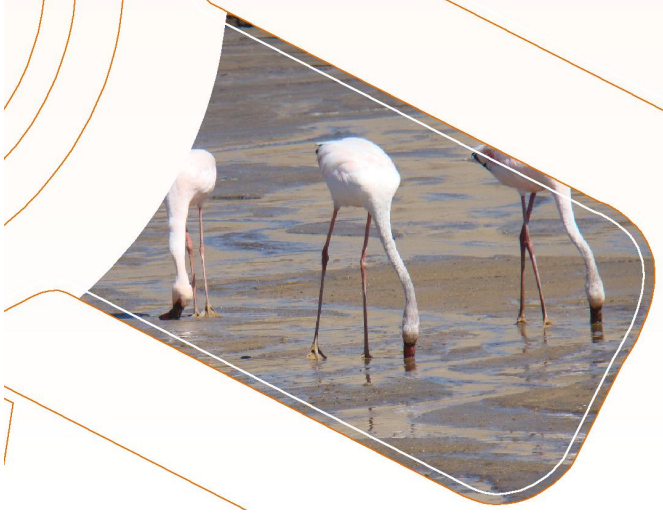

REVISED / AMENDED DRAFT ENVIRONMENTAL IMPACT REPORT FOR PROPOSED CONSTRUCTION OF ±370 KM 2nd 765KV TRANSMISSION POWER LINE FROM GAMMA SUBSTATION IN NORTHERN CAPE TO KAPPA (KORUSON) SUBSTATION IN WESTERN CAPE AND ASSOCIATED SUBSTATION UPGRADES

NEAS REFERENCE DEA/EIA/0001267/2012 DEA REFERENCE14/12/16/3/3/2/353.

Revised / Amended Draft Report

July 2018

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NZUMBULULO

Revised / Amended Draft Report:

EIR Report for the Proposed Construction of the ± 370km 2nd 765kV Transmission Power Line from Gamma Substation in the Northern Cape to Kappa (Koruson) Substation in the Western Cape and Substation Upgrade
NEAS Reference DEA/EIA/0001267/2012 DEA Reference14/12/16/3/3/2/353
July 2018

Prepared by: Hellen Mlotshwa

For and on behalf of
Nzumbululo sustainability, Energy and Environment (SEE)
Approved by: Dr. McEdward Murimbika

Signed
Position: Partner/ Director

This report has been prepared by Nzumbululo Sustainability Energy and Environment the trading name of Nzumbululo (Pty) Limited, one of the few consultancies able to combine natural, cultural and social environmental expertise under a one-stop consultancy supported by local expertise and knowledge with sub-Saharan regional reach and experience.

This report is confidential to the client and we accept no responsibility of whatsoever nature to third parties to whom this report, or any part thereof, is made known. Any such party relies on the report at their own risk.

EXECUTIVE SUMMARY

Introduction

This Environmental Impact Report (EIR) has been prepared as part of the Environmental Impact Assessment (EIA) process for the proposed development of the Gamma to Kappa 2nd 765kV Transmission power line and associated substations along the servitude traversing the Northern and Western Cape Provinces over a distance of approximately ±370km. To address the existing network constraints and increased electricity demand in the Cape Cape region, Eskom Holdings SOC Limited (hereafter to be refered to as Eskom) requires the development of a high capacity power line and associated substations infrastructure (i.e. transmission infrastructures).

As part of a strategy to achieve this, Eskom has proposed to develop a 2nd 765kV transmission power line between the existing Gamma (Victoria West) and Kappa (Koruson) substations. To integrate the new transmission power line into the National Grid, auxiliary and ancillary developments (such as upgrades of Gamma and Kappa substations, access roads, construction of new feeder bays, etc.) will form part of the proposed development. These proposed developments would improve the reliability and capacity of the transmission network and stabilise the electricity supply to the Western Cape Province. Three alternatives have been comparatively assessed to identify and finally recommend the “best practicable environmental option”.

The construction of the 2nd 765kV transmission power line including associated structures is an activity identified in terms of the National Environmental Management Act (NEMA) (Act No. 107 of 1998), in respect of the Environmental Impact Assessment (EIA) Regulations of 2010, and may not commence without Environmental Authorisation from the Department of Environmental Affairs (DEA).

Nzumbululo Heritage Solutions has been appointed by Eskom to conduct an EIA process for the proposed development. The EIA process comprises of the Scoping phase and EIA phase. The Scoping phase formed part of the process of collecting, organising, analysing, interpreting and communicating information that is relevant to the consideration of the application. In the EIA phase, decision making is made in terms of choosing the preferred alternative route on the basis of environmental and technical specialists recommendations. In addition, all comments and issues raised by interested and affected parties (I&APs) are

recorded and considered by the Environmental Assessment Practitioner (EAP) to assist in finalising the Environmental Impact Report (EIR).

The construction of the proposed 2nd 765kV transmission power line will only take place after the DEA has granted Environmental Authorisation (EA), appeals from I&APs or applicant have been dealt with and land acquisition with the affected landowners completed.

The Scoping phase commenced in June 2013 and was approved by the Authorities in August 2013. The EIA phase was then undertaken from August 2013 to December 2015 . The Final EIR could not be finalized and submitted to DEA during 2016 due to the magnitude of issues received from the EIA's public participation process. Eskom and Nzumbululo only managed to attend to these issues as of May 2017. The additional studies were then conducted and other studies were updated to reflect the current status. The summary of the EIA phase is thus as follows:

Study	**Specialist**	**Alternative Preferred**	**Comments**
Botanical Assessment	Mark Berry (Pri Sci Nat	2	Attention should be devoted to restrict disturbance as fas as practically possible to existing farm roads/ tracks in ordere to access the pylon sites. The later should be positioned on the most sisturbed or bare sites, preferably under the supervision of a suitable experienced botanist.
Avifauna	Chris Van Rooyen and Abert Foreman (Pr Sci Nat)	2	Emerged as the alternative with the lowest risk to birds. It is therefore recommended that this alignment is used
Ecology	Scientific Aquatic services. N. Van de Haar (Pr Sc Nat)	2	If all findings are taken into consideration option 1 is considered the least sensitive in terms of faunal and floral conservation followed by option 2 and then option 3. However, all options do traverse sensitive habitat and it is recommended that an option be chosen that follows an existing transmission line corridor which is alternative 2. .
Heritage	S Titlestad	2	Alternative 2 is assessed as the preferred power line route. This proposal sites the proposed new power lines in proximity to existing power lines including the first 765kV line along most sections of the proposed

	B O'Donoghue		route. It is clear from field assessments that in all environments except the extremely sensitive, the effect of accumulating impact where resources have already been impacted is preferable to creating new infrastructural corridors in intact environments. Mitigation to reduce the negative impacts along certain local sections of the route have been recommended. It is recommended that alternative 2 be relocated south of and adjacent to the existing first 765kV line due to high negative impacts on farmsteads Taaibosfontein, Hartebeesfontein and Buiterug, and to reduce impact on Karoo National Park, a provincial heritage resource.
Wetland	RHDHV Paul da Cruz	1	Alternative 1 corridor, and thus the power line in this corridor would cross fewer river systems. Examples of these are the Leeu and Koekemoers river systems which are relatively narrow where crossed by Alternative 1, with a greater number of tributaries higher up in the catchment (and which are also wider in extent) being crossed by Alternatives 2 and 3. Certain of the rivers in the Alternative 1 corridor run parallel to the direction of the power line alignment in this corridor (e.g. the Bloed River), thus being able to be avoided from being crossed. Lastly Alternatives 2 and 3 cross the mountainous areas within the Klein Roggeveld Mountains .
Agriculture	Johann Lanz Soil Scientist (Pri.Sci. Nat)	No preferred alternative	The most important agricultural parameters for assessing impacts in the context of the study area are slope steepness, land capability, grazing capacity, agricultural land use, and the occurrence of any agriculturally sensitive areas. A comparison of these parameters along the three proposed alternative routes shows negligible difference between them. Therefore, from an agricultural impact point of view, there is no preferred alternative for the power line route.
Social Impact assessment	Royal Haskoning DHV Luke Moore and Kim Moonsamy	2	The proposed development is supported by the Social Impact study and within recommendation to use Route 2, which would **have less minimal impact to the communities**.

Visual Impact Assessment	Axis landscape architects Gerhard Griesel	2	Alternative 2 is regarded as the most preferred alternative. Its alignment along the existing transmission line and transmission servitude is considered to cause the least impact on the landscape character due to the reduced sensitivity of the landscape along the roads and servitudes. The impact of Alternative 2 on visual receptors varies between residents, tourists and motorists. Alternative 2's great advantage lies in the less significant visual impact on tourists and residents as compared to the other alternatives. The public association with transmission lines and major public roads is a common perception, which makes the co-existence of these two features more acceptable.
Bat	Natural Scientific Services Kate Mac Ewan	2	The power line route alternative 2 appears to be the most preferable, as it parallels existing power line infrastructure along its entire length. Alternative 1 is the second most preferable route, as it follows the N1 for a considerable distance and traverses the least amount of climatically suitable habitat and cave roosting habitat for *R. aegyptiacus.*
Paleontology	Dr Durand	None preferred	None of the proposed routes for the transmission lines have a clear advantage above the others from a palaeontological perspective. Route 1 has a slight advantage above the others because runs over a significant distance of Ecca Group rocks which, except for the Whitehill Formation is relatively fossil poor. It is the only line, which passes over the *Eodicynodon* Assemblage Zone however. It is also important to mention that excavations are not necessarily detrimental to palaeontology. In many cases we would not have known of a fossil's existence if it were not for it being exposed during mining or construction. The success of the venture from a palaeontological perspective depends however on the diligence of the Environmental Control Officer and the quality of the surface survey.

Based on the above mentioned summary of the specialists studies, it is concluded that:

Alternative 2 is considered to be a suitable route alignment for the proposed 2nd 765kV transmission power line and is recommended to be granted Environmental Authorisation to satisfy the purpose and need of the proposed project.

In this regard it is fundamental that the EMPr and all other mitigation measures in this EIR be instituted during all phases of the proposed project. The key conditions are as follows:

- A walk-down by the specific specialists (not limited to biodiversity, avifauna archaelogy) will be undertaken for the compilation of construction Environmental Management Programme / Plan Report (prior to the construction phase) to ascertain that tower structures are not positioned or placed on sensitive areas, and if so what mitigations measures should be observed or implemented during construction phase, to advise the applicant of the location of the construction camps, laydown areas and access routes. The CEMP will be forwarded to DEA and any recommended commenting Authorities for approval.

- An independent ECO should be appointment to ensure compliance with the EMPr during the construction and rehabilitation phases.

- To apply and obtain any other permits which may be required prior to construction (General Authorisation, heritage and/or vegetation permits), if needs be.

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1.INTRODUCTION

Nzumbululo Heritage Solutions was appointed by Eskom Holdings SOC Limited (hereinafter referred to as Eskom) to conduct an Environmental Impact Assessment (EIA) study for the proposed construction of a 2nd ± 370km 765kV Transmission power line, infrastructures and associated auxiliary and substation infrastructure. The power line will traverse from the Gamma Substation outside the town of Victoria West in the Northern Cape Province to Kappa Substation close to Touwsrivier in the Western Cape Province.

1.1.1 Need and Desirability

The aim of the proposed transmission power line is to ensure that adequate and reliable electricity supply in the Cape Corridor network is achieved.

Currently, Koeberg Nuclear Power Station is the only base load power station in the Cape with a capacity of 1860 MW. The deficit between Koeberg generation and the Greater Cape load is offset by the generation pool in the Highveld via the Cape Corridor.

The Cape Corridor comprises of 400kV and 765kV lines originating from Zeus Substation (near Bethal) and Alpha Substation (near Standerton) in Mpumalanga to Hydra Substation (near De Aar) in the Northern Cape. It then extends into the Western Cape and terminates at Muldersvlei Substation (near Klapmuts).

The immediate problems in the corridor between Beta, Perseus and Hydra substations have been addressed to a large extent by the North-of-Hydra strengthening. The Beta-Delphi 400kV line has also brought additional relief to this corridor. In addition, the OCGT power stations in the Western Cape provide assistance to this corridor during the peak period. However, the planned duty cycle for the OCGTs and associated fuel costs of running these generators may not be able to cater for energy growth.

The Cape Corridor has been strengthened with the following 765kV lines that were commissioned and energized over the last five years:

- Zeus – Perseus and Mercury – Perseus in December 2012
- Hydra – Perseus in July 2013

- Perseus – Gamma and Hydra – Gamma in 2014
- Gamma – Kappa in April 2015
- Kappa –Sterrekus (Omega) in December 2016

Figure 1 shows a geographical view of the Cape network (i.e. 1st 765kV from Gamma to Sterrekus, 765kV Perseus to Gamma, 765kV Zeus to Mercury and Mercury to Perseus is shown by a solid line; while the approved 1st 765kV Zeus to Perseus, approved 2nd 765kV Gamma to Pesrsus and proposed 2nd 765kV from Gamma to Sterrekus is shown by a broken/dotted line). The completion of the 1st Kappa – Sterrekus 765kV has provided a further 700MW improvement in overall transfer capacity into the Greater Cape (as per the solid line).

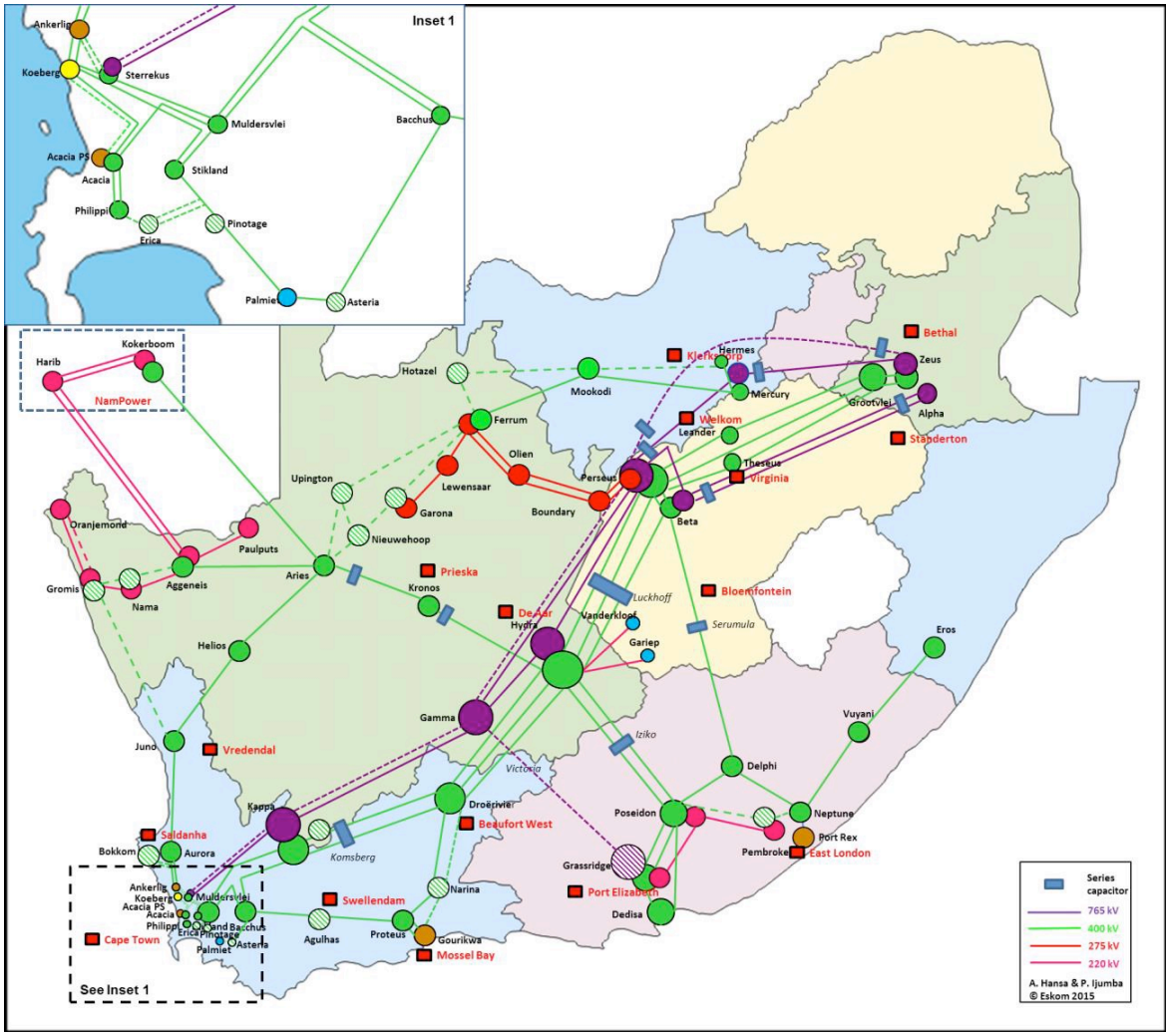

Figure 1: The Cape Corridor in 2017 from Zeus to Sterrekus

Furthermore, an Eskom directive requires that the existing 400kV series capacitor

installations containing Polychlorinated Biphenyls (PCBs) be removed from the system by 2023 in compliance with SANS 290, the "Regulation to phase-out the use of PCB materials and PCB contaminated materials". Therefore there is a recommendation that the series caps at Juno, Helios, Victoria and Hydra be decommissioned and replaced with series compensation on the 765kV network or other major corridor strengthening. The addition of the 400/132kV substation at Komsberg will also result in the downsizing of the Komsberg 2 series capacitor. Considering the aforementioned, the Cape Corridor network adequacy will be until ~2027. Thereafter, transfers will be limited by the loss of the Gamma-Kappa 765kV line.

Beyond 2027, the preferred strengthening to provide additional transfers into the Cape is the Cape Corridor Phase 4 (i.e. Zeus – Sterrekus 765kV line as shown in Figure 1 - in a broken/dotted line). The Cape Corridor Phase 4 has been split into two separate sub-phases:

- 2nd Gamma – Kappa 765kV line and 2nd Kappa – Sterrekus 765kV line (being proposed).
- 1st Zeus – Perseus 765kV line and 2nd Perseus – Gamma 765kV line (approved / EAs issued).

The order for implementation or completion regarding the above-mentioned phase is prioritized as follows: 2nd Gamma – Kappa 765kV line, 2nd Kappa – Sterrekus 765kV line, 2nd Perseus – Gamma 765kV line and then 1st Zeus – Perseus 765kV line.

Therefore the advantages of the proposed powerline are summarised as follows:

- To sustain economic growth in the Greater Cape network.
- To improve the overall reliability of the electrical systems beyond 2027, in order to benefit electricity users or customers in the Cape region.
- To allows a more flexible electrical network.
- To prevent and avoid future possible collapses of the network.

1.1.2 Scope of the work

The scope of work is as follows:

a)Construction of 2nd 765kV transmission power line from Gamma substation to Kappa substation with line reactors at both ends; and

b)Substation works, namely -

- Equip 1 x 765kV feeder bay at Gamma substation (extend existing busbar if necessary)
- Equip 1 x 765kV feeder bay at Kappa substation (extend existing busbar if necessary)
- Expansion of Gamma substation (i.e. expansion to the west of existing substation by approximately 300m) and Kappa substation (i.e. expansion to the left of the existing 765kV Yard by 400m)

The proposed 2nd 765kV transmission power line would be constructed from Gamma substation to Kappa substation for approximately +370km in length, depending on the final route alignment. Eskom will need to register a 80m wide servitude over the final alignment, which will be required to accommodate the towers upon which the 2nd 765kV power line will be strung and control activities below the transmission cables. In order to facilitate the final route determination, 2km wide alternative route were identified for specialist assessment study surveys along the proposed power line study area, as well as to avoid any environmentally sensitive areas during servitude acquisition negotiations and during construction phase of the project.

Furthermore, the transmission power line will require support structures and towers which will be spaced at approximately 500m intervals along the power line route, as well as construction vehicle access along the route for construction and maintenance purposes.

The project will require suitable areas to accommodate construction camps. It is anticipated that the construction camps would be set up on farms at central locations next to the preferred route alignment. The construction camps would consist of temporary structures such as tents or temporary buildings, as well as ablution facilities which are expected to be portable toilets and temporary shower facilities.

Once the final 2km route is authorized by DEA, a 80m servitude would be acquired within

the 2km route, which would require further negotiations with the affected landowners. Thereafter, a walk-down would be undertaken with the relevant specialists to guide on tower positions. At that stage, the required access roads, construction camps and laydown areas would be assessed and included in the site specific EMPr.

1.1.3 The construction on the transmission line of this nature process it follows this order:

Table 1: Process to be followed for the construction of the 765 Kv powerline

	Sequence of events for the 765kv
1	Aerial survey of the route;
2	Determine technically feasible alternative transmission line corridors;
3	Investigate the environmental feasibility of alternative options and recommend a preferred route
4	Route (part of this EIA process);
5	Environmental Authorisation with regard to the preferred route (part of this EIA process);
6	Negotiation of final route within the servitude with landowners;
7	Selection of best-suited structures and foundations;
8	Final design of line and placement of towers;
9	Establishment of construction camps and construction of access roads;
10	Vegetation clearance and gate erection;
11	Construction of foundations;
12	Assembly and erection of towers;
13	Stringing of conductors
14	Rehabilitation of working areas;
15	Testing and commissioning of the power line. During the operation phase, ongoing maintenance would need to be in accordance with an approved Operational Environmental Management Plan, including: aerial inspections, vehicle patrols, live-line maintenance using helicopters, periodic clearing and pruning of servitude vegetation, and periodic clearing of the centre line track.

1.1.4 Tower types for the 765 kV

Towers for the proposed transmission power line would be between approximately 35m and 55m in height and extend over a footprint area ranging from approximately 14.5m x 14.5m to 40.8m x 52.1m, depending on the tower type used. The distance between each tower would be approximately 500m, however, all will be influenced by the topography and the need for bends in the line to remain within negotiated servitudes. The actual number of towers, the type of towers and other support structures associated with the proposed power line would be confirmed and detailed following approval of the proposed development and once the final alignment is negotiated with property owners.

In general, the type of towers to be used would consider weight, the area (e.g. topography characteristic), height, costs and erection time. In addition, transmission power line routes are planned with as few bends along the route as possible.

Examples of some of the towers that Eskom is likely to use for the proposed Gamma to Kappa 2nd 765kV transmission power line and which have been widely used in similar developments are illustrated below.

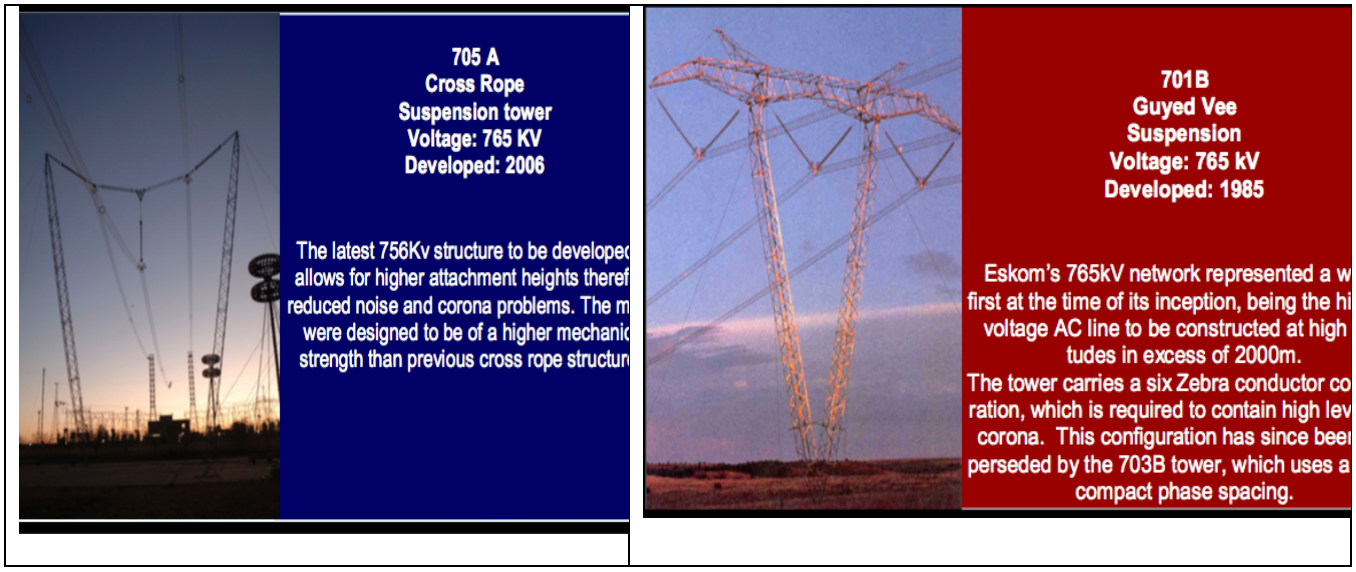

Figure 2: Cross rope and Guyed Vee suspension towers

1.1.5 Requirements of the Servitude

For the purposes of seeking Environmental Authorisation on 2km wide servitude was typically investigated in detail to determine the preferred alternative to avoid any environmental sensitive features and allow for minor deviations within the corridor during the servitude acquisition negotiation process and the power line construction along the route.

Eskom will register a servitude width of 80m (40m on either side of the centre line) against the title deeds of the properties that would be traversed by the proposed transmission power

line. A servitude does not mean that the holder of the servitude (Eskom) is the owner of the property. It simply means that Eskom has the right to convey electricity across the land, subject to conditions agreed between Eskom and the affected landowners. The servitude provides Eskom certain defined rights for the use of the specific area of land, for example access to erect a transmission line along a specific agreed route; reasonable access to operate and maintain the line inside the servitude area; and the clearance of vegetation that will interfere with the operation of the line.

1.1.6 Access roads

For Gamma to Kappa 2nd 765 kV transmission powerline, temporary access roads will be required for the construction vehicles to transport construction equipment and workers to and from tower position sites. Access roads will be established through recurring use.

A vehicle access road is usually required to be established to allow access along the entire length of the servitude. Access is required during both the construction and operation / maintenance phases of the transmission power line life cycle.

New access roads that are required will be established during the construction phase and are more established by vehicle passage than by grading or blading. In order to reduce potential impacts associated with the construction of new access roads, existing roads will be used as far as possible where available. New access roads will be constructed by means of driving over the vegetation where possible to avoid permanent removal of the existing vegetation.

During the operation phase of the power line, the centre line access road within the negotiated servitude will be a gravel road wider than 8m where no reserve exists. Negotiations between the landowner, contractor and Eskom Transmission will be undertaken in order to determine the final access routes.

1.1.7 Clearance

The minimum vertical clearance to buildings, poles and structures not forming part of the 765kV power line must be approximately 8.5m below conductors. The conductor ground clearance between the towers must be 10.4m. The minimum distance of a 765kV transmission power line structure from proclaimed public roads is 11.5m from the centre line of the structure to the centre line of the road. The minimum distance between any part of a tree or shrub and any bare phase conductor of a 765kV transmission power line must be 8.5m (OHSA, 1993). An approximately 8m wide strip is generally required to be cleared of all trees and shrubs down the centre of transmission power line servitude for stringing purposes

only. Any tree or shrub in other areas that will interfere with the operation and / or reliability of the transmission power line must be trimmed or completely cleared (CEA, 2003). The clearing of vegetation should be undertaken in accordance with the minimum standards to be used for vegetation clearing for the proposed 2nd 765kv power line construction as listed in Table (CEA, 2003) below.

Table 2: Minimum standards to be used for vegetation clearing for 765Kv

ITEM	STANDARD	FOLLOW UP
Centre line of the proposed transmission power line	Clear to a maximum depending on tower type and voltage of a 8m wide strip of all vegetation along the centre line. Vegetation to be cut flush with the ground. Treat stumps with herbicide.	Re-growth shall be cut within 100mm of the ground and treated with herbicide, as necessary. Monitor for invasive alien plants, and eradicate.
Inaccessible valleys (trace line)	Clear a 1m strip for access by foot only, for the pulling of a pilot wire by hand.	Vegetation not to be disturbed after initial clearing. Vegetation to be allowed to regrow. Monitor for invasive alien plants, and eradicate.
Access roads	Clear a maximum (depending on tower type) 6m wide strip for vehicle access within the maximum 8m width, including de- stumping/cutting stumps to ground level, treating with a herbicide and re-compaction of soil.	Re-growth to be cut at ground level and treated with herbicide as necessary. Monitor for IAP, eradicate
Proposed tower position and proposed support/stay wire position	Clear all vegetation within proposed tower position in an area not larger than a foot print of 20 x 20m (self-supporting towers) and 40 x 40m (compact cross-rope suspension towers) around the position, including de-stumping/cutting stumps to ground level, treating with a herbicide and re-compaction of soil. Allow controlled agricultural practices, where feasible.	Re-growth to be cut at ground level and treated with herbicide as necessary. Monitor for invasive alien plants, and eradicate.
Indigenous vegetation within servitude area	Area outside of the maximum 8m strip and within the servitude area, selective	Selective trimming

outside of maximum 8m strip	trimming or cutting down of those identified plants posing a threat to the integrity of the proposed transmission power line.	
Alien species within servitude area (outside of maximum 8m strip)	Area outside of the maximum 8m strip and within the servitude area, remove all vegetation within servitude area and treat with appropriate herbicide.	Cut and treat with appropriateherbicide.

2. EXPERTISE OF THE ENVIRONMENTAL ASSESSEMENT PRACTITIONERS

2.1 Introduction

The EIA Regulations of 2010 specifically require practitioners involved in the EIA process to list their qualifications and expertise in the report. An Environmental Assessment Practitioner (EAP) appointed in terms of Regulation 17 (1) is required to:

- Be independent
- Have expertise in conducting environmental impact assessments including knowledge of the Act, these regulations and any guidelines that have relevance to the proposed activity
- Perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant
- Comply with the Act, these regulations and all other applicable legislation
- Take into account, to the extent possible, the matters listed in regulation 13 when preparing the application and
- Disclose to the applicant and the competent authority all material information in the possession of the EAP that reasonably has or may have the potential of influencing any decision to be taken with respect to the application by the competent authority in terms of these regulations, or the objectivity of any report, plan or document to be prepared by the EAP in terms of these regulations for submission to the competent authority.

The table below lists the EAP study team involved in this project. These will work with other independent scientists and specialists until the DEA, makes a decision.

2.1.1Details of the EAP

Table 3: Details of EAP (H. Mlotshwa)

Name	Hellen S. Mlotshwa
Company	Nzumbululo Heritage Solutions
Physical Address	4 Berger Road, Vorna Valley Midrand
Postal Address	P. O. BOX 4106; HALFWAY HOUSE 1685
Telephone Number	011 029 2555
Fax Number	086 544 2177
E-mail	info@nzumbululo.com
Role in Project	Environmental Consultant/Practitioner

2.1.2 Detail of Applicant

Table 4: Details of the Proponent.

