the impact and the rationale behind the assessment of its significance has also been included.

- Rating System Used To Classify Impacts

The rating system is applied to the potential impact on the receiving environment and includes an objective evaluation of the mitigation of the impact. Impacts have been consolidated into one rating. In assessing the significance of each issue the following criteria (including an allocated point system) is used:

Table 1: Description of impacts

NATURE		
Include a brief description of the impact of environmental parameter being assessed in the context of the project. This criterion includes a brief written statement of the environmental aspect being impacted upon by a particular action or activity.		
GEOGRAPHICAL EXTENT		
This is defined as the area over which the impact will be expressed. Typically, the severity and significance of an impact have different scales and as such bracketing ranges are often required. This is often useful during the detailed assessment of a project in terms of further defining the determined.		
1	Site	The impact will only affect the site
2	Local/district	Will affect the local area or district

3	Province/region	Will affect the entire province or region
4	International and National	Will affect the entire country
PROBABILITY		
This describes the chance of occurrence of an impact		
1	Unlikely	The chance of the impact occurring is extremely low (Less than a 25% chance of occurrence).
2	Possible	The impact may occur (Between a 25% to 50% chance of occurrence).
3	Probable	The impact will likely occur (Between a 50% to 75% chance of occurrence).
4	Definite	Impact will certainly occur (Greater than a 75% chance of occurrence).
REVERSIBILITY		
This describes the degree to which an impact on an environmental parameter can be successfully reversed upon completion of the proposed activity.		
1	Completely reversible	The impact is reversible with implementation of minor mitigation measures
2	Partly reversible	The impact is partly reversible but more intense mitigation measures are required.
3	Barely reversible	The impact is unlikely to be reversed even with intense mitigation measures.
4	Irreversible	The impact is irreversible and no mitigation measures exist.
IRREPLACEABLE LOSS OF RESOURCES		
This describes the degree to which resources will be irreplaceably lost as a result of a proposed activity.		
1	No loss of resource.	The impact will not result in the loss of any resources.
2	Marginal loss of resource	The impact will result in marginal loss of resources.
3	Significant loss of resources	The impact will result in significant loss of resources.
4	Complete loss of resources	The impact is result in a complete loss of all resources.
DURATION		

This describes the duration of the impacts on the environmental parameter. Duration indicates the lifetime of the impact as a result of the proposed activity		
1	Short term	The impact and its effects will either disappear with mitigation or will be mitigated through natural process in a span shorter than the construction phase (0 – 1 years), or the impact and its effects will last for the period of a relatively short construction period and a limited recovery time after construction, thereafter it will be entirely negated (0 – 2 years).
2	Medium term	The impact and its effects will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).
3	Long term	The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 50 years).
4	Permanent	The only class of impact that will be non-transitory. Mitigation either by man or natural process will not occur in such a way or such a time span that the impact can be considered transient (Indefinite).
CUMULATIVE EFFECT		
This describes the cumulative effect of the impacts on the environmental parameter. A cumulative effect/impact is an effect which in itself may not be significant but may become significant if added to other existing or potential impacts emanating from other similar or diverse activities as a result of the project activity in question.		
1	Negligible Cumulative Impact	The impact would result in negligible to no cumulative effects
2	Low Cumulative Impact	The impact would result in insignificant cumulative effects
3	Medium Cumulative impact	The impact would result in minor cumulative effects
4	High Cumulative Impact	The impact would result in significant cumulative effects
INTENSITY/ MAGNITUDE		
Describes the severity of an impact		

1	Low	Impact affects the quality, use and integrity of the system/component in a way that is barely perceptible.
2	Medium	Impact alters the quality, use and integrity of the system/component but system/ component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).
3	High	Impact affects the continued viability of the system/ component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation.
4	Very high	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component permanently ceases and is irreversibly impaired (system collapse). Rehabilitation and remediation often impossible. If possible rehabilitation and remediation often unfeasible due to extremely high costs of rehabilitation and remediation.

SIGNIFICANCE

Significance is determined through a synthesis of impact characteristics. Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. This describes the significance of the impact on the environmental parameter. The calculation of the significance of an impact uses the following formula:

(Extent + probability + reversibility + irreplaceability + duration + cumulative effect) x magnitude/intensity.

The summation of the different criteria will produce a non weighted value. By multiplying this value with the magnitude/intensity, the resultant value acquires a weighted characteristic which can be measured and assigned a significance rating.

Points	Impact Significance Rating	Description
6 to 28	Negative Low impact	The anticipated impact will have negligible negative effects and will require little to no mitigation.

6 to 28	Positive Low impact	The anticipated impact will have minor positive effects.
29 to 50	Negative Medium impact	The anticipated impact will have moderate negative effects and will require moderate mitigation measures.
29 to 50	Positive Medium impact	The anticipated impact will have moderate positive effects.
51 to 73	Negative High impact	The anticipated impact will have significant effects and will require significant mitigation measures to achieve an acceptable level of impact.
51 to 73	Positive High impact	The anticipated impact will have significant positive effects.
74 to 96	Negative Very high impact	The anticipated impact will have highly significant effects and are unlikely to be able to be mitigated adequately. These impacts could be considered "fatal flaws".
74 to 96	Positive Very high impact	The anticipated impact will have highly significant positive effects.

Table 2: Rating of impacts

IMPACT TABLE FORMAT	
Environmental Parameter	*A brief description of the environmental aspect likely to be affected by the proposed activity e.g. Surface water*
Issue/Impact/Environmental Effect/Nature	*A brief description of the nature of the impact that is likely to affect the environmental aspect as a result of the proposed activity e.g. alteration of aquatic biota The environmental impact that is likely to positively or negatively affect the environment as a result of the proposed activity e.g. oil spill in surface water*
Extent	*A brief description indicating the chances of the impact occurring*
Probability	*A brief description of the ability of the environmental components recovery after a disturbance as a result of the proposed activity*
Reversibility	*A brief description of the environmental aspect likely to be affected by the proposed activity e.g. Surface water*
Irreplaceable loss of resources	*A brief description of the degree in which irreplaceable resources are likely to be lost*
Duration	*A brief description of the amount of time the proposed activity is likely to take to its completion*

IMPACT TABLE FORMAT		
Cumulative effect	*A brief description of whether the impact will be exacerbated as a result of the proposed activity*	
Intensity/magnitude	*A brief description of whether the impact has the ability to alter the functionality or quality of a system permanently or temporarily*	
Significance Rating	*A brief description of the importance of an impact which in turn dictates the level of mitigation required*	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	4	1
Probability	4	1
Reversibility	4	1
Irreplaceable loss	4	1
Duration	4	1
Cumulative effect	4	1
Intensity/magnitude	4	1
Significance rating	-96 (high negative)	-6 (low negative)
Mitigation measures	*Outline/explain the mitigation measures to be undertaken to ameliorate the impacts that are likely to arise from the proposed activity. Describe how the mitigation measures have reduced/enhanced the impact with relevance to the impact criteria used in analyzing the significance. These measures will be detailed in the EMPR.*	

2.3 Assumptions and Limitations

Because faunal populations are dependent on the flora that supports them, assumptions regarding the presence of fauna have been made based on the flora present. Detailed walk downs once the tower locations are final will be required to reduce impacts identified in this report.

3 DESCRIPTION OF THE ENVIRONMENT

3.1 Geology

The Northern Corridor is underlain by a variety of parent materials namely Arenite, Conglomerate, Mudstone, Limestone, Sedimentary and Shale. The area between Thyspunt and south of Hankey, mainly crosses Arenite and Shale. Arenite is a clastic sedimentary rock with a typical sand grain size of between 0.06 and 2 mm and is generally formed by erosion of other geological materials or the re-deposition of sands. Shale is also clastic sedimentary rock and formed by the settling and accumulation of clay rich minerals and other sediments. Due to the settling process this parent material usually takes the form parallel rock layers.

The Gamtoos River Valley is dominated by Conglomerate with limited Sedimentary parent materials. Sedimentary rock is formed by the settling and accumulation of sediments and usually takes the form of rock layers or strata. Sedimentary parent material will generally give rise to apedal soil types. As the corridor moves east, towards Port Elizabeth, it cross a variety of parent materials including Mudstone, Limestone, Arenite and Sedimentary features.

3.2 Topography

According to the ENPAT dataset the majority of the Northern Corridor is characterised by rolling and gently sloping topography with an average gradient of less than 10%. There are however, a number of steep ridges and valleys, which intermittently cross the various corridors. These steeper areas are prevalent to the north and west of Hankey.

3.3 Land Use

The Northern Corridor crosses an assortment of land uses. Cultivated areas are concentrated along river / valley lines and within flood plain areas. This is due to the proximity of these areas to a reliable source of irrigation water and rich alluvial soils. Areas of cultivation are interspersed with natural and degraded vegetation. Urban and built-up areas are more prominent to the east of

the study area and include Port Elizabeth and Uitenhage. The land use associated with each section of the route is discussed below.

3.4 Climate

The study area, which incorporates the Port Elizabeth and Jeffrey's Bay area, has a mild oceanic climate and lies between the summer and winter rainfall regions of South Africa. The study area receives moderate rainfall all year and has a Mean Annual Precipitation (MAP) of approximately 630 mm per year with an average of 9 rainfall days per month. A comparison between the Port Elizabeth and Jeffrey's Bay stations indicates that precipitation and temperature do not vary significantly over the study area (Table 3 and Table 4). Rainfall does however tend to decrease in a northerly direction (i.e. as one moves from inland). Winters are generally mild and summers are warm but considerably less humid and hot than the northern parts of the South African Coast. Average daily temperatures range from 25°C in summer to 20°C in winter. Average night time temperatures drop to around 8°C during winter (Table 3 and Table 4).

Table 3: Mean monthly precipitation and daily maximum and minimum temperatures for Port Elizabeth (SAWS, 2010)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean Rainfall (mm)	36	40	54	58	59	62	47	64	62	59	49	34	**624**
Average Daily Maximum (°C)	25	25	25	23	22	20	20	20	20	21	22	24	**22**
Average Daily Minimum (°C)	18	18	17	14	12	9	9	10	11	13	15	16	**14**

Table 4: Mean monthly precipitation and daily maximum and minimum temperatures for Jeffrey's Bay (SA-Explorer, 2010)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean Rainfall (mm)	36	37	49	54	55	51	56	64	69	69	52	40	**631**

Average Daily Maximum (°C)	24	25	24	23	21	20	19	19	19	20	22	23	**22**
Average Daily Minimum (°C)	16	15	15	13	11	9	8	9	10	12	13	15	**14**

3.5 Critical Biodiversity Areas

Critical Biodiversity Areas or CBA's are areas which are important for conserving biodiversity as well as the associated ecological support areas. In order to ensure the longevity of biodiversity, CBA's are demarcated to safeguard the biodiversity and its associated ecological services. These areas are usually demarcated through conservation plans. These CBA's allow for more informed decision making and feed into Local development plans, Spatial Development Frameworks (SDFs) etc.

Various conservation plans are in place for the study area which have been consulted for the purposes of this assessment.

Table 5: Conservation Plans relevant to the study area

Conservation Plan	Study Area covered	Notes
Eastern Cape Biodiversity Conservation Plan	Entire Eastern Cape	The study was conducted at a large scale and more detailed Conservation Plans which were available were utilised where possible
Baviaanskloof Mega-Reserve Conservation Plan	Areas of the corridors in the Longmore area	Didn't cover the entire route but extended in the study area, particularly the Northern Corridor.
The Garden Route Biodiversity Sector Plan	Covers the eastern part of the study area from Jeffrey's Bay and Humansdorp east.	This information was utilised for analysis of the sections in this area. Mostly associated with river systems within this area.
Nelson Mandela Bay Municipality: Metropolitan Open Space System (MOSS)	Nelson Mandela Bay Municipal Area	Detailed mapping of priority areas. Majority of ecosystems present are rated as vulnerable.

Please refer to Appendix B for the maps of the Critical Biodiversity Areas.

3.6 Flora of the Study Area

Several vegetation types are present along the Northern Corridor and these are listed below. Three endangered vegetation types are present, namely Humansdorp Shale Renosterveld, Algoa Sandstone Fynbos and Albany Alluvial Vegetation. Two Vulnerable vegetation types are also present namely Tsitsikamma Sandstone Fynbos, and Cape Lowland Freshwater Wetland.

Table 6: Vegetation types in the Northern Corridor (Mucina & Rutherford, 2006)

Vegetation type	Protection level	Ecosystem Status
Albany Alluvial Vegetation	Poorly protected	Endangered
Albany Coastal Belt	Poorly protected	Least Threatened
Algoa Sandstone Fynbos	Poorly protected	Endangered
Cape Lowland Freshwater Wetlands	Poorly protected	Vulnerable
Coega Bontveld	Poorly protected	Least Threatened
Eastern Coastal Shale Band Vegetation	Poorly protected	Endangered
Eastern Inland Shale Band Vegetation	Well protected	Least Threatened
Gamtoos Thicket	Poorly protected	Least Threatened
Humansdorp Shale Renosterveld	Hardly protected	Endangered
Kouga Sandstone Fynbos	Well protected	Least Threatened
Kouga Sandstone Grassy Fynbos	Moderately protected	Least Threatened
Loerie Conglomerate Fynbos	Moderately protected	Least Threatened
Southern Afrotemperate Forest	Moderately protected	Least Threatened
Sundays Thicket	Poorly protected	Least Threatened
Tsitsikamma Sandstone Fynbos	Poorly protected	Vulnerable

The distribution of these vegetation types are illustrated in the figures below.

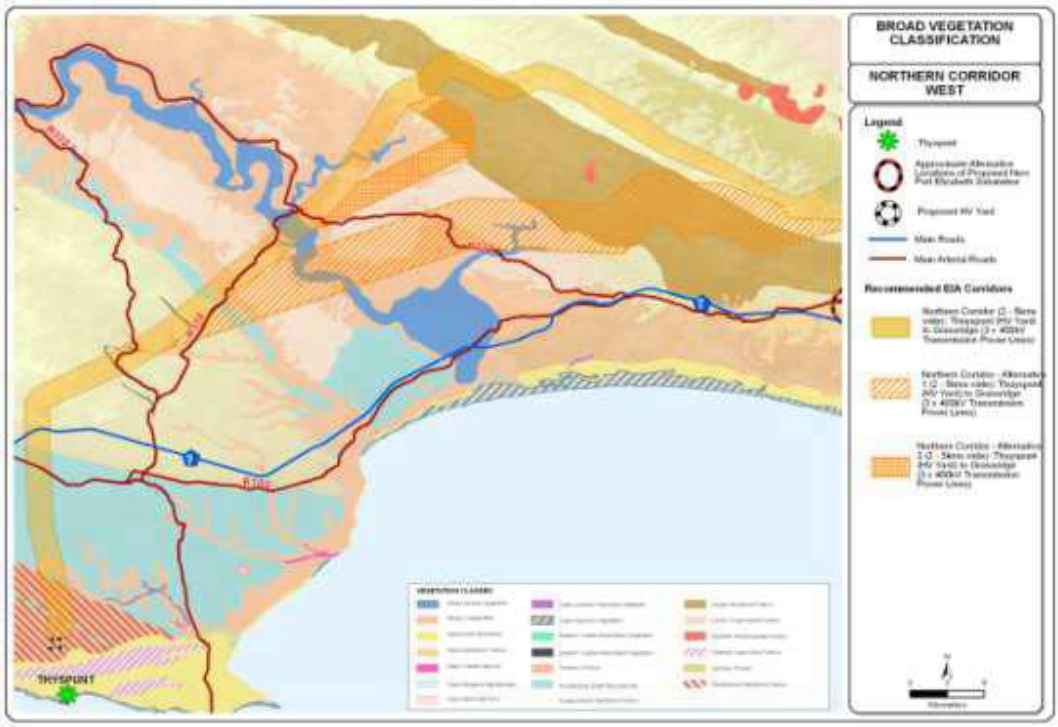

Figure 3: Vegetation of the Northern Corridor (West)

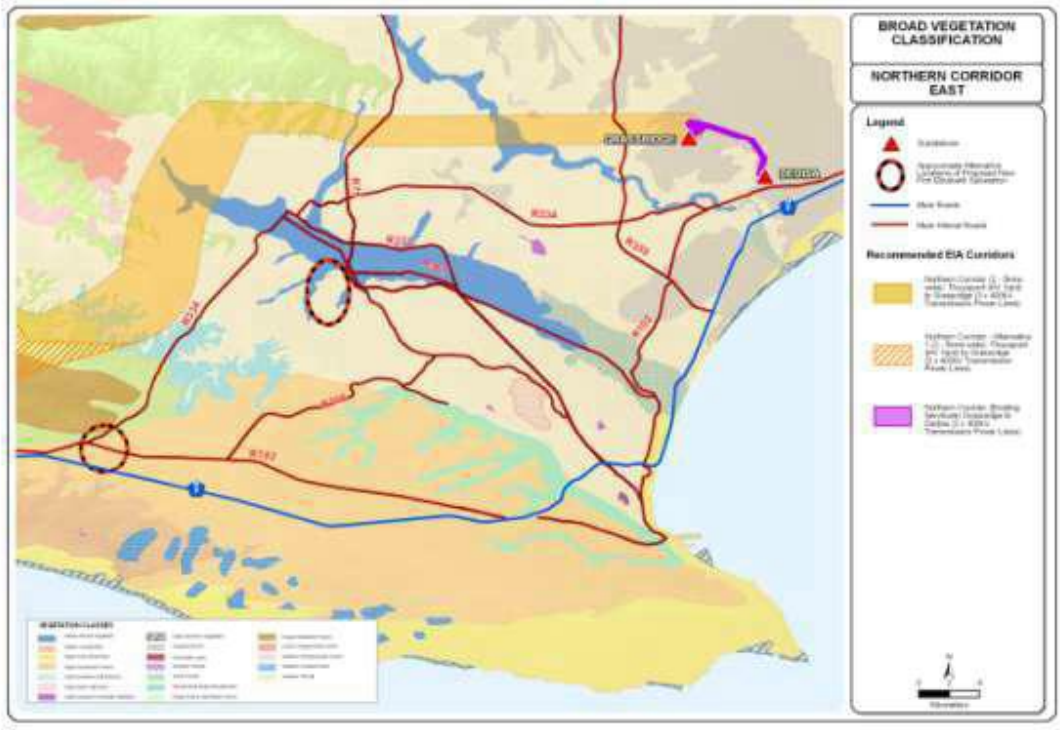

Figure 4: Vegetation of the Northern Corridor (East)

The above vegetation types are described in the floral analysis for this EIA by Coastec (Appendix A).

The information contained in the floral analysis report has been drawn on to assess each section of the corridor in the route assessment below.

3.7 Fauna of the Study Area

According to the STEP study, the area covered by this study shows a high level of biodiversity (both faunal and floral) although endemism is not quite at the level shown by the flora in the area. Several faunal species are present in the area although it has become apparent that the majority of species are no longer present due to the increase in anthropogenic activities (Cowling *et al*, 2003). The study area potentially provides habitat for the following faunal species:

- Mammals
- Amphibians

- Reptiles
- Invertebrates
- Fish

3.7.1 Mammals

Various mammal species are likely to occur within the study area. The table below comprises a list of mammals that are likely to occur in Northern Corridor with the assigned level of threat facing a particular species. A map was used to correlate the occurrence of the Red Data species with their approximate occurrence within the various sections of the corridor. According to the spatial data, the majority of species within sections of the route are listed as species of least concern. However, within the Northern Corridor, the South African Red Data Book (Friedman & Daly, 2004) lists the Honey Badger (*Mellivora capensis*), the Lesser Long-fingered Bat (*Miniopterus fracterculus*), Schreiber's Long-fingered Bat (*Miniopterus shreibersii*), Temminck's Hairy Bat (*Myotis tricolor*), the Cape Horseshoe Bat (*Rhinolophus capensis*) and Geoffrey's Horseshoe Bat (*Rhinolophus clivosus*) as Near Threatened. In addition, the Blue Duiker (*Philantomba monticola*) is classified as Vulnerable and the South-western black rhino (*Diceros bicornis bicornis*) which is Critically Endangered are also documented for the study area. Table 7 identifies the probability of these species occurring within the study area. The analysis indicates that the likelihood of the majority of Red Data species occurring within the study area is fairly low although the possibility still remains.

Table 7: Mammal probability analysis

MAMMAL SPECIES - 1: 50 000 Grids falling in the Northern Corridor						
Taxon name	Common Name	SA Red Data Book 2004	1: 50 000	Habitat availability	Food availability	Probability of occurrence
Diceros bicornis bicornis	South-western black rhino	CE	3324DD, 3325CC, 3325CD, 3325DA, 3324DC, 3325CB	very little	very little	Low
Amblysomus hottentotus	Hottentot's Golden Mole	DD	3325CC, 3325CD, 3325CB,	good	good	medium
Crocidura flavescens	Greater Musk Shrew	DD	3325CD, 3325CB	good	good	medium to low
Mellivora capensis	Honey Badger	NT	3324DD, 3424BA	very little	minimal food available	low
Miniopterus fraterculus	Lesser Long-fingered Bat	NT	3325CD	minimal habitat available	minimal food available	low to medium
Miniopterus schreibersii	Schreibers' Long-fingered Bat	NT	3324DD	minimal habitat available	minimal food available	low to medium
Myotis tricolor	Temminck's Hairy Bat	NT	3325CD	minimal habitat available	minimal food available	low to medium
Rhinolophus capensis	Cape Horseshoe Bat	NT	3325CD	minimal habitat available	minimal food available	low to medium
Rhinolophus clivosus	Geoffroy's Horseshoe Bat	NT	3325CD, 3325CB	minimal habitat available	minimal food available	low to medium
Philantomba monticola	Blue Duiker	VU	3424BA	very little	minimal food available	low

3.7.2 Amphibians

In terms of species associated with the CFR, there are more than 40 species of amphibians present in this hotspot, sixteen of which are endemic. Table 8 illustrates the amphibian species which are likely to be present within the study area. Three Red Data species have been recorded in the study area, namely the Cape Platanna (Endangered), Hewitt's Ghost Frog (Critically Endangered) and the Giant Bullfrog (Near Threatened). The probability of these species being present within the study area remains high (Table 9). The Hewitt's Ghost Frog is only located in the Elandsberge and is thus an extremely sensitive species. The frog species is known to occur within the Geelhoutboomrivier (*pers comm*., Werner Conradie Bayworld).

The area appears to the southern tip of the distribution of the Giant bullfrog (*Pyxicephalus adspersus).* The presence of this species is highly unlikely however all surface water features will be spanned and hence their habitat will not be affected.

Cape Sand Toad (*Vandijkophrynus cf. angusticeps*) & Arum Lily Frog (*Hyperolius cf. horstockii*) populations had been found in the past in the Humansdorp, Sandriver and Cape St. Francis area (*pers comm*., Werner Conradie Bayworld). The closest population is in the Western Cape Province and these isolated populations may prove to be new species. Due to the small area of occupancy and the threat to the habitat these species will be highly sensitive to the proposed development. Surface water features must be spanned to avoid the habitat which is the prefereance of these species.

Table 8: Amphibian species potentially present in the study area (Carruthers 2001)

Common Name	Scientific Name	Habitat	Fynbos Endemic Species	Red Data Status
Cape Platanna	*Xenopus gilli*	Natural pools in fynbos	Yes	Endangered
Hewitt's Ghost Frog	*Heleophryne hewitti*	Mountain streams in fynbos in Elandsberge	Yes	Critically Endangered
Southern Ghost Frog	*Heleophryne regis*	Forest streams	Yes	Not Threatened
Knysna Leaf Folding Frog	*Afrixalus knysnae*	Savanna pans with grassy shallows	No	Not Threatened

Common Name	Scientific Name	Habitat	Fynbos Endemic Species	Red Data Status
Rattling Frog	*Semnodactylus wealii*	Vleis and inundated grassland	No	Not Threatened
Bubbling Kassina	*Kassina senegalensis*	On the edge of vleis	No	Not Threatened
Painted Reed Frog	*Hyperolius marmoratus verrucosus*	Pans	No	Not Threatened
Bushveld Rain Frog (subspecies)	*Brericeps adspersus pentheri*	Dry savanna with sandy soils	No	Not Threatened
Giant Bullfrog	*Pyxicephalus adspersus*	Breeds in the shallows of temporary rain- filled depressions in grassland and dry savanna. Remains buried for most of the year	No	Near Threatened
Cape Sand Frog	*Tomoplerna delalandii*	On the edges of freshwater lagoons and vleis in fynbos	Yes	Not Threatened
Sand Toad	*Bufo angusticeps*	Fynbos - in temporary rain filled depressions	Yes	Not Threatened
Eastern Leopard Toad	*Bufo pardalis*	Breeds in deep water in fynbos	No	Not Threatened
Karoo Toad	*Bufo gariepinus*	Breeds in temporary rain pools and streams, but may forage in more arid areas	No	Not Threatened

Common Name	Scientific Name	Habitat	Fynbos Endemic Species	Red Data Status
Striped Stream Frog	*Strongylopus fasciatus*	Thick grass adjacent to streams, vleis and dams with relatively permanent water	No	Not Threatened
Cape River Frog	*Afrana fuscigula*	Fynbos and grassland rivers, streams and dams		Not Threatened
Clicking Stream Frog	*Strangylopus grayii*	Grassland and fynbos. They breed in vleis, slow moving streams and/or brakish seaside pools.	No	Not Threatened
Bronze Caco	*Cacosternum nanum*	Pans	No	Not Threatened
Common Caco	*Cacosternum boettgeri*	Marshland, inundated grass around temporary rain pools and ditches.	No	Not Threatened

Table 9: Amphibian probability analysis

Common Name	Scientific Name	Habitat	Red Data Status	Habitat availability	Food availability	Probability of occurrence
Cape Platanna	*Xenopus gilli*	Natural pools in fynbos	Endangered	good	good	high
Hewitt's Ghost Frog	*Heleophryne hewitti*	Mountain streams in fynbos in Elandsberge	Critically Endangered	very little	good	medium
Giant Bullfrog	*Pyxicephalus adspersus*	Breeds in the shallows of temporary rain- filled depressions in grassland and dry savanna. Remains buried for most of the year	Near Threatened	minimal habitat available	minimal food available	medium

3.7.3 Reptiles

With about 100 species (a quarter of which are endemic), reptile diversity in the CFR is considered to be relatively high. Several reptile species are present in the study area. Table 10 highlights the species which are likely to be present within the study area. The only Red Data species which is likely to be present is the Smith's Dwarf Chameleon which is listed as Critically Endangered. This species is unique to the Van Stadens Mountains and emphasis has been placed on the habitat that is available for this species. Habitat is present within the corridor for this species. Information has been supplement by the SARCA atlas although the majority of information from the SARCA atlas was not made available in time for the publishing of this report as it is only expected to be published towards the end of 2011.

Several reptile species which are listed in CITES Appendix II (Convention in the Trade of Endangered Species) are present within the study area. These species include the

- Leopard tortoises (*Geochelone pardalis*),
- Angulate tortoise (*Chersina angulata*)
- Parrot- beaked tortoise (*Homopus areolatus*).
- Rock monitor (*Varanus albigularis*)
- Water monitor (*Varanus niloticus*)
- Southern dwarf chameleon (*Bradypodion ventrale*)

Although these species have been placed on the CITES list due to the illegal pet trade.

The Grassridge area is known to provide habitat for the Critically Endangered Albany Adder (*Bitis albanica*). The Coega Bontveld near the Grassridge substation provides good habitat for this species.

Table 10: Reptile species potentially present in the study area (Branch, 1998)

Common Name	Scientific Name	Habitat	Endemic to South Africa	Red Data Status
Parrot-beaked Tortoise	*Homopus areolatus*	Coastal Fynbos	Yes	Not Threatened
Leopard Tortoise	*Geochelone pardalis*	Fynbos and thicket	No	Not Threatened
Angulate Tortoise	*Chersina angulata*	Fynbos and thicket	Yes	Not Threatened
Tent Tortoise	*Psammobates*	Rocky outcrops	Yes	Not

Common Name	Scientific Name	Habitat	Endemic to South Africa	Red Data Status
	tentorius			Threatened
Marsh or Helmeted Terrapin	*Pelomedusa subrufa*	Any slow moving or still waterbody	No	Not Threatened
Delalande's Beaked Blind Snake	*Rhinotyphlops lalandei*	Coastal bush and fynbos	Yes	Not Threatened
Black Thread Snake	*Leptotyphlops nigricans*	Fynbos and thicket	No	Not Threatened
Cape Centipede Eater	*Aparallactus capensis*	Coastal bush	No	Not Threatened
Dusky-bellied Water Snake	*Lycodonomorphus laevissimus*	Slow moving / well wooded streams	Yes	Not Threatened
Common Brown Water Snake	*Lycodonomorphus rufulus*	Small streams, pans and vleis	Yes	Not Threatened
Brown House Snake	*Lamprophis fuliginosus*	Everywhere	No	Not Threatened
Olive House Snake	*Lamprophis inornatus*	Coastal fynbos	Yes	Not Threatened
Spotted House Snake	*Lamprophis guttatus*	Karroid mountains	Yes	Not Threatened
Aurora House Snake	*Lamprophis aurora*	Coastal bush and fynbos	Yes	Not Threatened
Cape Wolf Snake	*Lycophidion capensis*	Coastal bush / fynbos	No	Not Threatened
Common Slug Eater	*Duberria lutrix*	Coastal bush / fynbos	No	Not Threatened
Mole Snake	*Pseudaspis cana*	Scrubland	No	Not Threatened
Many-spotted Snake	*Amplorhinus multimaculatus*	Mountain streams and vleis	Yes	Not Threatened
Sundevall's Shovel-snout	*Prosymna sundevallii*	Fynbos and thicket	No	Not Threatened
Spotted or Rhombic Skaapsteker	*Psammophylax rhombeatus*	Fynbos and thicket	No	Not Threatened
Karoo Sand Snake or Whip Snake	*Psammophis notostictus*	Scrubland	No	Not Threatened

Common Name	Scientific Name	Habitat	Endemic to South Africa	Red Data Status
Cross-marked or Montane Grass Snake	*Psammophis crucifer*	Fynbos	No	Not Threatened
Spotted Bush Snake	*Philothamnus semivarie gatus*	Inhabits bushes on rocky ridges or along river courses	No	Not Threatened
Eastern Green Snake	*Philothamnus natalensis occidentalis*	Savanna and thickets	Yes	Not Threatened
Common / Rhombic Egg Eater	*Dasypeltis scabra*	Everywhere	No	Not Threatened
Red Lipped Herald	*Crotaphopeltis hotamboeia*	Open woodland	No	Not Threatened
Boomslang	*Dispholidus typhus*	Wooded grassland	No	Not Threatened
Spotted Harlequin Snake	*Homoroselaps lacteus*	Coastal bush	Yes	Not Threatened
Coral Snake	*Aspidelaps lubricus*	Karroid	No	Not Threatened
Cape Cobra	*Naja nivea*	River courses	Yes	Not Threatened
Rinkhals	*Haemachatus haemachatus*	Grassland	Yes	Not Threatened
Common / Rhombic Night Adder	*Causus rhombeatus*	Mesic savannah	No	Not Threatened
Puff Adder	*Bitis arietans*	Everywhere	No	Not Threatened
Berg Adder	*Bitis atropos*	Coatsal / montane fynbos	No	Not Threatened
Cape Legless Skink	*Acontias meleagris meleagris*	Coastal / fynbos	Yes	Not Threatened
Percival's Legless Skink	*Acontias percivalii tasmani*	Coastal thicket	No	Not Threatened
Cape Skink	*Mabuya capensis*	Coastal bush	No	Not Threatened
Red-sided Skink	*Mabuya homalocephala*	Coastal bushy fynbos	Yes	Not Threatened

Common Name	Scientific Name	Habitat	Endemic to South Africa	Red Data Status
Western Rock Skink	*Mabuya sulcata sulcata*	Karroid	No	Not Threatened
Variable Skink	*Mabuya varia*	Mesic savanna	No	Not Threatened
Variegated Skink	*Mabuya variegata variegata*	Karroid, coastal bush and mesic thicket	No	Not Threatened
Delalande's Sandveld Lizard	*Nucras lalandii*	Montane and temperate grassland	Yes	Not Threatened
Stripped Sandveld Lizard	*Nucras taeniolata*	Mesic thicket	Yes	Not Threatened
Spotted Sand Lizard	*Pedioplanis lineoocellata pulchella*	Most habits	Yes	Not Threatened
Namaqua Sand Lizard	*Pedioplanis namaquensis*	Karroid	No	Not Threatened
Cape Moutain Lizard	*Tropidosaura gularis*	Fynbos covered mountain tops	Yes	Not Threatened
Common Mountain Lizard	*Tropidosaura montana*	Fynbos (mountains)	No	Not Threatened
Yellow-throated Plated Lizard	*Gerrhosaurus flavigularis*	Open coastal forest	No	Not Threatened
Short-legged Seps	*Tetradactylus seps*	Mountains to coastal forest	Yes	Not Threatened
Cape Grass Lizard	*Chamaesaura anguina*	Grass / fynbos covered slopes	No	Not Threatened
Cape Girdled Lizard	*Corylus cordylus*	Rock plateaus in fynbos or shale bands in thicket	Yes	Not Threatened
Karoo Girdled Lizard	*Corylus polyzonus*	Coastal Renosterveld	Yes	Not Threatened
Cape Crag Lizard	*Pseudocorylus microlepidotus*	Upper slopes in fynbos	Yes	Not Threatened
Rock Monitor	*Varanus albigularis*	Karroid	No	Not Threatened
Nile Monitor	*Varanus niloticus*	Rivers, pans and major lakes	No	Not Threatened
Ground Agama	*Agama aculeata*	Inland	No	Not

Common Name	Scientific Name	Habitat	Endemic to South Africa	Red Data Status
				Threatened
Southern Rock / Knobels Agama	*Agama atra atra*	Fynbos	No	Not Threatened
Knysna Dwarf Chameleon	*Bradypodion damaranum*	Wet coastal forest	Yes	Not Threatened
Smith's Dwarf Chameleon	*Bradypodion taeniabronchum*	Van Staden's Mountains	Yes	Endangered
Southern Dwarf Chameleon	*Bradypodion ventrale*	Thicket - rarely in fynbos	Yes	Not Threatened
Hewitt's Dwarf Leaf-toed Gecko	*Goggia hewitti*	Sandstone outcrops in mountain fynbos	No	Not Threatened
Moreau's Tropical House Gecko	*Hemidactylus mabouia*	Coastal towns	No	Not Threatened
Cape Dwarf Gecko	*Lygodactylus capensis*	PE	No	Not Threatened
Bibron's Thick-toed Gecko	*Pachydactylus bibronii*	Karroid veld	Yes	Not Threatened
Cape Thick-toed Gecko	*Pachydactylus capensis*	Karroid	Yes	Not Threatened
Ocellated Thick-toed Gecko	*Pachydactylus geitje*	Fynbos	Yes	Not Threatened
Spotted Thick-toed Gecko	*Pachydactylus maculatus*	Fynbos and coastal bush	Yes	Not Threatened
Marico Thick-toed Gecko	*Pachydactylus mariquensis*	Sandy plains	Yes	Not Threatened

3.7.4 Invertebrates

Although little is known about the invertebrate fauna of the CFR, the few groups that have been studied suggest high levels of endemism. Of more than 230 species of butterflies, about 30 percent are endemic. Environmental Impact Studies rarely include detailed studies of invertebrates due to the vast number of species that are present. The construction of power lines is not likely to have an adverse effect on the invertebrate populations due to their mobility which allows them to move away. We have included species which would likely be present however no detailed assessments have been included. Mitigation measures suggested in this report will

ensure that impacts are reduced in terms of vegetation loss and clearing which would ultimately ensure that invertebrate populations are not adversely affected in the long term.

3.7.5 Fish

The table below indicates the fish species which are likely to be present within the study area. Three species are endemic to the Eastern Cape. Towers for the proposed transmission lines will more than likely span river systems and not impact on the stream flow. The proposed lines are thus not anticipated to affect fish species in the long term. Construction impacts can however result in impacts on river systems when access is required to the proposed servitude. Strict mitigation measures will need to put in place during this phase and access via roads rather than crossing rivers via informal crossings.

Table 11: Fish species likely to occur within the study area (Froese & Pauly, 2009)

Fresh Water Fish				
Order	Family	Species	Common Name	Endemic to the Eastern Cape
Perciformes	Sparidae	*Acanthopagrus berda*	Picnic seabream	No
Anguilliformes	Anguillidae	*Anguilla bengalensis*	African mottled eel	No
Anguilliformes	Anguillidae	*Anguilla marmorata*	Giant mottled eel	No
Anguilliformes	Anguillidae	*Anguilla mossambica*	African longfin eel	No
Cyprinodontiformes	Poecillidae	*Aplocheilichthys hutereaui*	Meshscaled topminnow	No
Perciformes	Gobiidae	*Awaous aeneofuscus*	Freshwater goby	No
Cypriniformes	Cyprinidae	*Barbus anoplus*	Chubbyhead barb	No
Cypriniformes	Cyprinidae	*Barbus pallidus*	Goldie barb	No
Cypriniformes	Cyprinidae	*Barbus trevelyani*	Border barb	Yes
Carcharhiniformes	Carcharhinidae	*Carcharhinus leucas*	Bull shark	No
Perciformes	Eleotridae	*Eleotris fusca*	Dusky sleeper	No
Siluriformes	Ariidae	*Galeichthys feliceps*	White baggar	No
Clupeiformes	Clupeidae	*Gilchristella*	Gilchrist's	No

Fresh Water Fish				
		aestuaria	round herring	
Perciformes	Gobiidae	*Glossogobius callidus*	River goby	No
Cypriniformes	Cyprinidae	*Labeo umbratus*	Moggel	No
Cypriniformes	Cyprinidae	*Labeobarbus aeneus*	Smallmouth yellowfish	No
Mugiliformes	Mugilidae	*Liza richardsonli*	South African mullet	No
Elopiformes	Megalopidae	*Megalops cyprinoides*	Indo-Pacific tarpon	No
Mugiliformes	Mugilidae	*Mugil cephalus*	Flathead mullet	No
Mugiliformes	Mugilidae	*Myxus capensis*	Freshwater mullet	Yes
Perciformes	Cichiidae	*Orechromis mossambicus*	Mozambique tilapia	No
Anguilliformes	Ophichthidae	*Pisodonophis boro*	Rice-paddy eel	No
Siluriformes	Poecillidae	*Plotosus nkunga*	Stinging eel catfish	No
Cyriniformes	Cyprinidae	*Pseudobarbus afer*	Eastern Cape redfin	Yes
Perciformes	Gobiidae	*Redigobius dewaali*	Checked goby	No
Perciformes	Anabantidae	*Sandelia bainsii*	Eastern Cape Rocky	Yes
Perciformes	Anabantidae	*Sandelia capensis*	Cape kurper	No, but it is endemic to South Africa
Perciformes	Terapontidae	*Terapon jarbua*	Jarbua terapon	No

3.8 Habitats

As mentioned previously, because faunal populations are dependent on the flora that supports them, assumptions regarding the presence of fauna can be made based on the flora present. Habitats within the study area are dominated by thicket vegetation with areas of Fynbos occurring. The study area falls within the Cape Floristic Region (CFR). The CFR is dominated by

fynbos although several non fynbos vegetation types are present such as Renosterveld (Conservation International-www.biodiversityhotspots.org , 2009).

Also present in the study area are two prominent floodplains, namely Gamtoos River Floodplain and Swartkops River Floodplain. These rivers have been severely transformed by agricultural and industrial activities and are no longer pristine. They do however remain an important habitat for several species, especially amphibians, and should not be discounted. Several other river systems are also present some of which are important for Red Data species such as the Elandsriver.

Parts of the study area also contain lush coastal thicket which is often associated with dunes and has several faunal species associated with it.

A large portion of the study area is heavily transformed by anthropogenic activities which have resulted in a reduction in viable habitat. Despite the high level of transformation, the topography in the study area has resulted in the inadvertent conservation of vegetation and hence provides habitat for faunal species. Large areas of the study area are inaccessible for development and agricultural activities and this has thus contributed to the conservation of these areas. Areas such as the Van Stadens River Gorge and Wild Flower Reserve and Lady's Slipper are examples of this. Further examples are discussed in detail in the route assessment below.

4 ROUTE ASSESSMENT AND SENSITIVE AREAS

In order to determine the impacts that could result from the proposed project, a detailed route assessment was undertaken from a biodiversity perspective. The route was split up into sections in order to ensure a thorough assessment whilst also to allow for easy reading. Figure 5 and Figure 6 illustrate the sections that were identified for assessment.

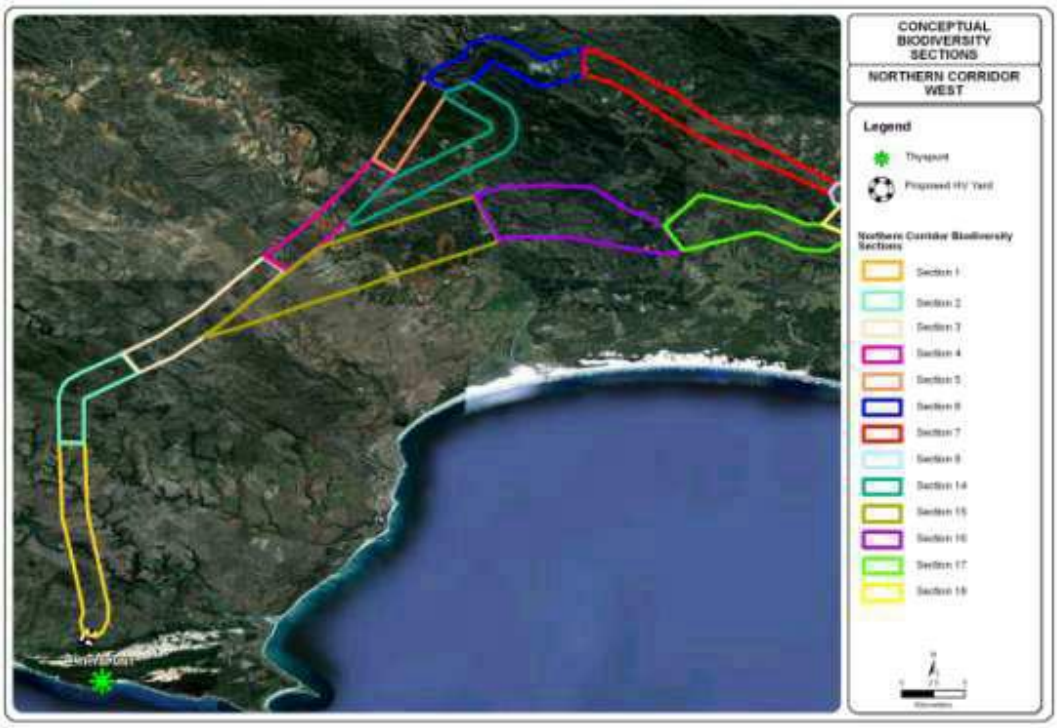

Figure 5: Northern Corridor Biodiversity Sections (West)

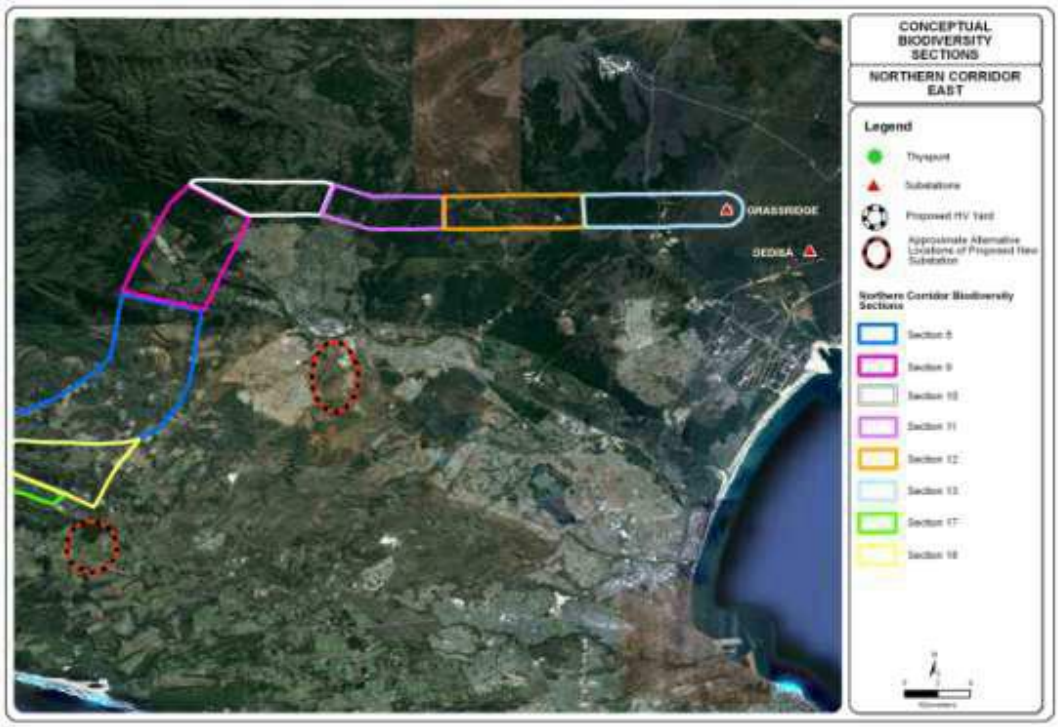

Figure 6: Northern Corridor Biodiversity Sections (East)

Each section involved the assessment of the following:

- General land use description
- Critical Biodiversity Areas (CBAs)
- Vegetation type
- Faunal habitat provision and faunal species of concern
- Implications for development

4.1 Biodiversity Route Assessment

4.1.1 Northern Biodiversity Section 1

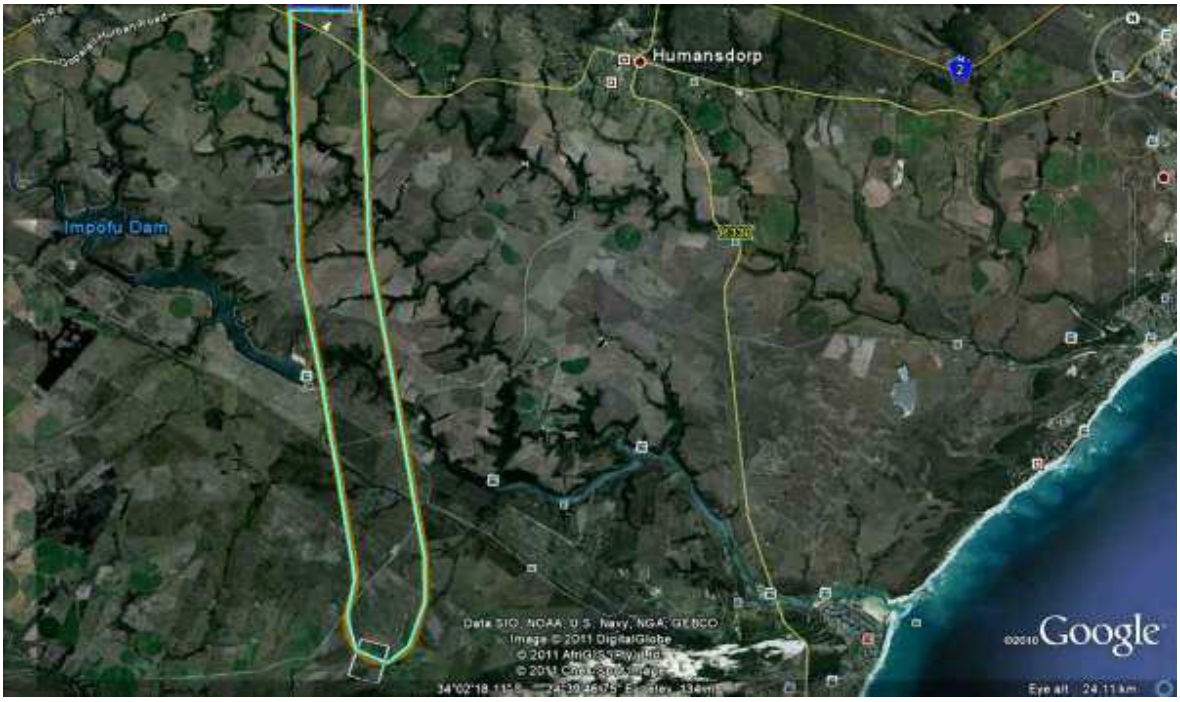

Figure 7: Northern Biodiversity Section 1

- General land use description

This section of the route is characterized by agricultural activities. The Kromme River system and the Geelhoutboom River flow across the corridor with associated tributaries. The majority of the vegetation has been transformed by the agricultural activities and very little natural vegetation remains, particularly in the agricultural fields. Ravines associated with the drainage systems exhibit natural vegetation mainly due to the inaccessibility of these areas. Centre pivot activities are present closer to Humansdorp.