Name	Martina Phiri
Company	Eskom Holdings SOC Limited
Physical Address	Megawatt Park Maxwell Drive Sunninghill
Postal Address	P.O. Box 1091, Johannesburg 2000
Telephone number	011 800 3550
Fax number	086 607 0618
Email	PhiriM@eskom.co.za
Role in Project	Programme Manager
	Eskom Senior Environmental Advisor & Project Manager Lerato Mokgwatlheng 011 800 6812 MokgwaLL@eskom.co.za

3 DESCRIPTION OF THE PROPOSED PROJECT

INTRODUCTION

The proposed project will include the construction of a new 2nd ± 370km-long 765kv Transmission power line from Gamma Substation to Kappa Substation in the Northern and Western Cape provinces respectively. The development will include auxiliary works such as upgrade of substations, access roads, construction camps and equipment or material storage sites along the proposed power line servitude.

3.1 Project Location

The proposed project area is located in the Northern Cape and Western Cape Provinces. The power line will traverse through the following municipal areas:

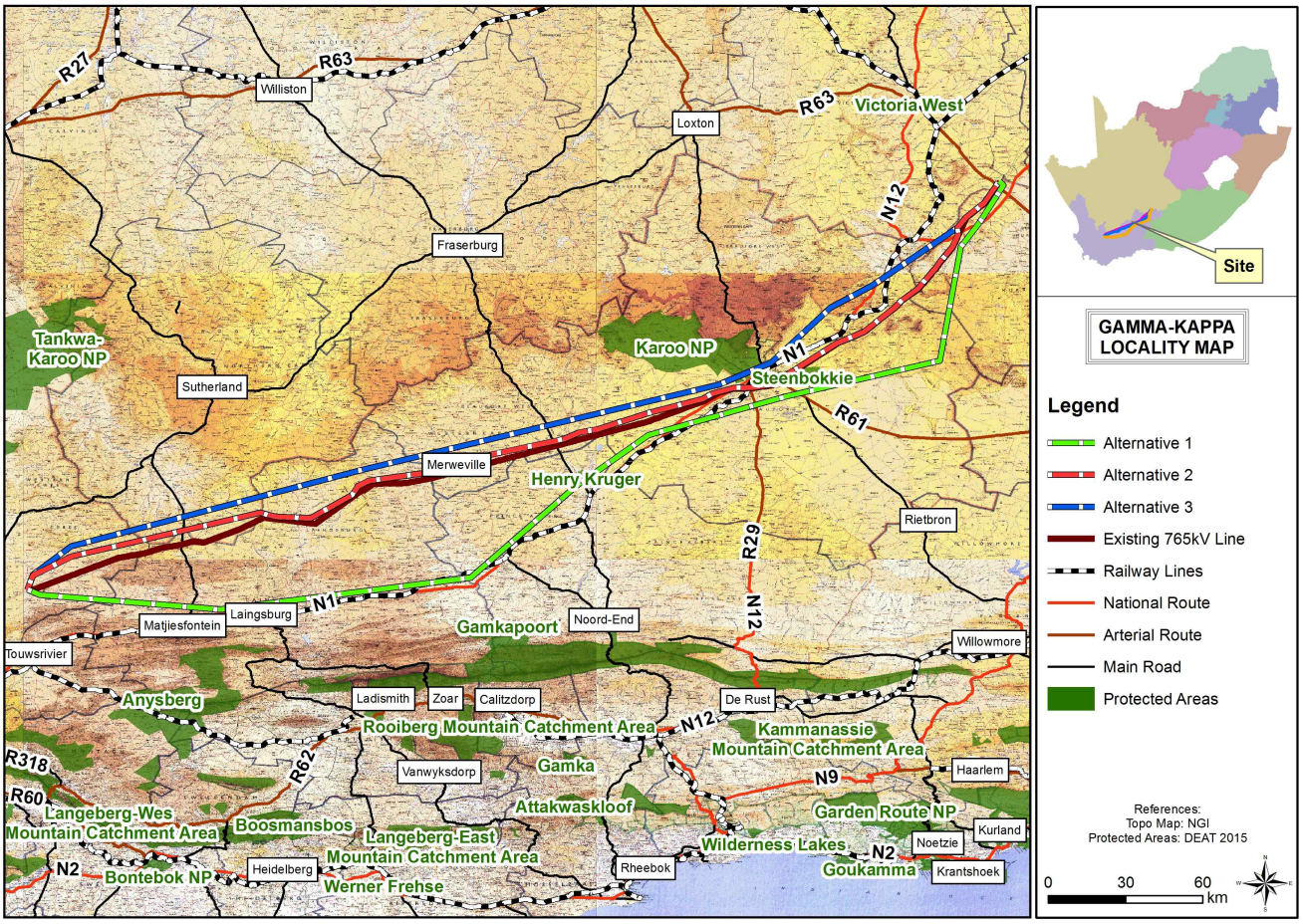

Figure 3: Shows locality map

- Victoria West
- Beaufort West,
- Three Sisters,

- Merweville,
- Murraysburg,
- Laingsburg,
- Touwsrivier.

The proposed power line servitude and associated alternative routes will traverse through the following listed farm properties: The list of individual farms affected by the proposed power line is attached in **Appendix 1** with the map.

These farms are distributed across the Northern Cape and Western Cape Provinces. The land-use activities on these farms comprises commercial animal husbandry, conservancies areas, urban and rural settlements, agro-industrial areas with associated infrastructures as well as vast networks of national regional and local roads, existing Transmission and Distribution power lines, bulk and reticulation subsurface water supply networks and such other auxiliary infrastructures.

3.2 Coordinates

Table 5: Shows coordinates

	Alternative Route 1	**Alternative Route 2**	**Alternative Route 3**
Start	20°6' 40.78" E 33°7' 37.53" S	20°7' 36.89" E 33°0' 31.94" S	20°1' 59.45" E 33°3' 10.31" S
Midpoint	22°34' 13.59" E 32°27' 23.36" S	22°28' 34.46" E 32°24' 2.15" S	21°49' 43.21" E 32°32' 2.24" S
End point	20°21' 43.39" E 33°8' 52.16" S	23°24' 6.35" E 31°41' 1.73" S	23°15' 34.01" E 31°50' 28.28" S

4.DISCUSSION OF THE PROJECT ALTERNATIVES

This section considers the three alternative routes for the proposed power line. Alternative route 1 is **396km**, Alternative route 2 is **372km** and Alternative route 3 is **366km** long. The preferred route for the power line is Alternative 2 **372km**. Explanations and discussions on each alternative option are presented below.

4.1.1 Route Alternatives

For this study, three alternative routes are being considered each estimated to be ±396km long with a 2000m (2km) wide corridor being considered. However, the final approved servitude route would be reduced to the appropriate width according to the final engineering designs and approvals by the DEA.

4.1.2 Alternative Power Line Route 1

This altenative route starts from the Gamma substation in Victoria West and is 392km long. The route runs in a relatively straight alignment towards the southwest and passes the R63 Provincial Road. The line runs in the vicinity of the road reserve and eventually traverses parallel to the N1 National Road. The route will pass in the vicinity of the Vale 4WD Trail and traverses past a number of guesthouses in the area such as the Lemoenfontein Guesthouse. The route passes along but outside the boundaries of the Karoo National Park. This power line route traverses through at least 69 farm properties including large estates such as Quaggasfontein, De Rante, Weltevreden, Cannon Fontein, and Driekoppen.

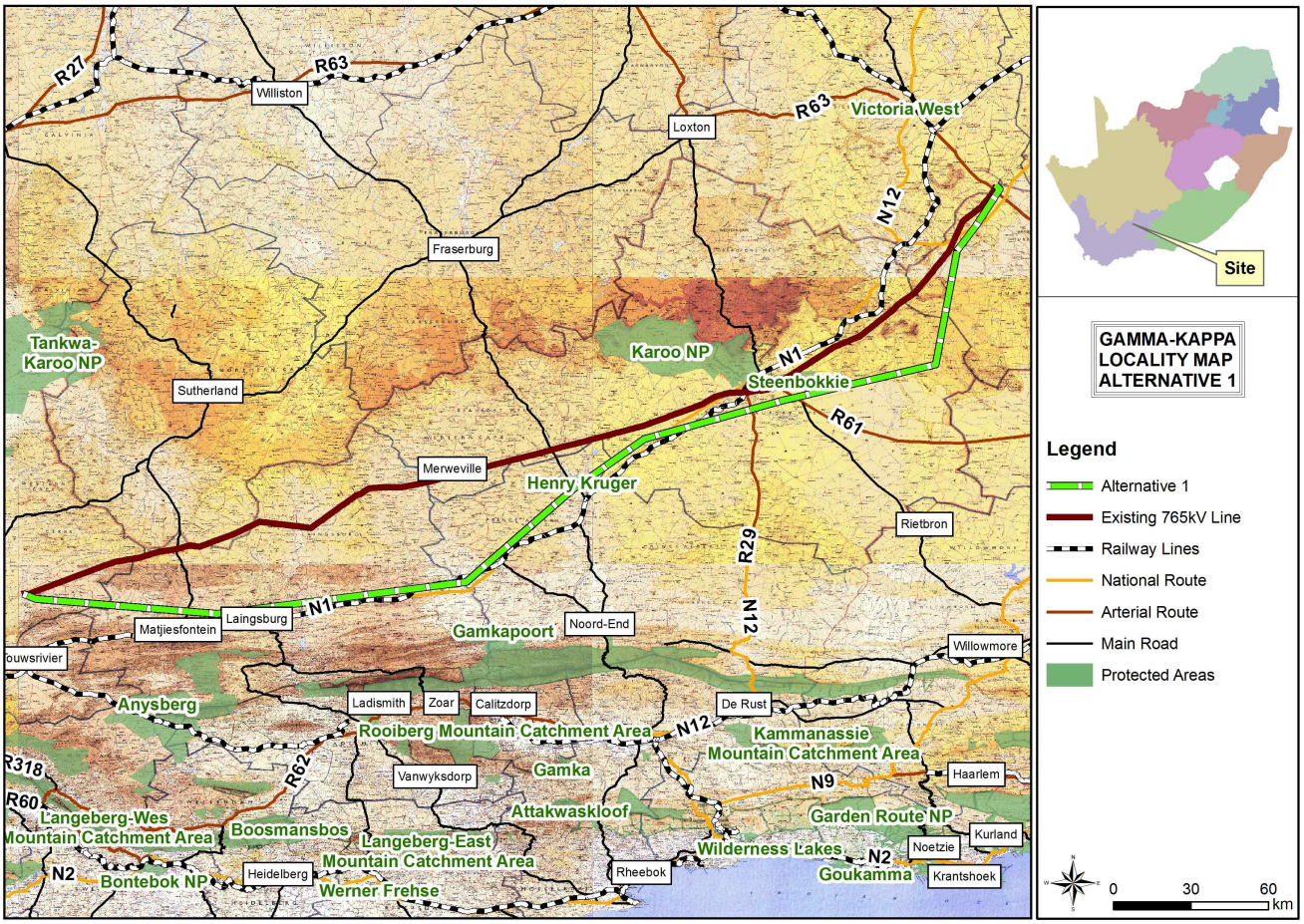

Figure 4: Shows Alternative 1

4.1.3 Alternative Power Line Route 2

The Alternative Route 2, is 372Km long starts from the Gamma substation in Victoria West. It bends towards and crosses the R353 and the R61 provincial roads, passing sheep land and also the Karoo National Park. A beacon, i.e. 257042 Katjieshoogte, was noticed during the site visit as a nature resources area. There are a number of guest houses such as Elandsrus Guesthouse, Gamamadi Guest Farm which also cuts on Alternative Route 1. Alternative Route 2 crosses 58 farms, including Yuk River, Weltevreden, Platfontein, Klipfontein Extension, Rietfontein, De Drift, and Montana., Note that both Alternative Route 1 and 2 cross the same farms, for example Weltevrden. The power line ends at the Kappa substation, also known as Koruson, near Touwsrivier.

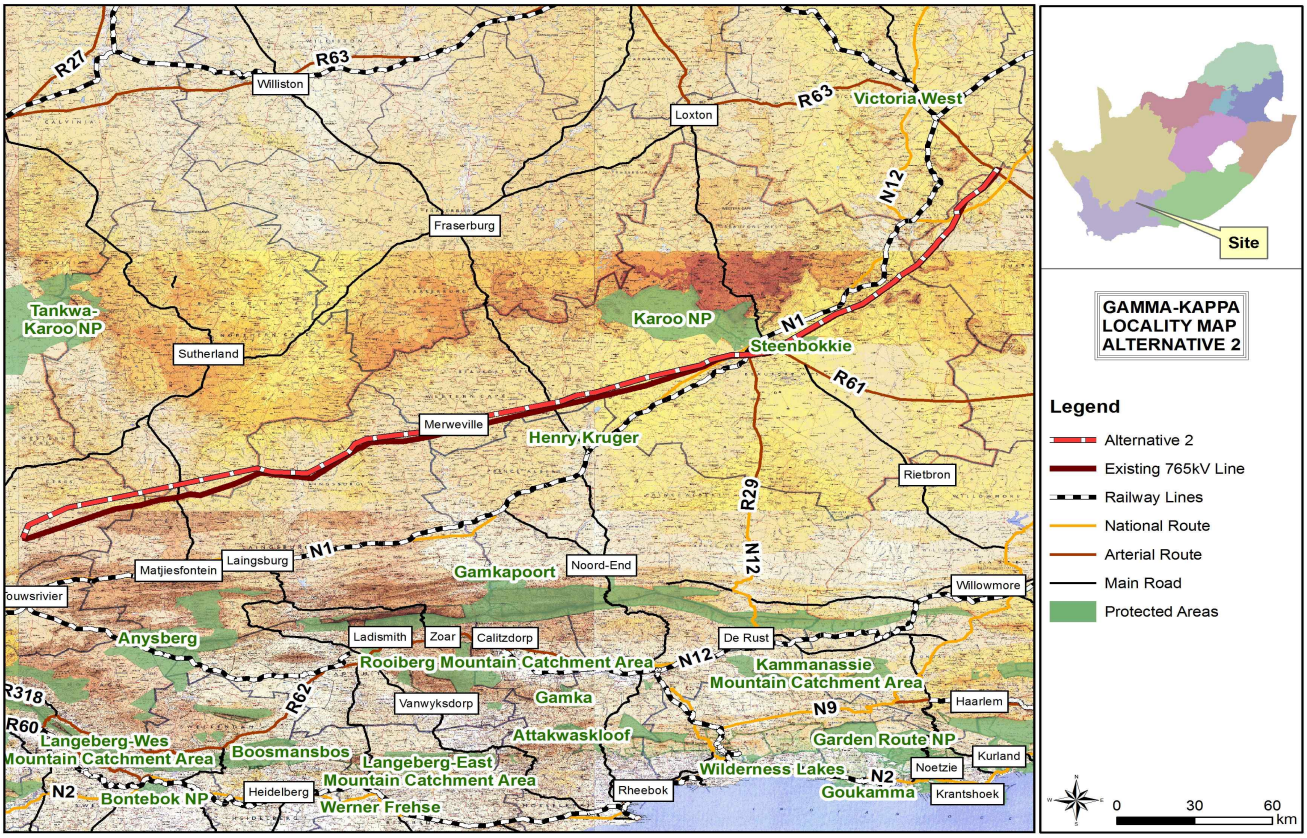

Figure 5: Shows Alternative 2

4.1.4 Alternative Power Line Route 3

Alternative Route 3 starts from the Gamma Substation in Victoria West, it is approximately 366km. This Alternative route has a lot of bends. After about 60km from Gamma Substation it bends towards Alternative route 2 and runs straight for about 90km where it bends. It passes a number of guest houses such as the Karoo Gastehuis,after which it bends and runs the vast lands of the Karoo. In Beaufort West it passes the Goliaths Head Karoo. It runs next to the current servitude for the 1st powerline . It crosses the N1 National Road. Adjacent to the route are a number of farm houses. It later crosses the R53 and runs parallel to Prince Albert Road, following the Swartberg near the Dwayka River, and finally crosses the R354 to (Kappa) Koruson. A total of 55 farms are affected by Alternative route 3, namely Good Hope, Stolshoek, Die Bad, Plaas 4008, Klipwal, etc.

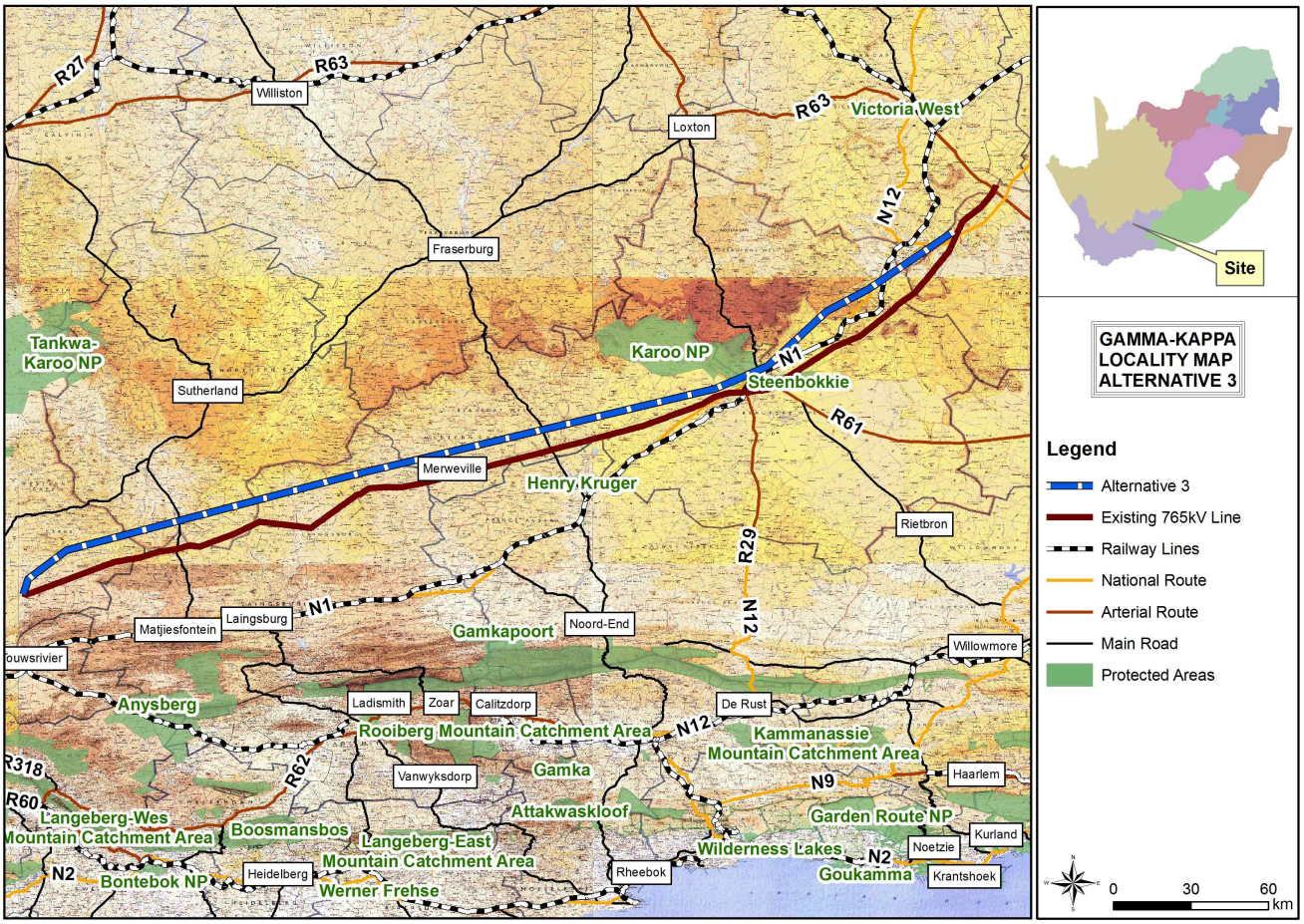

Figure 6: Shows alternative 3

4.2 Technical and Process Alternatives

There are two technical alternatives relevant to transmit electrical power other than the "Do-Nothing" Alternative. Electrical power is transmitted either through overhead power lines or underground cables. Each of the two types of cables has advantages and disadvantages.

4.2.1 Underground Cables

Underground cables are used where there are space constraints, within densely populated areas, in factories and even to supply power from the overhead posts to the consumer premises. Notwithstanding or disregarding the benefits or advantages that underground cables offer, underground cables are mostly used to transmit electric power of between 1kV – 132kV. They are used for short distances since the cable is 10 times more costly as compared to that of an overhead cable. The construction costs (i.e. including the digging of trenches, etc.) and environmental impacts are more.

4.2.2 Overhead Power Lines

From engineering, planning and financial perspectives, overhead lines have lesser requirements and are cheaper to construct than underground lines. The installation of overhead lines on poles or lattice structures is less complicated, easier and straightforward. They do not require insulation and sheathing. The fault detection and repair is easier and quicker. The overhead lines have the ability to carry more power (i.e. carry voltage power lines of more than 132kV). They are also less destructive on the ground as compared to underground cabling.

Therefore, the preference with overhead lines is mostly due to costs and the ability to carry power of more than 132kV. Due to this fact, the proposed construction of 2nd 765kV could only be constructed as overhead line.

4.2.2.1 Alternating Current (AC)

In AC voltage, the flow of electric charge periodically reverses direction, whereas in High Voltage Direct Current (HVDC) the flow of electric charge is in one direction. SA network is AC and the cost to equip a substation with DC/AC is huge. The space needed for the substation will be doubled. With AC, no major impact on the Substation layout and equipment.

The line length for an AC system is only viable for a line length of approximately 450km. Therefore, for this power line, which would be about ±372km in length, an AC system could be used.

4.2.2.2 High Voltage Direct Current (HVDC)

HVDC system uses direct current for the bulk transmission of electricity, compared to the more common AC system. For long distance transmission of more than 1000km, HVDC would be more appropriate. The structures for the DC bi-pole will be the same as the AC structures. DC requires a return path Earth Electrode which will be on structures separate from the main line with about 10km away from substation. DC insulation levels requirements are higher than AC. The risk of placing such high power transfer on one structure is high and thus two separate poles will be required and which requires another corridor.

4.2.3 No-Go Alternative

The “No-Go” Alternative is the option of not undertaking the proposed development, which implies that the proposed 2nd 765kV power line should not be considered and would not be constructed. Retention of the status quo would mean that it would not be possible to meet the growing electricity demands in the Western - and Northern - Cape Provinces.

This option is not socio-economically feasible because electricity users including industry, settlements, farmers and domestic users across the Western Cape Province would be unable to avoid interruptions and possible incrementally declining supply stability. Based on Eskom’s demand and supply calculations, Western Cape would face critical power supply shortage by 2027 if the proposed Transmission solution is not implemented. Consequently, reading from these Eskom calculated probabilities, without the proposed new 765kV Transmission power line it is reasonable to anticipate that there would be increasing possibility that outages and ultimate grid collapse would occur. This could result in widespread economic collapse across the Western Cape Province.

Based on the identified need for the proposed development to proceed and the fact that although there could be potential negative impacts associated with the proposed development, there are several possible and effective mitigating measures that could be implemented to minimise or eliminate negative impacts, where possible, associated with the construction and operational / maintenance phases for power line developments. It is reasonable to postulate and go as far as to indicate that the “No Go” Alternative is not a viable or sustainable option to be considered.

With reference to the above discussion, it should be noted that it is important to identify potential impacts in the early development process in order for timely influence the power alignment, the position of the power line, technical designs criteria and budget allocations for effective implementation of necessary mitigation measures.

The most prominent envisaged outcome of the proposed activity would be the effective and efficient transmission of electricity from the generation source to the Western Cape Province. Electricity supply developments are directly associated with economic and social development through improvement to the social welfare of communities, industries and overall economy of the region and country at large. A steady growth in electricity demand is expected to continue in South Africa for some time because required electrification of housing projects and developments such roads, schools and railway lines and other industrial developments such as mining and mining beneficiation industries are planned by provincial and national governments.

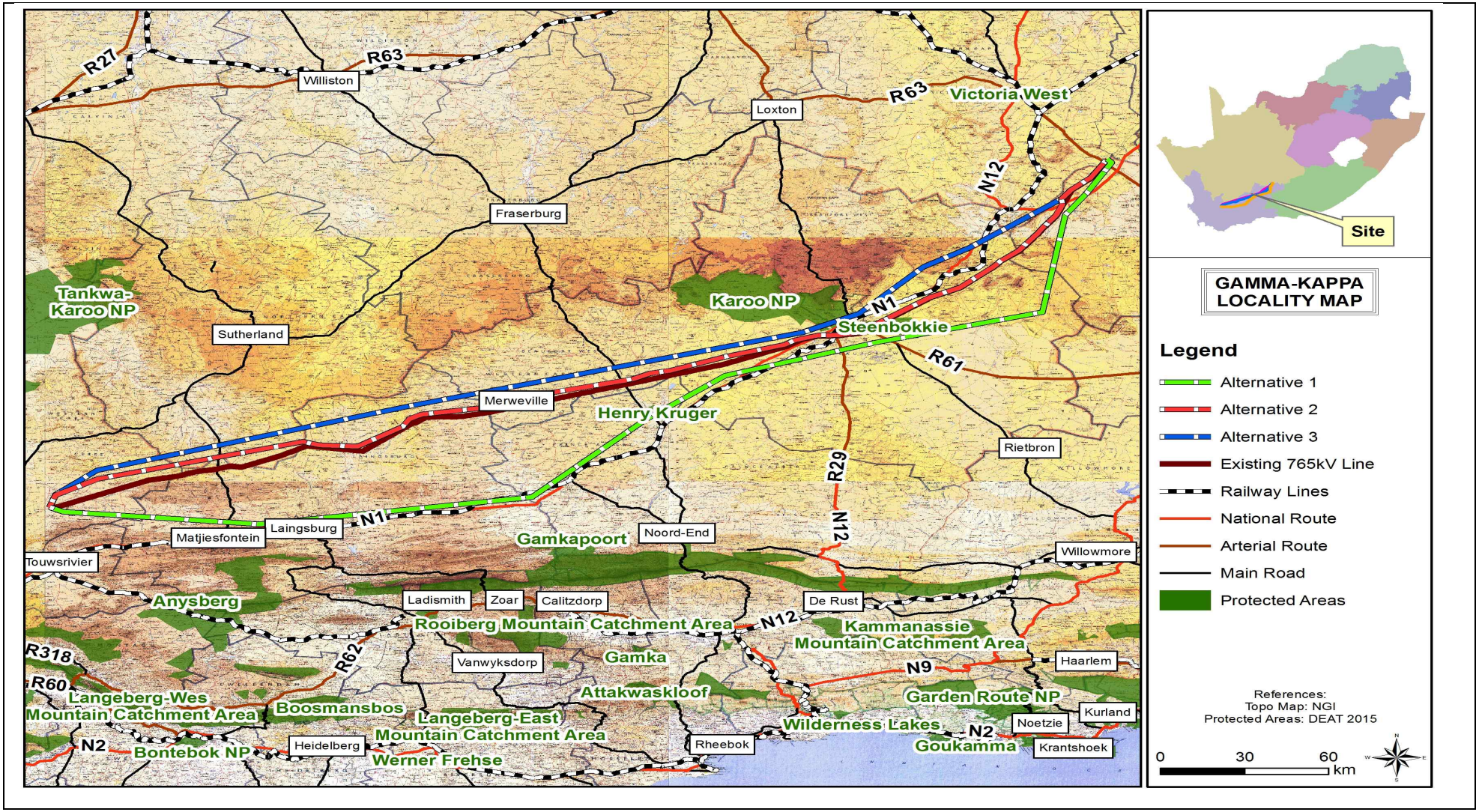

Figure 7: Locality map in 1: 50 000 showing the 3 power line routes and main roads and substations around the project area

5.REQUIREMENTS REQUIRED

The proposed development is guided and governed by Legislative Acts and Ministerial Guidelines . In addition, EIA studies for electricity Generation, Transmission and Distribution projects are also guided by additional internal Eskom Guidelines and Policies which derive from universal industry best practice (also see www.eskom.co.za)

5.1.1 LEGISLATION REQUIRED

Constitution of South Africa (Act 108 of 1996)

The Constitution (Act No. 108 of 1996) provides the legal basis for allocating powers to different spheres of Government and contains a number of rights. Primary to this study are those right specifically relevant to the national energy policy. The Constitution states that Government must establish a national energy policy to ensure that national energy resources are adequately tapped and delivered to cater for the needs of the nation. The production and distribution of energy should be sustainable and lead to an improvement in the standard of living of citizens (DME, 2003b:6). Section 24 of the Bill of Rights provides that:

"Everyone has the right:

a) to an environment that is not harmful to their well-being and

b) to have the environment protected, for the benefit of present and future generations through reasonable legislative and other measures that:

- prevent pollution and ecological degradation;
- promote conservation; and
- secure ecologically sustainable development and the use of natural resources while promoting justifiable economic and social development.".**Energy Policy**

The White Paper on Energy Policy (DME, 1998) sets out Government Policy with regard to the supply and consumption of energy for given decade intervals. The policy strengthens existing energy systems in certain areas and calls for the development of underdeveloped systems and demonstrates a resolve to change in a number of energy supply and consumption areas. The policy addresses most elements of the energy sector.

Furthermore, the White Paper on Energy Policy identified the need to undertake an Integrated Energy Planning (IEP) process in order to achieve a balance between the energy demand and resource availability, whilst taking into account the health, safety and environmental parameters. In addition, the policy identified the need for the adoption of a

National Integrated Resource Planning (NIRP) approach to provide a long-term cost-effective resource plan for meeting electricity demand, which is consistent with reliable electricity supply and environmental, social and economic policies.

Electricity Regulation Act of 2006

The proposed development is aligned to the following objectives (DME, 2006b:6):

- Achieve the efficient, effective, sustainable and orderly development and operation of electricity supply infrastructure in South Africa;
- Ensure that the interests and needs of present and future electricity customers and end users are safeguarded and met, having regard to the governance, efficiency, effectiveness and long-term sustainability of the electricity supply industry within the broader context of economic energy regulation in South Africa;
- Facilitate investment in the electricity supply industry;
- Promote the use of diverse energy sources and energy efficiency; and

Facilitate a fair balance between the interests of customers and end users, licensees, investors in the electricity supply industry and the public. In addition, the Electricity Regulation Act (Act No 4 of 2006) in terms of section 46 (2c) projects involving new generation capacity that is needed to ensure the continued uninterrupted electricity supply would require authorisations or exemptions in terms of NEMA (No 107 of 1998) or as may be required by any other law for the purpose of authorisation for proposed Eskom developments (DME, 2006).