- Critical Biodiversity Areas

This section of the corridor falls within the study area that was covered by the Garden Route Biodiversity Sector Plan for the southern regions of the Kouga and Koukamma Municipalities. According to the sector plan, the areas closest to the HV Yard are considered to be a Critical Biodiversity Area (CBA) and have been allocated a "natural" rating. In addition the drainage lines mentioned above are considered to be CBA's. Smaller ecological support areas also exist in these areas.

- Vegetation type and dominant species

The following vegetation types are present within this section of the corridor:

Table 12: Vegetation Types in Northern Biodiversity Section 1

Vegetation type	Protection Level	Ecological Status
Tsitsikamma Sandstone Fynbos	Poorly protected	Vulnerable
Eastern Coastal Shale Band Vegetation	Poorly protected	Endangered
Gamtoos Thicket	Poorly protected	Least threatened
Humansdorp Shale Renosterveld	Hardly protected	Endangered

- Tsitsikamma Sandstone Fynbos

This vegetation type occupies the sandstone flats north of Thyspunt. Dominant species include *Cliffortia serpyllifolia*, *Erica discolor*, *E.sparsa*, *Leucadendron conicum*, *Leucadendron eucalyptifolium, Restio triticeus besemgoed, Tetraria capillacea* and *Ursinia scariosa* (Mucina & Rutherford, 2006).

- Eastern Coastal Shale Band Vegetation

A very small band of Eastern Coastal Shale Band Vegetation is present to the north of Thyspunt.

- Gamtoos Thicket

Small patches of Gamtoos Thicket are present along the river systems in this section of the corridor.

Dominant species include: Capparis sepiaria, *Ehrharta calycina*, *E.erecta, Euphorbia triangularis*, *Felicia muricata*, *Hypoestes aristata*, *Panicum deustum*, *Portulacaria afra*, *Rhoicissus digitata* and *Setaria sphacelata* (Mucina & Rutherford, 2006).

- Humansdorp Shale Renosterveld

A large portion of the northern part of this section consists of Humansdorp Shale Renosterveld. The soils in this area are extremely well suited for agriculture and as a result large parts have been transformed in this regard.

Dominant species include *Eustachys paspaloides*, *Helichrysum anomalum*, *Oedera genistifolia* and *Themeda triandra* (Mucina & Rutherford, 2006). Thicket clumps can be found in this vegetation type, occasionally forming a mosaic with renosterveld. *Kniphofia citrina* red hot poker and the widespread *Erica glandulosa* occupy streamlines dissecting the area. Opuntia cactus is highly invasive in places.

- Faunal habitat provision and faunal species of concern

Faunal sensitivity in this area relates mainly to reptiles and amphibian species.

The Cape Sand Toad (*Vandijkophrynus* cf. *angusticeps*) & Arum Lily Frog (*Hyperolius* cf. *horstockii*) populations had been found in the past in the Humansdorp, Sandriver and Cape St. Francis area. The closest population is in the Western Cape Province and these isolated populations may prove to be new species. Due to the small area of occupancy and the threat to the habitat this species will be highly threatened.

Mammal species would be limited to small species such as antelope, rodents and other small species such as the Honey Badger (*Mellivora capensis*). Bat-eared fox were noted during field assessments (Figure 8).

Figure 8: Bat-eared Fox Den

- Implications for development

This section of the corridor is heavily transformed by agricultural activities. The Critical Biodiversity Areas identified above do not accurately reflect the activities on the ground. The sensitive amphibian species mentioned above could potentially be affected by the proposed development. Suitable mitigation measures can however reduce these impacts. The ravines along the drainage lines in this section provide good habitat for faunal species and it is critical that these areas are not affected. They represent the majority of natural habitat in this area. The river systems and wetlands that are present are also considered to be sensitive as they provide critical habitat for all faunal groupings. Suitable mitigation measure such as spanning of these areas can be put in place.

The placement of the towers in this section will not be to the detriment of the CBA's due to the level of transformation already present. Suitable mitigation measures can be implemented to reduce vegetation loss. River systems must be spanned and not towers placed within the buffer zones dictated by the surface water studies.

No Red Data floral species were noted in this section. Further fragmentation and transformation of the Humansdorp Shale Renosterveld is of concern as this vegetation type is under immense pressure.

4.1.2 Northern Biodiversity Section 2

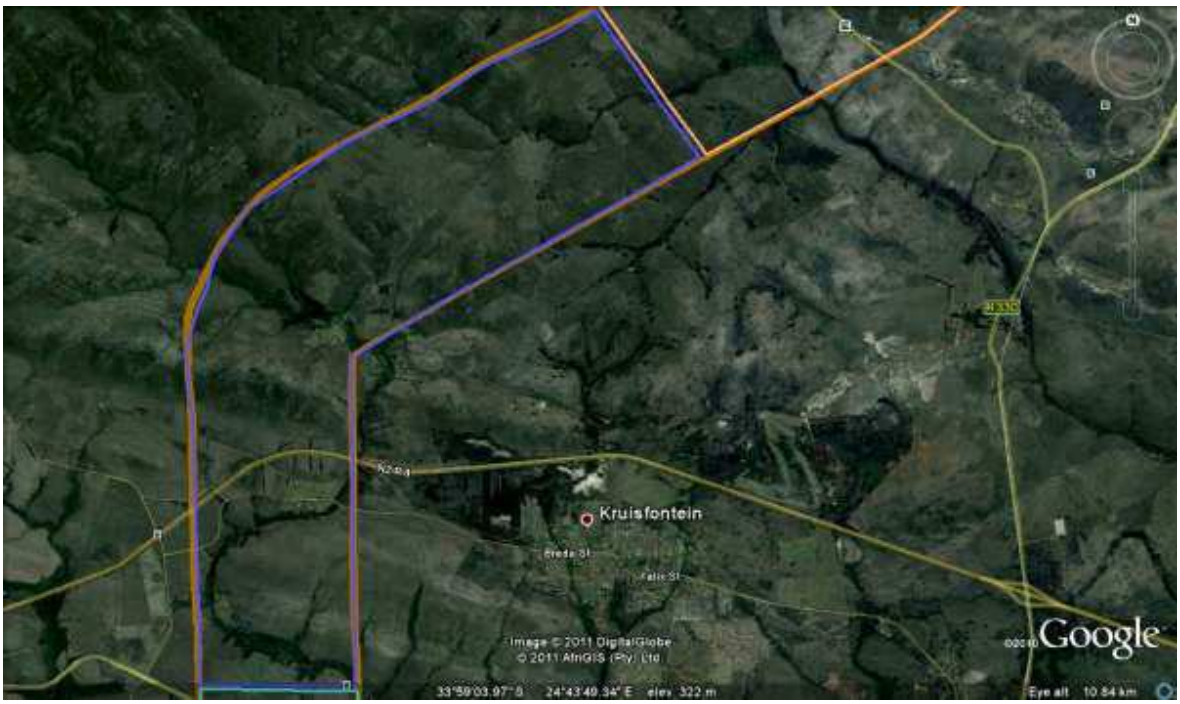

Figure 9: Northern Biodiversity Section 2

- General land use description

This section of the corridor is characterised by natural vegetation associated with the hilly terrain (Figure 10). Some agriculture is present in the valleys associated with farmsteads. The corridor crosses the N2 in this section. Small drainage lines are present as well as some wetland systems.

Figure 10: View across the N2 towards to the hilly terrain

- Critical Biodiversity Areas

The area to the south of the N2 Highway is considered to be a Critical Biodiversity Area according to the Biodiversity Conservation Plan compiled for the Garden Route. The area is fairly natural however some transformation from agriculture is evident.

- Vegetation type and dominant species

Table 13: Vegetation types in Northern Biodiversity Section 2

Vegetation type	Protection Level	Ecological Status
Kouga Sandstone Grassy Fynbos	Moderately protected	Least Threatened
Humansdorp Shale Renosterveld	Hardly protected	Endangered

- Kouga Sandstone Grassy Fynbos

The majority of this section is dominated by Kouga Grassy Sandstone Fynbos. Due to the hilly nature of this section, the vegetation is in a natural state with less transformation in comparison to the areas to the south.

Dominant species include: *Agathosma mucronulata*, *Aloe ferox*, *Aspalathus nivea*, *Cannomois virgata*, *Clutia alaternoides, Cymbopogon marginatus, Disparago ericoides, Dodonaea viscosa var. angustifolia, Erica pectinifolia, Gazania krebsiana, Helichrysum teretifolium, Heteropogon contortus, Ischyrolepis gaudichaudiana, Leucadendron salignum, Leucospermum cuneiforme, Merxmuellera stricta, Passerina obtusifolia, Pentaschistis pallida, Phylica axillaris, Protea nitida waboom, Rhodocoma fruticosa, Seriphium plumosum, Thamnochortus fruticosus, Themeda triandra* and *Watsonia meriana* (Mucina & Rutherford, 2006).

- Humansdorp Shale Renosterveld

A small area of the section south of the N2 consists of Humansdorp Shale Renosterveld. This is also the area that is dominated by agricultural activities.

Dominant species include *Eustachys paspaloides*, *Helichrysum anomalum*, *Oedera genistifolia* and *Themeda triandra* (Mucina & Rutherford, 2006). Thicket clumps can be found in this vegetation type, occasionally forming a mosaic with renosterveld. *Kniphofia citrina* red hot poker and the widespread *Erica glandulosa* occupy streamlines dissecting the area. Opuntia cactus is highly invasive in places.

- Faunal habitat provision and faunal species of concern

This section of the corridor provides good habitat for faunal species and numbers are expected to be higher than in other sections. An assumption has been made that intact habitat would result in a higher species diversity in terms of both faunal and floral species.

The Honey Badger, a Red Data species is likely to be present in these areas however no other Red Data faunal species are likely to inhabit the area. Bat-eared foxes were also sited in this area during field visits.

Amphibian species would be isolated to the drainage lines and wet areas whilst common reptile species would be found throughout the area.

Habitat exists for the FitzSimons Long-tailed Seps (*Tetradactylus africanus fitzsimonsi)* which resides in coastal grassland and grassy fynbos.

- Implications for development

The area is considered to be in a natural state and provides intact habitat for faunal and floral species. The CBA's represent areas of intact vegetation which are important for ecological functioning of these areas. In addition to the intact habitat, the drainage lines present also provide good habitat for faunal and floral species.

Access into the area must be limited in terms of access roads and tower footprints must be strictly maintained in order to preserve the condition of the habitat in this area.

The majority of this area can be spanned by the power lines and vegetation removal must be limited to tower footprints and access tracks.

No Red Data floral species were documented.

4.1.3 Northern Biodiversity Section 3

Figure 11: Northern Biodiversity Section 3

- General land use description

This section of the corridor is characterised by a patchwork of cultivation and stock farming. Portions of natural vegetation exist however large expanses of agricultural activities are evident. Small drainage lines are present which

- Critical Biodiversity Areas

A small area of the section falls within the study area of the Baviaans Mega-Reserve Conservation Plan (Skowno 2007). The area has been determined to be a CBA 2, which according to the accompanying documentation indicates that the area contains all remaining endangered habitats such as wetlands, rivers. This particular area contains the Kabeljous River which is an important linkage corridor.

The management interventions for this CBA include the maintenance of biodiversity in a near natural state with minimal loss of ecosystem integrity. No transformation of natural habitat should be permitted and land use practices should relate to conservation and game farming with limited livestock.

- Vegetation type and dominant species

Table 14: Vegetation types in Northern Biodiversity Section 3

Vegetation type	Protection Level	Ecological Status
Kouga Sandstone Grassy Fynbos	Moderately protected	Least Threatened
Eastern Inland Shale Band Vegetation	Well Protected	Least Threatened
Gamtoos Thicket	Poorly protected	Least threatened

- Kouga Sandstone Grassy Fynbos

Kouga Grassy Sandstone Fynbos is the dominant vegetation type in this section of the corridor. The grassy characteristic of this vegetation is evident is this part of the study area. An increase in grazing agriculture is also evident. Large portions of the vegetation have been transformed to varying degrees across this section due to the grazing and crop cultivation.

Dominant species include: *Agathosma mucronulata*, *Aloe ferox*, *Aspalathus nivea*, *Cannomois virgata*, *Clutia alaternoides, Cymbopogon marginatus, Disparago ericoides, Dodonaea viscosa var. angustifolia, Erica pectinifolia, Gazania krebsiana, Helichrysum teretifolium, Heteropogon contortus, Ischyrolepis gaudichaudiana, Leucadendron salignum, Leucospermum cuneiforme,*

Merxmuellera stricta, Passerina obtusifolia, Pentaschistis pallida, Phylica axillaris, Protea nitida, Rhodocoma fruticosa, Seriphium plumosum, Thamnochortus fruticosus, Themeda triandra and *Watsonia meriana* (Mucina & Rutherford, 2006).

- Eastern Inland Shale Band Vegetation

A small slither of Eastern Inland Shale Band Vegetation is present in this section. This vegetation is associated with shale bands of the Kougaberge and the Baviaanskloofberge (Mucina & Rutherford 2006).

Dominant species include *Protea nitida, Protea nerifolia, Protea repens, Leucadendron eucalyptifolium, Protea punctata, Elytropappus rhinocerotis, Lachnæa glomerata* and *Themeda triandra.*

- Gamtoos Thicket

Small patches of Gamtoos Thicket are present along the river systems in this section of the corridor.

Dominant species include: *Capparis sepiaria*, *Ehrharta calycina*, *E.erecta, Euphorbia triangularis*, *Felicia muricata*, *Hypoestes aristata*, *Panicum deustum*, *Portulacaria afra*, *Rhoicissus digitata* and *Setaria sphacelata* (Mucina & Rutherford, 2006).

- Faunal habitat provision and faunal species of concern

The area contains game farming activities and hence the presence of larger faunal species is evident. The presence of game farming has preserved the natural regime to a certain extent with no major transformation taking place. Impacts resulting from these activities are however evident with the presence of some signs of overgrazing in some areas. River systems are present which provide habitat for several faunal species. Amphibian species listed are likely to be isolated to these damp areas.

A Blue duiker was sited in riverine habitat provided by the Diep River which passes through this section of the corridor.

Habitat is available for the majority of reptile species listed in this report, particularly those associated with fynbos and coastal grassland such as the Rhombic Skaapsteker or Montane Grass Snake.

Habitat exists for the FitzSimons Long-tailed Seps (*Tetradactylus africanus fitzsimonsi)* which resides in coastal grassland and grassy fynbos.

Common ungulate species such as the Grey duiker and Cape Grysbok are likely to be present due to the grassy layer that is present.

- Implications for development

This section of the corridor is in a fairly natural state. Land use activities have assisted in maintaining the natural vegetation with minimal transformation. The northern part of this section forms part of the Baviaans Mega-Reserve Conservation Plan associated with the Kabeljous River.

No Red Data floral species were identified during sampling however habitat is present for faunal species in terms of grassy fynbos and riverine areas.

Intensive construction activities would result in loss of this vegetation however the vegetation layer in this area is extremely low and no major clearing would be required. Impacts would thus relate to tower locations and access tracks. Suitable mitigation measures can be implemented to reduce vegetation clearance and ensure spanning of sensitive drainage areas.

4.1.4 Northern Biodiversity Section 4

Figure 12: Northern Biodiversity Section 4

- General land use description

This section of the corridor illustrates a large degree of transformation from the natural state. Heavy agriculture on the fertile banks of the Gamtoos River Valley has resulted in the loss of large areas of natural vegetation. Higher, hilly areas still show some natural vegetation due to inaccessibility for agriculture however valley bottoms are mostly heavily cultivated.

- Critical Biodiversity Areas

This section of the corridor falls within the study area of the Baviaans Mega-Reserve Conservation Plan (Skowno 2007). The mountainous areas surrounding the R330 have been identified as a CBA 1a which indicates the presence of 100% irreplaceable habitats; restricted RDB plant species and Critically Endangered habitats as well as selected river reaches. In addition to being classified as a 1a CBA the surrounding areas are also classed as a CBA 2 which also indicates the presence of endangered habitats and linkages. The majority of the section is considered to be a CBA 3 which is associated with river reaches.

Management interventions for these CBA's are as follows:

CBA 1a - Maintain biodiversity in as natural a state as possible. Manage for no biodiversity loss. Favourable land use would be Conservation.

CBA 2 - Maintain biodiversity in a near natural state with minimal loss of ecosystem integrity. No transformation of natural habitat should be permitted. Favourable land use would be game farming, conservation and limited livestock.

CBA 3 - Manage for sustainable development, keeping natural habitat intact in wetlands (including buffers) and riparian zones. Environmental authorisations should support ecosystem integrity. Favourable land uses include conservation, game farming, Livestock, limited dryland crops, limited irrigated crops, limited dairy, limited timber and limited settlement.

- Vegetation type and dominant species

Table 15: Vegetation types in Northern Biodiversity Section 4

Vegetation type	Protection Level	Ecological Status
Loerie Conglomerate Fynbos	Moderately Protected	Least Threatened
Gamtoos Thicket	Poorly protected	Least threatened
Albany Alluvial Vegetation	Poorly protected	Endangered

- Loerie Conglomerate Fynbos

This vegetation type is confined to the sides of the Gamtoos River. Vegetation is characterised by a grassy layer interspersed with fynbos shrubs.

Dominant species include: *Aristida junciformis*, *Aspalathus nivea*, *Cliffortia ruscifolia*, *Cymbopogon marginatus*, *Dicerothamnus rhinocerotis*, *Dodonaea viscosa* var. *angustifolia*, *Helichrysum odoratissimum, Ischyrolepis gaudichaudiana, Leucadendron salignum, Passerina obtusifolia, Protea nitida, Sporobolus africanus* and *Tetraria cuspidata* (Mucina & Rutherford, 2006).

- Gamtoos Thicket

This section of the corridor crosses the Gamtoos River. The hilly areas surrounding the river are characteristic Gamtoos thicket.

Dominant species include: *Capparis sepiaria*, *Ehrharta calycina*, *E.erecta, Euphorbia triangularis*, *Felicia muricata*, *Hypoestes aristata*, *Panicum deustum*, *Portulacaria afra*, *Rhoicissus digitata* and *Setaria sphacelata* (Mucina & Rutherford, 2006).

- Albany Alluvial Vegetation

This vegetation is closely associated with the Gamtoos River and has been heavily transformed by farming activities. Due to activities such as these, this vegetation type is considered to be endangered.

Dominant species include: *Acacia natalitia*, *Cynodon dactylon*, Cyp*erus papyrus, Pentzia incana, Phragmites australis, Salix mucronata, Schotia afra* and *Sporobolus nitens* (Mucina & Rutherford, 2006).

- Faunal habitat provision and faunal species of concern

Limited habitat for faunal species is present in this section of the route due to the large scale transformation that has taken place due to agricultural activities. This is particularly evident surrounding the Gamtoos River. The inaccessible areas on either side of the river do however provide habitat however anthropogenic activities are increasing in these areas.

Mammal species that are likely to be present would be limited to small mammal species. Habitat is available for the Honey badger however habitat is limited for the Blue duiker due to the transformation around the river. Bat roosting spots may be present in the mountainous areas however no caves were noted and geological conditions do not allow for karst topography.

Amphibian species would be limited to the damp areas associated with drainage lines and the river. No Red Data species are likely to be present however the Cape Platanna may be present in the Gamtoos River.

Several reptile species are likely to be present. To the south of the Gamtoos, species preferring fynbos are likely to be present whilst species preferring thicket vegetation would be present to the north of the river. No Red Data species are likely to be present and none were observed.

The Gamtoos River provides habitat for several fish species however the power lines will span the river and will not directly affect the habitat.

- Implications for development

This section of the corridor is heavily transformed by anthropogenic activities however CBA's have been identified which dictates the management approach in these areas. The mountainous areas (Figure 13) to the south the Gamtoos River (Loerie Conglomerate Fynbos) provide intact habitat for faunal and floral species and have been accordingly assigned as a CBA1a. Construction in this area will need to be strictly managed to ensure that only the tower footprints result in loss of vegetation.

The heavy transformation that is already present in this area needs to be taken into consideration and the proposed development should not contribute further to the existing status quo.

Figure 13: Intact habitat in the mountainous area east of the Gamtoos River

4.1.5 Northern Biodiversity Section 5

Figure 14: Northern Biodiversity Section 5

- General land use description

This section of the corridor is characterised by intact thicket vegetation interspersed with citrus agriculture. Very few anthropogenic activities were noted in this section. The section includes the Stinkhoutberg Nature Reserve which is part of Eastern Cape Parks.

- Critical Biodiversity Areas

This section of the corridor falls within the study area of the Baviaans Mega-Reserve Conservation Plan (Skowno 2007). The natural nature of this section has resulted in the majority of the area being classed as a CBA 1 and 2.

A CBA 1 indicates the presence of 100% irreplaceable habitats; restricted RDB plant species and Critically Endangered habitats as well as selected river reaches. In addition the surrounding areas are classed as a CBA 2 which also indicates the presence of endangered habitats and linkages.

Management interventions for these CBA's are as follows:

CBA 1a - Maintain biodiversity in as natural a state as possible. Manage for no biodiversity loss. Favourable land use would be Conservation.

CBA 2 - Maintain biodiversity in a near natural state with minimal loss of ecosystem integrity. No transformation of natural habitat should be permitted. Favourable land use would be game farming, conservation and limited livestock.

- Vegetation type and dominant species

Table 16: Vegetation types in Northern Biodiversity Section 5

Vegetation type	Protection Level	Ecological Status
Loerie Conglomerate Fynbos	Moderately Protected	Least Threatened
Gamtoos Thicket	Poorly protected	Least threatened
Albany Alluvial Vegetation	Poorly protected	Endangered
Kouga Sandstone Grassy Fynbos	Moderately Protected	Least threatened

- Loerie Conglomerate Fynbos

This vegetation type is located to the south of Kleinrvier in this section of the corridor. Vegetation is characterised by a grassy layer interspersed with fynbos shrubs. The area is mountainous with little infrastructure present.

Dominant species include: *Aristida junciformis*, *Aspalathus nivea*, *Cliffortia ruscifolia*, *Cymbopogon marginatus*, *Dicerothamnus rhinocerotis*, *Dodonaea viscosa* var. *angustifolia*, *Helichrysum odoratissimum, Ischyrolepis gaudichaudiana, Leucadendron salignum, Passerina obtusifolia, Protea nitida, Sporobolus africanus* and *Tetraria cuspidata* (Mucina & Rutherford, 2006).

- Gamtoos Thicket

The area to the north of the Kleinrivier is dominated by Gamtoos Thicket and is very inaccessible. This area contains the Stinkhoutberg Nature Reserve. Patches of Afromontane forest occur in the kloofs that are present with protected Yellowwood and Milkwood trees present.

Dominant species include: *Capparis sepiaria*, *Ehrharta calycina*, *E.erecta, Euphorbia triangularis*, *Felicia muricata*, *Hypoestes aristata*, *Panicum deustum*, *Portulacaria afra*, *Rhoicissus digitata* and *Setaria sphacelata* (Mucina & Rutherford, 2006).

- Albany Alluvial Vegetation

This vegetation type is associated with the Kleinrivier system which runs across this section of the corridor.

Dominant species include: *Acacia natalitia*, *Cynodon dactylon*, Cyp*erus papyrus, Pentzia incana, Phragmites australis, Salix mucronata, Schotia afra* and *Sporobolus nitens* (Mucina & Rutherford, 2006).

- Kouga Sandstone Grassy Fynbos

The Gamtoos Thicket ends abruptly in the northern part of this section and a small area of Kouga Grassy Sandstone Fynbos is present within this section of the corridor. This area is however heavily transformed by the forestry plantation apart from the fire breaks which are not planted.

Dominant species include: *Agathosma mucronulata*, *Aloe ferox*, *Aspalathus nivea*, *Cannomois virgata*, *Clutia alaternoides, Cymbopogon marginatus, Disparago ericoides, Dodonaea viscosa var. angustifolia, Erica pectinifolia, Gazania krebsiana, Helichrysum teretifolium, Heteropogon contortus, Ischyrolepis gaudichaudiana, Leucadendron salignum, Leucospermum cuneiforme, Merxmuellera stricta, Passerina obtusifolia, Pentaschistis pallida, Phylica axillaris, Protea nitida, Rhodocoma fruticosa, Seriphium plumosum, Thamnochortus fruticosus, Themeda triandra* and *Watsonia meriana* (Mucina & Rutherford, 2006).

- Faunal habitat provision and faunal species of concern

The Gamtoos thicket and wooded kloofs in this section of the corridor provide perfect habitat for several faunal species. The area is protected by Eastern Cape Parks which contributes to the importance of this area. Bird diversity in this area is expected to be high (see avifaunal report). In addition the thicket provides ideal habitat for the rare Blue duiker as well as for other more common antelope species which would find refuge in the area. Patches of indigenous forest were noted in this area (Figure 15).

Figure 15: Indigenous forest in the Heuningkloof valley leading up to Stinkhoutberg Nature Reserve

This section also provides ideal habitat for primates such as the Chacma baboon and vervet monkey's which were noted during field studies.

The thicket does not provide habitat for the Dwarf Chameleon however the grassy fynbos, particularly in the firebreaks do provide ideal habitat for this species.

Klein Rivier provides habitat for amphibian species.

Figure 16: View of Stinkhoutberg Nature Reserve from Longmore Forest

- Implications for development

The area provides intact habitat for both faunal and floral species and it has been identified as sensitive. Placement of the power lines through this area would result in destruction of thicket and forest vegetation (Figure 16) as clearing would be required due to the accessibility of the area.

4.1.6 Northern Biodiversity Section 6

Figure 17: Northern Biodiversity Section 6

- General land use description

This section of the corridor consists of the firebreaks as well as pine plantations of the Longmore Forestry area. The area is mountainous but is accessible via forestry roads.

- Critical Biodiversity Areas

This section of the corridor falls within the study area of the Baviaans Mega-Reserve Conservation Plan (Skowno 2007).

CBA 1a associated with the river systems
CBA 2 associated with the forest (close to stinkhout)
CBA 3 associated with the forestry
CBA 1b associated with habitat for the Hewitts Ghost Frog– Diep River

Management interventions for these CBA's are as follows:

CBA 1 - Maintain biodiversity in as natural a state as possible. Manage for no biodiversity loss. Favourable land use would be Conservation.

CBA 2 - Maintain biodiversity in a near natural state with minimal loss of ecosystem integrity. No transformation of natural habitat should be permitted. Favourable land use would be game farming, conservation and limited livestock.

CBA 3 - Manage for sustainable development, keeping natural habitat intact in wetlands (including buffers) and riparian zones. Environmental authorisations should support ecosystem integrity. Favourable land uses include conservation, game farming, Livestock, limited dryland crops, limited irrigated crops, limited dairy, limited timber and limited settlement.

- Vegetation type and dominant species

Table 17: Vegetation types in Northern Biodiversity Section 6

Vegetation type	Protection Level	Ecological Status
Kouga Sandstone Fynbos	Well Protected	Least threatened
Kouga Sandstone Grassy Fynbos	Moderately Protected	Least threatened

- Kouga Sandstone Fynbos

This vegetation type is found in the mountains to the north west of Port Elizabeth. The grassy component is missing from this vegetation and fynbos species dominate. This section is dominated by this vegetation type.

Dominant species include: *Euryops virgineus*, *Leucadendron comosum*, *L.eucalyptifolium*, *Protea mundii, P.neriifolia, P.nitida, P.repens and Rhus lucida* (Mucina & Rutherford, 2006).

- Kouga Sandstone Grassy Fynbos

The fynbos component noted in section 5 continues across into this section and forms part of the Longmore Forest firebreaks. Portions of the vegetation have been transformed for forestry however the firebreaks provide good examples of this vegetation type.

Dominant species include: *Agathosma mucronulata*, *Aloe ferox*, *Aspalathus nivea*, *Cannomois virgata*, *Clutia alaternoides, Cymbopogon marginatus, Disparago ericoides, Dodonaea viscosa var. angustifolia, Erica pectinifolia, Gazania krebsiana, Helichrysum teretifolium, Heteropogon contortus, Ischyrolepis gaudichaudiana, Leucadendron salignum, Leucospermum cuneiforme, Merxmuellera stricta, Passerina obtusifolia, Pentaschistis pallida, Phylica axillaris, Protea nitida,*

Rhodocoma fruticosa, Seriphium plumosum, Thamnochortus fruticosus, Themeda triandra and *Watsonia meriana* (Mucina & Rutherford, 2006).

- Faunal habitat provision and faunal species of concern

Although transformation is very evident in this section, the remaining habitat is critical for two protected species namely the Hewitt's Ghost Frog and the Smiths Dwarf Chameleon. The frog is found in some of the rivers flowing through Longmore such as the Diep and Geelhoutboom (Figure 18). These drainage lines are heavily affected by forestry however they still provide this habitat making them sensitive. The firebreaks located on the boundaries of the forestry have provided ideal habitat for the Dwarf Chameleon.

In addition to these sensitive species, generic faunal species are also likely to be present within this section such as the common duiker, Cape Grysbok as well as the Honey Badger. Reptile species that prefer the fynbos habitat are also likely to be present. Amphibian species are likely to be limited to the drainage areas.

Figure 18: River system in Longmore Forest

- Implications for development

Destruction of habitat for Dwarf Chameleon although construction access can be limited. Pylon construction will not be placed in Ghost Frog habitat and existing access roads will / must be used in these areas.

The transformation by the forestry entails that the fynbos firebreaks have become important habitat provision in this section. Some protected tree species are also likely to be present.

4.1.7 Northern Biodiversity Section 7

Figure 19: Northern Biodiversity Section 7

- General land use description

This section of the corridor consists of the firebreaks as well as pine plantations of the Longmore Forestry area. The area is mountainous but is accessible via forestry roads. The area overlooks the Elandsrivier Conservancy.

- Critical Biodiversity Areas

CBA 3 – southern portion near Van Stadens Dam. Fynbos present – firebreak bordered by forestry and Elandsrivier on the other.

Management interventions for these CBA's are as follows:

CBA 3 - Manage for sustainable development, keeping natural habitat intact in wetlands (including buffers) and riparian zones. Environmental authorisations should support ecosystem integrity. Favourable land uses include conservation, game farming, Livestock, limited dryland crops, limited irrigated crops, limited dairy, limited timber and limited settlement.

- Vegetation type and dominant species

Table 18: Vegetation types in Northern Biodiversity Section 7

Vegetation type	Protection Level	Ecological Status
Kouga Sandstone Grassy Fynbos	Moderately Protected	Least threatened

- Kouga Sandstone Grassy Fynbos

The fynbos component noted in section 5 continues across into this section and forms the Longmore Forest firebreaks. Portions of the vegetation have been transformed for forestry however the firebreaks provide good examples of this vegetation type (Figure 20).

Figure 20: Fynbos Firebreaks on the boundary of Longmore Forest

Dominant species include: *Agathosma mucronulata*, *Aloe ferox*, *Aspalathus nivea*, *Cannomois virgata*, *Clutia alaternoides, Cymbopogon marginatus, Disparago ericoides, Dodonaea viscosa var. angustifolia, Erica pectinifolia, Gazania krebsiana, Helichrysum teretifolium, Heteropogon contortus, Ischyrolepis gaudichaudiana, Leucadendron salignum, Leucospermum cuneiforme, Merxmuellera stricta, Passerina obtusifolia, Pentaschistis pallida, Phylica axillaris, Protea nitida,*

Rhodocoma fruticosa, Seriphium plumosum, Thamnochortus fruticosus, Themeda triandra and *Watsonia meriana* (Mucina & Rutherford, 2006).

Cycad species (Figure 21) were noted in this vegetation type in the low lying areas near Elandsrivier. These are protected by legislation and would require a permit if they were to be removed.

Figure 21: Cycad species (*Encephalartos* sp) present in the Longmore firebreak

Several Red Data species are likely to be present within Longmore on the periphery:

- *Cyclopia longifolia* (honeybush tea)
- *Encephalartos longifolius* (cycad)
- *Leucodendron loeriense* (Loerie conebush)
- *Paranomus reflexus* (Van Staden's scepter)
- *Leucodendron orientale* (Van Staden's sunbush)
- *Gladiolus geardii* (gradiolus)

The walkdown will determine whether these species will be affected and if permits are required. If identified, they need to be avoided and spanned rather than moved or destroyed.

- Faunal habitat provision and faunal species of concern

As with section 8, transformation is very evident in this section, the remaining habitat is critical for two protected species namely the Hewitt's Ghost Frog and the Smiths Dwarf Chameleon. The frog is found in some of the rivers flowing through Longmore such as the Diep and Geelhoutboom (Figure 22). These drainage lines are heavily affected by forestry however they still provide this habitat making them sensitive. The firebreaks located on the boundaries of the forestry have provided ideal habitat for the Dwarf Chameleon.

In addition to these sensitive species, generic faunal species are also likely to be present within this section such as the common duiker, Cape Grysbok as well as the Honey Badger. Reptile species that prefer the fynbos habitat are also likely to be present. Amphibian species are likely to be limited to the drainage areas.

Figure 22: Ghost Frog Habitat in Longmore Forest

- Implications for development

Destruction of habitat for Dwarf Chameleon although construction access can be limited. Pylon construction will not be placed in Ghost Frog habitat and existing access roads will / must be used in these areas.

The transformation by the forestry entails that the fynbos firebreaks have become important habitat provision in this section. Some protected tree species are also likely to be present.

4.1.8 Northern Biodiversity Section 8

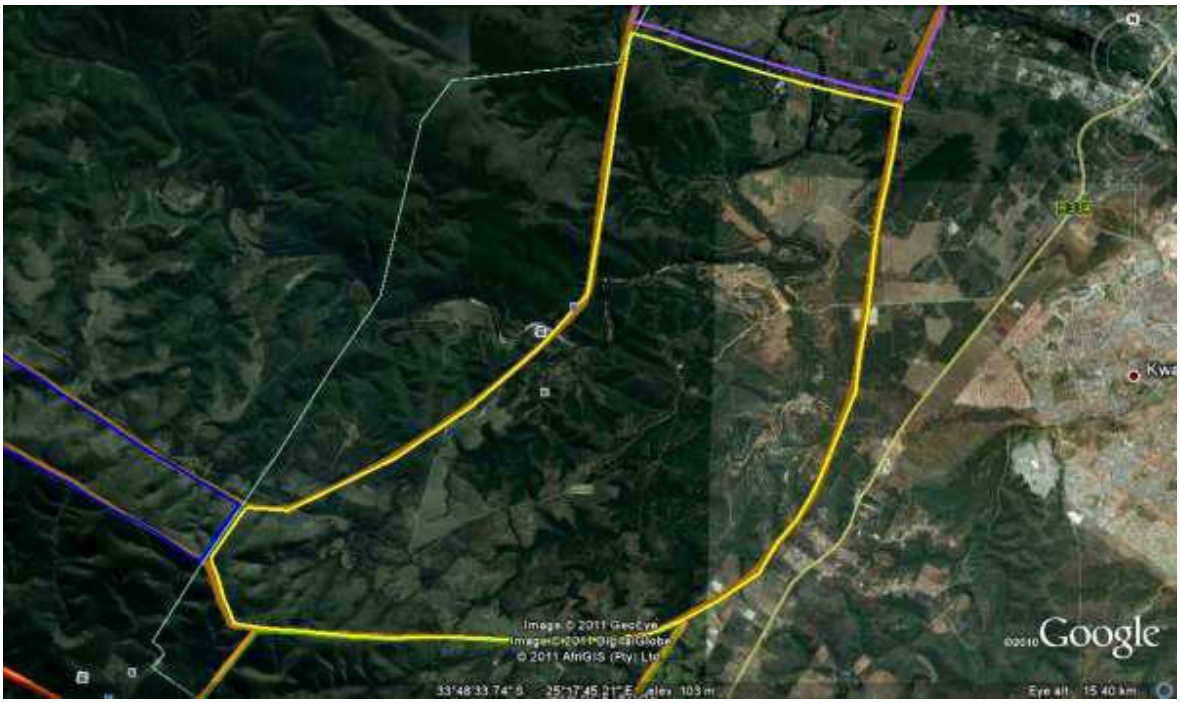

Figure 23: Northern Biodiversity Section 8

- General land use description

Transformation increases in this section of the route. Several chicken farms are present and infrastructure in general increases in this area. Game farming activities are also present associated with the thicket vegetation. Agricultural activities are present around Rocklands as well as on and surrounding the banks of the Elands River.

- Critical Biodiversity Areas

CBA 1 - Hopewell – Groendal Corridor. This CBA is associated with the ecological linkage between Groendal and the Hopewell Conservancy.

The CBA represents a linkage corridor as part of the Nelson Mandela Bay Metro Biodiversity Conservation Plan.

- Vegetation type and dominant species

Table 19: Vegetation types in Northern Biodiversity Section 8

Vegetation type	Protection Level	Ecological Status
Kouga Sandstone Grassy Fynbos	Moderately Protected	Least threatened
Humansdorp Shale Renosterveld	Hardly protected	Endangered
Sunday's Thicket	Poorly protected	Least threatened

- Kouga Sandstone Grassy Fynbos

This section contains a mosaic of several different vegetation types. The remnants of the Kouga Sandstone Grassy Fynbos are located near Rocklands where the mountainous terrain flattens out slightly. The vegetation is transformed to some extent by agricultural activities.

Dominant species include: *Agathosma mucronulata*, *Aloe ferox*, *Aspalathus nivea*, *Cannomois virgata*, *Clutia alaternoides, Cymbopogon marginatus, Disparago ericoides, Dodonaea viscosa var. angustifolia, Erica pectinifolia, Gazania krebsiana, Helichrysum teretifolium, Heteropogon contortus, Ischyrolepis gaudichaudiana, Leucadendron salignum, Leucospermum cuneiforme, Merxmuellera stricta, Passerina obtusifolia, Pentaschistis pallida, Phylica axillaris, Protea nitida waboom, Rhodocoma fruticosa, Seriphium plumosum, Thamnochortus fruticosus besemriet, Themeda triandra* and *Watsonia meriana* (Mucina & Rutherford, 2006).

- Humansdorp Shale Renosterveld

Located in the transition between the grassy fynbos and Sundays thicket. It is largely transformed for agricultural purposes.

Dominant species include *Eustachys paspaloides*, *Helichrysum anomalum*, *Oedera genistifolia* and *Themeda triandra* (Mucina & Rutherford, 2006). Thicket clumps can be found in this vegetation type, occasionally forming a mosaic with renosterveld. *Kniphofia citrina* red hot poker and the widespread *Erica glandulosa* occupy streamlines dissecting the area. Opuntia cactus is highly invasive in places.

- Sunday's thicket

The majority of this section is characterised by Sunday's thicket vegetation. It is dominated by tall, dense thicket with a co-dominance of trees, shrubs and succulents. It is heavily spinescent. Game farming in this section of the corridor takes advantage of this thicket however agricultural activities are present which have resulted in transformation of the thicket.

Dominant species include: *Aloe africana*, *Aristida adscensionis*, *A.congesta*, *Bulbine frutescens*, *Cynodon dactylon*, *C.incompletus* soetkweek, *Drimia intricata*, *Euclea undulata*, *Euphorbia caerulescens*, *E.ledenii*, *Olea europaea* subsp. *africana* wild olive, *Panicum maximum* purple-top buffalo, *Pappea capensis*, *Pelargonium peltatum*, *Pentzia globosa*, *Portulacaria afra*, *Schotia afra*, *Senecio radicans* and *Tragus bertonianus* (Mucina & Rutherford, 2006).

- Faunal habitat provision and faunal species of concern

Common species likely to be present. Thicket vegetation provides abundant habitat for antelope.

The Elands River present in this section provides riverine habitat for species which prefer this habitat such as the Blue duiker and amphibian species. The river corridor has been affected by alien infestation as well as anthropogenic activities.

- Implications for development

Thicket clearing will result in major fragmentation given the characteristics of thicket vegetation. No clearing is recommended for these areas. Existing power lines in this area have illustrated that the thicket vegetation is not too high beneath the power lines and the 400kV lines will be taller than those already present. The Elands River is considered to be a sensitive area however this can be spanned.

The CBA in this section is associated with linkage corridors and the power line construction will not impact on this corridor or form a hard barrier. Suitable mitigation measures can be implemented to ensure that these areas are not negatively impacted by clearing and construction activities.

4.1.9 Northern Biodiversity Section 9

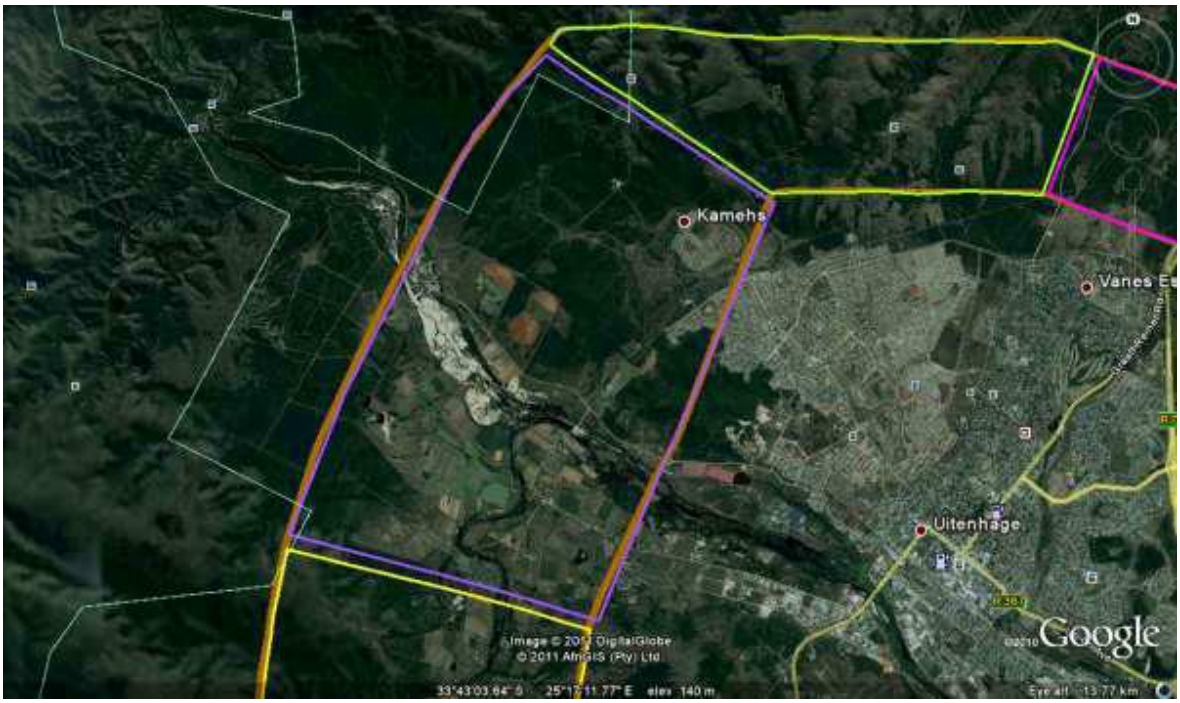

Figure 24: Northern Biodiversity Section 9

- General land use description

This section of the corridor passes to the west of Uitenhage. The area is dominated by agricultural activities associated with the Swartkops River. Heavy agricultural activities were observed in this area.

- Critical Biodiversity Areas

The Swartkops River has been identified by the Nelson Mandela Biodiversity Conservation Plan as an important linkage corridor.

- Vegetation type and dominant species

Table 20: Vegetation types in Northern Biodiversity Section 9

Vegetation type	Protection Level	Ecological Status
Albany Alluvial Vegetation	Poorly protected	Endangered

Sunday's Thicket	Poorly protected	Least threatened

- Albany Alluvial Vegetation

This vegetation is closely associated with the Swartkops River and has been heavily transformed by farming and mining activities. Due to activities such as these, this vegetation type is considered to be endangered.

Dominant species include: *Acacia natalitia*, *Cynodon dactylon*, Cyp*erus papyrus, Pentzia incana, Phragmites australis, Salix mucronata, Schotia afra* and *Sporobolus nitens* (Mucina & Rutherford, 2006).

- Sunday's thicket

Sunday's Thicket dominates this section of the corridor and more intact patches of this vegetation are present in the western part of this section. This links to the Groendal Wilderness area. It is dominated by tall, dense thicket with a co-dominance of trees, shrubs and succulents. It is heavily spinescent. Game farming in this section of the corridor takes advantage of this thicket however agricultural activities are present which have resulted in transformation of the thicket.

Dominant species include: *Aloe africana*, *Aristida adscensionis*, *A.congesta*, *Bulbine frutescens*, *Cynodon dactylon*, *C.incompletus* soetkweek, *Drimia intricata*, *Euclea undulata*, *Euphorbia caerulescens*, *E.ledenii*, *Olea europaea* subsp. *africana* wild olive, *Panicum maximum* purple-top buffalo, *Pappea capensis*, *Pelargonium peltatum*, *Pentzia globosa*, *Portulacaria afra*, *Schotia afra*, *Senecio radicans* and *Tragus bertonianus* (Mucina & Rutherford, 2006).

- Faunal habitat provision and faunal species of concern

This section of the corridor is affected by transformation and habitat provision is limited. The northern parts of this area which comprise of the Sunday's Thicket provide habitat for faunal species. The Swarkops River provides habitat for amphibian species however the river has been severely transformed and very little riparian habitat exists along the river.

Sensitive species likely to be present include the Blue Duiker and the Honey Badger. No Red Data amphibians or reptiles are likely to be present.

- Implications for development

A high level of transformation is present in this section. It is preferable to steer clear of intact thicket vegetation. The Swartkops River will be able to be spanned. Housing development

(Rosedale) is present in the northern part of this section and is expected to expand. It is preferable to not clear thicket vegetation in this section due to the high fragmentation impacts that results but rather to span the thicket vegetation. This will maintain linkage within the area and assist with faunal and floral movement across the study area between the Springs area to the Groendal area.

4.1.10 Northern Biodiversity Section 10

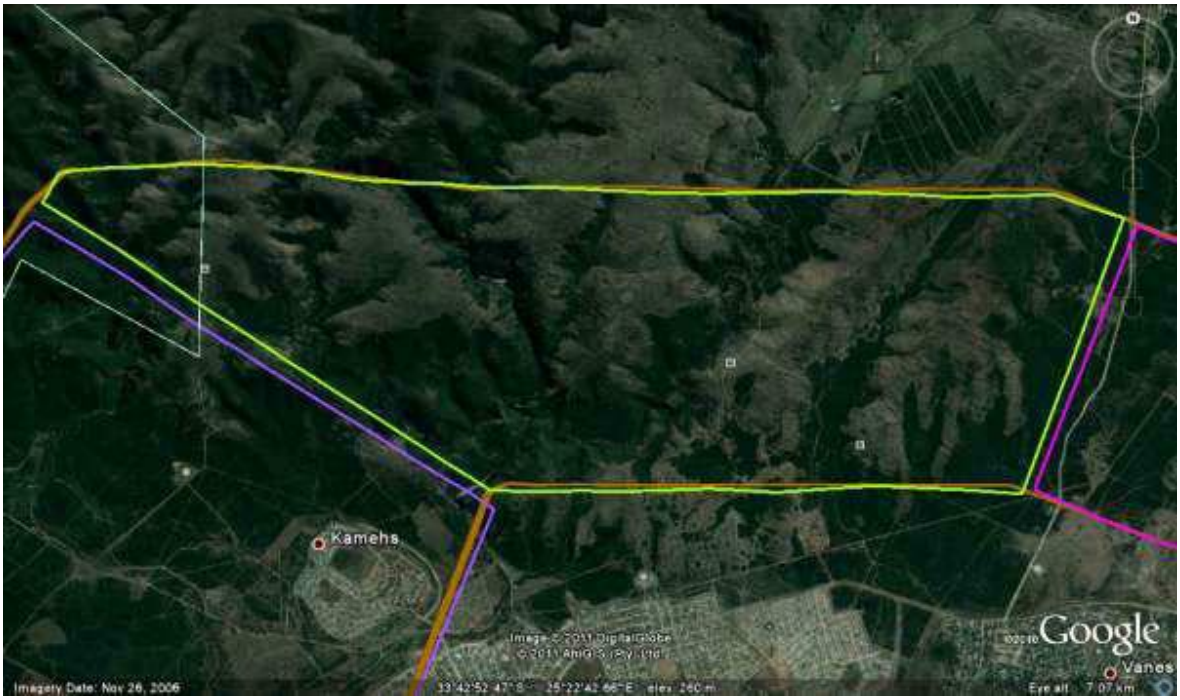

Figure 25: Northern Biodiversity Section 10

- General land use description

This section of the corridor is characterised by hilly terrain. The section is located to the north of the Rosedale community and is considered to be in a natural state. Wooded kloofs and fynbos hilltops are common.