Integrated Energy Plan (IEP) – 2003

The Department of Minerals and Energy (DME) commissioned the IEP to provide a framework in which specific energy policies, development decisions and energy supply trade-offs could be made on a project-by-project basis. The framework was intended to create a balance in providing low cost electricity for social and economic development, ensuring a security of supply and minimizing the associated environmental impacts. The IEP projected that as the years accumulate the additional demand in electricity would necessitate an increase in electricity generation capacity in South Africa. Therefore, contemporary concerns relate to electricity capacity to accommodate growth in demand (DME, 2003a). Integrated Resource Plan (IRP) – 2010-2030.

The Department of Energy, under the New Generation Capacity regulations has authorised the System Operations and Planning Division in Eskom to produce the IRP for electricity in

consultation with the Department and the National Energy Regulator of South Africa (NERSA) (DOE, 2011). The objective of the IRP is to develop a sustainable electricity investment strategy for generation capacity and transmission infrastructure for South Africa over the next 25 years. In summary, the IRP is intended to:

- Improve the long term reliability of electricity supply through meeting adequacy criteria over and above keeping pace with economic growth and development
- Ascertain South Africa's capacity investment needs for the medium term business planning environment;
- Consider environmental and other externality impacts and the effect of renewable energy technologies.
- Provide the framework for Ministerial determination of new generation capacity (inclusive of the required feasibility studies) as envisaged in the New Generation Capacity regulations.

Environmental Legislation
The National Heritage Resources Act (No. 25 of 1999)

The proposed development comprises certain activities (e.g. changing the nature of a site exceeding 5 000m^2 and linear development exceeding 300m or river crossing for more than 50m in length) that require authorisation in terms of Section 38 (1) of the NHRA, Act 25 of 1999. Section 38 (8) of the Act states that if heritage considerations are taken into account as part of an application process undertaken in terms of the ECA, there is no need to undertake a separate application in terms of the National Heritage Resources Act (NHRA). The requirements of the National Heritage Resources Act can thus be addressed as an element of the EIA process, specifically by the inclusion of a Heritage Impact Assessment (South African Heritage Resource Agency, 1999) and other compliance and commenting authorities such as the Heritage Western Cape and the Northern Cape Provincial Heritage resources Authority. In addition, for instance, NEMA section 24(4)(b)(iii) appears to reinforce the provisions of NHRA by requiring that procedures for assessing impacts including heritage impacts for most of NHRA sections 38(1) activities be addressed in an application for Environmental Authorisation.

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

In terms of the Act, the sourcing of material for road construction purposes (i.e. the use of borrow pits) is regarded as mining and accordingly is subject to the requirements of the Act.

In terms of the proposed project, Section 106 (3) provides exemption from the Act. “Only where the organ of state has obtained formal exemption from the Minister, the organ of state has to:

- make formal application for exemption;
- notice of the exemption has to be gazetted by the Minister; and
- the organ of state has to compile an EMP per borrow pit and submit these to DMR for approval” (DME, 2002).

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

Provisions of this Act, which are relevant to this study are the guiding principles relating to threatened and protected ecosystems and species, species and organisms posing a threat to biodiversity, permits relating to listed threatened and protected species, alien species or invasive species. Cognisance is also taken of the list of critically endangered, vulnerable and protected species as listed in the Government Notice No. R151 of 23 February 2007.

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

NEMWA came into effect on 1 July 2009 and Government Notice Regulation GNR 718, the list of waste management activities that have, or are likely to have a detrimental effect on the environment was published in Government Gazette 32368 on 3 July 2009.

Section 2 of the Act states that the objectives of NEMWA are to protect the health and well-being of the environment, ensure awareness of the impacts of waste on health and provide for compliance with measures to protect health in order to secure an environment that is not harmful to health and well-being.

In terms of section 16 (1) of the Act, duty of care is applicable to (DEAT, 2008b):

- Avoid the generation of waste and where such generation cannot be avoided, to minimize the toxicity and amounts of waste that are generated;
- Reduce, re-use, recycle and recover waste;
- Where waste must be disposed of, ensure that the waste is treated and disposed of in an environmentally sound manner;
- Manage the waste in such a manner that it does not endanger health or the environment or cause a nuisance through noise, odour or visual impacts;
- Prevent any employee or any person under the proponent’s supervision from contravening this Act; and

- Prevent the waste from being used for an unauthorised purpose.

Conservation of Agricultural Resources Act (Act 43 of 1983)

In Terms of GN 1048 of 1984 and GN 2485 of 1999, the Act provides management principles relating to weeds and invaders and also categories of weeds and invaders (DOA, 1983).

National Water Act (No 36 of 1998)

The proposed development will traverse through an area where water provision is a key issue. The Constitution of South Africa, 1996 (Act No. 108 of 1996), compels all to ensure the fundamental rights of the citizens of South Africa. Section 24 of the Constitution has caused a paradigm shift towards a new environmental policy for South Africa. The NEMA, was promulgated to give legal effect to the principles of sustainability and harmonise decision-making mechanisms aimed at managing the environment. With regard to the water resource component of the environment, the National Water Act, 1998 (Act No. 36 of 1998), was promulgated to give effect to Section 24 of the Constitution. A person who wishes to use, or who uses water in a manner that is not a Schedule 1 use, not covered under a General Authorisation, or in a manner that is not regarded or declared as, an existing lawful use, may only use that water under the authority of a licence (Section 4).

The National Water Act makes provision for two types of applications for water use licences, namely individual applications and compulsory applications. The Act also provides that the responsible authority may require an assessment by the applicant of the likely effect of the proposed licence on the resource quality, and that such assessment be subject to the Environmental Impact Assessment regulations promulgated under the National Environmental Management Act. This proposal is based on an individual application and includes a component on the determination of the lawfulness of the use.

The process of applying for an Integrated Water Use Licence under the National Water Act, Act 36 of 1998, is based on the following principles:

- The process follows a strong procedural approach;
- Application can be made for multiple water uses through the execution of a single process, resulting in the issuing of a single licence for these water uses;
- Existing water pollution or impact on surface or groundwater will not be legalised and a user will be expected to mitigate the situation. Such mitigatory actions will form part of a water use license application.

- Decision-making by the regulatory authority is based on a set of rules or criteria and makes provision for the integrated assessment of all potential impacts posed by proposed, existing and historical actions;
- An open and participatory approach, where the public are involved in decision-making. Information obtained during the assessment must be made available to the public in an understandable manner. It is assumed that this will form part of the EIA process;
- A staged procedure that increases in complexity as the process progresses, in order to ensure cost effectiveness, with each stage involving some type of assessment by the applicant, and a decision by the DWA; and
- Harmonisation of the Integrated Water Use License Application (IWULA) process with any Environmental Impact Assessment processes.

The following water uses generally have to be licensed, in accordance with Section 21 of the Water Act.

- S21(a) Taking water from a water resource;
- S21(b) Storing water;
- S21(c) Impeding or diverting the flow of water in a watercourse;
- S21(d) Engaging in a stream flow reduction activity;
- S21(e) Engaging in a controlled activity;
- S21(f) Discharging waste or water containing waste into a water resource
- through a pipe, canal, sewer or other conduit
- S21(g) Disposing of waste in a manner which may detrimentally impact
- on a water resource;
- S21(h) Disposing in any manner of water which contains waste from, or which has been heated in any industrial or power generation process;
- S21(i) Altering the bed, banks, course or characteristics of a watercourse;
- S21(j) Removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people; and
- S21 (k) Using water for recreational purposes.

Section 4(4) of the NWA replaces the water rights under old legislation, with entitlements under the new legislation. However, existing water uses were allowed to continue as "existing lawful water use". The following provisions of the NWA define and limit the extent of this entitlement:

- Section 32 defines existing lawful use as a water use that was lawfully undertaken during a two-year period immediately before the date of commencement of the Act.
- Section 33 allows for the declaration of any water use not considered under Section 32, as an existing lawful use.
- Section 34 provides the authority to continue with an existing lawful use until its replacement by a licence.
- Section 35 outlines provisions for persons claiming an existing lawful use entitlement, to apply for the verification of the extent of existing lawful use. Water users may not continue to use the water if they do not apply for verification when requested to do so, or if the verification application has been refused.
- The responsible authority can also conduct its own investigation into the veracity of the claims made.

Briefly, it is clear that the National Water Act placed the burden and duty of care to remedy the effects of pollution to water resources needs to be taken into consideration in all circumstances while stipulating procedures to be followed in the event of an emergency incident that may impact on a water resources, governing water use licences (Section 21) if required for construction purposes (DWAF, 1998).

National Environmental Management: Protected Areas Act (Act 57 of 2003) (NEMPAA)

NEMPAA provides for protection and conservation of ecologically viable areas representative of South Africa's biological diversity and its natural landscapes and seascapes. The Act also supports the establishment of a national register of all national; provincial and local protected areas, for the management of those areas in accordance with national norms and standards, for intergovernmental cooperation and public consultation in matters concerning protected areas, for continued existence, governance and functions of South African National Parks and for matters in relation to protected areas.

The proposed development would traverse environmental sensitive areas (to be identified by biodiversity specialists during field work). Nonetheless, mitigation measures will be

adhered to with regards to avoid and / or minimise detrimental impacts on the environmental sensitive areas

Expropriation Act (No. 63 of 1975)

The Expropriation Act is used to acquire land from unwilling sellers (South Africa, 1975). If necessary, Eskom may need to acquire additional land for this development. This would have to take place during the pre-construction phase of the development should the need to expropriate any section of land become necessary.

Promotion of Administrative Justice Act (PAJA) (Act no 3 of 2000)

The Promotion of Administrative Justice Act aims to give effect to the right to administrative action that is lawful, reasonable and procedurally fair, and to the right to written reasons for administrative action as contemplated in Section 33 of the constitution of the Republic of South Africa 1996 and provides for matters incidental thereto (PAJA, 2000). In particular, the proposed development was considered in accordance with this Act in terms of the following (PAJA, 2000:4):

An administrator undertaking procedurally fair administrative action must give adequate notice of the nature and purpose of the proposed administrative action:

- A reasonable opportunity to make representations;
- A clear statement of the administrative action;
- Adequate notice of any right of review or internal appeal, where applicable; and
- Adequate notice of the right to request reasons if they were not provided In cases where an administrative action affects the rights of the public, an administrator, must decide whether to hold a public inquiry and therefore conduct the public inquiry or appoint a suitably qualified person to do so and determine the procedure for the public inquiry, which must:
    - Include a public hearing and comply with the procedures to be followed in connection with public inquiries;
    - Conduct the inquiry in accordance with that procedure; and
- Compile a written report on the inquiry and give reasons for any administrative action taken or recommended. If an administrator decides to follow a notice and comment procedure, the administrator must:

- Take appropriate steps to communicate the administrative action to those likely to be materially and adversely affected by it and call for comments from them;
- Consider any comments received; and
- Comply with the procedures to be followed in connection with notice; and

- Comment procedures.

Any person whose rights have been materially and adversely affected by administrative action and who has not been given reasons for the action may, within 90 days after the date on which that person became aware of the action, request that the administrator concerned furnish written reasons for the action. The administrator to whom the request is made must, within 90 days after receiving the request, give that person adequate reason in writing for the administrative action.

National Veld and Forest Fire Act (101) of 1998 (NVFFA)

In terms of the Constitution of South Africa, nature conservation is a concurrent responsibility of all spheres of government. Since the management of the fynbos biome is predominantly a conservation activity, this responsibility in the Western Cape has fallen primarily to the Western Cape Nature Conservation Board (WCNCB) a parastatal formed on the 1st April 2000 to manage all nature conservation concerns in the Province.

Eskom Guidelines

The following Eskom guidelines are also relevant to the proposed development:

- Air Quality Management Policy (ESKPBAAA3)
- The Control Of Dust Exposure Within Eskom (ESKADAAD6)
- Environmental Impact Assessment (ESKPVAAL7)
- Passive Fire Protection For Oil Filled Equipment In High Voltage Yards (FSGASAAQ8)
- Standard For Bush Clearance And The Maintenance Of Overhead Power lines (ESKASABG3)
- Guidelines For Weed Eradication At Eskom Substations Using Herbicides (TRR/S.92/034)
- Oil Spill Clean-Up And Rehabilitation (ESKAGAAD7)

- Bird Collision Prevention Guideline (TGL41-335)

DEA Guidelines

- Companion to the National Environmental Management Act Environmental Impact Assessment Regulations of 2010, Integrated Environmental Management Guideline Series 5,2010, Department Affairs Pretoria

- Public Particiation in the EIA process, Integrated Environmental Management Guideline Series 7, 2010, Department of Environmental Affairs, Pretoria.

- Guideline 5:Assessment of Alternatives and Impacts in support of the Environmental Impact Assessment Regulations, Integrated Environmental Management Guideline Series 2006, Department of Environmnetal Affairs, Pretoria.

Best Practice Guidelines

The following Best Practice Guidelines will be taken into consideration:

- Pollution Prevention and minimisation of Waste (Department of Water Affairs)

- Water Re-use and Reclamation (Department of Water Affairs)

- Storm Water Management (Department of Water Affairs)

- Water Management for Mine Residue Deposits

- Pollution Control Dams (Department of Water Affairs).

5.2 Listed activities

EIA Regulations 2010 promulgated in terms of NEMA under Government Notice (GN) No. 543 outline the activities for which Scoping or EIAs should apply.

The proposed power line and associated auxiliary and substation works are all listed activities as defined by GNR 545 (Listing Notice 1) of 18 June 2010 of the National Environmental:

Activity 8 (l): “The construction of facilities or infrastructure, for the transmission and distribution of electricity with a capacity of 275 kilovolts or more, outside an urban area or industrial complex.”

The above-defined activities require a full Environmental Impact Assessment (EIA) study, in line with the 2010 Regulations. The EIA is specifically conducted in order to acquire the environmental authorisation in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA). The application for environmental authorisation for the proposed development was lodged in May 2012 with the lead environmental authority, the Department of Environmental Affairs (DEA). The DEA Application Reference for this study is 14/12/16/3/3/2/353) and NEAS: DEA/EA/0001267/2012 (Acknowledgement letter is attached in **Appendix 2).**

Table 6: Activities listed within Government Notice No. R544, R545 and R546 applicable to this project (as per Numbering in the Government Notice)

Activity number and date of the relevant notice	Describe each listed activity as per project description	Reason for the triggered activity
545, 18 June 2010 Activity 8:of Listing notice 2 of 2010		The proposed project involves the construction of a 765kV transmission power line from Gamma substation to Kappa substation in the Northern and Western Cape Province. The length of the power line will be approximately +370km, depending on the final route alignment.
544,18 June 2010 Activity 11(xi) of listing notice 2010	Infrastructure or structure covering 50 square metres or more where such construction occurs within 32 metres of a watercourse, excluding where such consruction will occur behind the development setback line	The footprint working area for each of the tower structures to be constructed.These area footprints exceed the threshold of 50 square metres Some of the tower structure will be constructed within a water course,and within 32m of a water course. The watercources will be impacted during the construction phase of the project and rehabilitation will be undertaken prior to the operational phase.
544, 18 June 2010 Activity 13 of listing Notice 2 of 2010	The construction of facilities or infrastructure for the transmission and distribution of electricity with a capacity of 275 kilovolts or more , outside an urban area or industrial complex	The 2nd powerline involves the construction of a 765kV transmission powerline from Gamma to Kappa. The length of the powerline will be +370 km depending on the final route aliggnment
544, 18 June 2010 Activity 22(ii)	The construction of a road outside an urban area(ii) where no reserve exists, where the road iswider than 8m	During the construction phase access roads will be required for construction vehicles to transport equipment and workers to tower positions sites, access roads will be established through recurring use. During operational the powerline , will be gravel road wider than 8m where no reserve exists. Negotians between the landowner, contractor are very critical.
544, 18 June 2010	The expansion of facilities for the	Gamma and Kappa substations will need to be upgraded to allow the 2nd 765kV to come

Activity number and date of the relevant notice	Describe each listed activity as per project description	Reason for the triggered activity
Activity 38: of listing notice 1 of 2010	transmission and distribution of electricity where the expanded capacity will exceed 275 kV and the development footprint will increase.	through.
546, 18 June 2010 Activity 12(b) of listing notice 3 of 2010	The clararnce of an area of 300m2 or more of vegetation whre 75% or more of the vegetative cover constitutes indigenous vegetation, (b) within CBA identified in bioregional plans	Each working area for tower construction will range from 210m2 to 2125 m2. These working area footprints will require vegetation clearance whre 75% or more of the vegetation cover constitutes indigeneous vegetation..
546, 18 June 2010 Activity 14(a)(i)	The clearance of an area of 5 hectares or more of vegetation where 75% or more of the vegetative cover indigeneous vegetatation,	Although most parts of the area of the proposed development is dry and limited plants are expected, it is envisaged that the proposed development would involve clearance of an area of 5 hectares and more for the construction of the proposed power line where 75% or more of the vegetation cover constitutes indigenous vegetation. Some Karoo fynbos might also be affected.
546, 18 June 2010 Activity 16	The proposed development would require the construction, Infrastructure covering 10 square metres or more where such construction occurs within a watercourse or within 32 metres of a watercourse, measure from the edge of a water course, excluding where such	Where such construction occurs within a watercourse or within 32 metres of a watercourse, measured from the edge of a watercourse, excluding where such construction will occur behind the development setback line. biodiversity areas: Upper Karoo Hardeveld, which is encountered on the steeper slopes of the eastern part of study area, is distributed in the Northern

Activity number and date of the relevant notice	Describe each listed activity as per project description	Reason for the triggered activity
	construction will occur behind the development setback line. (a) In northern cape Province: outside urban areas. (b) (bb) National procted Area Expansion Strategy focus areas, and (c) (ff) Critical Biodiversity area, as identified in bioregional plans	

Bearing in mind the above Regulations and listed activities, and as being discussed in proceeding sections of this report, the proposed development requires scoping and a full EIA process. Following the submission and acknowledgement of the EIA application by DEA (Reference No DEA: 14/12/16/3/3/2/353 and NEAS: DEA/EIA/0001267/2012, this study for the project was formulated in line with the applicable regulations to achieve the following:

a) Conduct at least the public participation process set out in Regulation 54-57
b) Give notice in writing of the proposed application to any organ of state which has jurisdiction in respect of any aspect of the activity
c) Open and maintain a register of all interested and affected parties in respect of the application in accordance with Regulation 57
d) Consider all objections and representations received from interested and affected parties following the public participation process
e) Subject the application to scoping by identifying
    i. Issues that will be relevant for consideration of the application
    ii. The potential environmental impacts of the proposed; and
    iii. Alternatives to the proposed activity that are feasible and reasonable
f) Prepare a scoping report in accordance with Regulation 28; and give all registered interested and affected parties an opportunity to comment on the scoping report in accordance with Regulation 57

6. DESCRIPTION OF AFFECTED ENVIRONMENT

Introduction

This section discusses the key characteristics of the biophysical and human environmental aspects of the project-receiving environment. The primary impact study area is defined as the development footprint servitude route of 2000m (2km) and its immediate surroundings as well as to a larger scale, the local municipal areas, the broader district and regions. The information pertaining to the receiving environment has been complemented by information from desktop studies and supplemented with reports from the various specialist impact assessments comprising of Vegetation, Fauna; Avifauna; Bat; Wetland; Agricultural Land Capability; Visual; Tourism; Heritage and Palaeontology; and Socio-economic impact assessment studies.

6.1 Flora

The vegetation types traversed by the proposed Gamma Kappa power line between the Kappa substation 25 km north of Touws River and the Gamma substation 6 km northwest of the N1-R63 (Victoria West road) intersection. Encroaching on the Western Cape Province's northern boundary, the proposed route traverses three biomes, namely Succulent Karoo (western section), Fynbos Biome (western section) and Nama Karoo (central and eastern sections), as well as azonal vegetation types (rivers and associated floodplains). Within these biomes, eight mapped vegetation types will be affected by the project, namely Tanqua Karoo, Tanqua Wash Riviere, Central Mountain Shale Renosterveld and Koedoesberge-Moordenaars Karoo in the western part of the study area, and Gamka Karoo, Southern Karoo Riviere, Upper Karoo Hardeveld and Eastern Upper Karoo in the central and eastern parts. None of the vegetation types are considered to be threatened (DEA 2011).

The proposed route traverses eight vegetation types, namely namely Tanqua Karoo, Tanqua Wash Riviere, Central Mountain Shale Renosterveld and Koedoesberge-Moordenaars Karoo in the western part of the study area, and Gamka Karoo, Southern Karoo Riviere, Upper Karoo Hardeveld and Eastern Upper Karoo in the central and eastern parts. The Karoo supports the richest desert flora in the world and the largest variety of succulents found anywhere. Over 9000 plant species have been reported in the region. Descriptions of the vegetation types were obtained from Mucina & Rutherford (2006).

The westernmost section of the proposed route runs through Tanqua Karoo before it crosses Tanqua Wash Riviere. Tanqua Karoo occurs in the Western and Northern Cape

Provinces and spreads from the Cederberg in the west to the Roggeveld Escarpment in the east. The landscape is described as a slightly undulating basin, sheltered by the steep slopes of adjacent mountain ranges. The plain is interrupted by dolerite koppies and ridges, flat sheet-washes and incised river channels (Tanqua Wash Riviere). The plains are sparsely vegetated, comprising a low, succulent shrubland. Members of the vygie family are common, such as Ruschia, Drosanthemum and Aridaria species. The geology comprises mudrocks of the Ecca Group, Dwyka Group diamictites and Bokkeveld Group sandstones. Precipitation falls mainly during the winter months. About 13% is formally conserved in the Tanqua Karoo National Park.

A considerable section of the route runs through Koedoesberge-Moordenaars Karoo, with sporadic high-lying portions in Central Mountain Shale Renosterveld. It is not easy to distinguish between these two vegetation types as they are floristically very similar. Koedoesberge-Moordenaars Karoo is distributed in the Western Cape and Northern Cape Provinces on a slightly undulating to hilly landscape between the Tanqua and Gamka Karoo vegetation types. The landscape is covered by low succulent scrub and dotted by scattered tall shrubs and patches of grass. The most conspicuous dominants being dwarf shrubs of Pteronia, Drosanthemum and Galenia. The geology comprise mudstone (mainly), shale and sandstone of the Beaufort Group, as well as sandstone, shale and mudstone of the Ecca Group. A small portion is formally conserved in the Gamkapoort Nature Reserve.

Central Mountain Shale Renosterveld is distributed in the Northern and Western Cape Provinces on the southern and south-eastern slopes of the Klein Roggeveld Mountains and Komsberg below the Roggeveld section of the Great Escarpment, as well as further east to the west of Merweville. Along with Upper Karoo Hardeveld and Eastern Upper Karoo, it is one of the highest lying vegetation types found along the proposed power line route. It occurs on the slopes and broad ridges of low mountains and escarpment, with tall shrubland dominated by renosterbos with mainly non-succulent karoo shrubs and with a rich geophytic flora. Geology comprises clayey soils overlying Beaufort Group mudstones and sandstones. The climate is arid to semi-arid. Rainfall is relatively even, with a slight high in autumn to winter. With the expansion of the Tanqua National Park, a portion of Central Mountain Shale Renosterveld is now also formally conserved.

The majority of the proposed route runs through Gamka Karoo. It occurs mainly in the

Western Cape and Eastern Cape Provinces, between the Great Escarpment (Nuweveld Mountains) in the north and the Cape Fold Belt mountains (mainly the Swartberg Mountains) in the south. The landscape can be described as slightly undulating plains, covered with dwarf spinescent shrubland and scattered low trees. Sometimes drought-resistant grasses dominate on sandy basins after good rains. The geology comprises mainly mudstones and sandstones of the Beaufort Group and some Ecca Group shale. It supports very shallow and stony soils. Being located in the rain shadow of the Cape Fold Belt, it is considered as one of the most arid units of the Nama-Karoo Biome. Rainfall occurs mainly in summer and autumn, with a peak in March. About 2% is formally conserved in the Karoo National Park and very little (<1%) is transformed.

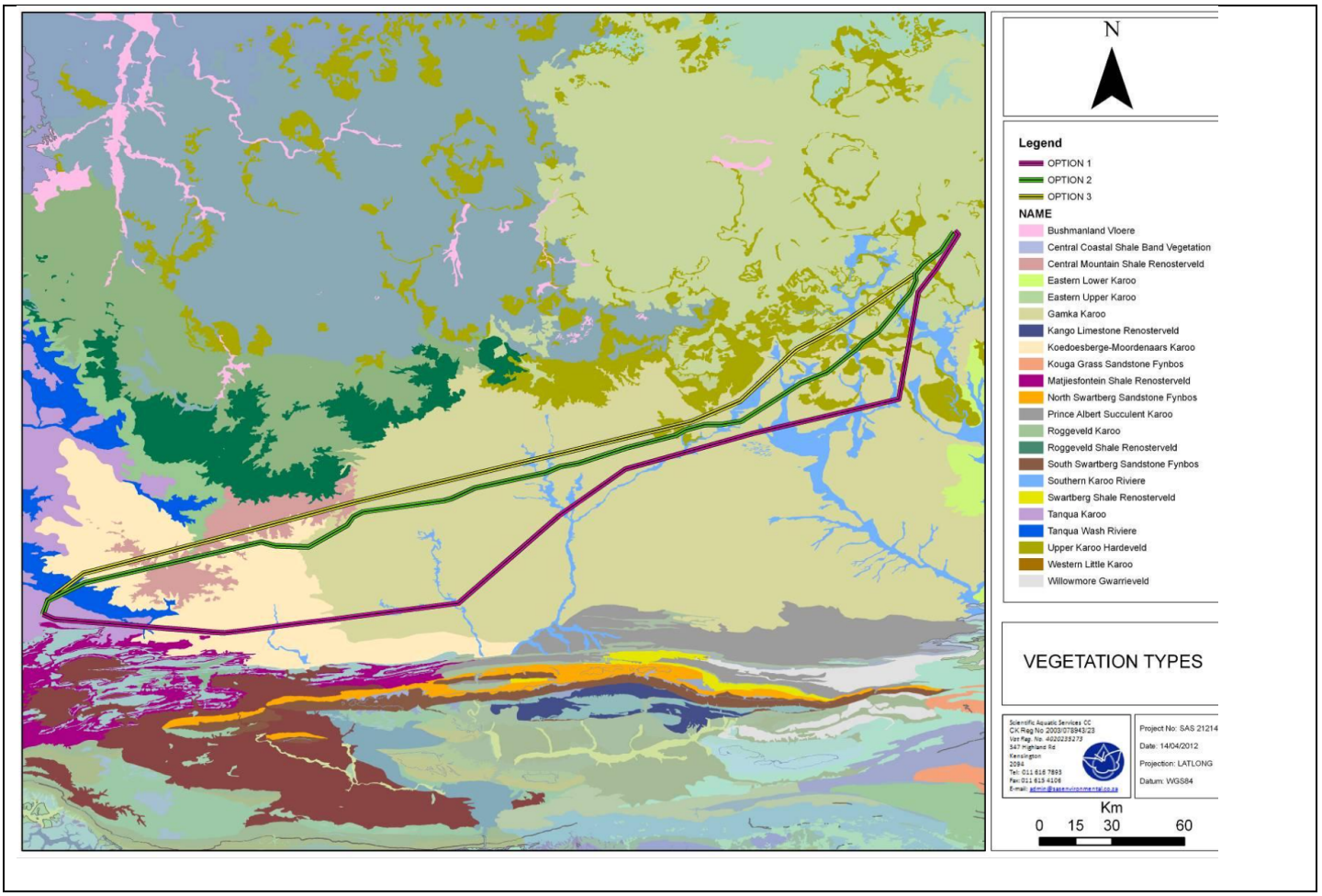

Figure 8: Vegetation types along the proposed Gamma to Kappa(Mucina & Rutherford, 2006)

Vegetation Type	Vegetation and landscape features	Conservation	Alternative
Central Mountain Shale Renosterveld	Slopes and broad ridges of low mountains and escarpments, with tall shrubland dominated by Renosterbos and large suites of mainly non- succulent karoo shrubs and with a rich geophytic flora in the undergrowth or in more open, wetter and rocky habitats.	**Least threatened**. Conservation target of 27%. None conserved in statutory or private conservation areas. Only about 1% transformed. Erosion moderate.	2 3
Eastern Upper Karoo	Flats and gently sloping plains (interspersed with hills and rocky areas of Upper Karoo Hardeveld in the West, Besemkaree Koppies Shrubland in the northeast and Tarkastad Montane Schrubland in the southeast), dominated by dwarf microphyllous shrubs, with "white" grasses of the genera *Aristida* and *Eragrostis* (these become prominent especially in the early autumn months after good summer rains). The grass cover increases along a gradient from southwest to northeast.	**Least threatened**. Conservation target of 21%. Statutorily conserved in Mountain Zebra and Karoo National Parks as well as in Oviston, Commando drift, Rolfontein and Gariep dam Nature Reserves. About 2% of the unit has been transformed, largely due to building of dams (Gariep, Grassridge, Killowen, Kommandodrift, Kriegerspoort, Lake Arthur, Modderpoort, Schuil Hoek, Vanderkloof, Victoria West, Wonderboom and Zoetvlei). *Medicago laciniata* is a common and widespread alien plant. Erosion is moderate (60%) and high (38%). Veld managers perceive much of the Eastern Upper Karoo to be experiencing changes in species composition requiring high-priority action (Hoffman et al. 1999).	3
Gamka Karoo	Extremely irregular to slightly undulating plainscovered with dwarf spiny shrubland dominated by Karoo dwarf shrubs (e.g.	**Least threatened**. Conservation target of 16% About 2% statutorily conserved in the Karoo National Park and some in private reserves, such as Steenbokkie	1 2 3

	Chrysocoma ciliate, Eriocephalus ericoides) with rare low trees (e.g. *Euclea undulata*). Dense stands of drought- resistant grasses (*Stipagrostis, Aristida*) cover (especially after abundant rains) broad sandy bottomlands.	Private Nature Reserve (near Beaufort West). Only small part has undergone transformation. The alien *Salsola kali* is a serious infestation problem locally. Erosion is moderate (78%), low (11%) and high (4%).	
Koedoesberge-Moordenaars Karoo	Slightly undulating to hilly landscape covered by low succulent scrub and dotted by scattered tall shrubs, patches of "white" grass visible on parts, the most conspicuous dominants being dwarf shrubs or *Pteronia, Drosanthemum* and *Galenia*	**Least threatened**. Conservation target of 19%. Only a very small portion enjoying statutory conservation in the Gamkapoort Nature Reserve. Transformed only to a very small extent. No serious alien plant invasions recorded. Erosion is moderate (88%) and only to lesser extent high or very low.	1 2 3
Southern Karoo Riviere	Narrow riverine flats supporting a complex of *Acacia karroo* or *Tamarix usneoides* thickets (up to 5m tall), and fringed by tall *Salsola*-dominated shrubland (up to 1,5m high), especially on heavier (and salt-laden) soils on very broad alluvia. In sandy drainage lines *Stipagrostis namaquensis* may occasionally also dominate. Mesic thicket forms in the far eastern part of this region (see Van der Walt 1980) may also contain *Leucosidea sericea, Rhamnus prinoides* and *Ehrharta erecta*	**Lease threatened**. Conservation target of 24%. Only about 1.5% statutorily conserved in the Karoo National Park as well as in the Aberdeen, Bosberg, Commando drift, Gamkapoort and Karoo Nature Reserves and in about 10 private reserves, mainly set up for game farming. Some 12% transformed for cultivation and building of dams, including Beaufort West, Beervlei, De Hoop, Floriskraal, Kommandodrift, Lake Arthur, Leeu-Gamka, Mentz and Veanryneveldspas Dams. Frequent disturbance (floods, concentrated grazing pressure), and associated input of nutrients, increase vulnerability of these habitats to invasion of alien woody species such as *Agave americana, Opuntia* species, *Prosopis*	1 2 3

		species, *Salix babylonica* and *Schinus molle,* and forbs including *Atriplex eardleyae, A. lindleyi* subsp. *inflata, Cirsium vulgara, Salsola kali* and *Schkuhria pinnata.*	
Tanqua Karoo	lightly undulating intramountain basin sheltered by steep slopes of mountain ranges. The plain is interrupted by a series of solitary dolerite butts and elevated ridges, extensive, flat sheet washes and deeper incised channels of intermittent rivers (these habitats support vegetation of the Tanqua Wash Riviere). The plains are very sparsely vegetated (low succulent shrubland with *Ruschia, Drosanthemum, Aridaria, Augea, Zygophyllum*), in extreme precipitation-poor years appearing barren, while the slopes of the koppies and adjacent mountain piedmonts support well developed medium tall succulent *Euphorbia mamata - pteronia incana* shrubland. Small quartz patches occur in the southern Tanqua Basin. Annual flora (*Gazania lichtensteinii*, *Euryops annuus*, *Ursinia nana*) becomes conspicuous with sufficient precipitation, while geophytes and grasses play a subordinate role. *Stipagrostis ciliata* and *S. obtusa* can become locally dominant	**Least Threatened.** Conservation target of 19%. About 10% statutorily conserved in the Tankwa Karoo National Park and a further 4% in private reserves, including Inverdoorn, Zwartbosch, Jakkalsfontein, Basjanskloof, Groote Kapelsfontein, Uitjieskraal and Vaalkloof. Only a small portion of this area of low agricultural production has been transformed but due to overgrazing in some places, aliens such as *Atriplex lindleyi* subsp. *inflata* have invaded. Erosion is moderate (47%), high (36%) as well as very low (14%.	1 2 3

	in places.		
Tanqua Wash Riviere	Deeply incised valleys (Sometimes several hundred metres broad) of intermittent rivers supporting a mosaic of succulent shrublands with *Solsola* and *Lycium* alternating with *Acacia karroo* gallery thickets. The broad sheet-wash plains support sparse vegetation of various *Salsola* species, often building phytogenic hillocks interrupting the monotonous barren fact of a sheet wash. Occasional rainfalls in early winter result in localised displays of annuals and early flowering geophytes along washes.	**Lease threatened**. Conservation target of 19%. About 13% statutorily conserved in the Tankwa National Park and in some private reserves (Inverdoorn, Jakkalsfontein, Uintjieskraal, Groote Kapelsfontein, Vaalkloof). About 3% already transformed for cultivation or dam building (Oudebaaskraal Dam and Swartkop se Dam. Alien *Atriplex lindleyi* subsp. *inflata* and *Prosopis* species and become frequent in places.	1 2 3
Upper Karoo Hardeveld	Steep slopes of koppies, butts, mesas and parts of the Great Escarpment covered with large boulders and stones supporting sparse dwarf Karoo scrub with drought tolerant grasses of genera such as *Aristida, Eragrostis* and *Stipagrostis*.	**Least threatened**. Conservation target of 21%. Only about 3% statutorily conserved in Karoo National Park and Karoo Nature Reserve. Small percentage also protected in private reserves such as Rupert Game Farm. Erosion is moderate (64%) and high (2%).	1 2 3

Table 7: Vegetation types associated with the proposed transmission line options.

Table 8: The estimated sections through the respective vegetation types (as presented on the South African vegetation map) are as follows:

Vegetation Type	Estimated Portion
Tanqua Karoo	8km
Tanqua Wash Riviere	11Km
Central Mountain Shale Renosterveld	19Km
Koedoesberge- Mooedenaars Karoo	61km
Gamka Karoo	191Km
Southern Karoo Riviere	18 Km
Upper Karoo Hardeveld	26Km
Eastern Upper Karoo	41km

Protected areas and Critical Biodiversity areas(CBA's)

The Karoo National Park, located northwest of Beaufort West, is the only formal conservation area in the near vicinity of the proposed power line. The proposed line runs past the southern boundary of the Park (just north of the N1), and does not cross it. It is uncertain if it will impact on future initiatives of the Park, such as further expansion towards the N2. The proposed power line runs through the Steenbokkie Private Nature Reserve, located a few kilometres east of Beaufort West. The latter has no formal conservation status and comprises mainly a guest farm offering tourist accommodation, game viewing, hiking, hunting and mountain biking. The line also runs through the Spitzkop protected environment, which has been included as a CBA, a 7639 ha area which form part of the CapeNature stewardship programme. The latter facilitates conservation on privately owned land through agreements between the landowners and CapeNature. It must be noted that the route follows the same route as an existing power line and gravel road through the Spitzkop area.

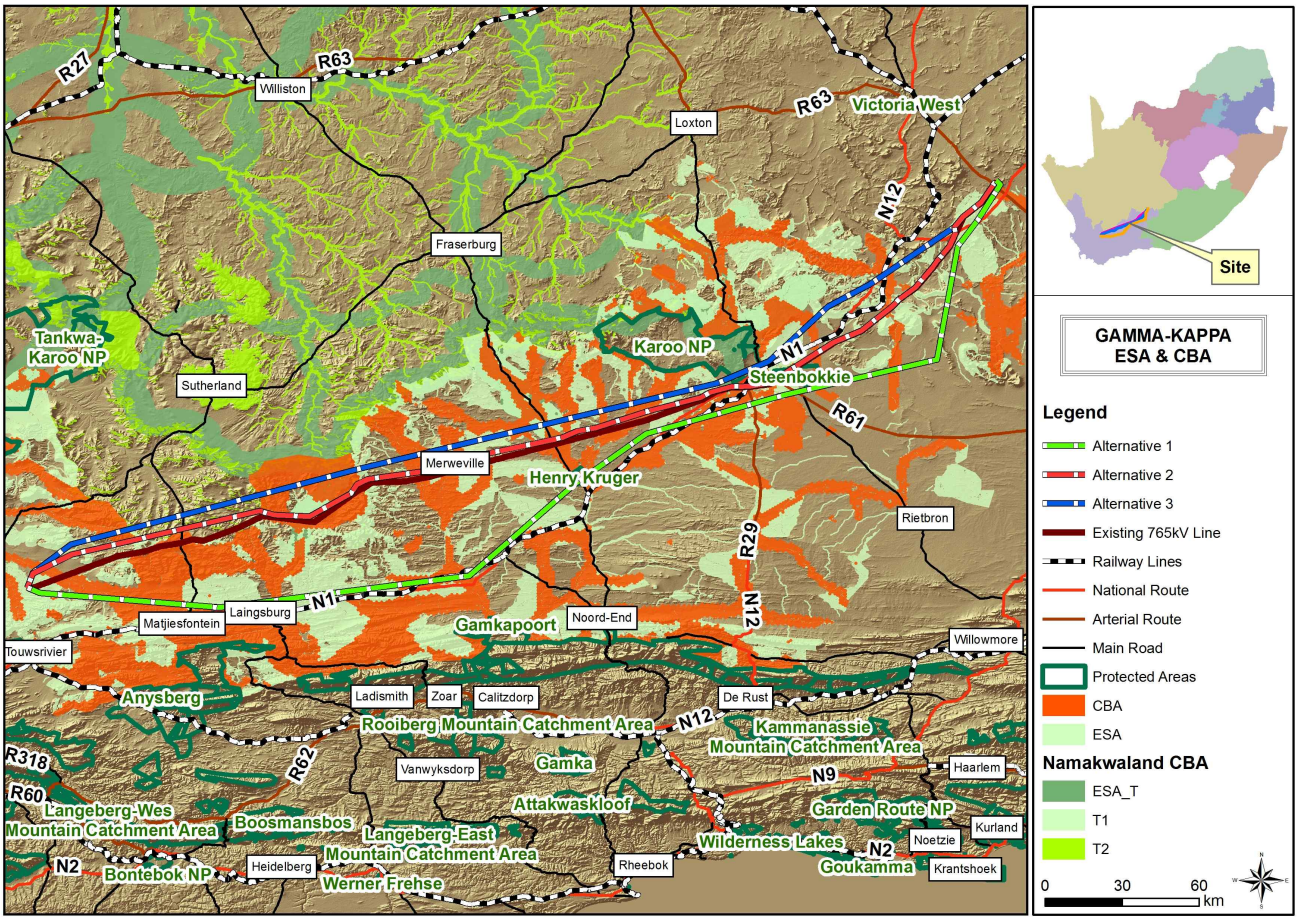

Figure 9: Critical Biodiversity Areas and Ecological Support Areas map

The biodiversity assessment for the Central Karoo District, including the north-eastern portion of the Cape Winelands District, was designed to identify an efficient set of Critical Biodiversity Areas (CBA's) and Ecological Support Areas (ESA's) that meet the targets for the underlying biodiversity features in areas with least conflict with other activities (Skowno et. al. 2009). Of critical importance is that these areas are identified in order to facilitate the functioning of ecological processes (both currently and in the face of climate change) which are required to ensure that the biodiversity features persist in the long term (Skowno et. al. 2009). These areas include high priority unfragmented landscapes, riparian corridors, areas of high topographical variability, south-facing slopes and kloofs. Similar to the existing lines, the proposed power line is expected to largely avoid the steeper slopes and mountains. The crossing of numerous seasonal rivers is however unavoidable.

CBA's incorporate areas that need to be safeguarded in order to meet national biodiversity thresholds; areas required to ensure the continued existence and functioning of species and ecosystems; and important locations for biodiversity features or rare species (Skowno et. al.

2009). ESA's, on the other hand, are supporting zones required to prevent the degradation of CBA's and Protected Areas. Two biodiversity hotspots have been identified during the SKEP initiative in the western part of the study area, one of which (i.e. Klipfontein se Berg) is traversed by the proposed power line (see Map 8). The existing power lines actually bypasses Klipfontein se Berg to the north and it is assumed that the new line will follow a similar route close by. Gravel patches like those associated with Klipfontein se Berg are home to the Tanquana vygie, a regional endemic genus. It is important that construction work is this area avoids gravelly areas as far as possible. Western part of the study area, one of which (i.e. Klipfontein se Berg) is traversed by the proposed power line. The existing power lines actually bypasses Klipfontein se Berg to the north and it is assumed that the new line will follow a similar route close by. Gravel patches like those associated with Klipfontein se Berg are home to the Tanquana vygie, a regional endemic genus. It is important that construction work is this area avoids gravelly areas as far as possible.

An approximately 17 km section of the power line runs through the initially mapped SKEP hotspot area which has been incorporated in a CBA between the R354 and Merweville. SKEP hotspots were initially identified during the SKEP initiative (Driver et al. 2003). Essentially all the significant rivers crossed by the proposed power line are considered to be priority rivers according to the National Protected Areas Expansion Strategy (NPAES) freshwater priorities and were classified as either critically endangered or endangered rivers. They are therefore indicated as CBA's in the Central Karoo District CBA network (see Maps 9-11). It is therefore unavoidable that these CBA's, which run in a roughly north-south direction across the study area, be crossed by the power line. The impact however can be mitigated by avoiding the positioning of pylons inside the riparian zones. Where the floodplains are too wide these cannot be avoided though.

Figure 10: Karoo Biome dominate the proposed power line servitude

6.2 Fauna

The Karoo region has a wide variety of endemic wildlife. Many species such as the Small grey mongoose (Galerella pulverulenta); Scrub hare (Lepus saxatilis); Cape grysbok(Raphicerus melanotis); Caracal (Felis caracal). The nocturnal Cape porcupine (Hystrix africaeaustralis) and small reptiles are found across the area through which the proposed power line will traverse.

Bats was studied in details, there are approximately 117 bat species in the Southern African sub-region, of which 5 species have a global Red list status of Vulnerable and 12 are classified as Near Threatened.(Monadjemet et al., 2010). More than 50 bat species occur in South Africa alone (Taylor, 2000; Monadjemet et al., 2010). Bats are the only mammals to have developed true powered flight and they have undergone various skeletal changes in an effort to be more efficient and economical in flight. The forelimbs are highly elongated, whereas the hind limbs are dramatically reduced and shortened to lessen the total body weight. This unique wing support frame allows bats to alter the camber of their wings in an effort to adapt the wing shape for different flight conditions while maximizing agility and maneuverability. This adaptability and versatility of the bat wing surpasses the more static design of the bird wings thus enabling bats to utilise a wider variety of food sources and diversity of insect groups (Neuweiler, 2000). The facial characteristics amongst species may

differ considerably to satisfy the requirements of their life style, with regard to their feeding and echolocatory navigation strategies. The majorities of South African bats are insectivorous, and can consume vast numbers of insects on a nightly basis (Taylor, 2000; Tuttle & Hensley, 2001), but they may feed on other invertebrates, amphibians, fruit and nectar. Insectivorous bats are therefore the only major predators of nocturnal flying insects in South Africa and contribute greatly in the control of insect numbers. Their prey also includes agricultural insect pests (such as moths) and disease vectors (such as mosquitoes) (Rautenbach, 1982; Taylor, 2000). Urban development and agricultural practices have contributed to the decline in bat abundance. Public participation and funding of bat conservation projects are often hindered by the negative images of bats created by a lack of knowledge and certain misconceptions about bats. The fact that some species roost in domestic residences also contributes to the negative reputation of bats. Unfortunately, the negative association people have towards bats, obscures the fact that they are an essential component of the ecology and by large beneficial to human. Many bat species roost in large aggregations and concentrate in small areas. Therefore, any major disturbance to that area can adversely impact many individuals of a population at the same time (Hester and Grenier, 2005). Secondly, the reproduction rates of bats are much lower than those of most other small mammals, because usually only one or two pups are born per female annually. According to O'Shea et al. (2003), bats may live for up to 30 years. Under natural circumstances, a population's numbers can build up over a long period of time, due to their longevity and the relatively low predation on bats, when compared to other small mammals. Therefore, the rate of recovery of bat populations is slow after major die-offs and roost. Although there is not much known about the migration routes of bats in South Africa, we do know of three species that conduct seasonal migrations. In Gauteng, Limpopo and the Western Cape (South Africa), it has been reported that Miniopterusnatalensis (Natal long-fingered bat) migrates up to 260 km (van der Merwe 1973a, 1975 cited in Monadjem et al., 2010) between warmer maternity caves where females give birth in summer (eg the De Hoop Guano Cave in the Western Cape, and several caves in the lowveld of Limpopo), and colder caves in winter, where mating and hibernation occurs (eg several caves in the interior of the Western Cape, and on the highveld of Gauteng). Myotis tricolor (Temminck's hairy bat) undertakes similar seasonal migrations, although the details are not yet known. Both these species are insectivorous bats. One frugivorous bat species, Rousettusaegyptiacus

(Egyptian rousette) is a gregarious cave dweller also known to migrate distances of 50 to 500 km (Monadjem et al., 2010; Herselman & Norton, 1985). The most well-known large-scale bat roosts in the Northern and Western Cape are De Hoop Cave in the W. Cape and Koegelbeen Cave in the N. Cape. There is evidence that some of these migrating bats hibernate at Steenkamps kraal, 560 km to the south-west of Koegelbeen Cave (Miller-Butterworth et al., 2003 cited in Monadjem et al., 2008). NSS visited Steenkamps kraal at the beginning of September 2010 and there were high numbers of M. natalensis and Rhinolophus sp. present. The central Cederberg features hundreds of rocky overhangs and caves, e.g. Stadsaal Caves. In addition, Herselman& Norton (1985) have mapped and surveyed 15 caves in the Western, Northern and Eastern Cape. The closest of these to Witberg is Die Hel Cave, near Groot Winterhoek to the east of Witberg and Montagu Cave, near Montagu to the south west of Witberg. Records from Herselman & Norton (1985) and NSS's professional opinion indicate that there are many caves and mine shafts in the Cape where these migrating bats roost or rest in during different seasons. However, the exact routes they follow and movement times are unknown.

6.3 Avifauna

The possible impacts of the proposed power line on avifauna include the following: collision of birds (predominantly large terrestrial species) with overhead cables; destruction or alteration of bird habitat during construction and maintenance; disturbance of birds (particularly those breeding) during construction and maintenance of the power line; nesting of birds on the tower structures; and electrical faulting caused by birds perching, nesting or roosting on towers.

Collision of birds with overhead cables, in particular earth wires

Large terrestrial bird species likely to be found in this area include Ludwig's Bustard *Neotis ludwigii*, Secretary bird *Sagittarius serpentarius*, Kori Bustard *Ardeotis kori*, Northern Black Korhaan *Afrotis afraoides*, and Karoo Korhaan *Eupodotis vigorsii*. Of these species, conservation concern is greatest for the bustards, which are classified as 'Vulnerable' by Barnes (2000), and the Secretary bird (Near-threatened, Barnes 2000). These species are well known to be susceptible to collisions with power lines and the existing power lines in the broader area already cause significant numbers of bird collisions of these species. The specialist highlighted the necessity of day-night markings on the power lines.

Habitat destruction

This route will traverse an arid area, with low vegetation and open landscapes. Although there appear to be no protected areas, Important Bird Areas (BirdLife South Africa 2012) or large open water sources or rivers requiring special concern along this route, this type of open landscape is prime habitat for large terrestrial birds and raptors. Fortunately this habitat type is likely to be fairly uniform in the broader landscape and so the impact of the proposed power line through habitat destruction is anticipated to be low.

Disturbance of birds

Whether disturbance of birds occurs or not will need to be confirmed during the walk down of the selected route within the authorised corridor, but it could be a concern for large eagles breeding on the existing transmission lines (or natural substrate) in the area.

Electrical faulting caused by birds

For this interaction to occur requires either large birds such as eagles and vultures or large numbers of smaller birds regularly perching or roosting on the towers. The likelihood of this will be assessed in more detail during the EIA phase but at this stage it is considered unlikely to be a significant impact. The probability of electrical faulting caused by birds is low on a 765kV power line due to the large clearances between hardware, but is also dependant on the exact tower structure used and will be assessed further in the EIA phase.

Nesting of birds on tower structures

Of the large raptors, White-backed Vulture *Gyps africanus* could possibly visit the area occasionally, as could Lappet-faced Vulture *Torgos tracheliotos*. White-backed Vulture have been recorded nesting on transmission towers previously. Verreaux's Eagle *Aquila verreauxii* and Martial Eagle *Polemaetus bellicosus* are also likely to occur here and have proven elsewhere that they readily use power lines to perch and nest on.

Of the medium sized raptors, Black-chested Snake-Eagle *Circaetus pectoralis*, African Marsh- Harrier *Circus ranivorus,* Black Harrier *Circus maurus*, Southern Pale Chanting Goshawk *Melierax canorus*, Steppe Buzzard *Buteo vulpinus*, Jackal Buzzard *Buteo rufofuscus*, Booted Eagle *Aquila pennatus*, and Lanner Falcon *Falco biarmicus* are also likely to be recorded in the area. Certain of these species could nest on the power line.

Nesting of birds on the proposed power line could be viewed as a positive interaction since the power line provides nesting substrate in an area otherwise devoid of substrate (few

trees). However it is likely that there are also negative consequences of birds breeding on power lines, such as increased exposure to collision with cables, and possible exposure to electromagnetic fields created by the electricity. There is also the consequence of nest management (trimming, relocation, removal) by Eskom staff being necessary if the birds choose to nest in the wrong areas on the towers.

6.4 Climate

The Western Cape climate is typically Mediterranean, with cold wet winters and hot dry summers. Temperature variations between summer and winter are severe. Rainfall extremes area also experienced over geographical regions. The winter rainfall region forms an integral climatic unit, which presents various implications for those managing the natural environment. On the west coast, the rainfall ranges from very low near desert conditions to medium to high rainfall in the South-western and Southern Cape. Rainfall in the mountainous regions of the South-western Cape is of the highest in the country and accounts for 76% of water yield for the province. Although snow sometimes occurs at high altitudes, the province has the mildest climate in the country, which is of considerable importance with, respect to its potential as a tourist destination (Anon 1994). Lightning strikes occur regularly on mountaintops during summer thunderstorms. Flash densities though may be lower than in other parts of the country (Edwards 1984). Desiccating strong south-easterly winds can blow for several successive days during the summer months, particularly in the south-western region of the province. Conversely hot Fohnlike “bergwinds” precede cyclonic weather systems, during winter in the south-eastern parts of the province. These winds are both associated with extremely high temperatures, and low relative humidity readings of between 5 and 20% (Kruger and Bigalke 1984).

The Western Cape and Northern Cape are the two regions in South Africa, which experience the highest moisture losses in terms of potential evaporation rates.

Due to high temperatures, low rainfall patterns and the high mean annual evaporation rates experienced, some areas in the Western Cape Province experience a non-moisture-growing season which means that the agricultural production in these affected areas are dependent on irrigation, and due to low rainfall experienced in Western Cape and Northern Cape, erosion is more prone. Ripped, exposed areas will be susceptible to severe erosion in the event of flash flooding due to unseasonal high rainfall.

6.5 Land Use and tourism

There are multiple land characteristics and existing land uses in the project area through which the proposed power line would traverse from the Northern Cape to Western Cape. The features include natural landscapes such as mountains, cultural landscape such as built up contemporary and historic settlements, farms, isolated homesteads, scenic routes, agricultural lands, declared nature areas and conservancies. Most of the significant portion of the receiving environment is situated within the Karoo region. Most of this landscape is used for grazing and agriculture. Livestock farming, including dairy cattle, ostriches an sheep make up 43% of land use in the Western Cape. Most agricultural activities in the region depended on irrigation supported by infrastructures such as dams and transformed river valleys. A further 36% of land use is made up of crops, which consist of wheat, citrus, deciduous fruit, and indigenous crops. The cultivation of grapes, citrus, tobacco, alfalfa and vegetables is practiced along the project area. Several small historical towns such as Tulbagh, Wolsely, Ceres and Prince Albert Hamlet are situated on the valley floor through which sections of the proposed power line would traverse. Tourism is not extensive, Tourist attractions are centred in the towns. There are no statistics available about visitor numbers to this specific area, bgiven the low numbers for the Northern Cape in total, it is not expected to be substantial . There are a number of bed and breakfast establishments, guesthouses and hunting lodges in the area. The establishments in town mostly attract overnight business visitors, while the farm and hunting lodges outside town mostly attract leisure visitors.

The hunting season runs from May to August, and this is the busiest time of the year for hunting lodges, however many hunting outfits have extended licenses that allow year-round hunting. School holidays are also busy periods because of an increase in through traffic between the Western Cape and other parts of the country.

Potential Impacts on the tourism:

Impacts on existing ecotourism products which have been developed based on an pristine natural environment;

- Impacts on management activities in proclaimed Protected Areas;

- Visual Impacts on visitors travelling along roads to their respective destinations;
- Impacts on sense of place for tourists;
- Potential lighting impacts on the experience of visitors. Especially bright lights of construction camps and nocturnal bird markers on the cables in the view shed of existing lodges in the area;
- Dust/noise pollution on tourism products during the construction phase; and
- Poaching of animals from hunting properties could increase during the construction phase.

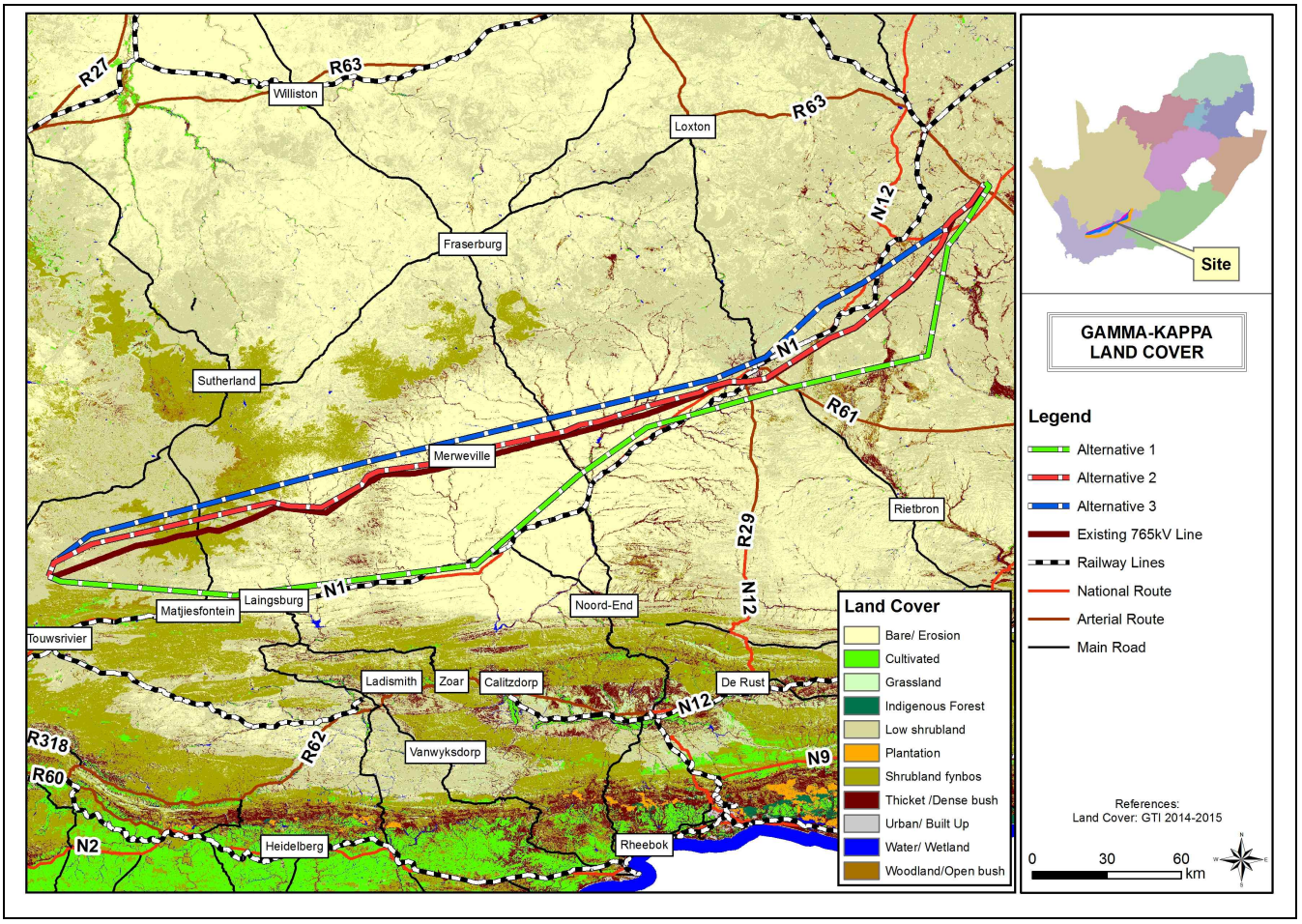

Figure 11: Land Cover in the Study Area

6.6 Geology and Soils

The Karoo Super group is the largest stratigraphic unit in Southern Africa, covering almost two thirds of the present land surface, including central Cape Province, almost all of Orange

Free State. The Lower most geological Unit of the Karoo Super group is the Dwyka formation, a glacial deposit laid down around 300 million years ago. The Karoo Super group in the Great Karoo Basin (South Africa) is divided into the following strata (from oldest to youngest):

- Dwyka Group (glacial marine)
- Ecca Group
- Beaufort Group (terrestrial)
- Stormberg Group (including basalts).

The project area lies in an area with the bedrock, which consists of dark olive to darkish brown tillite of the Dwyka Group out crops or occurs at shallow depts. The bedrock is covered by alluvial gravel and windblown sand. The project area's geology will be explored further during specialist studies including palaeontology. The latter will explore fossils presence, which may include plants (both macro-fossils and pollen), rare insects and fish, common and diverse *tetrapods* (mostly the rapid reptiles, *temnospondyl amphibians*, and in the upper strata dinosaurs), and *ichnofossils.* Their biostratigraphy has been used as the international standard for global correlation of Permian to Jurassic non-marine strata in other studies (Beater 2007).