- Critical Biodiversity Areas

CBA 1 Springs Groendal Corridor. This provides a linkage corridor between the Springs Nature Reserve and the Groendal Wilderness area in terms of the Nelson Mandela Biodiversity Conservation Plan.

- Vegetation type and dominant species

Table 21: Vegetation types in Northern Biodiversity Section 10

Vegetation type	Protection Level	Ecological Status
Kouga Sandstone Grassy Fynbos	Moderately Protected	Least threatened
Sunday's Thicket	Poorly protected	Least threatened

- Kouga Sandstone Grassy Fynbos

The tops of the hills in this section of the corridor are characterised by Kouga Sandstone Grassy Fynbos.

Dominant species include: *Agathosma mucronulata*, *Aloe ferox*, *Aspalathus nivea*, *Cannomois virgata*, *Clutia alaternoides, Cymbopogon marginatus, Disparago ericoides, Dodonaea viscosa var. angustifolia, Erica pectinifolia, Gazania krebsiana, Helichrysum teretifolium, Heteropogon contortus, Ischyrolepis gaudichaudiana, Leucadendron salignum, Leucospermum cuneiforme, Merxmuellera stricta, Passerina obtusifolia, Pentaschistis pallida, Phylica axillaris, Protea nitida waboom, Rhodocoma fruticosa, Seriphium plumosum, Thamnochortus fruticosus besemriet, Themeda triandra* and *Watsonia meriana* (Mucina & Rutherford, 2006).

- Sunday's thicket

The kloofs of the hills in this section contain Sunday's Thicket.

Dominant species include: *Aloe africana*, *Aristida adscensionis*, *A.congesta*, *Bulbine frutescens*, *Cynodon dactylon*, *C.incompletus* soetkweek, *Drimia intricata*, *Euclea undulata*, *Euphorbia caerulescens*, *E.ledenii*, *Olea europaea* subsp. *africana* wild olive, *Panicum maximum* purple-top buffalo, *Pappea capensis*, *Pelargonium peltatum*, *Pentzia globosa*, *Portulacaria afra*, *Schotia afra*, *Senecio radicans* and *Tragus bertonianus* (Mucina & Rutherford, 2006).

- Faunal habitat provision and faunal species of concern

The area has minimal transformation and provides good habitat for faunal and floral species. Common antelope species as well as the rare Blue Duiker are likely to be present. In addition the kloof areas provided good riverine habitat for amphibian species. Habitat for reptile species associated with the sandstone is good.

- Implications for development

The area is not formally protected however it has been identified as an important movement corridor by the Nelson Mandela Bay Municipality between the Springs Nature Reserve and the Groendal Wilderness Area. It is recommended that the proposed power lines are located in the southern parts of the corridor, close to existing infrastructure in order to limit transformation in this area (Figure 26). Thicket vegetation must not be removed and only vegetation required for the tower footprints must be cleared. This will ensure that the corridor functionality will not be compromised.

Figure 26: Development near Rosedale

4.1.11 Northern Biodiversity Section 11

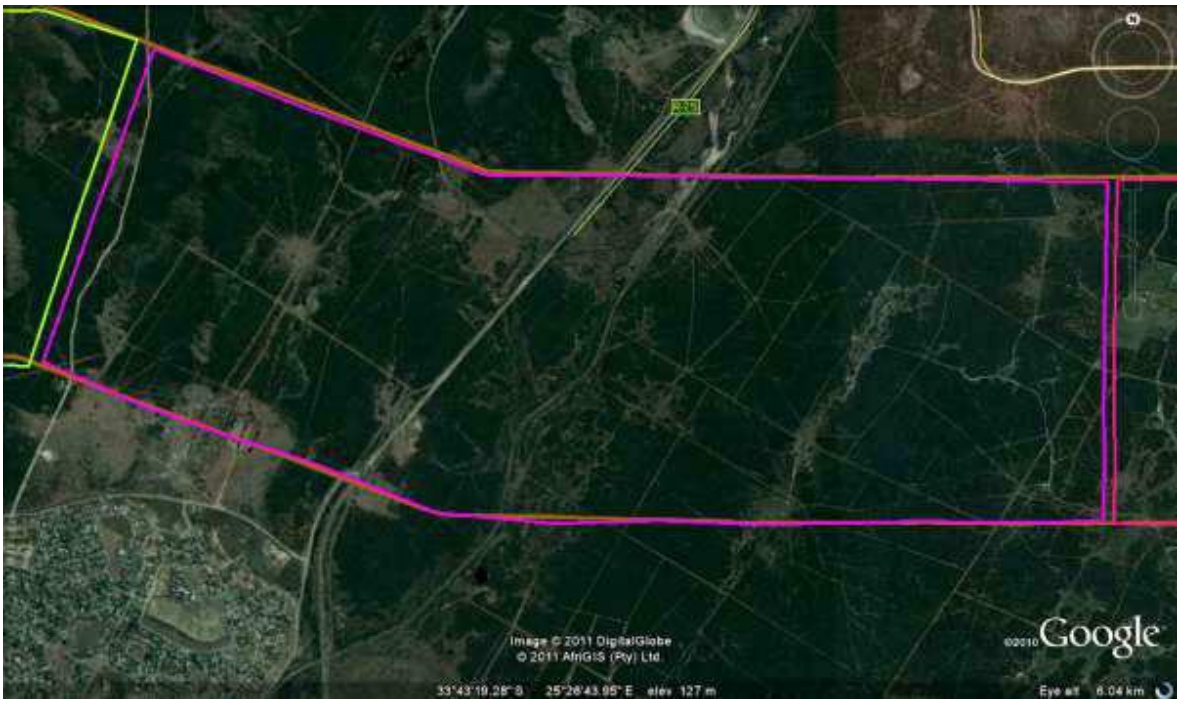

Figure 27: Northern Biodiversity Section 11

- General land use description

This section of the corridor is located to the south of the Springs Nature Reserve. The thicket vegetation in this section has been affected by grazing activities and transformed patches are obvious across the landscape. No development activities or settlements are present in this section however it is in close proximity to the northern border of the town of Uitenhage.

- Critical Biodiversity Areas

This section of the route contains linkage corridors associated with the Springs Nature Reserve and the Swartkops River. The area is considered to be a CBA1 according to the Nelson Mandela Bay Municipality Biodiversity Conservation Plan.

- Vegetation type and dominant species

Table 22: Vegetation types in Northern Biodiversity Section 11

Vegetation type	Protection Level	Ecological Status
Albany Alluvial Vegetation	Poorly protected	Endangered
Sunday's Thicket	Poorly protected	Least threatened
Kouga Sandstone Grassy Fynbos	Moderately Protected	Least threatened

- Albany Alluvial Vegetation

This vegetation is associated with the drainage line which flows down from the Springs Nature Reserve. Farming activities such as damming have affected this drainage line.

Dominant species include: *Acacia natalitia*, *Cynodon dactylon*, Cyp*erus papyrus, Pentzia incana, Phragmites australis, Salix mucronata, Schotia afra* and *Sporobolus nitens* (Mucina & Rutherford, 2006).

- Sunday's thicket

The majority of this section is considered to be Sunday's Thicket. This section illustrates the sensitivity of thicket to transformation as anthropogenic activities have resulted in the loss of the thicket vegetation in some areas of this section leaving very obvious scars on the landscape.

It is dominated by tall, dense thicket with a co-dominance of trees, shrubs and succulents. It is heavily spinescent. Game farming in this section of the corridor takes advantage of this thicket however agricultural activities are present which have resulted in transformation of the thicket.

Dominant species include: *Aloe africana*, *Aristida adscensionis*, *A.congesta*, *Bulbine frutescens*, *Cynodon dactylon*, *C.incompletus* soetkweek, *Drimia intricata*, *Euclea undulata*, *Euphorbia caerulescens*, *E.ledenii*, *Olea europaea* subsp. *africana*, *Panicum maximum*, *Pappea capensis*, *Pelargonium peltatum*, *Pentzia globosa*, *Portulacaria afra*, *Schotia afra*, *Senecio radicans* and *Tragus bertonianus* (Mucina & Rutherford, 2006).

- Kouga Sandstone Grassy Fynbos

A small section of this vegetation is present in this section stretching down from the Springs Nature Reserve.

Dominant species include: *Agathosma mucronulata*, *Aloe ferox*, *Aspalathus nivea*, *Cannomois virgata*, *Clutia alaternoides, Cymbopogon marginatus, Disparago ericoides, Dodonaea viscosa var. angustifolia, Erica pectinifolia, Gazania krebsiana, Helichrysum teretifolium, Heteropogon contortus, Ischyrolepis gaudichaudiana, Leucadendron salignum, Leucospermum cuneiforme, Merxmuellera stricta, Passerina obtusifolia, Pentaschistis pallida, Phylica axillaris, Protea nitida, Rhodocoma fruticosa, Seriphium plumosum, Thamnochortus fruticosus, Themeda triandra* and *Watsonia meriana* (Mucina & Rutherford, 2006).

- Faunal habitat provision and faunal species of concern

This section contains good habitat for faunal species however the proximity to Uitenhage is expected to have an effect on the presence of species. Common small mammal species are likely to be present however larger species are likely to be absent. The presence of infrastructure such as roads (R75) and the farming activities will reduce the abundance of species.

- Implications for development

It is recommended that the proposed power lines are located in the southern parts of the corridor, close to existing infrastructure in order to limit transformation in this area. Thicket vegetation must not be removed and only vegetation required for the tower footprints must be cleared. This will ensure that the corridor functionality will not be compromised.

4.1.12 Northern Biodiversity Section 12

Figure 28: Northern Biodiversity Section 12

- General land use description

This section of the route is characterised by intensive farming activities which have resulted in large scale transformation from the natural environment.

- Critical Biodiversity Areas

A CBA1 is present in this section which is associated with the Coega River.

- Vegetation type and dominant species

Table 23: Vegetation types in Northern Biodiversity Section 12

Vegetation type	Protection Level	Ecological Status
Albany Alluvial Vegetation	Poorly protected	Endangered
Sunday's Thicket	Poorly protected	Least threatened

- Albany Alluvial Vegetation

This vegetation is associated with the Coega River which passes across the corridor in this section. Farming activities have resulted in transformation of much of the riverine corridor.

Dominant species include: *Acacia natalitia*, *Cynodon dactylon*, Cyp*erus papyrus, Pentzia incana, Phragmites australis, Salix mucronata, Schotia afra* and *Sporobolus nitens* (Mucina & Rutherford, 2006).

- Sunday's thicket

Sunday's Thicket once again dominates this section of the corridor and is heavily transformed by farming activities however the thicket vegetation improves to the east of the Coega River (Figure 29).

It is dominated by tall, dense thicket with a co-dominance of trees, shrubs and succulents. It is heavily spinescent. Game farming in this section of the corridor takes advantage of this thicket however agricultural activities are present which have resulted in transformation of the thicket.

Dominant species include: *Aloe africana*, *Aristida adscensionis*, *A.congesta*, *Bulbine frutescens*, *Cynodon dactylon*, *C.incompletus* soetkweek, *Drimia intricata*, *Euclea undulata*, *Euphorbia caerulescens*, *E.ledenii*, *Olea europaea* subsp. *africana* wild olive, *Panicum maximum* purple-top buffalo, *Pappea capensis*, *Pelargonium peltatum*, *Pentzia globosa*, *Portulacaria afra*, *Schotia afra*, *Senecio radicans* and *Tragus bertonianus* (Mucina & Rutherford, 2006).

Figure 29: Sundays Thicket near Alwynhoek

- Faunal habitat provision and faunal species of concern

Habitat is limited in this section of the corridor due to the anthropogenic activities which are present. Common small mammal species such as scrub hare and Cape Grysbok are likely to be present and larger mammal species would be isolated to protected habitats. Some game farming activities are present in the northern section of the corridor.

- Implications for development

This section of the corridor illustrates a high level of transformation due to the farming activities. Property development is also planned for this section of the corridor. It is important that the Coega River is spanned and that the located of towers is well away from the riverine corridor. Clearance of thicket vegetation must be avoided to ensure no further fragmentation of thicket vegetation takes place.

4.1.13 Northern Biodiversity Section 13

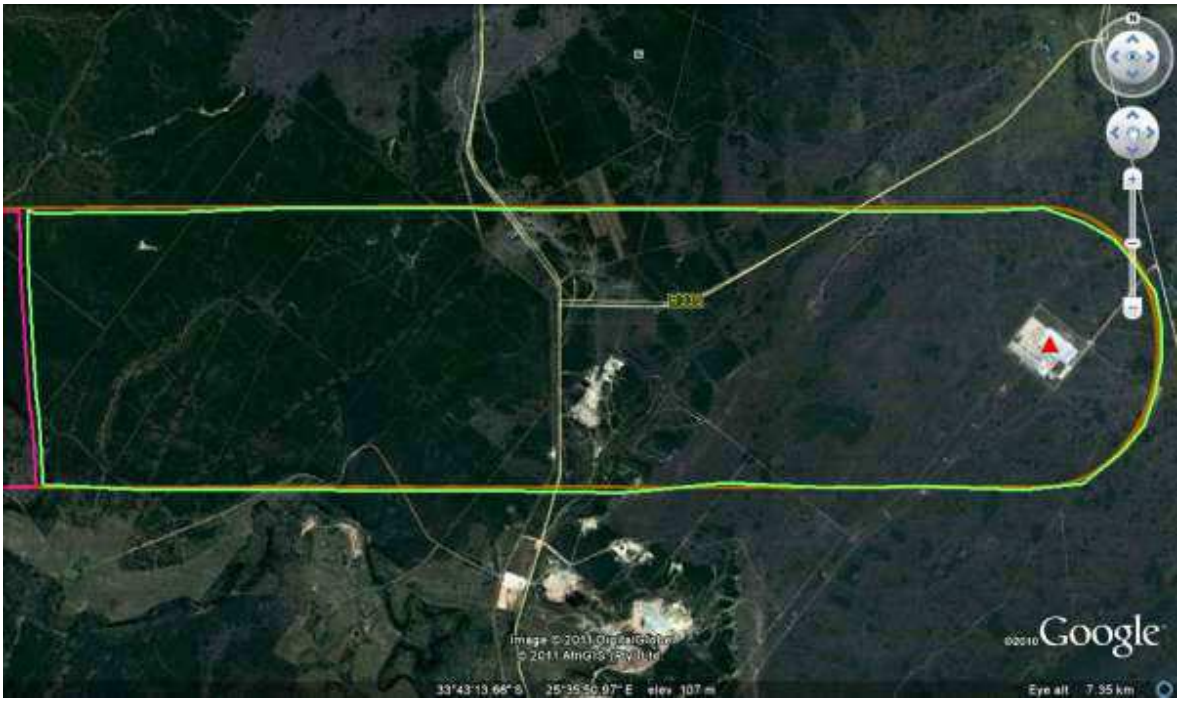

Figure 30: Northern Biodiversity Section 13

- General land use description

This section of the route is characterised by substantial thicket vegetation and semi industrial activities such as brick works.

- Critical Biodiversity Areas

No major CBA's are present in this area.

- Vegetation type and dominant species

Table 24: Vegetation types in Northern Biodiversity Section 13

Vegetation type	Protection Level	Ecological Status
Sunday's Thicket	Poorly protected	Least threatened
Coega Bontveld	Poorly Protected	Least threatened

- Sunday's thicket

This vegetation is located to the west of the R335 in this section of the corridor. It is dominated by tall, dense thicket with a co-dominance of trees, shrubs and succulents. It is heavily spinescent. Game farming in this section of the corridor takes advantage of this thicket however agricultural activities are present which have resulted in transformation of the thicket.

Dominant species include: *Aloe africana*, *Aristida adscensionis*, *A.congesta*, *Bulbine frutescens*, *Cynodon dactylon*, *C.incompletus* soetkweek, *Drimia intricata*, *Euclea undulata*, *Euphorbia caerulescens*, *E.ledenii*, *Olea europaea* subsp. *africana*, *Panicum maximum*, *Pappea capensis*, *Pelargonium peltatum*, *Pentzia globosa*, *Portulacaria afra*, *Schotia afra*, *Senecio radicans* and *Tragus bertonianus* (Mucina & Rutherford, 2006).

- Coega Bontveld

This vegetation type is located at the termination of the proposed lines. It consists of a mix of thicket and fynbos elements and has been severely transformed by grazing activities in the area.

Dominant species include: *Aristida diffusa, Crassula expansa strepiescrassula, Cynodon dactylon, C.incompletus, Euclea undulata, Helichrysum anomalum, Heteropogon contortus, Jamesbrittenia microphylla, Merxmuellera disticha, Ruschia hamata and Tephrosia capensis* (Mucina & Rutherford, 2006).

- Faunal habitat provision and faunal species of concern

The thicket vegetation west of the R335 provides good habitat for mammal species both large and small however the anthropogenic activities surrounding this area will reduce the probability of the presence of large mammal species.

The Coega Bontveld (Figure 31) is considered to be suitable habitat for the Critically Endangered Albany Adder. According to Branch, Grassridge contains the only extant population of Albany adders. The small patch of Bontveld leading up to the existing Grassridge substation is this considered to be sensitive.

Figure 31: Coega Bontveld near Grassridge

- Implications for development

The location of towers will result in loss of habitat however it is critical that the clearing of vegetation is limited to footprints of the towers and not to the entire servitude. Access must be limited to existing roads where possible. The Coega Bontveld area surrounding Grassridge Substation provides habitat for the Critically Endangered Albany Adder and is sensitive.

4.1.14 Northern Biodiversity Section 14

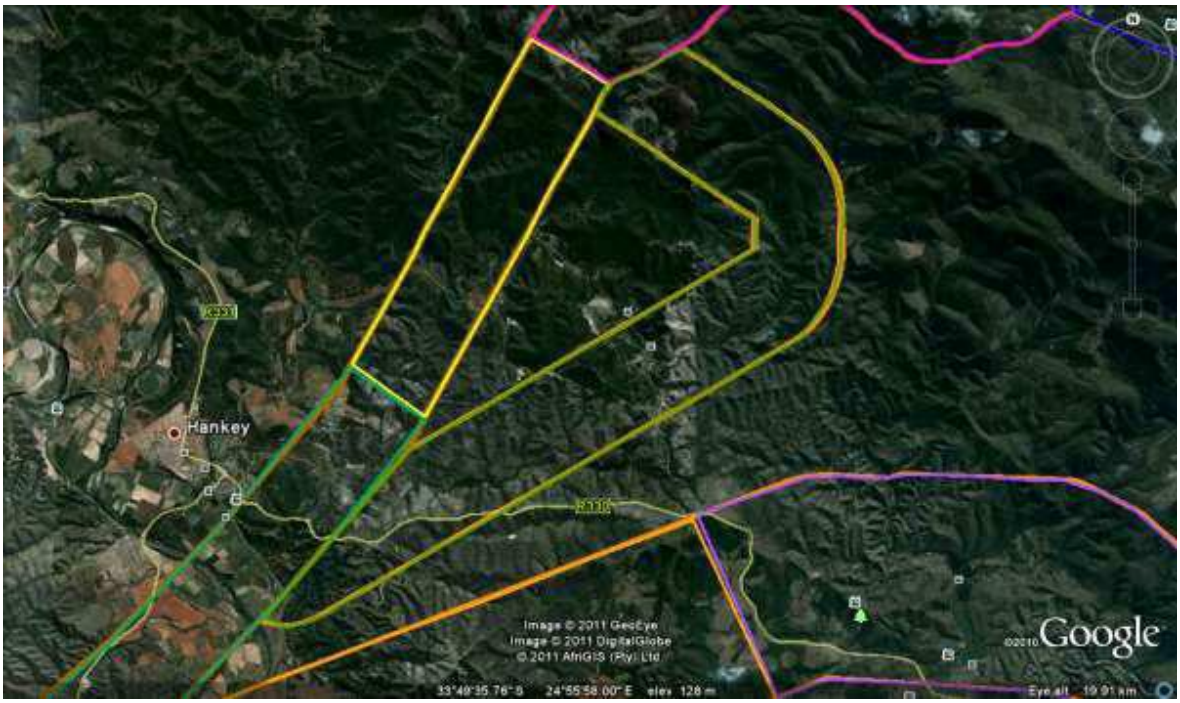

Figure 32: Northern Biodiversity Section 14

- General land use description

This section of the corridor is mountainous and due to the inaccessibility is in a fairly natural state. The eastern area of this section is characterised by pine plantations which are part of the Longmore Forest.

- Critical Biodiversity Areas

CBA's 1a, 2 and 3 are present in this area mostly associated with drainage and linkage corridors across the corridor.

Management interventions for these CBA's are as follows:

CBA 1a - Maintain biodiversity in as natural a state as possible. Manage for no biodiversity loss. Favourable land use would be Conservation.

CBA 2 - Maintain biodiversity in a near natural state with minimal loss of ecosystem integrity. No transformation of natural habitat should be permitted. Favourable land use would be game farming, conservation and limited livestock.

CBA 3 - Manage for sustainable development, keeping natural habitat intact in wetlands (including buffers) and riparian zones. Environmental authorisations should support ecosystem integrity. Favourable land uses include conservation, game farming, Livestock, limited dryland crops, limited irrigated crops, limited dairy, limited timber and limited settlement.

- Vegetation type and dominant species

Table 25: Vegetation types in Northern Biodiversity Section 14

Vegetation type	Protection Level	Ecological Status
Loerie Conglomerate Fynbos	Moderately Protected	Least Threatened
Gamtoos Thicket	Poorly protected	Least threatened
Kouga Sandstone Grassy Fynbos	Moderately Protected	Least threatened
Kouga Sandstone Fynbos	Well Protected	Least threatened

- Loerie Conglomerate Fynbos

The area to the south of the Kleinrivier road is characterised by this vegetation type. It is mountainous with grazing activities and some settlement present.

Dominant species include: *Aristida junciformis*, *Aspalathus nivea*, *Cliffortia ruscifolia*, *Cymbopogon marginatus*, *Dicerothamnus rhinocerotis*, *Dodonaea viscosa* var. *angustifolia*, *Helichrysum odoratissimum, Ischyrolepis gaudichaudiana, Leucadendron salignum, Passerina obtusifolia, Protea nitida, Sporobolus africanus* and *Tetraria cuspidata* (Mucina & Rutherford, 2006).

- Gamtoos Thicket

The Gamtoos thicket in this section of the corridor is mostly transformed by mining activities and forestry. Dominant species include: *Capparis sepiaria*, *Ehrharta calycina*, *E.erecta, Euphorbia triangularis*, *Felicia muricata*, *Hypoestes aristata*, *Panicum deustum*, *Portulacaria afra*, *Rhoicissus digitata* and *Setaria sphacelata* (Mucina & Rutherford, 2006).

- Kouga Sandstone Grassy Fynbos

Higher areas in this section are considered to be Kouga Sandstone Grassy Fynbos however a large amount of transformation is present due to the forestry plantation.

Dominant species include: *Agathosma mucronulata*, *Aloe ferox*, *Aspalathus nivea*, *Cannomois virgata*, *Clutia alaternoides, Cymbopogon marginatus, Disparago ericoides, Dodonaea viscosa var. angustifolia, Erica pectinifolia, Gazania krebsiana, Helichrysum teretifolium, Heteropogon contortus, Ischyrolepis gaudichaudiana, Leucadendron salignum, Leucospermum cuneiforme, Merxmuellera stricta, Passerina obtusifolia, Pentaschistis pallida, Phylica axillaris, Protea nitida, Rhodocoma fruticosa, Seriphium plumosum, Thamnochortus fruticosus, Themeda triandra* and *Watsonia meriana* (Mucina & Rutherford, 2006).

- Kouga Sandstone Fynbos

Higher lying areas in the section are considered to be Kouga Sandstone Fynbos but have been completely transformed by the forestry plantation in this section. Dominant species include: *Euryops virgineus*, *Leucadendron comosum*, *L.eucalyptifolium*, *Protea mundii, P.neriifolia, P.nitida, P.repens and Rhus lucida* (Mucina & Rutherford, 2006).

- Faunal habitat provision and faunal species of concern

The area is very mountainous and hence provides habitat for several faunal species due to the shelter that is available. Large mammal species are likely to be absent due to low protection levels however small mammals are expected to be abundant. The riverine habitat in this section is likely to provide habitat for amphibian species. The uniform nature of the forestry limits the faunal species. River systems in this area could potentially provide habitat for the Hewitts Ghost Frog. The fynbos in this section of the route has been transformed completely and thus the Smith's Dwarf Chameleon is not likely to be present.

- Implications for development

The area provides faunal habitat and linkage corridors in terms of drainage lines exist. Transformation is however extensive in these areas with large expanses of pine plantations. Power lines would be able to span the drainage lines and result in minimal habitat loss in this section.

4.1.15 Northern Biodiversity Section 15

Figure 33: Northern Biodiversity Section 15

- General land use description

This section of the corridor is dominated by farming activities. Grazing dominates around the Kabeljous River and cultivation increases around the Gamtoos River (Figure 34).

Figure 34: View across the Gamtoos Valley illustrating cultivation within the flood plain

- Critical Biodiversity Areas

CBA 2 areas have been identified associated with the Kabeljous and Gamtoos rivers. The remainder of the section is considered to be a CBA3.

- Vegetation type and dominant species

Table 26: Vegetation types in Northern Biodiversity Section 15

Vegetation type	Protection Level	Ecological Status
Kouga Sandstone Grassy Fynbos	Moderately Protected	Least threatened
Gamtoos Thicket	Poorly protected	Least threatened
Humansdorp Shale Renosterveld	Hardly protected	Endangered
Loeries Conglomerate Fynbos	Moderately Protected	Least threatened
Albany Alluvial Vegetation	Poorly protected	Endangered

- Kouga Sandstone Grassy Fynbos

This vegetation type forms part of a mosaic of vegetation types in this section. This vegetation type is located up to the Kabeljous River.

Dominant species include: *Agathosma mucronulata*, *Aloe ferox*, *Aspalathus nivea*, *Cannomois virgata*, *Clutia alaternoides, Cymbopogon marginatus, Disparago ericoides, Dodonaea viscosa var. angustifolia, Erica pectinifolia, Gazania krebsiana, Helichrysum teretifolium, Heteropogon contortus, Ischyrolepis gaudichaudiana, Leucadendron salignum, Leucospermum cuneiforme, Merxmuellera stricta, Passerina obtusifolia, Pentaschistis pallida, Phylica axillaris, Protea nitida waboom, Rhodocoma fruticosa, Seriphium plumosum, Thamnochortus fruticosus, Themeda triandra* and *Watsonia meriana* (Mucina & Rutherford, 2006).

- Gamtoos Thicket

Small patches of Gamtoos Thicket are present along the Kabeljous and Gamtoos River in this section of the corridor.

Dominant species include: *Capparis sepiaria*, *Ehrharta calycina*, *E.erecta, Euphorbia triangularis*, *Felicia muricata* taaibloublommetjie, *Hypoestes aristata* seeroogblommetjie, *Panicum deustum*, *Portulacaria afra*, *Rhoicissus digitata* and *Setaria sphacelata* (Mucina & Rutherford, 2006).

- Humansdorp Shale Renosterveld

A small portion close to the north of the Kabeljous River consists of Humansdorp Shale Renosterveld. Dominant species include *Eustachys paspaloides*, *Helichrysum anomalum*, *Oedera genistifolia* and *Themeda triandra* (Mucina & Rutherford, 2006). Thicket clumps can be found in this vegetation type, occasionally forming a mosaic with renosterveld. *Kniphofia citrina* red hot poker and the widespread *Erica glandulosa* occupy streamlines dissecting the area. Opuntia cactus is highly invasive in places.

- Loerie Conglomerate Fynbos

The mountainous areas to the west of the Gamtoos River are considered to be Loerie Conglomerate Fynbos. The area is fairly untransformed due to the irregular terrain.

Dominant species include: *Aristida junciformis*, *Aspalathus nivea*, *Cliffortia ruscifolia*, *Cymbopogon marginatus*, *Dicerothamnus rhinocerotis*, *Dodonaea viscosa* var. *angustifolia*, *Helichrysum odoratissimum, Ischyrolepis gaudichaudiana, Leucadendron salignum, Passerina obtusifolia, Protea nitida, Sporobolus africanus* and *Tetraria cuspidata* (Mucina & Rutherford, 2006).

- Albany Alluvial Vegetation

This vegetation is closely associated with the Gamtoos River and has been heavily transformed by farming activities. Due to activities such as these, this vegetation type is considered to be endangered.

Dominant species include: *Acacia natalitia*, *Cynodon dactylon*, Cyp*erus papyrus, Pentzia incana, Phragmites australis, Salix mucronata, Schotia afra* and *Sporobolus nitens* (Mucina & Rutherford, 2006).

- Faunal habitat provision and faunal species of concern

This section of the corridor has been transformed in part however intact vegetation is present in the mountainous areas. The riverine habitat surrounding the Kabeljous River provide habitat for thicket species and amphibian species. The Gamtoos River has been severely affected by cultivation and species diversity is thus reduced in this area.

- Implications for development

The riverine corridors in this section are considered to be sensitive. Anthropogenic activities have resulted in transformation particularly around these rivers. The construction of the power lines could result in further transformation of these areas. Simple mitigation measures can however be implemented to reduce this impact.

4.1.16 Northern Biodiversity Section 16

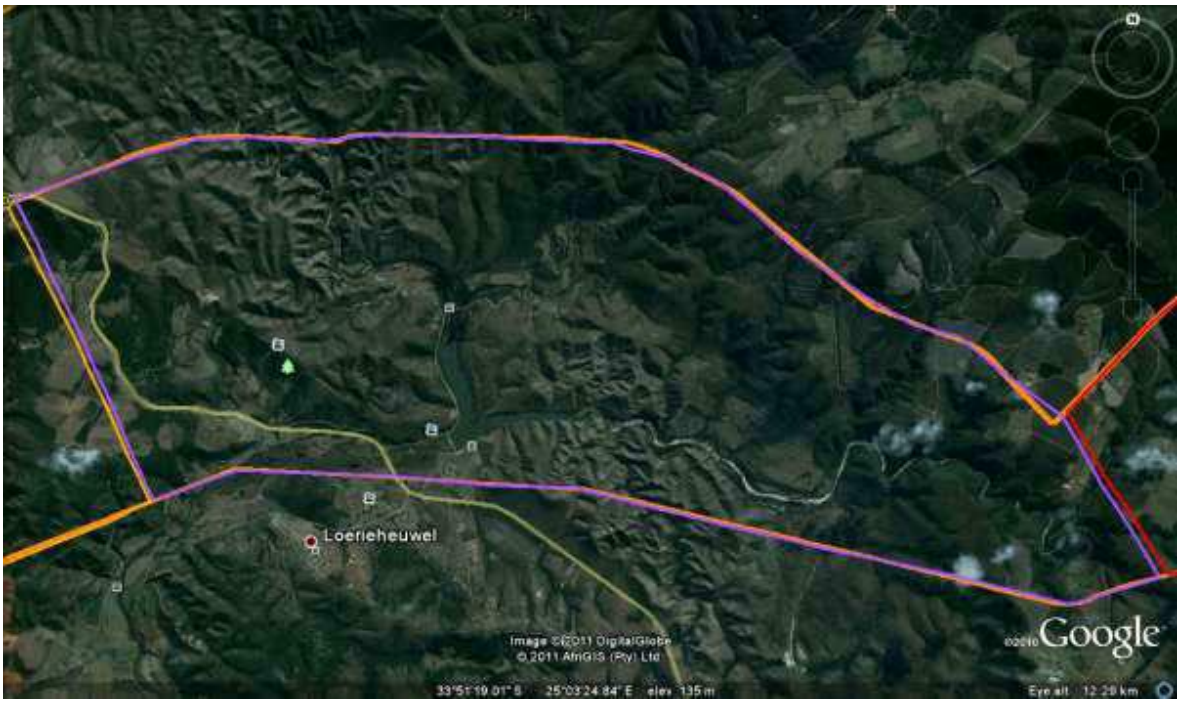

Figure 35: Northern Biodiversity Section 16

- General land use description

This section of the study area contains large expanses of natural vegetation. Agricultural activities are interspersed but the area contains very little transformation. The Loerie Dam is located within this section of the corridor.

- Critical Biodiversity Areas

The Loerie Dam area is considered a CBA 1a whilst the forest areas associated with the ravines and kloofs are considered to be a CBA 2.

Management interventions for these CBA's are as follows:

CBA 1a - Maintain biodiversity in as natural a state as possible. Manage for no biodiversity loss. Favourable land use would be Conservation.

CBA 2 - Maintain biodiversity in a near natural state with minimal loss of ecosystem integrity. No transformation of natural habitat should be permitted. Favourable land use would be game farming, conservation and limited livestock.

- Vegetation type and dominant species

Table 27: Vegetation types in Northern Biodiversity Section 16

Vegetation type	Protection Level	Ecological Status
Loerie Conglomerate Fynbos	Moderately Protected	Least Threatened
Kouga Sandstone Fynbos	Well Protected	Least threatened
Albany Alluvial Vegetation	Poorly protected	Endangered
Gamtoos Thicket	Poorly protected	Least threatened

- Loerie Conglomerate Fynbos

The majority of this section contains Loerie Conglomerate Fynbos and concentrates around the Loerie dam (Figure 36). Agricultural activities are present however much of the vegetation remains intact.

Figure 36: Loerie Conglomerate Fynbos surrounding the Loerie Dam

Dominant species include: *Aristida junciformis*, *Aspalathus nivea*, *Cliffortia ruscifolia*, *Cymbopogon marginatus*, *Dicerothamnus rhinocerotis*, *Dodonaea viscosa* var. *angustifolia*, *Helichrysum odoratissimum, Ischyrolepis gaudichaudiana, Leucadendron salignum, Passerina obtusifolia, Protea nitida, Sporobolus africanus* and *Tetraria cuspidata* (Mucina & Rutherford, 2006).

- Kouga Sandstone Fynbos

A small area of this vegetation is present in the eastern part of the section however farming activities have resulted in transformation of the fynbos. The Longmore firebreaks (Figure 37) assist in protecting some of this vegetation however regular burning does stunt the development of the vegetation. Dominant species include: *Euryops virgineus*, *Leucadendron comosum*, *L.eucalyptifolium*, *Protea mundii, P.neriifolia, P.nitida, P.repens and Rhus lucida* (Mucina & Rutherford, 2006).

Figure 37: Fynbos in the Longmore Firebreak

- Albany Alluvial Vegetation

This vegetation is closely associated with the Loerie River and Dam. This vegetation type is considered to be endangered.

Dominant species include: *Acacia natalitia*, *Cynodon dactylon*, Cyp*erus papyrus, Pentzia incana, Phragmites australis, Salix mucronata, Schotia afra* and *Sporobolus nitens* (Mucina & Rutherford, 2006).

- Gamtoos Thicket

The Gamtoos thicket in the west of this section has been transformed by cultivation activities. Dominant species include: *Capparis sepiaria*, *Ehrharta calycina*, *E.erecta, Euphorbia triangularis*,

Felicia muricata, *Hypoestes aristata*, *Panicum deustum*, *Portulacaria afra*, *Rhoicissus digitata* and *Setaria sphacelata* (Mucina & Rutherford, 2006).

- Faunal habitat provision and faunal species of concern

This section of the corridor provides some critical habitat for faunal species. The Loerie dam provides essential habitat for amphibian species whilst the fynbos surrounding this area provides good habitat for fynbos dependent species.

The absence of large scale transformation is likely to increase the abundance of all faunal groupings however large mammals are still not likely due to not formal protection status. The area surrounding the Loerie Dam is protected to some degree and species such as antelope and bat eared foxes are likely to occur in this area.

The riverine corridors provide good habitat for thicket species such as the Blue Duiker. These corridors also contain indigenous forest patches which provide a completely different biome for species and is unique to the study area. Forest species are likely in these patches such as Chacma baboons, Blue Duiker and Spotted genet.

- Implications for development

This section of the corridor contains natural vegetation which provides good habitat for the various faunal groupings and contains good representations of the vegetation types. Some Red Data species were noted in the Loerie Conglomerate Fynbos which highlights the minimal impact that the vegetation has experienced.

The power lines could result in fragmentation and loss of this vegetation and hence affect the faunal populations inhabiting the area. Suitable mitigation measures can however be implemented to ensure that the power lines do not adversely affect the current environment in this area. This would include spanning and limiting clearing to the tower footprints.

4.1.17 Northern Biodiversity Section 17

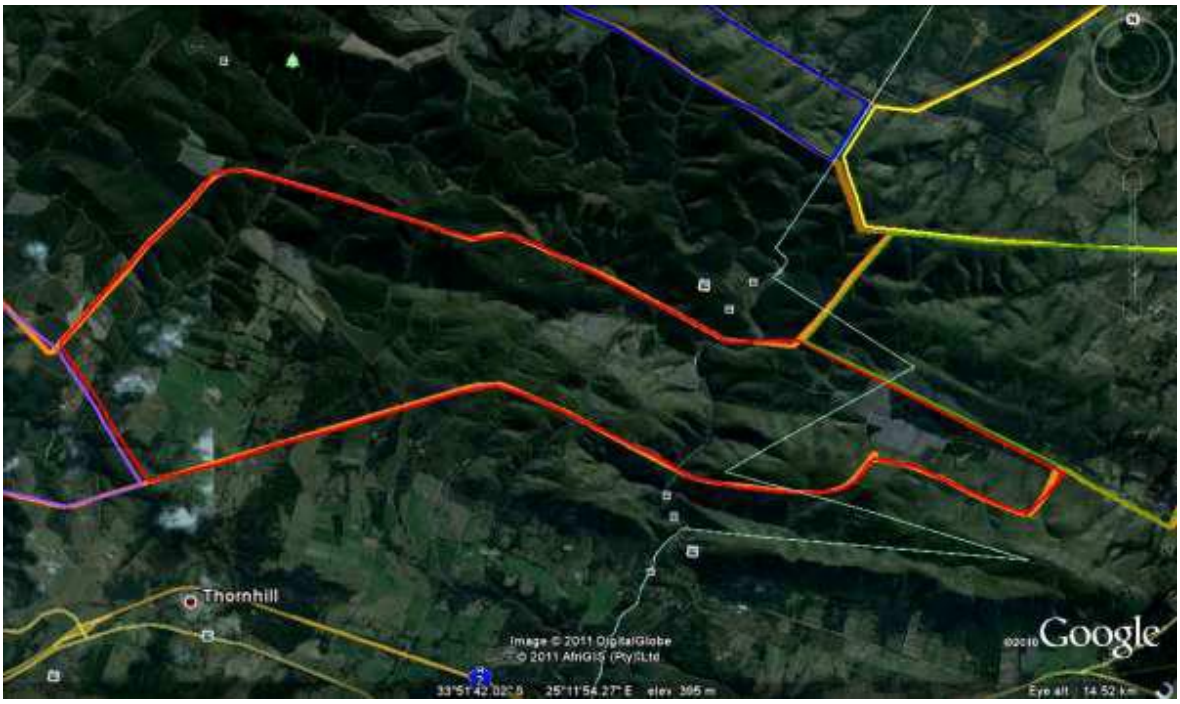

Figure 38: Northern Biodiversity Section 17

- General land use description

This section includes the southern firebreaks of Longmore plantation and illustrates increased transformation due to agriculture and forestry. The Van Stadens River passes across this section of the corridor.

- Critical Biodiversity Areas

CBA 3 associated with the forestry plantation.
CBA 1a associated with the river systems in this section.
CBA 2 associated with forest located in the kloof areas.

This section contains a small portion of the Van Stadens Natural Heritage Site which stretches down towards Lady's slipper.

Management interventions for these CBA's are as follows:

CBA 1a - Maintain biodiversity in as natural a state as possible. Manage for no biodiversity loss. Favourable land use would be Conservation.

CBA 2 - Maintain biodiversity in a near natural state with minimal loss of ecosystem integrity. No transformation of natural habitat should be permitted. Favourable land use would be game farming, conservation and limited livestock.

CBA 3 - Manage for sustainable development, keeping natural habitat intact in wetlands (including buffers) and riparian zones. Environmental authorisations should support ecosystem integrity. Favourable land uses include conservation, game farming, Livestock, limited dryland crops, limited irrigated crops, limited dairy, limited timber and limited settlement.

- Vegetation type and dominant species

Table 28: Vegetation types in Northern Biodiversity Section 17

Vegetation type	Protection Level	Ecological Status
Kouga Sandstone Grassy Fynbos	Moderately Protected	Least threatened
Kouga Sandstone Fynbos	Well Protected	Least threatened

- Kouga Sandstone Grassy Fynbos

A small patch of Kouga Sandstone Grassy Fynbos is present in the transition between section 16 and 17. It has been heavily transformed by farming activities.

Dominant species include: *Agathosma mucronulata*, *Aloe ferox*, *Aspalathus nivea*, *Cannomois virgata*, *Clutia alaternoides, Cymbopogon marginatus, Disparago ericoides, Dodonaea viscosa var. angustifolia, Erica pectinifolia, Gazania krebsiana, Helichrysum teretifolium, Heteropogon contortus, Ischyrolepis gaudichaudiana, Leucadendron salignum, Leucospermum cuneiforme, Merxmuellera stricta, Passerina obtusifolia, Pentaschistis pallida, Phylica axillaris, Protea nitida waboom, Rhodocoma fruticosa, Seriphium plumosum, Thamnochortus fruticosus, Themeda triandra* and *Watsonia meriana* (Mucina & Rutherford, 2006).

- Kouga Sandstone Fynbos

The majority of this section is Kouga Sandstone Fynbos however most has been transformed by forestry and farming (Figure 39). Patches of intact vegetation are present towards eastern part of the section. Dominant species include: *Euryops virgineus*, *Leucadendron comosum*, *L.eucalyptifolium*, *Protea mundii, P.neriifolia, P.nitida, P.repens and Rhus lucida* (Mucina & Rutherford, 2006).

Figure 39: Firebreaks along the Longmore boundary

- Faunal habitat provision and faunal species of concern

Transformation of natural habitat is high mostly associated with agriculture and the monoculture of the forestry plantation (Figure 40). The mountainous areas closer to the Van Stadens River illustrate more intact vegetation and hence provide more habitat for faunal groupings. The fynbos in this area is likely to house the Smiths Dwarf Chameleon.

Figure 40: Firebreak area showing fynbos and farming activities

Common faunal species such as Common duiker, Chacma baboons, Vervet monkeys and Porcupines will be present in this area. Reptile populations associated with the rocky terrain that is present are also anticipated to be abundant. Amphibian species are likely to be isolated to the riverine areas which are present in this section.

- Implications for development

Transformation is present in this section however a large amount of natural vegetation and thus habitat is available which could be affected by the construction of the power lines. The construction could affect habitat that is available for the Smith's Dwarf Chameleon and could affect the riverine habitat of the Van Stadens River.

4.1.18 Northern Biodiversity Section 18

Figure 41: Northern Biodiversity Section 18

- General land use description

This section includes the settlement of Rocklands and surrounds. Agricultural activities dominate as well as forestry activities associated with Longmore Plantation.

- Critical Biodiversity Areas

No CBA's have been identified for this section of the corridor.

- Vegetation type and dominant species

Table 29: Vegetation types in Northern Biodiversity Section 18

Vegetation type	Protection Level	Ecological Status
Kouga Sandstone Grassy Fynbos	Moderately Protected	Least threatened
Kouga Sandstone Fynbos	Well Protected	Least threatened

- Kouga Sandstone Grassy Fynbos

This section of the corridor contains both types of Kouga Sandstone Fynbos. The area has a high level of anthropogenic activities but higher areas remain intact.

Dominant species include: *Agathosma mucronulata*, *Aloe ferox*, *Aspalathus nivea*, *Cannomois virgata*, *Clutia alaternoides, Cymbopogon marginatus, Disparago ericoides, Dodonaea viscosa var. angustifolia, Erica pectinifolia, Gazania krebsiana, Helichrysum teretifolium, Heteropogon contortus, Ischyrolepis gaudichaudiana, Leucadendron salignum, Leucospermum cuneiforme, Merxmuellera stricta, Passerina obtusifolia, Pentaschistis pallida, Phylica axillaris, Protea nitida waboom, Rhodocoma fruticosa, Seriphium plumosum, Thamnochortus fruticosus, Themeda triandra* and *Watsonia meriana* (Mucina & Rutherford, 2006).

- Kouga Sandstone Fynbos

Dominant species include: *Euryops virgineus*, *Leucadendron comosum*, *L.eucalyptifolium*, *Protea mundii, P.neriifolia, P.nitida, P.repens and Rhus lucida* (Mucina & Rutherford, 2006).

- Faunal habitat provision and faunal species of concern

The areas around Rocklands in this section illustrate transformation from the natural fynbos vegetation and thus faunal populations are anticipated to be lower in these areas. Patches of intact fynbos are located in the south western area of the section associated with the Van Stadens Natural Heritage Site which lies to the south of this section. Some habitat for the Dwarf Chameleon is present in this area.

Common faunal species are likely to be present in these areas.

- Implications for development

The power lines could result in further transformation of the vegetation and affect the remaining habitat for the Dwarf Chameleon.

4.2 Sensitive Areas

Various sensitive areas have been identified across the Northern Corridor.

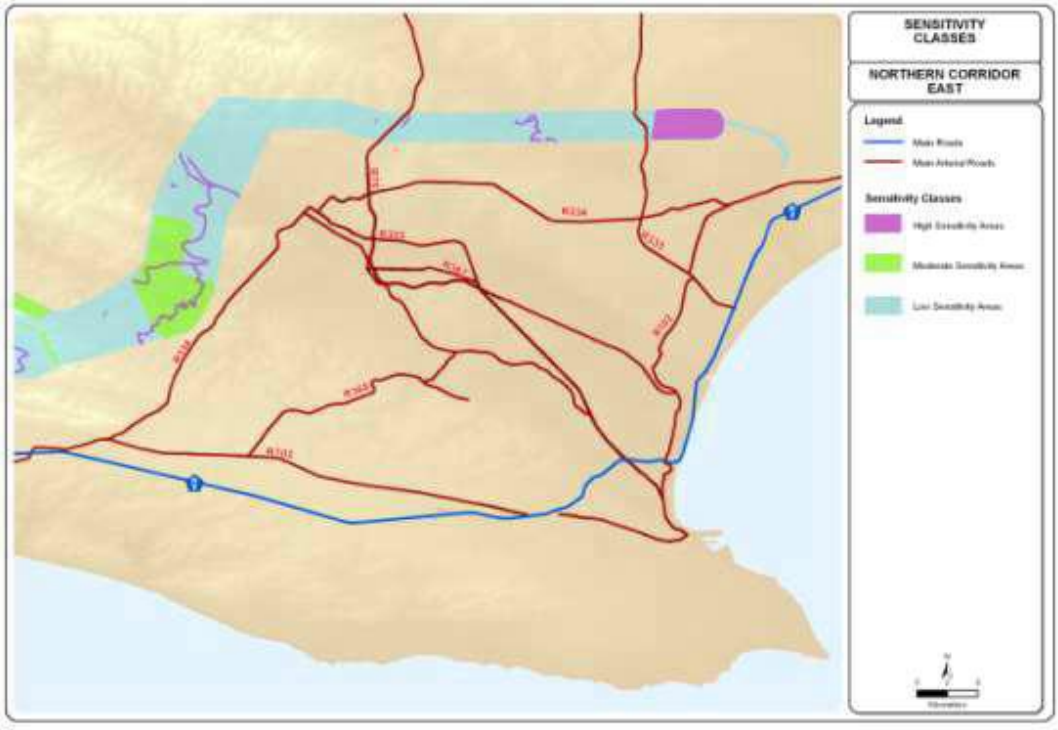

Figure **42** highlights these areas. Areas of **high sensitivity** relate to the Stinkhoutberg Nature Reserve which provides pristine Thicket with indigenous forest present. In addition habitat surrounding the Grassridge substation has been identified as highly sensitive due to the potential presence of the Albany Adder in this area. All the rivers and wetlands in the corridor have been identified as high sensitive areas as they are critical habitat for several species and form natural corridors for the movement of species. In addition they house the sensitive Hewitt's Ghost Frog.