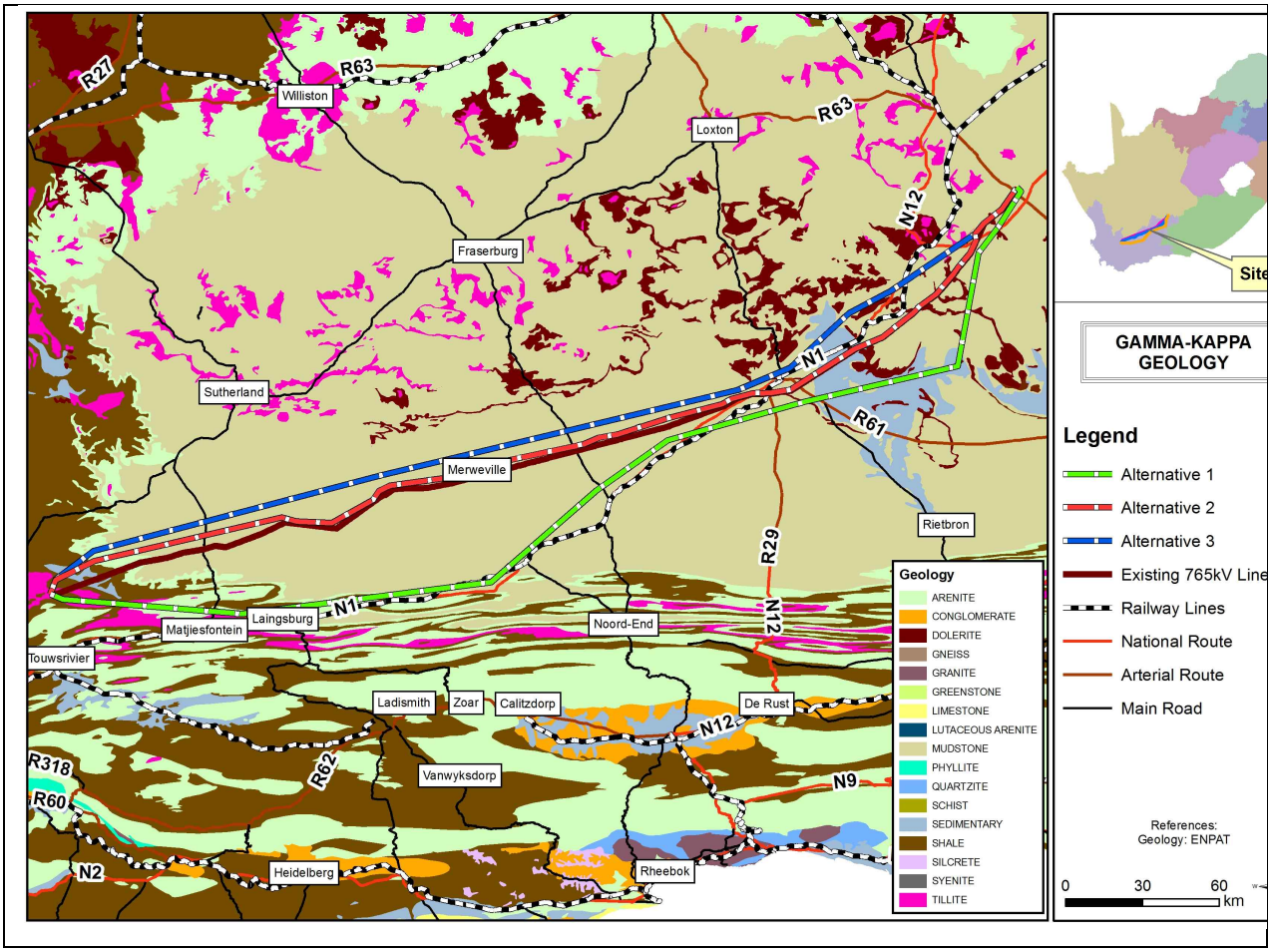

Figure 12: Geology Types in the Study Area

6.7 Wetland and rivers

Rivers and wetlands are very important features of the natural landscape both in a hydrological and an ecological context. The freshwater ecosystems that occur within rivers and wetlands, as well as the associated riparian habitats, are very important in the context of biodiversity, as unique plant and animal communities occur within them. This is particularly important in the context of the semi-arid Great Karoo, where the availability of moisture in the vicinity of drainage lines has led to the development of vegetation communities distinct from the surrounding Karoo plains. Due to the linear nature of this proposed power line, the corridor alternatives traverse a number of tertiary and quaternary catchments of rivers that generally flow in a southerly direction into the Indian Ocean.

The study area is located in a semi-arid climatic zone, receiving much less rain than areas to the south and west. The Cape Fold Mountains (such as the Swartberg to the south of the study area) form a barrier, creating a rain shadow in which most of the study area falls. The corridor alternatives traverse the interior of the Western Cape Province, in an area just to

the north of the Cape Fold mountain ranges that separate the Little Karoo and the Indian Ocean coastline from the interior plateau. The following list details mean annual rainfall figures for various locations along the route corridors:

Koruson Substation: 180mm/yr , foothills of the Roggeveld Mountains: 200mm/yr ,Beaufort West: 240mm/yr ,Gamma Substation: 230mm/yr. (Source: SA Rainfall Atlas Database).

There is also a relatively strong seasonality in the rainfall figures, although the area traverses both the summer and winter rainfall areas, as the south-western part of the route around the Koruson Substation has a slight rainfall peak in the mid-winter months, while the north-eastern parts of the line have a peak in summer and late summer. The scarcity of rainfall and nature of precipitation also entails that rainfall events are episodic in nature, i.e. single rainfall events will contribute a relatively significant portion of rainfall.

In a macro drainage context the corridors run close to the continental divide – the overall watershed that separates the catchments that drain into the Indian Ocean and those that drain into the Atlantic Ocean. Most of the quaternary catchments that are traversed by the power line corridors form the upper-most parts of rivers that drain south-wards towards the Indian Ocean. In the sections below the relevant quaternary catchment is stated behind the river draining it in parentheses

The north-eastern-most parts of the route cross certain areas within the upper-most catchment of the Groot River, itself a tributary of the Gamtoos River that flows into the Indian Ocean near Jeffreys Bay (Catchment L). A number of rivers flow into the upper parts of the Groot catchment from the area north-east of Beaufort West as traversed by the corridors – the Brak (L21A) and Tierhoek, Buffels, and Sand Rivers which form part of the Kariega River (L22A), and the Krom (L11D), Sout (L11E) and Platdoring (L11F) Rivers to the west.

The next major river system traversed by the power lines is that of the Gamka River. A number of tributaries of the Gamka River drain the southern slopes of the Nuweveld Mountains west of Beaufort West, including the Leeu (J22K) and its tributaries the Kliplaatfontein and Sand (J22H), Hottentots (J22J), Wilgerbos (J22E), Koekemoers (J22D), and Upper Gamka itself. The upper Gamka traverses quaternary catchments J 21A,B & D. The Dwyka River (J24A,B, C&D) to the west is another tributary of the Gamka River, draining the area around Merweville to the west of Beaufort West. The Gamka River flows

south through the Groot Swartberg Mountain Range, joining with the Olifants River west of Oudtshoorn to form the Gourits River (primary catchment J) that flows into the Indian Ocean West of Mossel Bay.

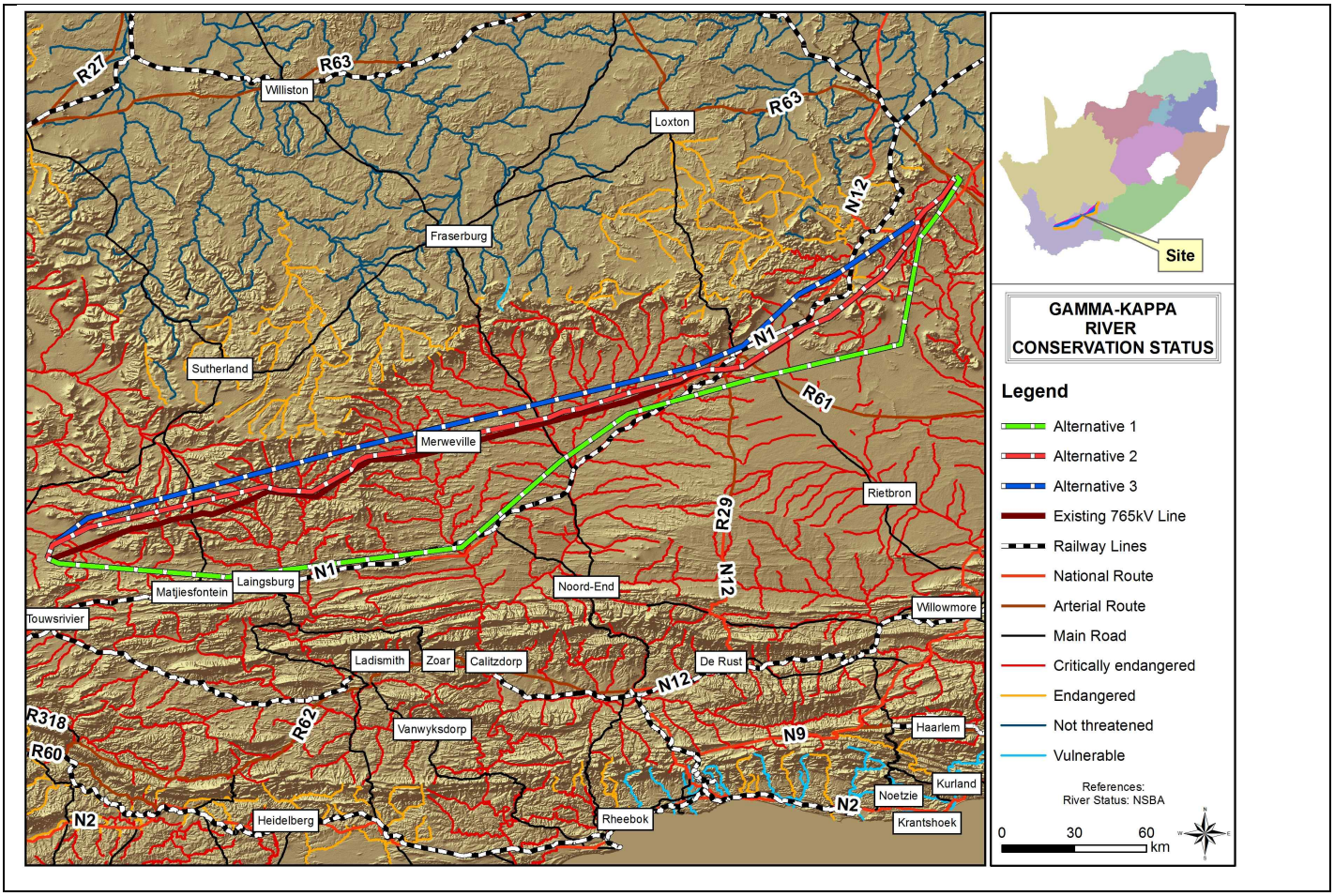

Figure 13: River conservation status

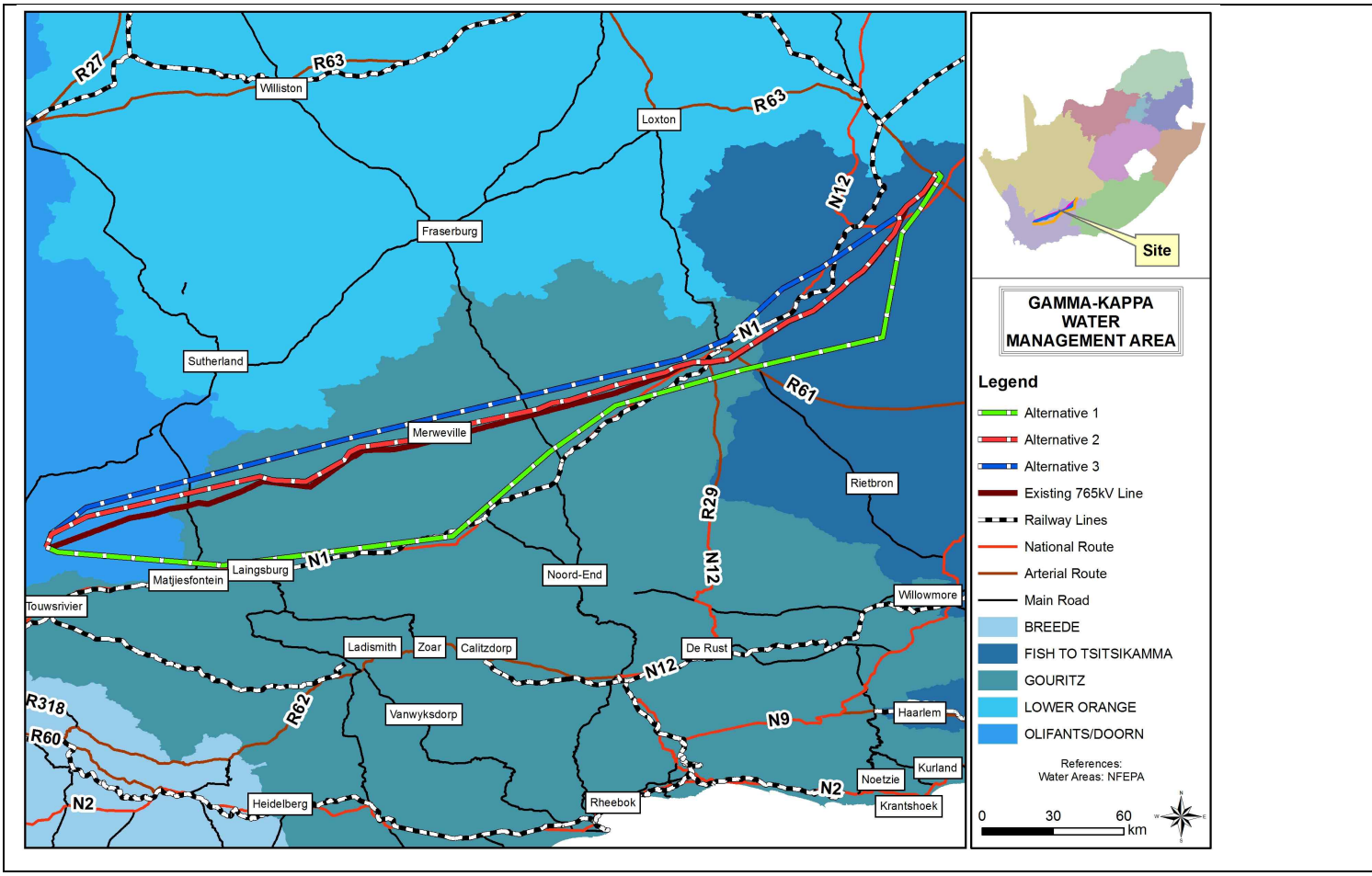

Figure 14: Water management area

6.8 Existing Infrastructure

The proposed development seeks to install a 765kV power line along an area that has sections that are either sparsely developed (Karroo dessert) and heavy developed built up areas such as urban centres. The study area has existing infrastructure that include the existing Eskom 400kV and 765kV which is currently under construction from existing Gamma and Kappa Substation. In addition to these power line networks, there are several lines of Distribution power lines traversing the entire project area and affected servitude. All three routes are located adjacent to the R46 Provincial Road linking the towns of Ceres and Touwsrivier. Sections run parallel to existing 400kV Transmission line. Several Farmhouses were observed in the close vicinity of the proposed alternative sites on the farms such as Brakpoort, Klein Koedoeskop, Standvastigheid, Tygerhoek, De Hoek Estates, and Vredehoek. Reconnaissance survey also recorded a number of guest houses and tourism facilities in the vicinity of the power line servitude section. These include facilities such as Lalaphansi, Karoo Gastehuis, Lemoenfontein Guest Lodge recorded on Alternative 1

servitude that runs parallel on existing N1 National Road and the R63 Road.

Figure 15: View of the existing power line crossing the N1 main road.

6.9 Noise

The main source of high noise level associated with the proposed project area derives from traffic from the local farmers, and also from agricultural machinery and activities. The environment in which the proposed development is located has the topography of an undulating landscape interspersed with some hills in the closer vicinity of the power line servitude. Furthermore, there are numerous human designed landscapes which together with the natural topography of the area provide significant screening against the propagation of noise.

6.10 Visual Features

Landscape and visual impacts may result from changes to the landscape. A distinction should be made between impacts on the visual resource (landscape) and on the viewers. The former are impacts on the physical landscape that may result in changes to landscape character while the latter are impacts on the sensitive receivers themselves and the views they experience.

The study area is consists of vacant and uninterrupted land as well as cultivated, residential, subsistence farming, and game farms. Extensive game faming and stock farming activities for example sheep farming are scattered throughout the study area.

Subsistence farming activities are concentrated around the small towns. Human settlements

are scattered throughout the study area and the landscape are degraded around these settlements.

The landscape character changes through the study area. The study area is divided into distinct landscape types, which are areas within the study area that are relatively homogenous in character (Swanwick, 2002). Landscape types are distinguished by differences in topographical features, vegetation communities and patterns, land use and human settlement patterns.

The assessment is done on a macro-scale and discusses the predominant landscape conditions and visual characteristics found in a particular landscape type. Each landscape type is given a descriptive name which relates to the vegetation type, topography and / or land use of the region (Adapted from Van Riet *et al.*, 1997); Touws River Karoo Region, Moordenaars Karoo Region; and Central Karoo Region.

Touws River Karoo Region

The vegetation consists of the Lowland Succulent Karoo of the Succulent Karoo Biome. This represents an extremely arid vegetation type. The very low vegetation is dominated by the Vygie family. The lack of summer rains results in almost no grasses being prevalent in the vegetation type (Low and Rebelo, 1996)..

Moordenaars Karoo Region

The Moordenaars Karoo Region consists mainly of the Escarpment Mountain Renosterveld of the Fynbos Biome, the Great Nama Karoo of the Nama Karoo Biome and the Upland Succulent Karoo of the Succulent Karoo Biome (Low and Rebelo, 1996).

The vegetation is generally very sparse and low throughout the region. It is characterized by a rolling topography, low vegetation and perceived absence of human intervention or intrusion.

Central Karoo Region

The Central Karoo Region consist of According to Low and Rebelo (1996) the vegetation of this region falls entirely within the Nama Karoo Biome and consists of the Eastern Mixed Nama Karoo, the Upper Nama Karoo, the Central Lower Nama Karoo and the Great Nama Karoo vegetation types.

The vegetation is generally low throughout the region varying from dwarf shrubs, succulents, and *Acacia karroo* trees in dry riverbeds in the Central Lower Nama Karoo to dwarf shrubs and a few trees in the Great Nama Karoo to mainly shrubs and grasses in the Upper Nama

Karoo. The Eastern Mixed Nama Karoo is the ecotone between the Nama Karoo and the Grassland Biome. It is a complete mix of grass and shrub dominated vegetation types with a few *Acacia karroo* trees in the dry riverbeds. (Low and Rebelo, 1996).

The region consist of irregular plains of the large flat basin formed between the escarpment in the north to a more undulating and diverse features such as the low mountains of the Karoo National Park.

Figure 16 &17: Existing transmission lines near the Droërivier Substation.

6.11 Air Quality

The existing power lines are not known to be or are currently a source of any potential air pollution; similarly the proposed power line installation is not expected to be a source of air pollution either. The nature of the proposed development entails that it is unlikely that there will be any activities during the operational phase of the development, which would generate any emissions. As such, apart from temporary construction vehicular tailpipe emissions pollution, the operation of the proposed power line is highly unlikely to cause air pollution in the surrounding area.

Vehicle tailpipe emissions are always present, and depending on whether the vehicle is maintained efficiently the tailpipe emissions can contribute heavily or minimally to air pollution. Vehicle emissions can be classified into two groups, primary and secondary pollutants. Pollutants such as carbon monoxide (CO), carbon dioxide (CO_2), sulphur dioxide (SO_2), oxides of nitrogen (NO_x), particulates and lead are generally released into the atmosphere depending on the type of fuel that is used; these pollutants are termed primary pollutants. Secondary pollutants exist only because of the chemical reactions that take place in the atmosphere; pollutants formed during this process include nitrogen dioxide (NO_2), photochemical oxidants (e.g. ozone), sulphates and nitrates to name a few. Within the project area there are small vehicle populations, such as cars, vans and on a smaller scale trucks or minibus taxis, there are also heavy vehicles used for hauling along the existing national, regional and local roads traversing through the project area.

However, mitigation measures, which will be put in place during the construction phase, are likely to prevent dust from affecting areas beyond the boundaries of the site. The Environmental Management Programme will specify measures such as the dust suppression agents to be as they reduce the need for high water use.

6.12 Fire

No open fires shall be allowed on site under any circumstance and the Contractor is referred to the Forest Act and specifications TRMSCAAC1 REV 3 Section 4.1.2. All cooking shall be done in demarcated areas that are safe and cannot cause runaway fires. The Contractor shall have operational fire-fighting equipment available on site and on all vehicles working on site, especially during the winter months.

The standing biomass of the Karoo grasses is too low to support fire and the shrubs are too far apart to provide sufficient fuel load for a run-away veld fire. Should fires occur they are likely to burn out quickly. Nevertheless, vigilance is required.

6.13 Human Environment

The project area falls predominantly within the Western Cape Province, which shares the immediate boarder with Northern Cape Province. The Western Cape is the second largest economic active province in contribution to the national GDP. The individual local municipalities (affected by the proposed project) have demographic features that resemble the districts in which they are located. The following socio-economic characteristics have been gathered from the following local Municipalities Pixley-kaSeme District Municipality and Ubuntu Local Municipality in Victoria West, and Central Karoo District Municipality with Beaufort West, Prince Albert and Laingsburg Local Municipality and Cape Winelands District Municipality with Breede Valley and Witzenberg Local Municipality Integrated Development Plans (IDPs).

A question that is regularly raised by interested and affected parties is whether the installation of power lines will have a detrimental medical effect on those living in close proximity of the power lines. In 2006, Eskom commissioned an independent study conducted by Empetus Close Corporation to assess the effect of electric and magnetic fields (EMF) on the surrounding environment. The report, and several others from international researchers and experts, highlights that all household appliances and other electrical equipment generate electrical and magnetic fields (EMF). Therefore people are generally exposed to varying levels of EMF in their daily lives at work and at home. EMF is always created, in varying levels, with the generation of electricity and the frequency of the electrical power system. Overhead power lines generate electric and magnetic fields but not any different from what people are already exposed to from other sources in their daily lives.

Table 8: Summary of typical electric field levels measured in the vicinity of the Eskom Power Lines (Empetus Close Corporation).

VOLTAGE (kV)	MAX ELECTRIC Field (V/m)	ELECTRIC FIELD AT SERVITUDE (V/m)	SERVITUDE WIDTH (m)
132	1,300	500	15,5
275	3, 000	500	23,5
400	4,700	1,500	23,5
765	7,00	2,500	40,0

Table 9: Summary of magnetic field in the vicinity of the Eskom Power Lines (Empetus Close Corporation).

Voltage (kV)	Current	Max Magnetic field	Magnetic field at Servitude Boundary	Servitude Width
132	150	4,0	1,0	15,5
275	350	6,0	1,0	23,5
400	650	10,5	2,5	23,5
765	560	6,0	1,5	40,0

The above Tables 8 and 9) illustrate that the electric and magnetic fields fall to lower levels with an increase in distance from the line. The main concern that is raised with regard to power lines is that they are thought to increase chances of cancer. No evidence of a causal relationship between magnetic field exposure and childhood leukaemia or breast cancer has been found and no dose-response relationship has been shown to exist between EMF exposure and biological effects (Ibid).

The (Empetus Report, 2006) concluded that according to findings of studies on the effects of electric and magnetic fields on plants with levels typical of a power line environment, complying with the requirements for proper servitude management as prescribed by the electric utility, are unlikely to affect plants in terms of growth, germination and crop production.

The guidelines for electric and magnetic field exposure set by the International Commission for Non- ionising Radiation Protection (ICNIRP 2000) receives world wide support and are endorsed by the Department of Health in South Africa (2006). Calculations of electric and magnetic field levels created by overhead power lines have shown that areas where

members of the public may be exposed at the servitude boundary and further away from the line are well within the ICNIRP guidelines. Where field levels exceed the ICNIRP guidelines within the servitude, Eskom is experienced and has advanced techniques that exist to reduce the field levels.

The proposed development may traverses through section where it is near residential areas such as Beaufort West side, however it is not anticipated to result in prohibitive and high significant impacts or fatal flaws.

Nonetheless, one class of impact that has been identified relates to heritage resources, such as historical buildings and settlements in areas such as Beaufort West, Prince Albert and scenic routes associated within the proposed servitudes. These are usually fixed and Eskom will have to consider applicable mitigation or apply avoidance measure where applicable should the line be cleared to proceed as planned.

6.14 Economic Environment

The main economic activities are commercial agriculture, manufacturing, wholesale and retail and tourism. The levels of income in the municipalities are also low based on the fact that unemployment is high. Access to water, lighting and refuse removal in the rural areas are other challenges. Furthermore, the construction and maintenance of the transmission power lines and substations could lead to a change in the number and composition of people within any given community, which in turn could lead to economic, land use, and socio-cultural change processes.

6.15 Heritage (Cultural – Historic Environment)

The proposed project may impact on a range of heritage resources as defined in Section 3 of the National Heritage Resources Act (No. 25 of 1999) including places, homesteads and buildings of cultural and historical significance, archaeological sites, graves and burial grounds. Stone artefacts found scattered on the surface of the earth mark archaeological sites such as Stone Age sites or that form part of the deposits in caves and rock shelters. The Stone Age is divided into the Early Stone Age (ESA) (from 2.5 million years ago to 250 000 years ago), the Middle Stone Age (MSA) (from 250 000 years ago to 22 000 years ago) and the Late Stone Age (LSA) (from 22 000 years ago to about 2 000 years ago). The same categories of Iron Age archaeological sites are available in the project area.

6.16 Paleontological Environment

The study area is dominated by sedimentary rocks (Carboniferous to Cretaceous) which were set down over older igneous, metamorphic and sedimentary rocks. The proposed transmission line will run over the Dwyka and Ecca Groups of the Karoo Supergroup of which the palaeontological content varies from barren, to negligible, to moderately important, to highly significant. The study area is in general relatively fossil poor except for certain areas where exceptional concentrations of highly scientific significant fossils may occur.

The fossils of the region include fossilised wood, leaf and stem imprints, invertebrates and vertebrate skeletal material. The Gamma-Kappa Section coincides with the geology and fossiliferous nature of the Karoo Supergroup.

The Karoo Supergroup

The proposed alternative 2 and option 3 lines and largest part of the proposed potion 1 lines run over the Karoo Supergroup and cross the Dwyka, Ecca and Beaufort Groups.

Dwya Group

The Dwyka is relatively fossil poor and mostly limited to arthropod and fish trace fossils. Outcrops of Dwyka rocks are scarce and are mostly covered by alluvium occur in the areas demarcated for proposed power lines.

Ecca Group

The fossils that occur in the Ecca Group in the Ceres Karoo have a limited diversity and are mostly limited to trace fossils and fragmented plant material. These fossils are of low palaeontological importance. The Whitehill Formation of the Ecca Group in the Tanqua Karoo on the other hand yields fossils of palaeoniscoid fish and *Mesosaurus* skeletons, which are scientifically important. *Mesosaurus* was one of the fossil species that enabled palaeontologists to prove the existence of Gondwanaland. Fossils of crustaceans and other invertebrates, trace fossils and fossilised wood have been found in the Whitehill Formation as well. There are exposures of fossiliferous Ecca Group rocks in the Matjiesfontein and De Doorns regions.

7. POTENTIAL ENVIRONMENTAL IMPACTS

Introduction

The environmental impacts of a project are those consequential changes in environmental parameters, in space and time, compared with what would have happened had the project not been undertaken. The subsections below give a simplistic summary of the anticipated negative environmental impacts of the proposed development.

7.1 Biodiversity

Biodiversity is an important environmental component. It is essential for the regulation of natural processes that support human life such as soil formation. Vegetation will be cleared for the construction camps as well as for the servitude, which may result in loss of species. There could be habitat loss and degradation as a result of the vegetation clearance and natural environmental processes such as soil erosion could be affected.

As a result of the noise during construction activities, animal species may migrate in search of other habitat; this may disturb the ecosystem in the area. In addition, birds may be electrocuted by the power line in three possible ways, i.e. simultaneously touching two live wires, simultaneously touching an energised wire, and any other piece of equipment on a pole or tower that is bonded to the earth through a ground wire.

7.2 Agricultural economy

Current or future economy will be affected on sections of the receiving environment due to the proposed construction of the power line. Should the power line be approved and installed, any future development would be planned around or taking into consideration this line. Nonetheless, power lines usually run across various property boundaries and livestock pasture lands, agricultural lands, and settlements. Portions of agricultural land may need to be changed from its current land use should a power line be developed on such lands. For example, power line towers may limit a specific area from irrigation activities. Boundary fences may be damaged during construction or gates may be left open resulting in the unplanned integration of livestock. The portions of land earmarked for the proposed development are currently agricultural land and other areas are wine/ Vineyards lands dotted and fruit plantations.

7.3 Construction Impacts

The activities that are expected to cause landscape impacts and that are associated with the construction phase, are the establishment of the construction camps, construction of access roads and the clearance of the site. These activities will result in the removal of vegetation and the exposure of the underlying soil.

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

The construction camps and lay-down yards are anticipated to disturb a much larger area. The size and location of the construction camps will play a major role in the severity of the impact. Two options are considered, namely the location of construction camps on remote, virgin land, or on/adjacent existing settlements.

Servitudes will generally be cleared of higher growing and dense vegetation to reduce biomass that may cause a fire hazard if ignited. The complete removal of high growing vegetation and scrubs will result in disturbed areas of exposed soil and difference in texture.

7.4 Archaeological/Heritage Resources

Cultural heritage resources can be broadly defined as physical features, both natural and man-made, which are associated with human activity. Heritage resources would include both tangible and intangible resources such as archaeological resources, palaeontological remains, meteorites, historical sites and belief systems, religious practices, ideas and oral traditions respectively. The National heritage Resources Act (Act No 25 of 1999) regards the following as heritage resources:

- Places, homesteads, building structures and equipment,
- Places to which oral traditions are attached
- Places which are associated with living heritage
- Historical settlements and townscapes
- Landscapes and natural features
- Geological sites of scientific or cultural importance

- Graves and burial grounds.

Any development that alters the *status quo* has the potential to impact upon any of the listed heritage resources particularly during construction phase.

Figure 18: View of an old historic farmhouse and a graveyard

7.5 Water Resources

Construction grading and utility excavations for the pylon installations would increase the sediment load in storm water during rainfall events. Sediment sources created during construction include soil stockpiles and soil tracked across construction areas, debris resulting from the installation of electric pylons foundation. These sediment loads could be deposited into the water bodies close to the site.

Due to the vast spatial extent of power line developments, it is often impossible for the power line corridor not to cross over water bodies such as rivers and wetlands. Construction activities within the vicinity of these water bodies create problems if not taken care of to prevent them. These range from erosion into rivers, which creates water pollution to draining

of wetlands in order to give way for the construction equipment. Some of the construction equipment could be located within floodplains and/or within 1:50 000 year flood lines. The combinations of all these presents direct threat to water resources. Concrete residues from tower foundations or runoff have the potential to alter aquatic environments.

7.6 Soil

Soil has an important role in the environment as it supports biodiversity and provides for a physical base for plants, buildings and other infrastructure. Soil structure will be disrupted during the digging of foundations for the new pylons for the power line. Continuous movement of heavy machinery to and from the construction site will result in soil compaction thereby reducing its capacity to hold water which may in turn result in increased runoff during the rainy season.

Fuel leakages and accidental oil spills from construction vehicles and machinery have the capability of contaminating soil once they infiltrate into the soil, this indirectly also affects plant growth in the near future.