The fynbos areas associated with the firebreaks of Longmore Forestry have been identified as being **moderately sensitive**. These areas provide habitat for the Smith's Dwarf Chameleon however they are affected by burning and forestry activities.

Other patches of intact vegetation has also been identified such as the area to the north of the N2, the fynbos hills to the west of the Gamtoos, the thicket vegetation near Echodale north of Rocklands and the Loerie Conglomerate Fynbos surrounding the Loerie Dam. These areas exhibit some level of existing impact however large tracts of habitat are available making them more sensitive to the proposed development. These areas have been assigned **moderate sensitivity**.

The remainder of the study area has been rated as low sensitivity however these areas still require the strict implementation of mitigation measures to ensure that further transformation does not occur.

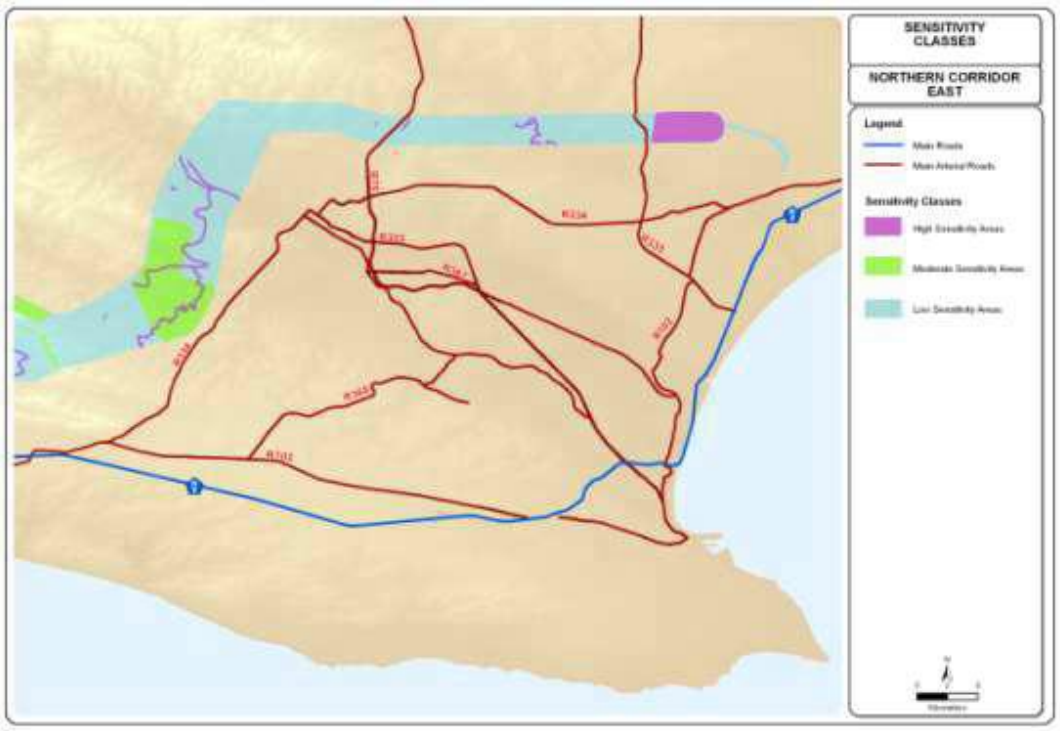

Figure 42: Sensitivity Map (East)

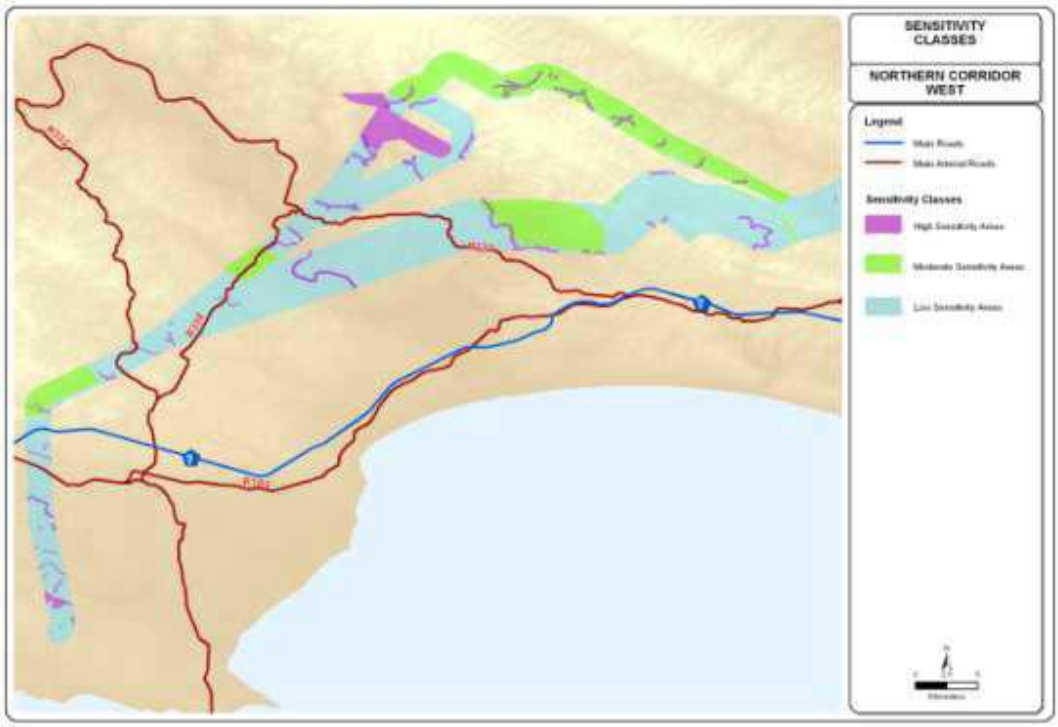

Figure 43: Sensitivity Map (West)

5 ALTERNATIVES ASSESSMENT

Alternatives have been assessed as part of the process and the table below indicates a comparative assessment from a biodiversity perspective.

Table 30: Alternatives Assessment

Alternative	Discussion
Northern Corridor	Areas of intact vegetation as well as more sensitive areas identified. Suitable mitigation measures can be implemented to reduce impacts. CBA's will not be compromised if mitigation measures are implemented. Not preferable to go through Stinkhoutberg Nature Reserve.
Northern Corridor – Alternative 1 (Southern firebreak)	This route follows the southern firebreaks of Longmore Forest. A large amount of transformation has taken place however areas of natural vegetation are present. Suitable mitigation measures can be implemented to reduce impacts. CBA's will not be compromised if mitigation measures are implemented.
Northern Corridor – Alternative 2 (around Stinkhoutberg)	This alternative is preferred as it avoids the Stinkhoutberg Nature Reserve.
Northern Corridor– existing servitude	An existing impact is present in this area however the area may house the Albany Adder and mitigation measures will need to be implemented.

No fatal flaws have been identified across the corridors however strict mitigation measures will be required to ensure identified impacts do not occur. These are discussed at length below.

6 PREFERRED ROUTE IDENTIFICATION

Several potential impacts associated with the fauna and flora of the study area have been identified in section 4 above which could negatively affect the environment. The construction of a power line entails a light footprint in comparison to a fixed point development which results in complete loss of resources most of the time. Detailed mitigation measures can be implemented to ensure that habitat loss and thus transformation is limited during construction. Suitable rehabilitation measures can ensure re-establishment of habitat to some degree and ensure that edge effects are not experienced.

The study area crosses a vast amount of different habitat types in various stages of condition. Drainage areas and rivers are considered to be sensitive and will need to be spanned by the power lines in order to ensure that these areas are not impacted.

The Longmore Forestry firebreaks have inadvertently protected fynbos vegetation and thus provide good habitat for the Smith's Dwarf Chameleon as well as other species. Whilst these areas burn more regularly than fynbos should, they do provide natural habitat and provide an important function.

The Longmore drainage lines also provide habitat for the Hewitts Ghost Frog however the terrain would require the power lines to span these areas and are unlikely to affect drainage lines. Construction access will need to be limited to existing access in these sections or well away from the buffer zones along these rivers.

Large patches of thicket vegetation are present across the corridors. This vegetation is particularly sensitive to transformation and removal becomes a clear barrier for movement of species and a scar is present on the landscape. Spanning of this vegetation is therefore recommended.

The sensitive species that have been identified such as the Albany Adder, the Dwarf Chameleon etc which may be affected by the proposed power lines. However suitable mitigation measures can be implemented to ensure that these species are not adversely affected. The incorporation of these mitigation measures into the Environmental Management Plan is critical to ensure that these are implemented during construction.

Although several Critical Biodiversity Areas are located within the study area, the mitigation measures that have been recommended will ensure that these are not affected. Linkage can still be maintained with the construction of the power lines. Rehabilitation after construction is critical

to maintaining the functionality and importance of these CBA's. The power lines can in fact assist in maintaining movement corridors as not further development will be allowed within the servitudes once construction has been completed and the lines are operational.

In addition to the mitigation measures which can be implemented, a specialist workshop was held on the 24th of January 2011. During this workshop the proposed corridors and a route were discussed at length to determine a preferred route which did not result in a detrimental effect on all parameters assessed.

Both corridors under assessment were discussed at this meeting. The socio-economic studies identified several fatal flaws whilst conducting their assessment. These related mainly to the Southern Corridor however hot spots were also identified associated with agriculture in the Northern Corridor.

A refined route based on this workshop was thus identified based on all inputs from the specialists. Biodiversity aspects taken into consideration in the preferred route decision include the following:

- Steering away from Stinkhoutberg
- Preserving the fynbos of the firebreaks and thus Dwarf Chameleon habitat

The majority of route refinements made were based on other specialist findings which took priority over biodiversity but were not to the detriment of biodiversity. This included:

- Proposed developments
- Agricultural activities

The preferred route for the Northern Corridor is highlighted by the yellow route in the map below. This route has been adjusted to allow for development expansion north of Humansdorp and avoids the intense agriculture around the Gamtoos River. The corridor has also been pulled out of the firebreaks slightly and into the forestry in an effort to protect the fynbos vegetation. The route has also been adjusted for development near Grassridge in the Alwynhoek area.

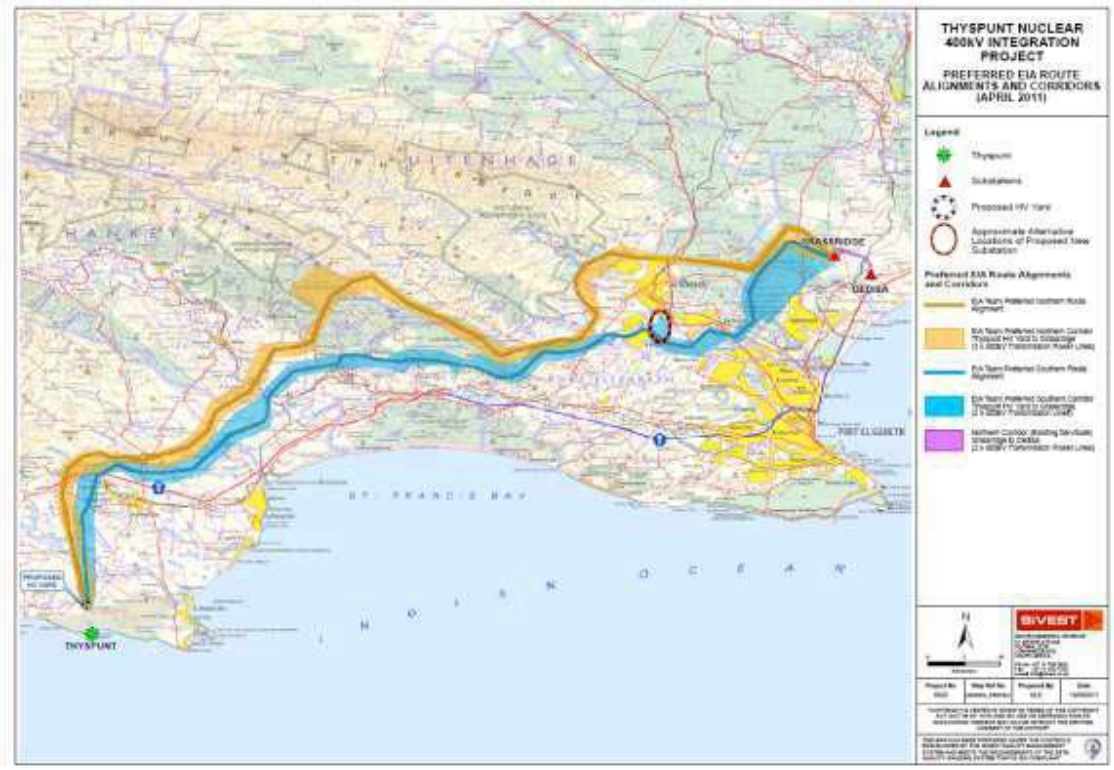

Figure 44: Preferred Routes

As mentioned above, the Southern Corridor proved to be problematic from a socio economic perspective and this route was thus moved up into the Northern Corridor Alternative 1. The routing follows the southern firebreaks of the Longmore Forest. This is illustrated above as the blue corridor.

Sensitivities associated with the preferred route are illustrated below.

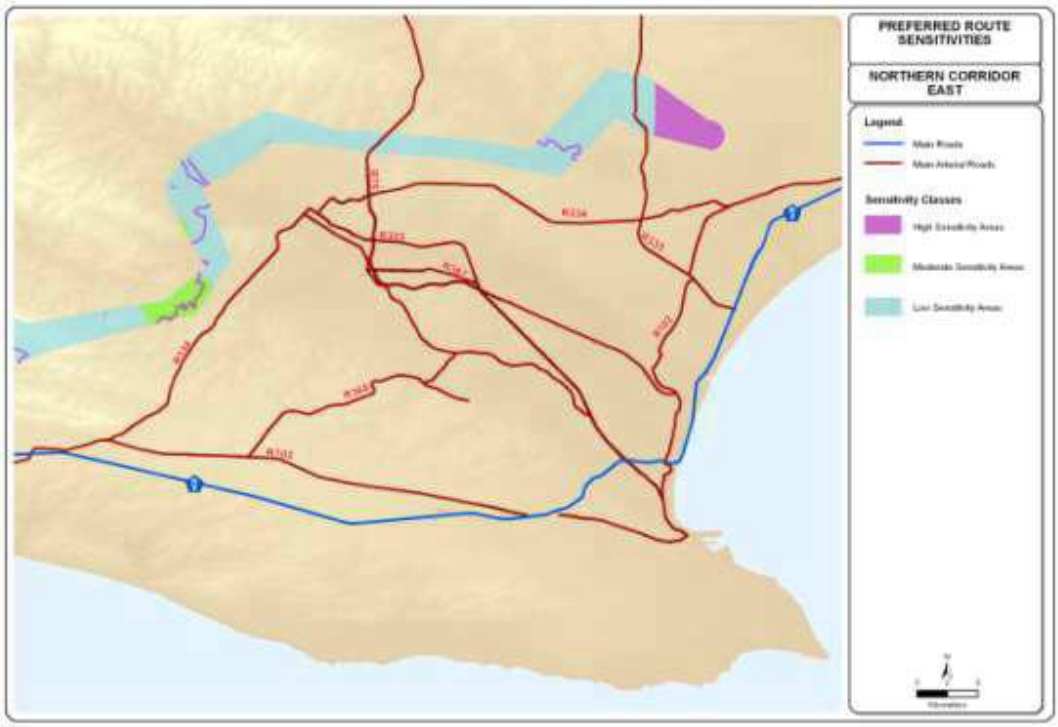

Figure 45: Sensitivities associated with the preferred route (East)

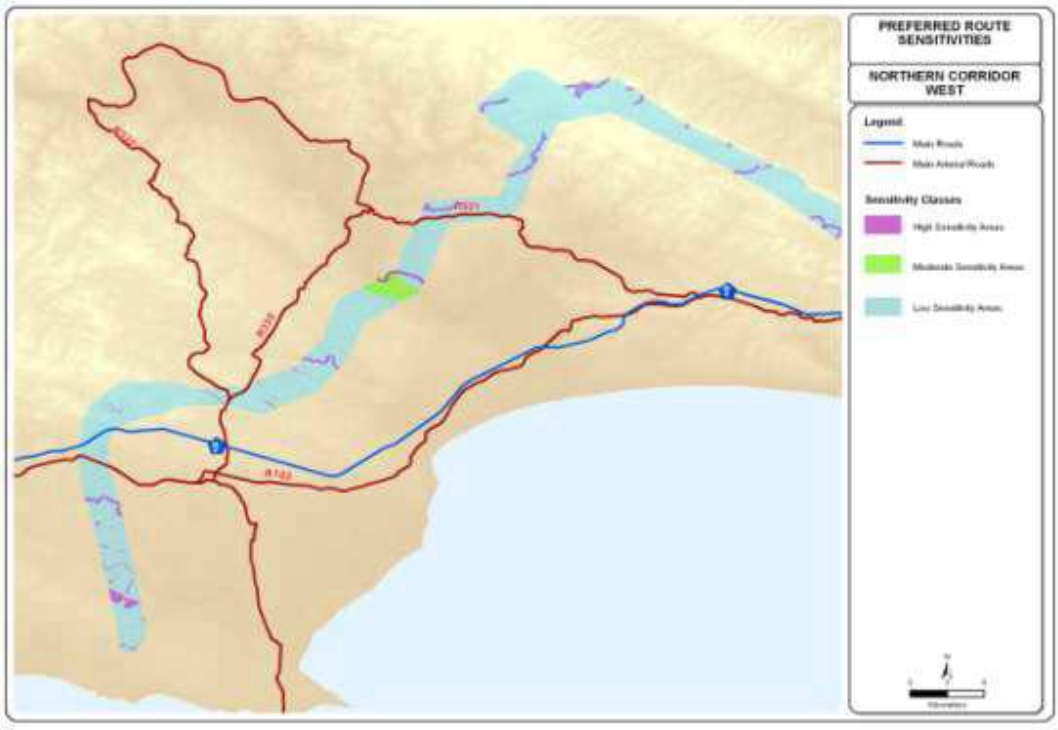

Figure 46: Sensitivities associated with the preferred route (West)

Areas of **high sensitivity** remain the rivers and wetlands and the area around Grassridge where the Albany Adder could occur.

Areas of **moderate sensitivity** relate to the thicket vegetation which is sensitive to change.

8 POTENTIAL IMPACTS ON BIODIVERSITY AND BIOPHYSICAL FEATURES

The potential impacts of the proposed power lines mainly related to loss of habitat for red data and general species; potential loss of species richness, edge effect, transformation and erosion. The impact of the proposed development will be limited to the assigned corridor. Vegetation outside the corridor will remain intact and will not be impacted upon. As such the impact is localised and if the mitigation measures are implemented, the overall impact can be reduced.

8.1 Construction Phase

During the construction phase the following impacts are predicted in terms of each of the biodiversity groupings.

8.1.1 Flora

The impacts associated with the floral environment relate to the removal of vegetation and associated loss of habitat for endemic and Red Data species. In addition the transformation of sensitive vegetation is of concern particularly those vegetation types which have already been transformed by anthropogenic activities. This could result in loss of species richness and increase the edge effect. The edge effect implies an increase of alien species into the study area thus affecting the local species.

Also, areas of poorly protected vegetation should be preserved as much as possible in order to avoid further impacts on these already heavily impacted vegetation units. Examples of these include Albany Alluvial Vegetation, Eastern Coastal Shale Band Vegetation and Humansdorp Shale Renosterveld.

8.1.2 Mammals

The impact associated with the mammal population on site relates to the loss of habitat and disturbance during construction. Although a large portion of the study area has been transformed as a result of anthropogenic activities, portions of potential mammal habitat still exist. However

the available habitat is mainly for small mammals. This is because the habitat for large mammal species (e.g. Bushbuck (*Tragelaphus scriptus*), Mountain Reedbuck (*Redunca fulvorufula*), Eland (*Taurotragus oryx*) and Greater Kudu (*Tragelaphus strepsiceros*)) has been transformed. Large mammals are restricted to protected areas. The present mammal species will move into surrounding habitat during construction. Furthermore, relevant mitigation measures during construction will reduce the impact of the proposed development on mammals

8.1.3 Reptiles

The area surrounding Grassridge is considered to be sensitive as this provides critical habitat for the Albany Adder which is considered to be Critically Endangered. The construction of the power lines could thus affect this species in this area. In addition the Dwarf Chameleon is also present within the Longmore and Van Stadens Mountains and could be affected by loss of habitat. Strict mitigation measures are proposed for the Grassridge area and the route amended to avoid as much fynbos habitat in order to not affect the Dwarf Chameleon. Fynbos vegetation as well as the Coega Bontveld (Albany Adder) will not require large scale clearing which will assist in reducing the impacts on these species.

8.1.4 Amphibians

Amphibians are present throughout the study area especially near drainage lines and small pans. If appropriate mitigation measures (such as avoiding species habitats) are implemented, amphibian species present in the study area are unlikely to be affected by the proposed development. All drainage areas will be spanned by the power lines and the surface water assessment ensures that access through these areas is limited to existing crossings. This will limit the impact on the sensitive species that have been identified in this report such as the Hewitt's Ghost Frog.

8.1.5 Invertebrates

The site presents a remarkable invertebrate diversity. Invertebrates are fairly mobile and will be able to move away during construction to the surrounding habitat.

8.2 Operation Impacts

Potential impacts of the proposed development mainly related:

8.2.1 Edge effect

The removal or clearing of vegetation results in providing habitat for alien and invasive species to move into an area. This in turn reduces the species richness and diversity of an area as these species tend to take over and dominate the area.

Without suitable rehabilitation and implementation of recommended mitigation measures this remains a major concern during operation of the project.

8.2.2 Erosion

Clearing of vegetation results in the exposure of soils which are sensitive to erosion from stormwater run off. Rehabilitation of areas affected by construction is essential to ensure that exposed surfaces are stabilized and erosion does occur. This of particular concern near rivers and wetlands as this can result in siltation pollution of the rivers.

8.2.3 Poor maintenance

In addition to the power lines having an effect on the biodiversity, vegetation can also have an effect on the power lines. Without suitable maintenance of the servitude, vegetation could go grow up and affect the operation of the power line. Vegetation across the study area exhibits a fairly low canopy in most parts however regular inspections will be required to monitor the vegetation given the mitigation measures that have been recommended in this report i.e. limited vegetation clearance. The emergence of pine trees within the servitude due to the invasive nature of this species will need to be monitored.