Mixing of cement on unpaved surfaces during construction could result in change of soil chemistry, such as changes in the alkalinity/ acidity of the soil, which could reduce soil fertility hence indirectly affecting flora.

7.7 Noise

Noise levels are expected to increase as a result of various construction activities. The noise will be limited to the construction phase.

7.8 Air Quality

The quality of the air will be impacted on and the sources are likely to emanate from: excessive emission of exhaust gases from construction vehicles, dust during excavation works, digging of foundations, stock piled soils and gravel surface access roads.

7.9 Health and Safety

If construction workers are exposed to excessive and continuous levels of construction-related dust and noise their health could be negatively affected. Exposure to dust may

aggravate respiratory conditions such as asthma. Exposure high levels of noise may result in temporary deafness, shock and discomfort.

7.10 Infrastructure and Services

Power lines often intersect or are aligned in close proximity to existing infrastructure such as sewer, hazardous pipelines, water supply pipelines and services such as roads, telecommunication lines, boundary lines and existing power lines. There could be temporary disruption of services during the construction of the power line.

7.11 Socio-Economic

Employment opportunities may arise during the construction phase especially for activities that do not require the use of machinery. This will have a temporary positive impact on the local communities especially if provision of appropriate training and skills development is implemented.

Other potential social impacts associated with the proposed development will emanate from safety and security concerns of the affected communities from the uncontrolled influx of migrant workers during the construction phase of the project. This is especially so given the fact that the project area is sparsely populated and contractors may have to bring in labour from outside the study area.

7.12 Topography

The topography of the area will determine the level of visual exposure of the power line. The power line will be visible from a distance if it is located on an elevated landscape. There are other linear developments already in the vicinity of the project area and as such, the proposed development will conform to some of these developments, such as, traction lines for Transnet, 400kv and the 765kv power lines from Gamma to Kappa in the Western Cape region.

7.13 Avifauna

The construction of the 2nd765kv power line from Gamma to Kappa in the Western and Northern Cape Provinces could potential have a negative effect on different vulnerable bird

species in the receiving area. According to Roberts (date) a total of 510 bird species occur in the Western Cape Province.

Some of the big birds are likely to utilise the power line for perching and roosting, which will place them at risk of collision with the earth wires. Eskom has got different bird nesting guidelines, which will be used on the construction of the power line as well with the Management plan, which will be used. The purpose of the bird nesting guideline seeks to minimise and prevent incidences of bird collisions through a bird physically striking either the overhead conductor or overhead ground wire of a power line. In case of Transmission lines, the overhead ground wire of a power line.

In case of Transmission, the overhead ground wire is usually involved. It is generally accepted that birds usually avoid the highly visible bundled conductors but often fail to see the thin ground wire. The following potential impacts on avifauna anticipated to occur as a result of the construction and maintenance of the proposed Transmission line have been identified:

The proposed transmission line is anticipated to be beneficial to the birds by providing safe nesting and roosting sites for birds preferring large trees.

Collision of birds with the proposed overhead powerline, or more specially with the earth wires is likely to be the most significant impact of this proposed transmission line on birds.

The species present in the study area may be impacted on through habitat destruction as a result of the proposed 765kv powerline.

Strain towers could serve as roots and nesting platforms for large raptors such as vulture and eagles.

7.14 Palaeontology

The study area is dominated by sedimentary rocks (Carboniferous to Cretaceous), which were set down over older igneous, metamorphic and sedimentary rocks. The proposed Transmission line will run over the Dwyka and Ecca Groups of the Karoo Supergroup of which the palaeontological content varies from barren, to negligible, to moderately important, to highly significant. The study area is in general relatively fossil poor except for certain areas where exceptional concentrations of highly scientific significant fossils may occur.

The fossils of the region include fossilised wood, leaf and stem imprints, invertebrates and vertebrate skeletal material. The Gamma-Kappa Section coincides with the geology and fossiliferous nature of the Karoo Super group.

8. ENVIRONMENTAL IMPACT ASSESSMENT METHODOLOGY

This section represents the methodology used and adopted in assessing the identified or anticipated impacts on the proposed power line's receiving environment. This ,methodology is followed by the Assessment Chapter which will identify mitigation measures.

8.1 Measuring Environmental Impacts Assessment Methodology

All impacts identified during scoping and EIA stages of the study are classified in terms of their significance. The Broad significance categories are as follows

- **Nature:** of the impact , this is described as the cause and the effect , what woud be affected and how it would be affected.
- **Mitigation Level**:The degree of which the impact could be mitigated.
- The **Extent**:this is categorised as local, regional or national
- The Magnitude of the impact: this is quantified as

Low, will caise a low impact on the environment

Moderate , will result in the process continuing but in a controllable manner

High: Will alter processes to the extent that they temporarily cease, and

Very high : will result in complete destruction and permanet cessation of processes.

- The **Probability**: describes the likelihood of impact occurring and reated as follows
  - Extremely remote: which indicates that the impact will probably not happen
  - Can occur: there is a possibility of occurance
  - Unusual but Possible : Distinct possibility of occurrence
  - Almost Certain: Most likely to occur
  - Certain/ Inevitable: Impact will occur despite any preventative measures put in place.

- The duration / Exposure it is indicated as follows

- The impact will be immediate,
- The impact will be of short term (0-5 years)
- The impact will be of medium term (Between 5- 15 years)
- The impact will be long term 15 and more years and
- The impact will be permanent

- Revesibility / Replaceability : The degree to which the impact is reversible or the lost resource can be replaced.

The Significance of the impact is calculated as follows

SIGNIFICANCE= CONSEQUENCE (Magnitude+Duration+Extent+Reversibility) x PROBABILITY

Table 10: significance ranking (Savahanna Environmental, 2008)

RANKING	Magnitude	REVERSIBILITY	EXTENT	DURATION	PROBABILITY
5	Very high	Irreversible	International	Permanent	Certain/inevitable
4	High		National	Long term (impact ceases after operational life of asset	Almost certain
3	Moderate	Reversibility with human intervention	Provincial	Medium term	Can occur
2	Low		Local	Short term	Unusual but possible
1	Minor	Completely reversible	Site bound	Immediate	Extremely remote
0	None		None		None

RANKING	100-65	64-36	35-16	15-5	4-1
SIGNIFICANCE	VERY HIGH	HIGH	MODERATE	LOW	MINOR

9. IMPACT ASSESSMENT AND MITIGATION MEASURES

The impact assessment assesses the impacts identified which may impact on the receiving environment of the proposed development and how the proposed development will impact on the receiving environment. The impacts are assessed for the various phases of the project, i.e. construction, operation and decommission. Construction and decommission is handled together as they would have similar impacts in most cases and where they would be different, the sections are separated.

9.1 Air Quality

The quality of the air will be impacted on during the construction and decommissioning phases only. The sources are likely to be from excessive emission of exhaust gases from construction vehicles, dust during excavation works, digging of foundations, stock piled soils and gravel access roads. The dust may affect animals, vegetation and people on the site and the surroundings.

Table 11:Rating matrix for air quality impacts in the construction phase

Criteria	**Rating**
Extent	Local (2)
Duration	Short term (1)
Magnitude	Low (1)
Probability of occurrence	Definite (5)
Degree of confidence	Medium
Status	Negative
Significance	Moderate (25)
Degree to which the impact can be reversed	Low (1)
Degree the impact may cause irreplaceable loss of resources	Low
Degree to which the impact can be mitigated	Moderate
Mitigation measures:	Mitigation measures will include the following but not limited to: • No open fires will be permitted on site. • Burning of materials, grass and refuse will not be permitted on site. • Construction machinery and vehicles will be maintained and serviced regularly. • Speed limits of about 40km/hr will be enforced and maintained on the construction site. • **Dust control.**

	Damping down of un-surfaced access roads, road shoulders and un vegetated areas during dusty period is required Digging and other clearing activities shall only be done during agreed working times to avoid drifting of sand and dust into neighbouring areas. **Emission control** Regular servicing of vehicles and machinery in order to limit gaseous emissions (to be done off-site). **Fire Prevention** The Contractor shall have operational fire-fighting equipment available on site at all times. The level of fire-fighting equipment shall be assessed and evaluated through a typical risk assessment process. It may be required to increase the level of protection especially during the winter months No open fires shall be allowed on site under any circumstance. All cooking shall be done in demarcated areas that are safe and cannot cause runaway fires No fires shall be allowed at active construction areas and stop and go stations

9.2 Soil

Soil structure will be disrupted during the digging of foundation for the towers and during excavation works associated with the development. Continuous movement of heavy machinery such as cranes used to erect the towers to and from the construction site will result in soil compaction thereby reducing its capacity to hold water. This will result in increased runoff during the rainy season.

Mixing of cement for the foundations on unpaved surfaces during construction will result in change of soil chemistry particularly changes in the alkalinity or acidity of the soil. This will result in reduced soil fertility thereby indirectly affecting flora and consequently the fauna that depend on both the soil and the flora. Such an effect will be limited to the construction phase and it will be of short duration limited to the construction site. The significance of the impact can be avoided if mitigation measures are implemented. The mitigation measures identified have been included in the Environmental Management Programme (EMPR) attached as Appendix 16.

Table 12: Rating table for soil impacts in the construction and operational phase

Criteria	Without mitigation	With mitigation
Extent	Local (1)	N/A

Duration	Permanent (5)	N/A
Magnitude	Low (4)	N/A
Probability of occurrence	Definite (5)	N/A
Significance	High (50)	N/A
Status	Negative	N/A
Reversibility	Irreversible	
Irreplaceable loss of resources	Yes, but minor	
Can impacts be mitigated	No	
Mitigation	N/A	
Cumulative impacts	Numerous localized small footprints associated with towers (existing and proposed but no significant cumulative impacts envisaged.	

9.3 Vegetation

The Karoo vegetation is sensitive to disturbance due to various factors, the low rainfall which falls in the area, high temperature within the study area to a low production phytomass (the total amount of living organic plant matter, of both higher and lower plants, accumulated at a given moment in the aboveground and underground spheres) and hence, slow nutrient cycle and low organic content of soils, due to harsh climatic conditions experienced in the area the establishment of seedlings and the growth of plants to adult is slow. The sensitivity of the vegetation in the study area is evidenced by the many scars on the Karoo landscape (erosion gullies) resulting from overgrazing and insensitive development without adequate rehabilitation measures, a number of concerns regarding the potential long term impact on vegetation along the Transmission line servitude have been expressed by many land owners, largely as a result of historical experience associated with disturbances of the vegetation along the existing power lines in the area and the one which is current under construction (i.e. the 1st 765kV Transmission line). Strict measures to specific mitigation and general practice during construction and maintenance is therefore in order to demonstrate commitment to the environmental management principles laid down with the environmental management programme.

With the follow up of mitigation measures and the use of existing access roads within the area, the proposed Transmission line is not anticipated to impact on any highly sensitive area in terms of natural vegetation. Impacts, which are anticipated, are as follows.

Distribution of natural vegetation along access/ service routes through trampling, compaction by motor vehicles.

The total destruction of the vegetation at the tower footprint

Establishment and spread of declared weeds and alien invader plants from disturbed areas, which can lead to the replacement of indigenous vegetation.

Establishment and spread of declared weeds and alien invader plans from disturbed areas, which can lead to the replacement of indigenous vegetation

Although the majority of the impacts are likely to occur, they will be localised and of moderate significance due to the low sensitivity of the vegetation in the area of the proposed site. Through the implementation of appropriate mitigation, measure, these impacts can be effectively minimised

Criteria	**Without mitigation**	**With Mitigation**
Extent	Local (3)	Local (1)
Duration	Short term (3)	Short term (2)
Magnitude	Low (2)	Low (4)
Probability of occurrence	Definite (2)	Definite (5)
Significance	**Moderate (50)**	**Moderate(35)**
Status	Negative	Negative
Is impact reversible	Mostly	Mostly
Degree to which the impact can be reversed	Mostly	Mostly
Irreplaceable loss of vegetation	No	No
Degree to which the impact can be mitigated	NA	NA

Mitigation measures	Mitigation measures will include the following but not limited to: 1.During the construction phase workers must be limited to areas under construction and access to the undeveloped areas, especially the surrounding open grassland and valley bottom wetland areas must be strictly regulated ("no-go" areas during construction activities). 2. Close site supervision must be maintained during construction of the power line. 3.Minimal disturbance to vegetation where such vegetation does not interfere with construction 4.No unnecessary destruction to surrounding vegetation 5.Protection of or endangered plant species 6.Where herbicides are used to clear vegetation, specimen-specific chemicals should be applied to individual plants only No dumping of any materials in undeveloped open areas and neighbouring properties
Residual Impacts	1.The residual impacts (small areas of natural habitat will be disturbed) is best mitigated by effectively and appropriately managing the currently natural and partly natural portions of the servitude area, and obviously by also minimizing disturbance in these areas at the construction phase

Table 13: Rating matrix of the vegetation impact

Impact	Mitigation Measure
Destruction of natural vegetation The contruction of the 2nd 765 kv Gamma to Kappa Powerline would require the removal of vegetation for the purpose of access roads, servitude and the pylon footprint. Areas where structures are stored would flatten vegetation that could be detrimental to the persistence of the vegetation. The illegal disposal of construction material such as oil , cement could destroy natural vegetation. Where vegetation was removed.	Alternative 2 which runs parallel to the existing powerline would concentrate the impact, instead of spreading it over the landscape, alternative would mostlikely use the existing servirtude and access roads, minimising the impact of the natural vegetation.
Exposure to erosion The removal of surface vegetation will expose the soils, which in rainy season could cause sedimentation of watercourses. Indegeneous vegetation communitities are unlikely to colonise eroded soils successfully andseeds from proximate alien invasive plants , or unpalatable shrubs that reduce grazing capacity, can spread easily into these eroded sol. Raindrops on bare soils disperses the clay fraction in the soil that settles into or block the soil pores on the surface, sealing it so that water nannot penetrate (Esler,etal,2006).	1.Make use of existing roads and tracks, rather than creating new routes through naturally vegetates areas 2.no construction or activities should be undertaken within moist soils or watercourses and their assoiciated buffers until a Water Use licence has been granted by the Department of Water Affairs (DWA) 3.Remove on;y the vegetation where essential for construction and do not allow any disturbance to the adjoining natural vegetation cover 4. protect all areas susceptible to erosion and ensure that there is no undue soil erosion resultant from activities within and adjacent to the construction camp and work areas.
Removal / destruction of protected plants The consuction of the 765 kv powerline from gamma to Kappa would result in removal of plant species of conservation concern, impact on their habitat, pollinators and inevitably the persistence of these.	**1. where possible , construction activities must be restricted to previously disturbed areas** 2. A qualified ecologist or botanist should survery the final rought alignment and pylon footprints within the growing season of the plants. 3.construction workers maynot tamper or remove plants. 4. it is recommended that the construction crew be educated about the sensitivities involved along the route as well as the potential

	species they could encounted diring the construction activities.
Disturbance to non –perennial and perennial rivers: Removal of vegetation surrounding drainage lines and within riparian areas could result in a disturbance and potential loss of faunal habitat associated with the stream as well as loss of mature trees which could destabilise soil conditions. addition, all watercourses (including nonperennial rivers) in South Africa are protected by legislation and must be classified as no-go areas along with protective buffer zones. Note that any activities within the watercourses (non-perennial rivers and natural channels included) are subject to authorisation by the Department of Water Affairs (DWA) by means of a Water Use License.	1.After construction, compacted soil access roads should be rip, mechanically break the surface to increase water infiltration; 2.Construction should take place outside of the rainy season when the flow of the non-perennial rivers is at a minimum; 3.Do not permit vehicular or pedestrian access into natural areas beyond the demarcated boundary of the construction area; 4.Linear infrastructure should span across the rivers. Where it is unavoidable to place the pylon footprint within the protective buffer zones, the construction activities must be restricted to as small a footprint possible and rehabilitation undertaken as soon as construction is complete; 5.It is advised that environmental audits be undertaken by an independent party during this construction period, especially in sensitive areas.
Soil compaction: The movement of heavy machinery will result in soil compaction that will modify habitats, destroy vegetation and inhibit revegetation. Soil compaction as a result of construction vehicles and traffic, could lead to a decrease of water infiltration and an increase of water runoff.	1.Construction (and maintenance) vehicles may not veer from the dedicated roads; 2.Once construction is complete, obsolete roads should be obliterated by breaking the surface crust and erecting earth embankments to prevent erosion, while vegetation should be re-established; 3.It is advised that environmental audits be undertaken by an independent party during this construction period, especially in sensitive areas

9.4 Avifauna

During the construction phase and maintenance of power lines and substations, some habitat destruction and transformation inevitably takes place. This happens with the construction of access roads, the clearing of servitudes and the levelling of substation yards. Servitudes have to be cleared of excess vegetation at regular intervals in order to allow access to the line for maintenance, to prevent vegetation from intruding into the legally prescribed clearance gap between the ground and the conductors and to minimize the risk of fire under the line, which can result in electrical flashovers. These activities have an impact on birds breeding, foraging and roosting in or in close proximity of the servitude through transformation of habitat, which could result in temporary or permanent displacement. In the present instance, the risk of displacement of Red Data species due to **habitat destruction** is likely to be fairly limited, given the nature of the habitat. The biggest risk is likely to be where the line crosses ephemeral rivers, which could potentially result in the removal of trees, which are important breeding substrate for a number of species.

Apart from direct habitat destruction, construction and maintenance activities also impact on birds through **disturbance**, particularly during breeding activities. This could lead to breeding failure if the disturbance happens during a critical part of the breeding cycle. As far as disturbance is concerned, a specific situation may arise if the line is constructed near an existing transmission line. As mentioned earlier in this report, transmission lines are highly sought after by large raptors, particularly Martial Eagles, for roosting and breeding purposes. Construction activities in close proximity could be a source of disturbance and could lead to temporary breeding failure or even permanent abandonment of nests. Disturbance may also occur where the line traverses steep cliff faces where Verreaux's Eagle, Booted Eagle, Jackal Buzzard, Lanner Falcon, Martial Eagles, Cape Vultures, Peregrine Falcon or Black Stork could be breeding or roosting.

	Impact	Nature of impact	Magnitude	Reversibility	Extent	Duration	Probabilityof occurance	ranking	significance	
									Without mitigation	With mitigation
Construction phase	Habit Destruction	Destruction of bird habitat during construction of the powerline	2 2	3 3	1 1	4 4	4 4	40 40	Moderate	Moderate
	Collision	Birds colliding with earth wires and conductors	4 3	5 5	4 4	4 4	4 2	68 32	Very high	Moderate
	Nesting	Nesting on Towers	2 2	0 0	1 1	3 3	2 2	27 16	Moderate	low
	Disturbance	Of birds during and to a lesser extent during maintainance	3 3	2 2	2 1	2 2	3 2	27 16	Moderate	Low
	Electrical faulting	Electrical faulting on lines, caused by birds	3 2	1 1	1 1	4 4	3 2	27 16	Moderate	low

Table 14: Rating matrix for Avifauna impacts in the construction and operational phase

Impact	Mitigation
Electrical faulting	Fit Bird guards on self support towers as per Eskom transmission guidelines
Nesting	Impacts cannot necessarily be mitigated NB any intervention with nesting once line is operational must be subject to national and provincial legislation and Eskom nest management guidelines.
Disturbance	A walk through for the construction EMPR must be conducted and best environmental practice must be followed during construction and maintenance activities.
Collision	Once the final alignments and tower positions have been selected, the sections of the line that would need the application of Bird Flight Diverters to mitigate for potential collisions should be indicated by the avifaunal specialist.
Habitat destruction	Avifaunal walk through must be conducted to identify particularly sensitive habitat and environmental best practise must be followed during construction and mainatanance

The avifauna will be impacted by the proposed power line and substation works during operation, as the birds will pose threats to be electrocuted on towers and at the substation, and colliding with the actual power lines, which are earth wires and conductors.

Collisions

Collisions are probably the biggest single threat posed by transmission lines to birds in southern Africa (van Rooyen 2004). Most heavily impacted upon are bustards, storks, cranes and various species of water birds. These species are mostly heavy-bodied birds with limited manoeuvrability, which makes it difficult for them to take the necessary evasive action to avoid colliding with power lines (van Rooyen 2004, Anderson 2001).

"The collision of large terrestrial birds with the wires of utility structures, and especially power lines, has been determined to be one of the most important mortality factors for this group of birds in South Africa (Herholdt 1988; Johnsgard 1991; Allan 1997). It is possible that the populations of two southern African endemic bird species, the Ludwig's Bustard *Neotis ludwigii* and Blue Crane *Anthropoides paradiseus*, may be in decline because of this single mortality factor (Anderson 2000; McCann 2000). The Ludwig's Bustard (Anderson 2000) and Blue Crane (McCann 2000) are both listed as "vulnerable" in the Eskom Red Data Book of Birds of South Africa, Lesotho & Swaziland (Barnes 2000) and it has been suggested that power line collisions are one of the factors which are responsible for these birds' present precarious conservation status.

Collisions with power lines and especially overhead earth-wires have been documented as a source of mortality for a large number of avian species (e.g. Beaulaurier *et al.*, 1982; Bevanger 1994, 1998). In southern Africa, this problem has until recently received only limited attention. Several studies however have identified bird collisions with power lines as a potentially important mortality factor (for example, Brown & Lawson 1989; Longridge 1989). Ledger *et al.,* (1993), Ledger (1994) and Van Rooyen & Ledger (1999) have provided overviews of bird interactions with power lines in South Africa. Bird collisions in this country have been mainly limited to Greater and Lesser Flamingos, various species of waterbirds (ducks, geese, and waders), Stanley's (Denham's) *Neotisdenhami* and Ludwig's Bustards, White Storks *Ciconia ciconia*, and Wattled *Grus carunculatus*, Grey Crowned

Balearica regulorum and Blue Cranes (for example, Jarvis 1974; Johnson 1984; Hobbs 1987; Longridge 1989; Van Rooyen & Ledger (1999)). Certain groups of birds are more susceptible to collisions, namely the species which are slow fliers and which have limited manoeuvrability (as a result of high wing loading) (Bevanger 1994). Birds, which regularly fly between roosting and feeding grounds, undertake regular migratory or nomadic movements, fly in flocks, or fly during low-light conditions are also vulnerable. Other factors which can influence collision frequency include the age of the bird (younger birds are less experienced fliers), weather factors (decreased visibility, strong winds, etc.), terrain characteristics and power line placement (lines that cross the flight paths of birds), power line configuration (the larger structures are more hazardous [for collisions, with electrocutions the opposite is the case]), human activity (which may cause birds to panic and fly into the overhead lines), and familiarity of the birds with the area (therefore nomadic Ludwig's Bustards would be more susceptible) (Anderson 1978; APLIC 1994).

Although collision mortality rarely affects healthy populations with good reproductive success, collisions can be biologically significant to local populations (Beer & Ogilvie 1972) and endangered species (Thompson 1978; Faanes 1987). The loss of hundreds of Northern Black Korhaans *Eupodotis afraoides* due to power line collisions would probably not affect the success of the total population of this species and would probably not be biologically significant, but if one Wattled Crane was killed due to a collision, that event could have an effect on the population that would be considered biologically significant. Biological significance is an important factor that should be considered when prioritising mitigation measures. Biological significance is the effect of collision mortality upon a bird population's ability to sustain or increase its numbers locally and throughout the range of the species."

A significant impact that is foreseen is collisions with the earth wire of the proposed line. Quantifying this impact in terms of the likely number of birds that will be impacted, is very difficult because such a huge number of variables play a role in determining the risk, for example weather, rainfall, wind, age, flocking behaviour, power line height, light conditions, topography, population density and so forth. However, from incidental record keeping by the Endangered Wildlife Trust, it is possible to give a measure of what species are likely to be impacted upon (Jenkins *et al.* 2010). This only gives a measure of the general susceptibility

of the species to power line collisions, and not an absolute measurement for any specific line.

The most likely candidates for collision mortality on the proposed power lines are Ludwig's Bustards, Kori Bustards, Greater Flamingo, Lesser Flamingo, Blue Cranes and Secretary birds. For Ludwig's Bustard, this risk is particularly relevant in the Karoo in the flat areas, as that is the preferred habitat for the species. Ludwig's Bustard is highly vulnerable to power line collisions (Jenkins & Smallie 2009; Jenkins *et al.* 2010). Ludwig's Bustard will be at risk, based on the species flight characteristics and tendency to fly long distances between foraging and roosting areas and when migrating. Movements by this species are triggered by rainfall (Allan 1994), and so are inherently erratic and unpredictable in this arid environment, where the quantity and timing of rains are highly variable between years. Hence, it is difficult to anticipate the extent to which Ludwig's Bustard may be exposed to collision risk, but the alignments cross suitable habitat and the species is likely to be present in varying numbers, depending on foraging conditions. The highest risk for Black Stork will be where the alignments cross ephemeral rivers, where there are pools of standing water, and on slopes containing cliffs. Flamingos might be at risk near water bodies, particularly large dams e.g. the Gamka Dam. The biggest risk for Blue Cranes will be near water bodies that are used as roost sites. Kori Bustards might be at risk anywhere in the Karoo habitat in flat areas, particularly when flying to roost sites in the late afternoon and early evening. It is not possible to link the risk to Secretarybirds to any specific habitat of behaviour, they could be at risk anywhere in flat areas in their foraging range. Lanner Falcon and Peregrine Falcon will be most at risk on slopes with associated cliffs, as would Verreaux's Eagle, Booted Eagle and Jackal Buzzard.

Comparative assessment for Gamma Kappa power line alternative

The alternative that follows the existing Transmission lines, alternative 2 is strongly preferred. Placing new lines adjacent to existing lines makes good sense in terms of avifaunal impacts for the following reasons:

1.The more overhead power lines there are together, the more visible they would be to the birds in the area. This would partially mitigate for the impact of bird collision.

2.Resident birds in an area become accustomed to a power line that crosses their flight paths, and learn to avoid it during their everyday activities. Hence their flight paths, and learn to avoid it during their everyday activities. Hence adding a new power line adjacent to an existing line would have less impact than putting it in a totally new area, where the resident birds are not yet accustomed to overhead power lines.

3.Spatially, it makes more sense to have all the treats to birds (in particular through collision) in one relatively confined area, rather than spread out across the landscape.

4. Building the new line adjacent of an existing line should eliminate the need for new access road and gates etc, and therefore reduce the levels of disturbance and habitat destruction

The results of this study show that the most preferred alternative is alternative 2. This alternative follows existing lines for the entire length and thus the impact on avifauna in terms of collisions, habitat destruction and disturbance will be significantly lower than the other alternatives considered.

9.4.1 Bats

The current study identifies 12 potentially occurring bat species. Six of these species are of conservation importance due to their Near-threatened status. Although Australian research suggests fruit bats are particularly prone to collision with and electrocution of power lines, the likelihood of fruit bats occurring within the study area is low. Only two species have a very slight possibility of occurring, namely *R. aegyptiacus* and *E. wahlbergi,* but climatic and habitat suitability models produced in this study suggest that the hot, dry and highly variable

temperature regime of the Karoo, likely precludes the presence of these species throughout the study area, except perhaps in a small patch near Beaufort West where winter temperatures remain warm enough.

The potential impacts to bats during the construction phase include habitat loss associated with clearing the right of way (which is expected to continue into the operational phase) and sensory disturbance due to increased levels of noise and dust associated with heavy vehicles and other machinery. During the operational phase, bats (particularly fruit bats) could potentially be negatively impacted by collision with power lines and to a lesser extent electrocution by them. Other impacts associated with the operational phase include electromagnetic radiation emitted by the power lines and its potential repellent effects, which may in turn lead to habitat fragmentation of certain species. The impacts suggested may be compounded if the power line is erected along bat migratory routes.

Table 15: Rating matrix for Bats impacts in the construction and operational phase

Criteria	**Rating**
Extent	Local (1)
Duration	Short term(1)
Intensity	Low(3)
Probability of occurrence	Probable (3)
Significance	Low (15)
Status	Negative
Degree to which the impact can be reversed	Low
Degree the impact may cause irreplaceable loss of resources	Moderate
Degree to which the impact can be mitigated	High
Mitigation measures	Mitigation of these impacts may include the implementation of dust control measures such as sprayer trucks (where practical) to avoid dust accumulating on vegetation used by bats or their prey as food or as roosting sites. Noise mufflers should be used on heavy commercial vehicles and idling should be minimised wherever possible. To minimise the risk of electrocution, the powerlines and other

	live neutral structures should be spaced at very least at distances wider than the wingspan of the largest potentially occurring bat species R. aegyptiacus which may reach 60 cm . where this is not possible, the cables should be insulated. Mitigating the effects of electromagnetic radiation is limited but will be best achived by avoiding the areas where bats may congregate for prolonged period such as roost sites or around water holes.

9.5 Wetland and Riparian areas

Construction grading and utility excavations for the pylons would increase the sediment load in storm water during rainfall events. Sediment sources created during construction include soil stockpiles and soil tracked across construction areas, debris resulting from the installation of pylons foundation. These sediment loads could be deposited into the water bodies close to the site. Due to the vast spatial extent of power line developments, it is often impossible for the power line corridor not to cross over water bodies such as rivers and wetlands. Construction activities within the vicinity of these water bodies create problems if not taken care of to prevent them. These range from erosion into rivers, which creates water pollution. Some of the construction equipment could be located within floodplains and/or within 1:50 year flood lines. The combination of all these presents threat to water resources.

Table 16: Rating matrix for water resources impacts in the construction and operational phase

Criteria	**Rating**
Extent	Local
Duration	Short
Intensity	High
Probability of occurrence	Definite
Degree of confidence	High
Status	Negative
Significance	Medium-High
Degree to which the impact can be	Low

reversed	
Degree the impact may cause irreplaceable loss of resources	Medium
Degree to which the impact can be mitigated	Medium
Mitigation measures	Mitigation measures will include the following but not limited to: • Construction to take place during dry season • Construction should avoid sedimentation • Access road to be sealed with dust suppressant • Develop wetland and vegetation habitat biomonitoring programme

9.6 Land Use

The study area consists of vacant and greenfields land as well as cultivated, residential, subsistence farming, and game farms.

Subsistence farming activities are concentrated around the small towns. Human settlements are scattered throughout the study area and the landscape is degraded around these settlements.

The landscape character changes throughout the study area. The study area is divided into three distinct landscape types, which are areas within the study area that are relatively homogenous in character (Swanwick, 2002). Landscape types are distinguished by differences in topographical features, vegetation communities and patterns, land use and human settlement patterns. The assessment is done on a macro-scale and discusses the predominant landscape conditions and visual characteristics found in a particular landscape type. Each landscape type is given a descriptive name which relates to the vegetation type, topography and/or land use of the region (Adapted from Van Riet et al, 1997), namely Touws River Karoo Region; Moordenaars Karoo Region; and Central Karoo Region.

Table 17:Rating matrix for land use impacts in the construction phase

Criteria	Rating
Extent	Local
Duration	Long term
Intensity	High
Probability of occurrence	Definite
Degree of confidence	Medium
Status	Negative
Significance	High
Degree to which the impact can be reversed	Low
Degree the impact may cause irreplaceable loss of resources	Low
Degree to which the impact can be mitigated	High
Mitigation measures	Mitigation measures will include the following but not limited to: • Confine impacts only to the development area.

9.7 Visual Impact

Landscape impacts are alterations to the fabric character, visual quality and or visual value which will either positively or negatively affect the landscape character. During the construction and operational phases the project components are expected to impact on the landscape character of the landscape types as it traverses. The activities expected to cause landscape impacts are that associated with the construction phase, are the establishment of the construction camp, construction of roads and clearance of the servitude. These activities will create surface disturbance, which will result in the removal of vegetation and the exposure of the underlying soil. Surface disturbance created during construction may remain for an extended period during the operational phase. These are seen as residual effects carried forward from the construction phase and can be completely or substantially be mitigated if treated appropriately during the construction phase. An additional impact will be caused as a result the presence of the completed Transmission line.

The excavated soil will have to be stockpiled. While evidence of such will be visual to the farm owners and others in the nearby vicinity, such visual disruptions will be short term and limited to the construction phase only.

Table 18:Rating matrix for visual impacts in the construction and operational phase

Nature of impact : Potential visual on residents and visitors in close vicinity of the proposed transmission lines. Both alternatives have the potential to visually impact on residents and visitors in close proximity to the proposed infrastructure.			
Criteria	**Alternative 1**	**Alternative 2**	**Alternative 3**
Extent	Local (1)	Local1	Local1
Duration	Long term 4	Long term	Long term
Magnitude	Moderate(3)	Low (2)	Moderate (3)
Probability of occurrence	High probability 4	High probability 4	High probability 4
Status	Negative	Negative	Negative
Reversibility	Recoverable 3	Recoverable	Recoverable
Significance	High 56	High 52	High 56
Irreplaceable loss of resources	No	no	No
Can impacts be mitigated during operational phase	No	no	No
Mitigation measures	where areas are going to be disturbed through the destruction of vegetation, establishment of a construction camp, the vegetation occurring in the area to be disturbed meust salvaged and kept in a controlled environment such a s a nursery for futkre replanting in the disturbed areas as a measure of rehabilitation.		
Cumulative impacts	The placement of too many power lines into one servitude can increase the potential cumulative visual impacts associated with existing power lines, especially at a local scale.		

Table 23: Rating matrix for Potential visual on users of major roads in close vicinity of the proposed transmission lines

Nature of impact: Potential visual on users of major roads in close vicinity of the proposed Transmission lines. Both alternatives have the potential to visually impact on users on the main roads in close proximity to the proposed infrastructure			
Criteria	**Alternative 1**	**Alternative 2**	**Alternative 3**
Extent	Local (4)	Local	Local
Duration	Long term 4	Longterm	Longterm
Magnitude	Moderate(3)	Low (2)	Moderate (3)
Probability of occurrence	High probability 4	High probability 4	High probability 4
Status	Negative	Negative	Negative
Reversibility	Recoverable 3	Recoverable	Recoverable
Significance	Moderate 56	Moderate 52	Moderate 56
Irreplaceable loss of resources	No	no	No
Can impacts be mitigated during operational phase	No	no	No
Mitigation measures	• Make use of existing roads where possible • Where new access roads are required, the disturbance area should be kept small as possible • If it is necessary to clear vegetation for a road avoid a continuos straight line, curve the road in order to reduce the visible extent of the clared road • Avoid crossing over or through ridges pans or rivers or ant natural feature that have visual value. • Locate access routes so as to limit modification to the topography and to avoid the removal of established vegetation. • Align the powerline route along the foot slopes of hills, mountains and ridges. This helps to maximise the backdrop screening effect of the topography • Avoid areas where the current landuses such as lodges often rely on the absence of human visual intrusion.		
Cumulative impacts	The placement of too many power lines into one servitude can increase the potential cumulative visual impacts associated with existing power lines, especially at a local scale.		

Comparative assessment

The construction of the 2nd Transmission power line adjacent to the existing power line and infrastructure already present, is preferred from the visual point of view to the creation of

new “green area” route. The utilisation of the existing route will aid in consolidating the potential visual impact of the proposed Gamma to Kappa although it may contribute to the increase in cumulative visual impact of the existing lines. The study area is renowned for its Karoo and mountainous landscapes especially in the Karoo National Park as well as the central and southern regions. These characteristics provide the basis for the tourism industry, which plays a role in the economy of the Western and Northern Cape Provinces. The entire study area is considered to have a moderately high tourism potential.

The type of tourist that visits this area is expected to travel considerably through the study area by vehicle. This implies that they will experience a large part of the study area in a relative short time span.

9.8 Archaeological / Heritage Resources

The proposed power line will go through disturbed areas due to previous land uses such as existing power line, railway line activities, agricultural, commercial, industrial and residential use. Under such disturbed conditions the chances of archaeological material preserved in situ are unlimited as stated by the Heritage Specialist report attached.

Impact will include:

- Impact on fossils
- Impact on late stone age and possible iron age sites

Table 19: Rating matrix for archaeological impacts in the operational phase

Criteria	Without mitigation	With mitigation
Extent	Local (1)	Local (1)
Duration	Long term (4)	N/A
Magnitude	Small (1)	Small (1)
Probability of occurrence	Unlikely (2)	Unlikely (2)
Significance	Low (12)	Minor (4)
Status	Neutral-Negative	Positive
Reversibility	Non-reversible	Non-reversible
Degree to which the impact can be reversed	No	No
Can impacts be mitigated	Yes	Impacts can be avoided
Mitigation measures	Mitigation measures will include the following but not limited to:	

	• If during construction, the Contractor unearths archaeological resources or unmarked graves, all work will stop immediately and Eskom will be notified who will in turn inform an Archaeologist for further action on what should be done.

9.9 Palaeontology Resources

The palaeontological heritage of South Africa is unsurpassed and can only be described in superlatives. The South African palaeontological record gives us insight in *i.a.* the origin of life, mammals, dinosaurs and humans. Fossils are also used to identify rock strata and determine the geological context of the sub region with other continents and to study evolutionary relationships, sedimentary processes and palaeo environments. The Cape Supergroup is renowned for its invertebrate fossils and the Beaufort Group of the Karoo Supergroup contains amongst others approximately 70% of all known synapsid (also known as mammal-like reptile) fossils in the world which have played a crucial role in our understanding of the origin of mammals and the Permo-Triassic terrestrial palaeo environment including the existence of Gondwanaland.

The Heritage Act of South Africa stipulates that fossils and fossil sites may not be altered or destroyed. The purpose of this document is to detail the probability of finding fossils in the study area, which may be impacted by the proposed development. The impact of the development can be ameliorated in several ways in the areas where fossils are common.

Table 20:Rating matrix for paleontology impacts in the operational phase

Criteria	Without mitigation	With mitigation
Extent	Local (3)	Local (2)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (3)	Low- Moderate (2)
Probability	Probable (3)	Probable (3)
Significance	high(36)	Moderate (24)
Status	- Negative	- Negative
Reversibility	Reversible	Reversible
Degree the impact may cause irreplaceable loss of resources	No	No
Degree to which the impact can be mitigated	Yes	Impacts can be avoided
Mitigation measures	Mitigation measures will include the following but not limited	

	to: • If during construction, the Contractor unearths palaeontological resource, all work will stop immediately and Eskom will be notified who will in turn inform a Palaeontologist for further action on what should be done.

Whereas large parts of the proposed routes for the transmission lines traverse areas of no to negligible palaeontological importance, there are areas that are palaeontologically highly significant.

Care should be given to constructions such as access routes, construction facilities, substations, pylons and buildings that are going to be built within the fossiliferous Lower Beaufort Group of the Karoo Supergroup which is encountered over the largest part of the Gamma-Kappa line. It is recommended that a palaeontological surface survey is conducted in all these fossiliferous areas prior to construction.

Due to the fact that it would be impractical and very expensive for a qualified palaeontologist to do a field survey in the potentially fossiliferous areas in a corridor along each proposed route, it would be more practical to and cost effective to employ a palaeontologist to do a surface survey only along the preferred route and sites where the proposed infrastructure such as access roads and buildings are going to be built. This field survey will indicate which areas along the route are more palaeontologically sensitive than others and where construction should be avoided. It is also advised that the palaeontologist should salvage any highly scientifically significant fossil he or she may encounter during the field survey and donate it to the South African Museum in Cape Town.

None of the proposed routes for the transmission lines have a clear advantage above the others from a palaeontological perspective. The alternative 1 has a slight advantage above the others because runs over a significant distance of Ecca Group rocks which, except for the Whitehill Formation is relatively fossil poor. It is the only line which passes over the *Eodicynodon* Assemblage Zone. However, it is also important to mention that excavations are not necessarily detrimental to palaeontology. In many cases we would not have known

of a fossil's existence if it were not for it being exposed during mining or construction. The success of the venture from a palaeontological perspective depends however on the diligence of the Applicant and the quality of the surface survey.

Due to the fact that it would be impractical and very expensive for a qualified palaeontologist to be present at all localities and for the duration of construction, the responsibility of the recording of fossil localities and the collection of samples such as trace fossils and plant fossil material will fall upon the ECO. Fossil localities should be recorded in all cases by means of photographs and GPS readings and written up in a log book with the date, locality, photograph number and short description of the site.

In the case of trace fossils and plant fossils, it would be sufficient for the ECO to collect samples from areas being excavated for construction. In the case of *Mesosaur* or fish fossils these should be collected in the rocks in which they occur and kept aside for a palaeontologist to collect for an acknowledged fossil repository such as the South African Museum in Cape Town. No attempt must be made to remove the fossils from the rock further.

It is recommended that a palaeontologist be appointed to do a site visit to determine whether fossils are exposed in the area earmarked for development in the area where Lower Beaufort strata are exposed. This survey would of course be limited to a surface inspection only. In the event of fossils being uncovered during the construction phase, the ECO should photograph and record the position of fossiliferous material. If the fossiliferous material is going to be damaged during construction, the ECO could make an attempt to salvage it and store it safely in order for a professional appointed palaeontologist to collect it at his or her earliest convenience. If however the fossil is part of a skeleton or too big or delicate to remove, palaeontological assistance should be called for immediately. Little harm will come to a fossil if it could be collected simply by picking it up (as long as it is numbered and the locality is recorded by means of GPS), but actual excavations should be left to a professional palaeontologist. A professional palaeontologist should be appointed to salvage and collect fossiliferous material from the site which is exposed during construction.

The excavations and collection of fossils should be performed by a qualified palaeontologist and with a permit from the South African Heritage Resources Agency. The fossils should preferably be donated to South African Museum.

It is also recommended that the ECO be sent to the South African Museum where he or she must familiarise him- or herself with the fossils to be expected in the areas where development is going to take place. It is important for the ECO to study fossils in their unprepared state as well and not only prepared (cleaned) fossils and fossil reconstructions because that is not how they will appear in nature. It is very important that the ECO accompanies the palaeontologist on his or her site visit in order to be sensitised to the occurrence and appearance of fossils in their natural state.

9.10 Agriculture

The components of the project that can impact on agricultural resources and productivity are: Occupation of the land by the footprint of the development, which includes pylon bases, access roads, and during the construction phase, construction and storage camps. Construction activities that disturb the soil profile and vegetation, for example for excavations, levelling, bush clearing, etc. The following are identified as potential impacts of the development on agricultural resources and productivity, and assessed in the table formats below. There are two factors that influence the significance of all agricultural impacts. The first is that the proposed development is almost entirely on land of extremely limited agricultural potential that is only suitable as non-arable, low potential grazing land. The second is that the actual footprint of disturbance of the power line is very small in relation to available, surrounding land **.**

The activities associated with the construction phase, such as establishment of access roads and the construction camps, movement of heavy vehicles, establishment of lay-down areas for towers and cables and preparation of foundations for the towers has the potential damage and result in the loss of farmland for future farming activities. This is an issue that has been raised as a concern by the farmers during the public participation process held.

The impact on farmland associated with the construction phase can be mitigated by

minimising the footprint of the construction related activities and ensuring that disturbed areas are fully rehabilitated on completion of the construction phase. Recommended mitigation measures are outlined below.

The presence of construction workers on the site increases the potential risk of livestock (sheep, goats, chickens) and produce (grapes, peaches) theft. The farming activities that are exposed to this impact are livestock farming and intensive agricultural farming, specifically vineyards, orchards and vegetables. Plastic littering also poses a threat to livestock.

The movement of construction workers on and off the site also poses a potential threat to farm safety and farm infrastructure, such as fences and gates, which may be damaged. Irrespective of the project, farmers frequently raise the issue of livestock losses, resulting from gates being left open and/or fences being damaged, as key concern. Impacts are generally more severe in remote locations where they may only be discovered some time after occurrence. A number of farmers also indicated that incidents involving Eskom and or Eskom's maintenance contractors are frequently disputed. Construction related activities, such as the establishment of access roads and tower foundations, also pose a threat to irrigation systems, specifically in the case of vineyards and orchards. Stock and produce losses and damage to irrigation systems pose a threat to the productivity of the operations and the livelihoods of the affected farmers.

Table 21:Rating matrix for agriculture impacts in the construction phase

Nature of impact: impact on farmland due to construction related activities The activities associated with the construction phase, such as establishment of access roads and the construction camp, movement of heavy vehicles, establishment of lay- down areas for towers and cables and preparation of foundations for the towers has the potential damage and result in the loss of farmland for future farming activities. This is an issue that has been raised as a concern by farmers. The impact on farmland associated with the construction phase can be mitigated by minimizing the footprint of the construction related activities and ensuring that disturbed areas are fully rehabilitated on completion of the construction phase. Recommended mitigation are outlined below.		
Criteria	**Without mitigation**	**With mitigation**
Extent	Local (2)	Local (1)
Duration	long term- permanent if	Very short tem if damaged areas are

	disturbed areas are not rehabilitated (5)	rehabilitated (1)
Magnitude	Moderate, due to importance farming in terms of local livelihoods and creation of employment opportunities (4)	Minor (2)
Probability of occurrence	Definite (5)	Highly probable (4)
Significance	High (55)	Moderate (16)
Reversibility	No, in case of footprint associated with pylons	Negative No, in case of footprint associated with pylons
irreplaceable loss of resources	Yes, loss of farmland. However disturbed areas can be rehabilitated.	Yes, loss of farmland. However disturbed can be rehabilitated
Can impact be mitigated	Yes, however, loss of farm land cannot be avoided	Yes, however, loss of farmland cannot be avoided
Mitigation measures	Mitigation measures will include, but not limited to: a)An Environmental Control Officer (ECO) should be appointed by Eskom to monitor the construction phase, including the establishment component. b)The footprint associated with construction related activities (access roads, turning circles, lay-down areas, construction platforms, work shop should be minimised. Eskom and the appointed contractor as well as the ECO must consult with affected landowners to identify suitable sites for the establishment of these areas. • Eskom and the appointed contractors must consult with the affected landowners to identify the location of key infrastructure, such as irrigation systems, and ensure that damage to infrastructure is avoided and or minimised. • Eskom and the appointed contractors must consult with the affected landowners with regard to timing of construction related activities. The aim of this should be to avoid critical periods in the farming process, such as planting and harvesting. • Every effort should be made by Eskom and the appointed contractors to minimise time associated with construction activities, specifically in the intensive vegetable growing areas for example grapes and, peaches	

	• The movement of construction vehicles on the site should be strictly controlled and confined to clearly defined access roads and areas. • All areas disturbed by construction related activities, such as access roads, lay-down areas, construction platforms, workshop area, should be rehabilitated at the end of the construction phase. • The implementation of a rehabilitation programme should be included in the terms of reference for the contractor/s appointed to construct the power lines. • Compensation should be paid to farmers that suffer a permanent loss of land due to the establishment of the transmission line. Compensation will be paid by Eskom based on accepted land values for the area. **Livestock** • Eskom should establish a Monitoring Forum that includes local farmers and develop a Code of Conduct for construction workers. This committee should be established prior to commencement of the construction phase. The Code of Conduct should be signed by Eskom and the contractors before the contractors move onto site. • Eskom should hold contractors liable for compensating farmers and communities in full for any livestock, animals and produce losses and/or damage to farm infrastructure that can be linked to construction workers. This should be contained in the Code of Conduct to be signed between Eskom, the contractors and affected landowners. The agreement should also cover loses and costs associated with fires caused by construction workers or construction related activities. • The EMP must outline procedures for managing and storing waste on site, specifically plastic waste that poses a threat to livestock if ingested. • Contractors appointed by Eskom must ensure that all workers are informed at the outset of the construction phase of the conditions contained on the Code of Conduct, specifically consequences of stock theft and trespassing on adjacent farms. • Contractors appointed by Eskom must ensure that construction workers who are found guilty of stealing livestock and farm

	produce and/or damaging farm infrastructure are dismissed and charged. This should be contained in the Code of Conduct. All dismissals must be in accordance with South African labour legislation; • The housing of construction workers on the site should be limited to security person
Cumulative impacts	Overall loss of farmland could impact on the livelihoods of the affected farmers, their families and the workers on the farms and their families. However, disturbed areas can be rehabilitated.

9.11 Noise

Noise levels are expected to increase as a result of various construction activities and use of heavy machinery. The noise will be limited to the construction phase. Many people will be affected by construction activities as the proposed power line routes are in residential and in farms.

Table 22:Rating matrix for noise impacts in the construction phase

Criteria	**Rating**
Extent	Local
Duration	Short term
Intensity	Low
Probability of occurrence	Definite
Degree of confidence	High
Status	Negative
Significance	Low
Degree to which the impact can be reversed	Low
Degree the impact may cause irreplaceable loss of resources	Low
Degree to which the impact can be mitigated	High
Mitigation measure	Mitigation measures will include, but not limited to: • Working hours will be limited to 7:00am -17:00pm strictly from Monday-Friday. • Affected residents will be notified of excessive noisy activities (if any are going to take place).

	• Open liaison channels with affected community will be developed in order to facilitate their concerns and complaints about the construction activities.

9. 12 Health and Safety

The construction workers will be exposed to excessive and continuous levels of construction-related dust and noise, without protective measure, which may affect their health. Mitigation measure such as Personnel Protective Equipment (PPE) will assist in reducing health impacts. Exposure to dust may aggravate conditions such as asthma, while exposure to excessive levels of noise may result in temporary deafness, shock and discomfort.

Other impact will include:

- Impact of electromagnetic fields on human beings
- Fire hazards pose a threat to human health and safety

Table 23: Rating matrix for health and safety impacts in the construction and operational phase

Criteria	**Rating**
Extent	Local
Duration	Short term
Intensity	Low
Probability of occurrence	Definite
Degree of confidence	High
Status	Negative
Significance	Medium
Degree to which the impact can be reversed	Low
Degree the impact may cause irreplaceable loss of resources	Medium
Degree to which the impact can be mitigated	High
Mitigation measures	Mitigation measures will include, but not limited to: • All workers will be fully informed about the Health and

	Safety Policy by the contractor • All workers will wear PPE at all times. • No worker shall act in any way that may pose risk to other workers.

Employment opportunities will rise during the construction phase. Local unskilled people may be hired for unskilled labour.

Other potential social impacts associated with the proposed development will emanate from safety and security concerns of the affected communities from the uncontrolled influx of migrant workers during the construction phase of the project

Impacts would include:

- Employment of local labour (South African citizens and people local to the area) and preference given to a local contractor.
- Property values have a potential negative impact both on the residential and agricultural taking into consideration that it is a 765kv power line. The impact on property value is mostly linked to visual impacts associated with Transmission lines. The values of property can be also be affected by the servitudes and impacts that they have on farming activities and future developments since Eskom will take ownership of the servitude through negotiations and compensations where possible.
- In terms of compensation, only those directly affected by the proposed 2nd 765kv Transmission power line will be compensated. The compensation is linked to the loss of land associated with the establishment of the servitude and forms part of the Servitude negotiations.
- Creation of employment and business opportunities during construction phase

The duration of the construction phase will be determined by Eskom and the contractor. The contractor may employ skilled and unskilled staff. The work associated with the construction phase will be undertaken by contractors and will include the establishment of the access roads and the erection of the towers and establishment of the power lines. There should be adequate accommodation where needed in the vicinity of the servitude and should be no leisure accommodation along the servitude during construction. However, construction camps for the storage of construction related material will need to be established and security personnel will be required to remain on site overnight.

A portion of the construction phase employment opportunities will be for low skilled job categories. The remaining jobs will fall within the skilled category. The majority of the employment opportunities are likely to be associated with the qualified contactors appointed by Eskom to construct the transmission lines and the associated infrastructure.

The proposed development will create an opportunity to provide on-site training and increase skills levels. However, these opportunities are likely to benefit the workers employed by the contractors and not locals from the area.

In terms of business opportunities for local companies, the expenditure during the construction phase will create business opportunities for the regional and local economy. The potential opportunities for the local service sector would be linked to accommodation, catering, cleaning, transport and security. As indicated above, the majority of the construction workers will be accommodated in the local areas. This will create opportunities for local hotels, B&Bs, guest farms and people who want to rent out their houses. In addition, a proportion of the total wage bill earned by construction workers over the construction phase will be spent in the local economy.

These benefits are associated with accommodation and meals for professionals for example engineers, quantity surveyors, project managers, product representatives and other personnel involved on the project. Experience from other large construction projects indicates that the potential opportunities are not limited to onsite construction workers but also to consultants and product representatives associated with the project.,

Table 24:Rating matrix for Socio economic impacts in the construction phase

While the presence of construction workers does not in itself constitute a social impact, the manner in which construction workers conduct themselves can impact on the local community. This risk is linked to the potential behaviour of male construction workers, including • An increase in alcohol and drug use and abuse • An increase in crime levels • The loss of girlfriends and or wives to construction workers • An increase in teenage and unwanted pregnancies • An increase in prostitution

- An increase in sexually transmitted diseases (STDs)

Criteria	Without mitigation	With mitigation
Extent	Local (3)	Local (2)
Duration	Long term term – permanent for individuals who may be affected by STDS(3)	long term permanent for individuals who may be affected by STD etc(3)
Magnitude	for specific individuals who may be affected by STDs etc (3)	High- very high for specific individuals who may be affected by STDs etc(2)
Probability of occurrence	Probable (5)	Probable (4)
Significance	Low for the community as a whole Moderate for specific individuals who may be affected by STDs etc (45)	Low for the community as a whole Moderate for specific individuals who may be affected by STDs etc (28)
Status	Negative	Negative
Reversibility	No in case of HIV and AIDS	No in case of HIV and AIDS
Irreplaceable loss of resources	Yes, if people contract HIV/ AIDS. Human capital plays a critical role in communities that rely on farming for their livelihoods.	
Mitigation measures	**Employment:** Where feasible, training and skills development programmes should be initiated prior to the initiation phase or construction phase • The recruitment selection process should seek to promote gender equality and the employment of women wherever possible. **Social** • Eskom and the contractor should be, in consultation with representatives to, develop a code of good conduct for the construction phase. The code should identify what types of behaviour	

	and activities by construction workers are not permitted and construction workers that breach the code of good conduct should be dismissed. • All dismissals must comply with the South African labour legislation. • Eskom and the contractor should implement an HIV/AIDS awareness programme for all construction workers at the outset of the construction phase. • The movement of construction workers on and off the site should be closely managed and monitored by the contractors. In this regard the contractors should be responsible for making the necessary arrangements for transporting workers to and from site on a daily basis, without any interaction with the local community. **Business** • Eskom should develop prior to construction starting a database of local companies, specifically Historically Disadvantaged (HD) companies, that qualify as potential service providers (e.g. engineering and construction companies, catering companies, waste collection companies, security companies etc.) prior to the commencement of the tender process for construction contractors. These companies should be notified of the tender process and invited to bid for project-related work;
Cumulative impacts	• Impacts on family and community relations that may, in some cases, persist for a long period of time. Also in cases where unplanned/ unwanted pregnancies occur or members of the community are infected by an STD, specially HIV and or AIDS, the impacts may be permanent and have long term to permanent cumulative impacts on the affected individuals and/ or their families and the affected communities.

10 AUTHORITY CONSULTATION AND PUBLIC PARTICIPATION

The public is classified as a group whose interest may be affected positively or negatively by the proposal of an activity or project and who are concerned with the proposal or activity and its consequences. The public should be adequately engaged in processes that affect their biophysical, social, cultural and economic environment.

For the different levels of success achieved thus far in the process of public participation many different perceptions exist with regard to the value it adds and its effectiveness. To ensure an effective process the objectives with regards to the process should be clearly defined as well as partakers' responsibility, appropriate approaches and techniques. The level of engagement considers the social profile of stakeholders, with context related to the issue of literacy and spatial scale of the activity.

The Public Participation Process (PPP) is a cornerstone of any EIA. It is an integral requirement of the National Environmental Management act (Act 107 of 1998). The nature and manner in which the PPP should take place is governed by Chapter 6 of the Environmental Impact Assessment Regulations (GN No. R.543 of 02 August 2010). This chapter outlines the PPP which should be advertised on site and in the media, the requirement of maintaining a register of Interested and Affected Parties (IAPs) and the entitlement of registered IAPs to comment on written submissions to the decision-making authority, i.e. the Department of Environmental Affairs (DEA). The process followed during the PPP has taken into account all aspects of public participation as stipulated in legislation and relevant guidelines.

10.1 Public Participation Process

The principles of the National Environmental Management Act (NEMA) govern many aspects of EIAs, including public participation, the provision of sufficient and transparent information on an ongoing basis to the I&APs to allow to comment.

The PPP is primarily based on two factors, firstly the ongoing interaction with the EAP and the project team in order to achieve integration during the environmental assessment, technical assessment and consultation. Secondly, to obtain the issues to be addressed early on in the process, with the latter half of the process designed to provide environmental and technical evaluation of these issues. These findings are presented to I&APs for verification that their issues have been captured correctly, have been interpreted correctly and for further comment, if required.

10.1.1Objectives of Public Participation

The PPP is designed to provide and make information accessible to IAPs in an objective manner to assist them:

- During the Scoping Phase:
    - Register as an I&AP
    - Raise concerns and issues they may have for inclusion in the EIA process
- During the Impact Assessment Phase:
    - Verify that their issues have been considered by the specialist and technical investigations
    - Comment on the findings of the EIA

10.1.2 Press Advertising

Advertisements were placed in the following newspapers:

- Regional Newspaper / local newspapers

Background Information Documents were forwarded to relevant Ward Councillors and union representatives making them aware of the meetings and availability of Draft EIR Report for them to comment on the reports.

10.3 Public review of Draft EIA Report

The Draft EIA Report will be sent to I&APs and government stakeholders and posted on different public areas for review and comment from July 2018 to September 2018 . The reports will be sent to:

- Cape Winelands District Municipality;

- Witzenberg Local Municipality;
- Namakwa District Municipality;
- Karoo Hoogland Local Municipality;
- Central Karoo District Municipality;
- Laingsburg Local Municipality;
- Prince Albert Local Municipality;
- Beaufort West Local Municipality;
- Pixley-ka-Seme District Municipality;
- Ubuntu Local Municipality.
- Farmers Union,(Victoria west farmers, agri central Karoo,Koup Farmers association,Laingsburg farmers association, Merweville Farmers Association, Agri west cape
- Department of Agriculture, Forestry and Fisheries
- Western Cape Department of Environment Agriculture and rural Development
- Department of Water Affairs (now renamed to the Department of Water and Sanitation)
- Karoo National park
- Wind energy Farms (ACED Hidden Valley,
- Capenature

Public meetings/ focus group meeting

I&APs have been invited through the local community leaders, farmers Union for Public meetings.

Comments and Response Report

Section 56 of GNR543 dictates that comments received from IAPs should be kept and appropriate responses recorded. Issues and comments raised by I&APs over the duration of the EIA process have been recorded into the Comments and Response Report (refer to Appendix 15). A summary of the key issues raised to date includes:

- Social and socio-economic issues
- Visual issues
- Avifauna Issues
- Heritage issues
- EIA process comments/issues
- Technical comments/issues
- Issues related to the proposed route alternative corridors
- Servitude comments/concerns
- Compensation comments/concerns
- Existing infrastructure
- Proposed/planned infrastructure/developments
- Eskom distribution related issues
- Communication issues:

Where possible, comprehensive responses to issues raised have been included in the Comments and Response Report by the EIA project team as well as Eskom Transmission. Where issues are raised that the EIA team considers beyond the scope and purpose of this EIA process, clear reasoning for this view is provided. Specialist investigations included desktop evaluations of existing information (including that provided by land owners during the PPP), as well as detailed field surveys (including field surveys by the ecologist specialist and heritage specialist) of the identified corridors. In undertaking field assessment and public participation, effort was made to contact all affected landowners.

11 CONCLUSIONS DRAWN FROM THE EIA PROCESS

During the course of the EIA investigation, specialists' input was obtained for all aspects of the proposed Transmission power line along with the associated impacts on the receiving environment. Specialist assessment of route alternatives along with a comparative assessment of specialist findings helped elucidate the preferred route alternatives from a purely specialist perspective. The detailed PPP will give input on the potential impacts of the power line and have been used to inform the final route selection.

Possible impacts that have been identified are detailed below (according to the relevant specialist field) and significant impacts are detailed with possible mitigation measures proposed in order to reduce the cumulative impact of the development. It must be borne in mind that a Transmission power line does not only provide benefits to a small number of individuals in a limited area but is part of the national electricity grid which benefits the nation as a whole.