8.3 Rating of impacts

8.3.1 Potential Impacts During the Construction Phase

- Loss of habitat for general species

Table 31: Rating of Related to Loss of Habitat for General Species during the Construction Phase

IMPACT TABLE		
Environmental Parameter	Biodiversity	
Issue/Impact/Environmental Effect/Nature	Loss of habitat for red data / general species	
Extent	The impact is only expected to affect the site.	
Probability	Impact will certainly occur (Greater than a 75% chance of occurrence).	
Reversibility	The impact is partly reversible but more intense mitigation measures are required.	
Irreplaceable loss of resources	The impact will result in significant loss of resources.	
Duration	The impact and its effects will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2– 10 years).	
Cumulative effect	The impact would result in minor cumulative effects	
Intensity/magnitude	Impact alters the quality, use and integrity of the system/component but system/ component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).	
Significance Rating	**Prior to mitigation measures:** There will be a negative medium impact i.e. the anticipated impact will have moderate negative effects and will require moderate mitigation measures. **After mitigation measures:** After mitigation measures, the negative low impact is achieved.	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	1	1
Probability	4	2

IMPACT TABLE		
Reversibility	2	1
Irreplaceable loss	3	2
Duration	2	1
Cumulative effect	3	2
Intensity/magnitude	2	1
Significance rating	-30 (medium negative)	-9 (low negative)
Mitigation measures	▪ Maintain footprint strictly during construction ▪ Appoint Environmental Control Officer (ECO) for the duration of construction. ▪ Conduct construction walk down prior to construction to conduct a search and rescue exercise. ▪ Existing indigenous vegetation must be retained where possible. ▪ Remove and relocate any plants of botanical or ecological significance (these must be indicated by the ECO) ▪ Vegetation to be removed as it becomes necessary ▪ No vegetation to be used for firewood. ▪ Demarcation of sensitive areas prior to construction activities starting.	

- Edge effect

Table 32: Rating of Impacts Related to Edge Effect during the Construction Phase

IMPACT TABLE	
Environmental Parameter	Biodiversity
Issue/Impact/Environmental Effect/Nature	Edge effect
Extent	The impact is only expected to affect the site.
Probability	The impact will likely occur (Between a 50% to 75% chance of occurrence).
Reversibility	The impact is partly reversible but more intense mitigation measures are required.

IMPACT TABLE		
Irreplaceable loss of resources	The impact will result in marginal loss of resources.	
Duration	The impact and its effects will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).	
Cumulative effect	The impact would result in minor cumulative effects	
Intensity/magnitude	Impact alters the quality, use and integrity of the system/component but system/ component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).	
Significance Rating	**Prior to mitigation measures:** There will be a negative Low impact i.e. the anticipated impact will have negligible negative effects however mitigation measures must be implemented. **After mitigation measures:** After mitigation measures, the negative low impact persists.	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	1	1
Probability	3	1
Reversibility	2	1
Irreplaceable loss	2	1
Duration	2	1
Cumulative effect	3	2
Intensity/magnitude	2	1
Significance rating	-26 (low negative)	-7 (low negative)
Mitigation measures	▪ The contractor should be responsible for implementing a programme of weed control (particularly in areas where soil has been disturbed); and grassing of any remaining stockpiles to prevent weed invasion. ▪ The spread of exotic species occurring throughout the site should be controlled. ▪ All exotic vegetation must be removed from the site (if present).	

IMPACT TABLE	
	▪ Rehabilitation must take place as soon as construction is complete to avoid the edge effect, the infiltration of alien species and soil erosion around the study area.

- Transformation

Table 33: Rating of Impacts Related to Transformation during the Construction Phase

IMPACT TABLE	
Environmental Parameter	Biodiversity
Issue/Impact/Environmental Effect/Nature	Transformation
Extent	The impact is only expected to affect the site.
Probability	Impact will certainly occur (Greater than a 75% chance of occurrence).
Reversibility	The impact is partly reversible but more intense mitigation measures are required.
Irreplaceable loss of resources	The impact will result in significant loss of resources.
Duration	The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 50 years).
Cumulative effect	The impact would result in minor cumulative effects
Intensity/magnitude	Impact alters the quality, use and integrity of the system/component but system/ component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).
Significance Rating	**Prior to mitigation measures:** There will be a negative medium impact i.e. the anticipated impact will have moderate negative effects and will require moderate mitigation measures.

IMPACT TABLE		
	After mitigation measures: After mitigation measures, the negative low impact is achieved.	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	1	1
Probability	4	2
Reversibility	2	1
Irreplaceable loss	2	1
Duration	3	2
Cumulative effect	3	2
Intensity/magnitude	2	1
Significance rating	-30 (medium negative)	-9 (low negative)
Mitigation measures	▪ Existing indigenous vegetation must be retained where possible. ▪ Demarcation of sensitive areas prior to construction activities starting. ▪ The contractor should be responsible for implementing a programme of weed control (particularly in areas where soil has been disturbed); and grassing of any remaining stockpiles to prevent weed invasion. ▪ The spread of exotic species occurring throughout the site should be controlled. ▪ Rehabilitation must take place as soon as construction is complete. ▪ Rehabilitation process must make use of species indigenous to the area. Seeds from surrounding seed banks can be used for re-seeding.	

- Erosion

Table 34: Rating of Impacts Related to Erosion during the Construction Phase

IMPACT TABLE	
Environmental Parameter	Biodiversity
Issue/Impact/Environmental Effect/Nature	Erosion
Extent	The impact is only expected to affect the site.

IMPACT TABLE	
Probability	Impact will certainly occur (Greater than a 75% chance of occurrence).
Reversibility	The impact is partly reversible but more intense mitigation measures are required.
Irreplaceable loss of resources	The impact will result in marginal loss of resources.
Duration	The impact and its effects will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).
Cumulative effect	The impact would result in insignificant cumulative effects
Intensity/magnitude	Impact alters the quality, use and integrity of the system/component but system/ component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).
Significance Rating	**Prior to mitigation measures:** There will be a negative Low impact i.e. the anticipated impact will have negligible negative effects however mitigation measures must be implemented. **After mitigation measures:** After mitigation measures, the negative low impact persists

	Pre-mitigation impact rating	Post mitigation impact rating
Extent	1	1
Probability	4	2
Reversibility	2	1
Irreplaceable loss	2	1
Duration	2	1
Cumulative effect	2	1
Intensity/magnitude	2	1
Significance rating	-26 (low negative)	-7 (low negative

IMPACT TABLE	
Mitigation measures	▪ Rehabilitation must take place as soon as construction is complete to avoid soil erosion around the study area.

- Loss of Red Data species

Table 35: Rating of Impacts Related to Loss of Red Data Species during the Construction Phase

IMPACT TABLE	
Environmental Parameter	Biodiversity
Issue/Impact/Environmental Effect/Nature	Loss of Red Data species
Extent	The impact will only affect the site
Probability	Impact will certainly occur (Greater than a 75% chance of occurrence).
Reversibility	The impact is partly reversible but more intense mitigation measures are required.
Irreplaceable loss of resources	The impact will result in significant loss of resources.
Duration	The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 50 years).
Cumulative effect	The impact would result in minor cumulative effects
Intensity/magnitude	Impact affects the continued viability of the system/ component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease.
Significance Rating	**Prior to mitigation measures:** There will be a negative medium impact i.e. the anticipated impact will have moderate negative effects and will require moderate mitigation measures. **After mitigation measures:**

IMPACT TABLE		
	After mitigation measures, the negative low impact is achieved.	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	1	1
Probability	4	2
Reversibility	2	1
Irreplaceable loss	3	1
Duration	3	1
Cumulative effect	3	1
Intensity/magnitude	3	1
Significance rating	-48 (medium negative)	-7 (medium negative)
Mitigation measures	▪ Demarcation of sensitive areas prior to construction activities starting as per the sensitivity map. ▪ Use of appropriate construction methods in the sensitive area. ▪ Intensive environmental audits (frequently in sensitive areas) by an independent party during this construction period. ▪ A copy of the Environmental Management Programme as well as the specialist studies must be present at the construction site for easy reference to specialist recommendations in sensitive areas. ▪ It is recommended that the construction crew be educated about the sensitivities involved in these areas as well as the potential species they could encounter. A poster of sensitive species (compiled by a qualified specialist) should be kept on the construction site for easy reference.	

8.3.2 Potential Impacts During the Operation Phase

- Edge effect

Table 36: Rating of Related to Edge Effect during the Operation Phase

IMPACT TABLE		
Environmental Parameter	Biodiversity	
Issue/Impact/Environmental Effect/Nature	Edge effect	
Extent	The impact is only expected to affect the site.	
Probability	The impact may occur (Between a 25% to 50% chance of occurrence).	
Reversibility	The impact is partly reversible but more intense mitigation measures are required.	
Irreplaceable loss of resources	The impact will result in marginal loss of resources.	
Duration	The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 50 years).	
Cumulative effect	The impact would result in minor cumulative effects	
Intensity/magnitude	Impact alters the quality, use and integrity of the system/component but system/ component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).	
Significance Rating	**Prior to mitigation measures:** There will be a negative Low impact i.e. the anticipated impact will have negligible negative effects however mitigation measures must be implemented. **After mitigation measures:** After mitigation measures, the negative low impact persists.	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	1	1
Probability	2	1
Reversibility	2	1

IMPACT TABLE		
Irreplaceable loss	2	1
Duration	3	1
Cumulative effect	3	1
Intensity/magnitude	2	1
Significance rating	-26 (low negative)	-6 (low negative)
Mitigation measures	▪ Mitigation measures mentioned for the construction phase above must be implemented for any maintenance of the development that may be undertaken during the operation phase. ▪ Monitoring programme to ensure that rehabilitation efforts are successful to ensure that risks such as erosion and the edge effect are avoided. ▪ Constant maintenance of the area to ensure re-colonisation of floral species. ▪ Regular removal of alien species which may jeopardise the proliferation of indigenous species.	

- Erosion

Table 37: Rating of Impacts Related to Erosion during the Operation Phase

IMPACT TABLE	
Environmental Parameter	Biodiversity
Issue/Impact/Environmental Effect/Nature	Erosion
Extent	The impact is only expected to affect the site.
Probability	The impact may occur (Between a 25% to 50% chance of occurrence).
Reversibility	The impact is reversible with implementation of minor mitigation measures
Irreplaceable loss of resources	The impact will result in marginal loss of resources.
Duration	The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct

IMPACT TABLE		
	human action or by natural processes thereafter (10 – 50 years).	
Cumulative effect	The impact would result in negligible to no cumulative effects	
Intensity/magnitude	Impact alters the quality, use and integrity of the system/component but system/ component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).	
Significance Rating	**Prior to mitigation measures:** There will be a negative Low impact i.e. the anticipated impact will have negligible negative effects however mitigation measures must be implemented. **After mitigation measures:** After mitigation measures, the negative low impact persists	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	1	1
Probability	2	1
Reversibility	1	1
Irreplaceable loss	2	1
Duration	3	1
Cumulative effect	1	1
Intensity/magnitude	2	1
Significance rating	-20(low negative)	-6 (low negative
Mitigation measures	▪ Monitoring must be undertaken to ensure that no erosion is taking place as a result of the development. ▪ Monitoring programme to ensure that rehabilitation efforts are successful to ensure that risks such as erosion are avoided.	

- Poor maintenance

Table 38: Rating of Impacts Related to Poor Maintenance during the Operation Phase

IMPACT TABLE

IMPACT TABLE		
Environmental Parameter	Biodiversity	
Issue/Impact/Environmental Effect/Nature	Poor Maintenance	
Extent	The impact will only affect the site	
Probability	The impact may occur (Between a 25% to 50% chance of occurrence).	
Reversibility	The impact is reversible with implementation of minor mitigation measures	
Irreplaceable loss of resources	The impact will result in marginal loss of resources.	
Duration	The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 50 years).	
Cumulative effect	The impact would result in minor cumulative effects	
Intensity/magnitude	Impact alters the quality, use and integrity of the system/component but system/ component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).	
Significance Rating	**Prior to mitigation measures:** There will be a negative Low impact i.e. the anticipated impact will have negligible negative effects however mitigation measures must be implemented. **After mitigation measures:** After mitigation measures, the negative low impact persists	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	1	1
Probability	2	1
Reversibility	1	1

IMPACT TABLE		
Irreplaceable loss	2	1
Duration	3	1
Cumulative effect	3	2
Intensity/magnitude	2	1
Significance rating	-24 (low negative)	-7 (low negative
Mitigation measures	▪ Constant monitoring of vegetation height by Eskom.	

8.3.3 Cumulative Impacts

- Construction

Because the pylons occupy limited areas along the route, cumulative impacts are anticipated to be low during construction.

- Operation

If mitigation measures (e.g. rehabilitation, Constant maintenance among others) are implemented, cumulative impacts during the operation phase are expected to be negligible. However should these not be implemented, cumulative impacts as a result of the power lines could result in further impacts on biodiversity in the long term. The implementation of the recommended

8.3.4 Residual Impacts

If rehabilitation of the study area is undertaken efficiently and according to the Environmental Management Plan, no residual impacts on biodiversity are anticipated.

9 MITIGATION MEASURES

The following mitigation measures are proposed during construction and operation.

9.1 Construction Phase

Once tower locations are available prior to construction, a detailed walkdown to each tower must be undertaken to refine the mitigation measures stipulated below. This will ensure that any sensitive faunal or floral species are not affected by the location of the tower. Should this walk down reveal site specific sensitivities, tower locations may need to be moved based on these findings.

It is critical that all surface water features i.e. rivers and wetlands are spanned by the power lines and that towers are located out of their buffer zones as assigned by the wetland assessment. This is particularly important for drainage areas within the Longmore area due to the potential presence of the Hewitt's Ghost Frog.

Clearing must be limited in areas of intact vegetation as highlighted in the sensitivity maps. Existing access roads must be utilised as much as possible. If access is required across natural vegetation, this must be limited to a two lane access track with no major clearing. It is critical that thicket clearing is kept to an absolute minimum due to the sensitivity of this vegetation to clearing. Spanning is possible across this vegetation particularly with power lines of this size.

Also, areas of poorly protected vegetation should be preserved as much as possible in order to avoid further impacts on these already heavily impacted vegetation units. Examples of these include Albany Alluvial Vegetation (associated with the rivers in the study area), Eastern Coastal Shale Band Vegetation and Humansdorp Shale Renosterveld.

More detailed mitigation measures are listed below.

9.1.1 Construction Site Specific Mitigation Measures

The following mitigation measures are recommended for the sensitive areas which have been identified in the study area:

- A walkdown of the route by a specialist should take place when tower locations and access requirements are finalised.
- A construction EMP must be compiled based on the walkdowns and tower locations adjusted accordingly.
- A reptile specialist must be on site when construction is undertaken at Grassridge and surrounds to conduct a search for Albany Adder specimens.
- The walkdown must determine the presence of any protected tree species that will be affected such as the Milkwood or Yellowwood. Should they need to be destroyed, the correct permits must be applied for by Eskom with the Department of Agriculture, Forestry and Fisheries (DAFF).
- The ECO must be in possession of all tower locations and these must be overlayed with sensitivity information and visited prior to construction to ensure suitable mitigation measures and construction methodologies are implemented.
- An on-site ecologist should be present when excavation takes place to ensure that any uncovered species are protected from destruction (It is important to remember that even though these species have not been encountered, they could be in a dormant stage and suddenly arise during construction due to more favourable conditions).
- Demarcation of sensitive areas prior to construction activities starting as per the sensitivity map.
- Intensive environmental audits (frequently in sensitive areas) by an independent party during this construction period.
- A copy of the Environmental Management Programme as well as the specialist studies must be present at the construction site for easy reference to specialist recommendations in sensitive areas.
- It is recommended that the construction crew be educated about the sensitivities involved in these areas as well as the potential species they could encounter. A poster of sensitive species (compiled by a qualified specialist) should be kept on the construction site for easy reference.
- Where possible, construction should take place during winter i.e. the dormant stage to minimise impacts on vegetation during the growing season.
- Only vegetation within the footprint must be removed.
- Vegetation removal must be phased in order to reduce impact of construction.
- Construction site office and laydown areas must be clearly demarcated and no encroachment must occur beyond demarcated areas.
- All natural areas impacted during construction must be rehabilitated with locally indigenous species.
- Construction areas must be well demarcated and these areas strictly adhered to.
- Rehabilitation must take place as soon as construction is complete to avoid the edge effect, the infiltration of alien species and soil erosion around the study area.

- Rehabilitation process must make use of species indigenous to the area. Seeds from surrounding seed banks can be used for re-seeding.
- The use of pesticides and herbicides in the study area must be discouraged as these impact on important pollinator species of indigenous vegetation.
- Soils must be kept free of petrochemical solutions that may be kept on site during construction. Spillage can result in a loss of soil functionality thus limiting the re-establishment of flora.
- Access must be limited in natural areas to existing tracks or two lane tracks which can be used during operation for maintenance.

9.2 Operation Phase

9.2.1 Operation Site Specific Mitigation Measures

The following mitigation measures are recommended for the sensitive areas which have been identified in the study area

- Monthly monitoring of these sensitive areas should take place during the first year after construction to ensure that rehabilitation is successful.
- These monitoring exercises must ensure that no erosion is taking place as a result of the development.
- Six monthly checks of the area should take place for the emergence of invader species.
- Mitigation measures mentioned for the construction phase above must be implemented for any maintenance of the development that may be undertaken during the operation phase.
- Correct rehabilitation with species which are locally indigenous.
- Monitoring programme to ensure that rehabilitation efforts are successful to ensure that risks such as erosion and the edge effect are avoided.
- Constant maintenance of the area to ensure re-colonisation of floral species.
- Regular removal of alien species which may jeopardise the proliferation of indigenous species.
- Monitoring of height of vegetation.

9.3 Achievability of Mitigation Measures

Mitigation measures included within this report are feasible and will be easy to achieve. Several of the mitigation measures included here are generic in nature and have been implemented successfully on several different construction sites. The unique mitigation measures stated in this report are also achievable and it is essential that these are taken into account when the proposed development is constructed.

9.4 Management and Monitoring

It is recommended that a formal monitoring and reporting strategy/protocol be developed for monitoring the impact on the vegetation in the area during construction. This will ensure that the mitigation measures stipulated for the construction are well enforced and the identified impacts minimised as much as possible.

Specific areas of concern that require strict monitoring include:

- Containment of construction to the demarcated areas
- Reduction in vegetation clearance
- Erosion control
- Emergence of alien species
- Rehabilitation of the site
- Containment of construction near sensitive areas
- Protection of wetlands and ecological linkage

If Red Data species are located in the identified sensitive areas, the relevant permits must be applied for from the relevant authorities. No listed plants may be removed without these permits. It will be the responsibility of the ECO to ensure that these permits are in place where necessary.

The precautionary principle should be applied during the construction of the power lines and care taken to implement the recommended mitigation measures. This is especially relevant in identified sensitive areas.

9.5 Rehabilitation

Once the proposed development has been constructed, rehabilitation needs to take place. This needs to take place timeously to ensure that alien plant emergence and erosion do not occur.

The first stage of rehabilitation will be the reinstatement of top soil. The top soil must be exposed for the shortest possible time so that it is not lost through wind and run off erosion. The top soil layer is likely to carry a natural seed bank of the local species which will aid in re- establishing the vegetation layer. It is also likely to contain weed and alien species seed bank. For this reason, regular maintenance of the site will be required until the indigenous species have established themselves and risk of alien infestation and erosion is decreased.

In addition to the seed bank present within the top soil, it is recommended that the site be hydro-seeded with locally indigenous plant species where required.

10 CONCLUSIONS AND RECOMMENDATIONS

Several sensitivities relating to both the faunal and floral environment have been identified within the corridors. The proposed project could result in detrimental effects on these environments as discussed. However, power lines do not result in large scale clearing and suitable mitigation measures can be implemented to reduce the identified impacts. It is thus essential that these are implemented which emphasises the importance of the EMP which will be utilised on site to ensure this.

The placement of the power lines will not affect the CBA's which have been identified across the study area if mitigation measures are implemented. Mitigation measures provided will ensure that linkages between areas are not affected negatively. The servitudes can also provide a potential positive impact by not allowing further development within these areas. It is critical that operations are limited to the required footprint only. The CBA areas must be incorporated into the detailed EMP which will be completed once the walkdown has been conducted to ensure that tower locations are strategically positioned and access to these locations is appropriately planned.

It is essential that biodiversity specialists are on the project team during construction to ensure that the issues identified in this report are prioritised.

11 REFERENCES

1. **Barnes, K.N.** 2000. The Eskom Red Data book of birds of South Africa, Lesotho and Swaziland. BirdLife South Africa, Johannesburg.
2. **Branch, W.R.** 1998. Field guide to snakes and other reptiles of southern Africa. Struik, Cape Town.
3. **Carruthers, V.C. 2001.** Frogs and Frogging. Struik, Cape Town
4. **Conservation International** – Biodiversity Hotspots. World Wide Web electronic publication. www.biodiversityhotspots.org. version (2007)
5. **Cowling R.M, Lombard A.T, Rouget M, Kerley G.I.H, Wolf T, Sims-Castley R, Knight A, Vlok J.H.J, Pierce S.M, Boshoff A.F, Wilson, S.L.** 2003. A conservation assessment for the Subtropical Thicket Biome
6. **Dean, W.R.J. 2002.** Distribution patterns and habitat of avifauna in the Thicket Biome. TERU Report 41: 32pp.
7. **Driver A., Cowling R.M., & Maze K. 2003.** Planning for living landscapes: perspectives and lessons from South Africa. Center for Applied Biodiversity Science at Conservation International, Washington DC; Botanical Society of South Africa, Cape Town.
8. **Driver A., Maze K., Rouget M., Lombard A.T., Nel J., Turpie J.K., Cowling R.M., Desmet P., Goodman P., Harris J., Jonas Z., Reyers B., Sink K. & Strauss T.** 2005. National Spatial Biodiversity Assessment 2004: priorities for biodiversity conservation in South Africa. Strelitzia 17. SANBI, Pretoria.
9. **Friedmann Y. & Daly B.** (eds) 2004. Red Data Book of the mammals of South Africa: a conservation assessment. CBSG Southern Africa, Conservation Breeding Specialist Group (SSC/IUCN), Endangered Wildlife Trust, South Africa.
10. **Froese, R. and D. Pauly**. Editors. 2009. FishBase. World Wide Web electronic publication. www.fishbase.org, version (01/2009).
11. **Harrison J.A**., 2007. Specialist Vertebrate Fauna Assessment - Nuclear 1 Environmental Impact Assessment and Environmental Management Programme
12. **Midgley, J.J. 1991.** Valley bushveld dynamics and tree euphorbias. In Proceedings of the First Valley Bushveld /Subtropical Thicket Symposium, Grassland Society of Southern Africa, Howick.
13. **Mucina L. & Rutherford M.C.** (eds) 2006. The Vegetation of South Africa, Lesotho and Swaziland. Strelitzia 19. South African National Biodiversity Institute, Pretoria.
14. **Passmore, N.I & V.C Carruthers.** 1995. South African Frogs - a Complete Guide. Southern Book Publishers and Witwatersrand University Press. Johannesburg.
15. **Picker. M, Griffiths. C, & Weaving, A.** 2004. A. Field guide to Insects of South Africa. Struik, Cape Town.
16. **Pierce, S.M & Mader, A.D. 2006.** The STEP Handbook. Integrating the natural environment into land use decisions at the municipal level: towards sustainable development. Centre for African Conservation Ecology (ACE). Report Number 47 (Second Edition). Nelson Mandela Metropolitan University, South Africa.

17. **Rouget M., Reyers B., Jonas Z., Desmet P., Driver A., Maze K., Egoh B., Cowling R.M., Mucina L. & Rutherford M.C.** 2005. South African National Spatial Biodiversity Assessment 2004: Technical Report. Vol. 1: Terrestrial Component. South African National Biodiversity Institute, Pretoria.
18. **Skinner J.D. & Chimimba C.T., (eds) 2005:** The Mammals of the Southern African Subregion. Van der Horst D. (Ed.). Third Edition. Cambridge University Press, Cambridge.
19. **Skowno, A. 2007:** Baviaanskloof Mega-Reserve Conservation Plan – Draft 2 (Skowno 2007)
20. **Skowno, A. 2008:** Baviaanskloof Mega-Reserve Biodiversity Assessment Version 3. Baviaanskloof Mega-Reserve Project Management Unit.

Appendix A

EIA Phase flora report by Coastec, 2010

Appendix B

CBA Maps

Appendix C

Large Biodiversity Maps

SiVEST Environmental Division
51 Wessels Road, Rivonia. 2128. South Africa
PO Box 2921, Rivonia. 2128. South Africa

Tel + 27 11 798 0600
Fax +27 11 803 7272
Email info@sivest.co.za
www.sivest.co.za

Contact Person: Liesl Koch
Cell No.: +27 83 6876543
Email: lieslk@sivest.co.za