11.1 Avifaunal perspective

Whilst much of the distribution and abundance of the bird species in the study area can be explained by the composition of the natural vegetation, it is as important to also examine the modifications which have changed the natural landscape, and which may have an effect on the distribution of power line sensitive species. These are sometimes evident at a much smaller spatial scale than the biome types, and are determined by a host of factors such as vegetation type, topography, land use and man-made infrastructure. For purposes of the analysis in this report, the following bird habitat classes were defined from an avifaunal Red Data power line sensitive perspective (vegetation descriptions based largely on Harrison *et al* 1997):

Nama and Succulent Karoo

The Nama Karoo is dominated by low shrubs and grasses; peak rainfall occurs in summer. Trees, e.g. *Acacia karoo*, and alien species such as the Honey Mesquite *Proposis glandulosa*, are mainly restricted to watercourses, where fairly dense stands can develop. The Succulent Karoo falls within the winter rainfall region in the far west, and is characterised by succulents and shrubs, and a particular paucity of grass cover and trees. In

comparison with the Succulent Karoo, the Nama Karoo has higher proportions of grass and tree cover. The two Karoo vegetation types support a remarkably high diversity of bird species endemic to Southern Africa, particularly in the family *Alaudidae* (Larks). Its avifauna typically comprises ground-dwelling species of open habitats. Rainfall in the Nama Karoo falls mainly in summer, while peak rainfall in the Succulent Karoo occurs mainly in winter. This provides opportunities for birds to migrate between the Succulent and the Nama Karoo, to exploit the enhanced conditions associated with rainfall. Many typical Karoo species are nomads, able to use resources that are patchy in time and space (Barnes 1998). Power line sensitive Red Data species that are associated with Karoo habitat in the study area are Ludwig's Bustard, Kori Bustard, Martial Eagle, Lesser Kestrel, Secretary bird, Blue Crane, Black Harrier, and Lanner Falcon. The major expected impact in this habitat is collisions with the earthwire of the proposed power line, particularly for Ludwig's Bustard, Blue Crane, Kori Bustard and Secretary bird.

Renosterveld

Fynbos is dominated by low shrubs and has two major vegetation divisions: fynbos proper characterised by restioid, erioid and proteoid components; and renosterveld, dominated by Asteraceae, specifically Renosterbos *Elytropappus rhinocerotis*, with geophytes and some grasses. The fynbos biome is primarily present in the western part of the study area and it is represented by shale renosterveld. Renosterveld, unlike fynbos, extends into the Karoo shales, where rainfall patterns allow a high grass cover and abundance of non-succulent shrubs. Shale renosterveld shows strong affinities with neighbouring succulent Karoo vegetation (Mucina & Rutherford 2006). This biome is characterised by a high level of diversity and endemism in its botanical composition, which is not paralleled in its terrestrial avifauna relative to other southern African biomes. Power line sensitive Red Data species that may occur in the fynbos biome in the study area are Black Harrier, Martial Eagle, and Secretary bird while Ludwig's Bustard may occur sporadically, especially in ecotonal areas between Renosterveld and the Succulent Karoo. Envisaged impacts are collisions with the earthwire (mainly large terrestrial species) and displacement due to disturbance may also occur, e.g. breeding Black Harrier.

Water bodies and rivers

The study area contains a variety of man-made water bodies (e.g. the Gamka Dam, Leeugamka Dam, Floriskraal Dam and many smaller ones) and a myriad of ephemeral rivers, which are of specific importance to some Red Data power line sensitive bird species in the semi-arid study area. Ephemeral drainage lines are also corridors for woodland, which Kori Bustard often associate with, and occasionally, after good rains when pools form in the channels, it acts as a draw card for water birds, including Black Stork. During such times, small birds are attracted to the water, which in turn may attract Lanner Falcons and other raptors. Man-made dams attract a multitude of water birds, including both Lesser and Greater Flamingo, and may sometimes be used as roosts by Blue Cranes in the eastern part of the study area. Dams with shallow sloping sides are also important for large raptors for bathing and drinking. Secretary birds may be attracted to small *Acacia karoo* trees in the watercourses for breeding purposes. The major envisaged impact is collisions with the earthwire (waterbirds, cranes, flamingos and to a lesser extent raptors), and displacement due to habitat destruction.

Transmission lines

Transmission lines are an important roosting and breeding substrate for large raptors in the study area. Existing Transmission lines are used extensively by large raptors - an aerial survey conducted under the auspices of Eskom and the Endangered Wildlife Trust (Eskom Electric Eagle Project) in 2006 recorded a total of 38 large eagle nests on Transmission line towers in the study area (Jenkins *et al* 2006).Transmission lines therefore hold a special importance for large raptors. Should any new lines be constructed next to existing lines, the construction activities could lead to temporary displacement of breeding eagles, resulting in breeding failure in a particular season, or even permanent abandonment of a breeding territory (Jenkins & De Goede 2011),

Slopes

The majority of the proposed alignments are located in the topographically flat plains below the Nuwe Veld escarpment. However, in places the proposed alignments do cross steep terrain. In some instances, e.g. along the Nuwe Veld escarpment in the east between Beaufort West and the Gamma Substation, in the mountains in the west nearer to Kappa Substation (e.g. Koedoesberge, Oliviersberg, Klein Roggeveldberge), along or close to

inselbergs (e.g. Blinkfonteinseberg, Rooiberg, Three Sisters and Perdeberg) and along some of the drainage lines (e.g. Buffelsrivier) these slopes contain cliffs. These cliffs are potentially important roosting and breeding habitat for a variety of Red Data power line sensitive species, e.g. Black Stork, Lanner Falcon, Peregrine Falcon and the non-Red Data Verreaux's Eagle *Aquila verreauxii,* Jackal Buzzard *Buteo rufofuscus* and Booted Eagle *Aquila pennatus*. The major envisaged impact on these species is collisions with the proposed power line, and displacement of breeding birds due to disturbance. Steep slopes are also important in that they are generally avoided by the Red Data collision-prone Ludwig's Bustard and Kori Bustard, which prefer the topographically flat plains and plateaus.

Low impact areas

The proposed corridors run through several types of habitat, which would generally not attract power line sensitive Red Data species. For purposes of the analysis, these have all been grouped together under low impact areas. These are degraded areas, mines, urban/industrial areas, a few agricultural areas and major roads. No significant impacts on power line sensitive Red Data species are expected in these areas.

The alternative that emerged with the lowest risk score is **alternative 2**. Whereas it is acknowledged that this alternative could potentially result in significant short term temporary displacement impacts on breeding eagles on the adjoining existing transmission line, this should be weighed up against the reduction of the risk of long-term collision impacts on large terrestrial species. Placing the new line next to an existing Transmission line should reduce the risk of collisions in the long term because it creates a more visible obstacle to birds and the resident birds, particularly breeding adults, are potentially used to an obstacle in that geographic location and may have learnt to avoid it. The avifauna specialist report is included as Appendix 3.

11.2 Social perspective

The CMMC would serve as a communication channel between the community and Eskom. Members of the CMMC should include a representative each from environmental groups, civil society, ward councillors, government departments, construction teams and Eskom. The CMMC will play an important role in executing the proposed mitigation measures. It is anticipated that most social impacts pertaining to the power line will be experienced in the

pre-construction and construction phases, with minimal impacts in the operational and decommissioning phases.

Each of the three Options / alternatives shows an equal number of impacts, of equal type and range. This is so because the environment in which the project is proposed (for each of the three routes), is almost identical in terms of habitation and usage.

This study, if compelled to recommend a route for this project, would recommend the following:

Primarily keep with to Alternative Route 2 but consider the following

- It is equally important that affected individuals be aware of the existing power lines, farm portions and owners to make informed decisions;
- To fully understand the direct economic impacts that will be experienced by each landowner in the widely farmed area, it is recommended that individual economic audits/cost benefit analyses be undertaken for each prior to signing any contractual agreements with Eskom;
- The option to run the new line closer to the old line, which rests largely north of alternative Route 2 power line, which runs closer to N1 all the way to Beuafort West.
- Keep with the intended routing of the line closer to the Nelspoort area.

The social specialist report is attached in Appendix 4.

11.3 Visual perspective

The impact of alternative 2 on visual receptors varies between residents, tourist and motorists. Alternative 2 lies in the less significant visual impact on tourist and residents as compared to other alternatives. The public association with Transmission lines and major public road is a common perception, which makes the coexistence of these two features more acceptable.

It is highly probable that the proposed 765kV Transmission power line will have at least a medium negative impact on the local visual environment in the short term during the

construction phase. During the operational phase, the significance of impact is predicted to be medium in the long term i.e. the impact will only cease after the operational life span of the project.

Mitigation measures are not feasible after the route has been chosen i.e. mitigation can only take place in the routing of the line to avoid conflict areas. Therefore mitigation of any significant kind is not achievable during the operational phase.

The visual impact assessment report is attached as Appendix 5.

11.4 Ecological perspective

Based on the impact assessment results, it is evident that there are several possible impacts on the floral and faunal ecology within each area of sensitivity. In the consideration of mitigation it is assumed that a high level of mitigation takes place in line with best practice protocols but which does not lead to prohibitive costs. The most significant impact in terms of floral ecology is loss of habitat due to vegetation clearing prior to construction of support structures that will most likely be lost permanently if this impact is not effectively mitigated. However, with adequate planning of the corridor in order to avoid areas of increased sensitivity, impact on floral habitat can be significantly reduced. Many of the floral species in the region are very habitat specific and grow extremely slow, therefore rescue and relocation may not prove feasible for all species. Therefore, it will be necessary to undertake a walk down of the proposed support structure locations of the selected development corridor and associated construction corridor in order to identify niche floral habitat supporting cryptic species that could be avoided during the planning and construction phases.

Impact on faunal ecology would most likely be less significant in comparison to floral ecology. Fauna are more mobile and can therefore move away from areas where construction is taking place. However, many faunal species such as reptiles and amphibians do require specialised habitat such as rocky outcrops and riverine habitats that, if impacted upon by the proposed activities, could result in loss of individuals as well as long term loss of habitat.As with the walk down of the high sensitivity floral habitat a walk down of high sensitivity faunal habitat would also reduce the impact significance. In addition, sensitive faunal species encountered during construction activities should be rescued by a qualified

person and released into similar surrounding habitat.

If all findings are taken into consideration option 1 is considered the least sensitive in terms of faunal and floral conservation, followed by option 2 and then option 3. However, all options do traverse sensitive habitat and it is recommended that an option be chosen that follows an existing transmission line corridor. Furthermore, it is recommended that support structure placement be ground-truthed prior to construction by means of a site walk down within areas considered to be of increased conservational value in order to attempt to avoid the disturbance of smaller niche habitats such as koppies, outcrops and rivers as far as possible which invariably play host to more endemic and sensitive taxa that are of conservation concern.

After conclusion of the faunal and floral assessments, and taking into consideration that expansion of power supply in South Africa is a necessary requirement for socio-economic development, it is the opinion of the ecologist that the proposed development of the Transmission line be considered favourably, provided that the recommendations below are strictly adhered to:

- All footprint areas should remain as small as possible and vegetation removal kept to a minimum. In this regard specific mention is made of the need to avoid site clearing between tower positions in order to minimise the impact footprint of the proposed development. This is particularly important in areas of high and very high ecological sensitivity;

- All Species of Conservational Concern (SCC) and plants considered to be of medicinal value should be marked during the walk down of the preferred corridor, prior to commencement of construction activities. Marking of SCC should be undertaken by a suitably qualified and appropriately experienced Botanist;

- Relevant permits should be obtained for rescue and relocation of any SCC and protected floral species identified;

- All SCC individuals encountered during the walk down or construction phase of the development should be rescued and relocated to the nearest similar habitat to that from which it was taken, by a suitably qualified specialist;

- Care should be taken if chemical methods (herbicides) are to be utilised for both vegetation clearing prior to construction as well as alien vegetation removal post-construction. Spill or indiscriminate use of herbicides could result in the loss of indigenous floral individuals or habitat;
- All areas surrounding construction footprints should be kept off-limits to construction vehicles and personnel;
- Wherever possible, develop crossings of sensitive areas (wetlands, ridges and mountains) at 90 degree angles to the features to prevent the extent of the areas disturbed;
- Wherever possible, the Transmission line should follow existing Transmission line corridors. Where formal or informal protected areas will be crossed, it is recommended that the line be constructed as close to the property boundary as possible;
- Proliferation of alien and invasive species is expected within disturbed areas. These species should be eradicated and controlled as needed based on sound monitoring to prevent their spread beyond the footprint;
- Specific eradication recommendations for alien and weed species:
- No indiscriminate driving of vehicles through open veld should be allowed during the eradication of alien and weed species;
- Prevent run-off from work areas entering floral habitats within surrounding areas;
- Impacts on wetland features should be managed to minimise impacts with special mention of erosion and sedimentation;
- Implement waste management as contemplated in the EMPr in order to prevent construction related waste from entering the wetland environment;
- Provide a sufficient amount of dustbins near construction camps to ensure no littering takes place;

- Provide appropriate sanitation facilities for the duration of the proposed development and remove all waste to an appropriate facility;
- Service and refuel construction vehicles in a designated area or off site;

All waste , with special mention of waste rock and spoils and remaining building material should be removed from the site on completion of the project,

All soils compacted as a result of construction activities falling outside of the servitude and construction footprint areas should be ripped and profiled. Special attention should be paid to alien and invasive control within these areas. Alien and invasive vegetation control should take place throughout all phase to prevent loss of floral habitat,

as far as possible existing roads should be taken of the following:

–Design tracks to cross open veld at 90 degree angles to avoid as much natural vegetation possible.

- Tracks should not traverse wetlands, rivers or outcrops; and
- Instate a speed limit of 40km/h where tracks cross open veld to reduce the amount of dust created.
- It is recommended that a speed limit of 40km/h is implemented on all access roads in order to minimise risk to fauna from vehicles;
- No trapping or hunting of fauna is to take place. Access control must be implemented to ensure that no illegal trapping or poaching takes place;
- Ensure that migratory connectivity is maintained where appropriate, especially where temporary tracks need to cross sensitive faunal habitat;
- Rescue and relocate faunal species prior to construction within areas earmarked for support structures as well as temporary tracks. Relocation should be done by a qualified person to ensure individuals are not harmed during the rescue process; and

- No fire should be allowed during any phase of the development.

- The ecological impact assessment report is attached as Appendix 6.

11.5 Heritage perspective

Alternative 2 is assessed as the preferred power line route. The proposed new power lines in proximity to existing power lines including the first 765kV line along most sections of the proposed route. It is clear from field assessments that in all environments except the extremely sensitive, the effect of accumulating impact where resources have already been impacted is preferable to creating new infrastructural corridors in intact environments.

Mitigation measures to reduce the negative impacts along certain local sections of the route have been recommended. It is recommended that Alternative 2 be relocated south of and adjacent to the existing first 765kV line due to high negative impacts on farmsteads Taaibosfontein, Hartebeesfontein and Buiterug, and to reduce the impact on the Karoo National Park, a provincial heritage resource.

The negative impacts on Merweville of siting the proposed line between the town and its cemetery, and closer to the historical settlement than the newly constructed can be mitigated by positioning the line south of the 1st 765kV line and outside of the spatial arrangement of the town. The topography surrounding Merweville ensures that if the line were relocated south, impacts on Merweville would be neutral.

All sites are protected by law: a permit would be required if any site is to be destroyed or graves to be shifted. Mitigation measures, if necessary, would need to be formulated and acted upon. From a heritage perspective, the proposed Transmission power line is not expected to have a high negative impact since the tower positions will be inspected by a qualified archaeologist prior to final sitting and construction taking place.

The Heritage Impact Assessment report is attached as **Appendix 7**.

11.6 Palaeontology

Due to the fact that it would be impractical and very expensive for a qualified palaeontologist to do a walk down for the potentially fossiliferous areas in a wide corridor along each proposed route, it would be more practical to and cost effective to employ a palaeontologist

to do a surface survey only along the preferred route and sites where the proposed infrastructure such as access roads, buildings and substations are going to be built. This field survey will indicate which areas along the route are more palaeontological sensitive than others and where construction should be avoided. It is also advised that the palaeontologist should salvage any highly scientifically significant fossil he or she may encounter during the field survey and donate it to the South African Museum in Cape Town.

None of the proposed routes for the Transmission lines have a clear advantage above the others from a palaeontological perspective. Alternative 1 has a slight advantage above the others because runs over a significant distance of Ecca Group rocks which, except for the Whitehill Formation is relatively fossil poor. However, it is the only line which passes over the *Eodicynodon* Assemblage Zone.

It is also important to mention that excavations are not necessarily detrimental to palaeontology. In many cases we would not have known of a fossil's existence if it were not for it being exposed during mining or construction. The success of the venture from a palaeontological perspective depends, however, on the diligence of the Applicant and the quality of the surface survey.

Mitigation

The responsibility of the recording of fossil localities and the collection of samples such as trace fossils and plant fossil material will fall upon the Applicant as specified in the EMPr. Fossil localities should be recorded in all cases by means of photographs and GPS readings and written up in a log book with the date, locality, photograph number and short description of the site.

In the case of trace fossils and plant fossils, it would be sufficient for the Applicant to collect samples from areas being excavated for construction. In the case of *Mesosaur* or fish fossils these should be collected in the rocks in which they occur and kept aside for a palaeontologist to collect for an acknowledged fossil repository such as the South African Museum in Cape Town. No attempt must be made to remove the fossils from the rock further.

It is further recommended that a palaeontologist be appointed to undertake a site visit to

determine whether fossils are exposed in the area earmarked for development in the area where Lower Beaufort strata are exposed. This survey would of course be limited to a surface inspection only. In the event of fossils being uncovered during the construction phase, a photograph and record of the position of fossiliferous material will be taken. If the fossiliferous material is going to be damaged during construction, the Applicant could make an attempt to salvage it and store it safely in order for a professional appointed palaeontologist to collect it at his or her earliest convenience. If however the fossil is part of a skeleton or too big or delicate to remove, palaeontological assistance should be called for immediately. Little harm will come to a fossil if it could be collected simply by picking it up (as long as it is numbered and the locality is recorded by means of GPS), but actual excavations should be left to a professional palaeontologist. A professional palaeontologist should be appointed to salvage and collect fossiliferous material from the site which is exposed during construction.

The excavations and collection of fossils should be performed by a qualified palaeontologist and with a permit from the South African Heritage Resources Agency. The fossils should preferably be donated to the South African Museum.

It is will be also a great advantage that the Contractor's Environmental Officer (EO) be sent to the South African Museum where he or she must familiarise him or herself with the fossils to be expected in the areas where development is going to take place. It is important for the Contractor's EO to study fossils in their unprepared state as well and not only prepared (cleaned) fossils and fossil reconstructions because that is not how they will appear in nature. It is very important that the Contractor's EO accompanies the palaeontologist on his or her site visit in be sensitised to the occurrence and appearance of fossils in their natural state.

The Paleontological Impact Assessment Report is attached as **Appendix 11**

11.7 Surface water

Transmission power lines are not typically associated with impacts on surface water resources, as the power lines do not have a physical footprint over the length of the power line other than the footprint of each tower position. As the lines are strung above the ground and as the towers are spread approximately 450-500m apart, most wetlands and rivers are

able to be 'spanned' by the power lines and thus avoided from being physically affected. Power lines can however be associated with impacts on surface water resources if the towers are placed within a river or wetland, or if the vegetation within the riparian zone under the lines is cleared. The process of constructing the power line can also cause impacts on surface water resources, especially if certain mitigation measures and procedures are not followed.

11.7.1 Placing of towers within surface water features

Towers / electricity pylons are large structures and require foundations in order for the structures to remain standing. The process of excavating the foundations would disturb the substrate and entail the removal of soil and vegetation from parts of the footprint, as well as the potential damage to vegetation due to the movement of construction machinery in the vicinity. If towers are constructed within a wetland, this activity could potentially adversely affect the wetland soil and vegetation through the compaction of wetland soils, the trampling / smothering of wetland vegetation and the resultant exposure of wetland soils that could result in their desiccation and subsequent erosion. The presence of concrete, as well as machinery which may leak fuel into the wetland could result in the introduction of pollutants into the wetland. The movement of heavy construction machinery into the wetland could result in the alteration of the sub-surface hydrology of the wetland by creating conduits for the movement of water in the wetland. The placing and construction of a tower in a wetland would also require a licence from the Department of Water and Sanitation as this activity would fall under two of the specified water uses under Section 21 of the National Water Act: (c) diverting the flow in a watercourse and (i) altering the bed, banks, course or characteristics of a watercourse.

11.7.2 Clearing of Vegetation within the riparian zone

In certain cases, riparian vegetation is cleared from the riparian zone directly underneath a power line span, and in some cases the entire width of the power line servitude is cleared. Vegetation higher than 4m is typically cleared under power lines, as this is above the height of the minimum clearance that needs to be maintained between any object and the lines and conductors. In other cases, vegetation (especially woody vegetation) of a lower height than 4m is also cleared from under the lines, as this vegetation poses a fire risk. In this case, clearance of all vegetation from a riparian zone can occur. This clearing of vegetation is a particularly important impact in the context of the riparian zones which occur along most of

the rivers, and drainage lines in the study area. This practice of felling all vegetation impacts negatively on the structural integrity of the riparian zone. Importantly it introduces the edge effect which can have an important effect on biota within the riparian zone, and create a very convenient 'entry point' into the riparian zone and wider riverine corridor for alien invasive vegetation. As stated above, riparian zones of rivers are ecologically very important and typically contain a different suite of biota to the surrounding Karoo habitats. Levels of biodiversity for certain types of biota, e.g. birds, are elevated in this area. Riparian areas act as an important refuge for many species and are important movement corridors. The woody vegetation is also typically very important in providing stabilisation for the banks of the surface water features along which they occur as well as the unconsolidated alluvial sandy material that has been deposited *in situ*, and their felling can greatly reduce the stabilising effect of their roots, as the roots rot over time. This would result in the increased erosion potential (by water and Aeolian deflation (wind-based erosion)) in this area, a factor which is exacerbated by the exposure of soils in the cleared strip, and by the cleared strip being used as a convenient pathway to the river for cattle.

11.7.3 Other construction-related impacts

Even if towers are not placed in wetlands, the process of constructing the power line could potentially impact on surface water resources. A number of activities, especially those relating to the access of construction vehicles along the alignment of the power line being constructed can result in damage to and impacts on surface water resources. Construction vehicles and machinery that move along the alignment of a power line during construction would typically cross rivers and drainage lines. Accesses across these surface water resources may need to be constructed should existing accesses for vehicles not exist (this is often the case as power lines can run in rural settings in which there is little human infrastructure). There are large parts of the study area traversed by the corridor alternatives in which there is very little formal access. Accordingly, the following impacts on surface water can result from construction activities along the power line servitude:

- Uncontrolled interaction of construction workers within watercourses that could lead to the pollution of the water in these drainage systems. Examples of this may be the washing of equipment in water within the watercourse, dumping of construction material into the drainage system, etc.

- The lack of provision of adequate sanitary facilities and ablutions on the servitude may lead to the direct or indirect faecal pollution of surface water resources.
- Leakage of hazardous materials, including chemicals and hydrocarbons such as fuel, and oil, which could potentially enter nearby surface water resources through storm water flows. This may arise from their incorrect use or incorrect storage.
- The incorrect mixing (batching) of cement could lead to siltation and contamination of watercourses.
- Storm water management and soil stabilisation measures in cleared areas could lead to erosion that may lead to siltation of nearby watercourses.
- The placing and use of access roads for construction traffic across watercourses may lead to the erosion of banks and disturbance of riparian vegetation that may trigger the further development of gulley (donga) erosion.
- Access of vehicles through rivers and riparian zones that can cause a significant adverse impact on the hydrology and soil structure of these areas through rutting (which can act as flow conduits) and through the compaction of soils.

The surface water study has identified the surface water features within the corridor alternatives that could be impacted upon by the proposed Transmission power line. All surface water features must be treated as sensitive features of the natural environment. However, a number of surface water 'hotspots', especially surface water features of extensive size, have been identified in the area. It is in these areas that the line is most likely to have an impact on surface water features. The potential impacts of the proposed construction and operation of the proposed Transmission line have been scoped. The most important potential impacts on surface water resources include the placing of towers within surface water features and the concomitant physical disturbance of the riparian zone, as well as the potential damage to surface water resources through various construction practices such as placing of roads through these features.

The identification of surface water hotspots has enabled the comparative assessment of alternative alignments along the Northern Corridor where these have been presented. In this

context the Southerly-aligned (N1) Alternative 3 corridor is least preferred, with the other two corridor alternatives having fewer hotspot areas.

The Wetland Delineation and Impact Assessment Report is attached as Appendix 8.

11.8 Tourism perspective

From a tourism perspective visual impacts and potential disruption from construction activities are the greatest possible issues.

Tourism is a sensitive industry based primarily on subjective perspectives of visitors to an area. In destinations where tourism is focused on outdoors or based on natural elements, such as wilderness, sky, rivers, veld and wildlife, the tourism value rests largely on the experience which can be provided. The study area has the potential for negative visual impacts on tourism from the erection of a Transmission line. This can potentially be an issue during the day as well as during the night. During the day, the line can potentially obscure views, degrade scenery and decrease the scenic value of the area or part of the area. Additionally, any lighting that may potentially be used may extend the visual impact into the night in a part of the country renowned for its night skies and stargazing.

There is also the potential that construction activities carried out in close proximity to tourism enterprises or to places where tourists visit will negatively impact on and detract from the tourist experience. Such impacts could include noise, site disturbance during the construction phase, dust from vehicles and visual and aesthetic impacts from such construction and crew camps on the feeling of tourists having a serene and secluded nature experience. The location of work camps in close proximity to tourism enterprises can also be a potential issue in terms of noise, light, and feelings of solitude that tourists are seeking out.

There are reports in the area of problems with the reliability and quality of the power supply. If developments such as Transmission lines can lead to better services for local people and for tourism enterprises seeking to provide a high standard of service, then there is potential for a positive impact, or spin off, from the development. By better servicing areas with electricity, this can create an environment where tourism can emerge or improve.

The Tourism Impact Assessment Report is attached as Appendix 9.

11.9 Agricultural perspective

There are two factors that influence the significance of all agricultural impacts. The first is that the proposed development is almost entirely on land of extremely limited agricultural potential that is only suitable as non-arable, low potential grazing land. The second is that the actual footprint of disturbance of the power line is very small in relation to available, surrounding land.

- Because of these factors, there will be negligible impact of the development on agricultural production and livelihoods.
- The dominant soils in the study area are soils with minimal development, usually shallow, on hard or weathering rock. The dominant soil forms are Glenrosa and Mispah. These shallow soils are a major limitation to agriculture in the study area.
- The other major limitation is the aridity and lack of access to water.
- Agricultural land use throughout the study area is overwhelmingly grazing of sheep. There is a negligible impact of the development on any cultivated land.
- Four potential negative impacts of the development on agricultural resources and productivity were identified as:
- Loss of agricultural land use caused by direct occupation of land by the footprint of the power line infrastructure (medium significance during construction phase; low-medium significance during operational phase; no mitigation possible).
- Soil Erosion caused by alteration of the surface run-off characteristics (during construction phase - low-medium significance without mitigation and low with mitigation; during operational phase - medium-high significance without mitigation and low with mitigation).
- Loss of topsoil in disturbed areas, causing a decline in soil fertility (low significance without mitigation and very low with mitigation; only occurs in construction phase).
- Degradation of surrounding veld due to vehicle trampling (low significance without mitigation and very low with mitigation; only occurs in construction phase).

The most important agricultural parameters for assessing impacts in the context of the study area are slope steepness, land capability, grazing capacity, agricultural land use, and the occurrence of any agriculturally sensitive areas. A comparison of these parameters along the three proposed alternative routes shows negligible difference between them. Therefore, from an agricultural impact point of view, there is no preferred alternative for the power line route. The Agricultural Potential Study Report is attached as Appendix 10.

11.10 Bat Perspective

Bats play an important role in the ecosystem, benefiting both biodiversity and humans alike through the pollination, seed dispersal, and pest control services they provide. Fruit and nectar- feeding bats for instance aid in seed dispersal and pollination, upon which many of the world's economically important crop varieties are dependant. Insectivorous bats help to control agricultural pests and disease vectors such as malaria carrying mosquitoes (Kalka et al. 2008; Gonsalves et al. 2013). The important ecological roles that bats fulfil make them a keystone group that are excellent indicators of environmental disturbance (Fenton & Ratcliffe 2010). Additionally, bats represent a significant portion of vertebrate biodiversity (Simmons 2005), and are among the most overlooked, yet economically important, non-domesticated animals. The conservation of bats is therefore, in the best interest of national and international economies (Boyles et al. 2011). Unfortunately, many bat species (particularly cave-dwelling and migratory species) are susceptible to severe population crashes, as they often congregate in large numbers in specific locations are relatively long-lived, have low fecundity and slow growth rates (Hester and Grenier 2005; O'Shea et al. 2003). Consequently, disturbance of only a few populations can have a devastating impact on a species. Power lines represent one such possible disturbance, potentially negatively impacting bats both directly and indirectly through collision and electrocution, as well as habitat loss and sensory disturbance. In recognition of the environmental, health and safety aspects associated with electrical transmission lines, the International Finance Corporation (IFC) and World Bank published guidelines in 2007. In these guidelines, they highlight the risks to birds and bats associated with potential collision and electrocution, as follows:

Birds and bats may be electrocuted by power lines in one of three ways: i) Simultaneously

touching an energized wire and a neutral wire; ii) Simultaneously, touching two live wires; and iii) Simultaneously touching an energized wire and any other piece of equipment on a pole or tower that is bonded to the earth through a ground wire. Bird collisions with power lines have been shown to occur in large numbers if located within daily flyways or migration corridors, or if groups are travelling at night or during low light conditions (e.g. dense fog). In addition, bird and bat collisions with power lines may result in power outages and fires. The Bat Study Report is attached as Appendix 12

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Table 25: Summary of findings regarding route alternatives in the study area.

Study	Specialist	Alternative Preferred	Comments
Botanical Assessment	Mark Berry (Pri Sci Nat	2	Attention should be devoted to restrict disturbance as fas as practically possible to existing farm roads/ tracks in ordere to access the pylon sites. The later should be positioned on the most sisturbed or bare sites, preferably under the supervision of a suitable experienced botanist.
Avifauna	Chris Van Rooyen and Abert Foreman (Pr Sci Nat)	2	Emerged as the alternative with the lowest risk to birds. It is therefore recommended that this alignment is used
Ecology	Scientific Aquatic services. N. Van de Haar (Pr Sc Nat)	2	If all findings are taken into consideration option 1 is considered the least sensitive in terms of faunal and floral conservation followed by option 2 and then option 3. However, all options do traverse sensitive habitat and it is recommended that an option be chosen that follows an existing transmission line corridor which is alternative 2. .
Heritage	S Titlestad B O'Donoghue	2	Alternative 2 is assessed as the preferred power line route. This proposal sites the proposed new power lines in proximity to existing power lines including the first 765kV line along most sections of the proposed route. It is clear from field assessments that in all environments except the extremely sensitive, the effect of accumulating impact where resources have already been impacted is preferable to creating new infrastructural corridors in intact environments. Mitigation to reduce the negative impacts along certain local sections of the route have been

			recommended. It is recommended that alternative 2 be relocated south of and adjacent to the existing first 765kV line due to high negative impacts on farmsteads Taaibosfontein, Hartebeesfontein and Buiterug, and to reduce impact on Karoo National Park, a provincial heritage resource.
Wetland	RHDHV Paul da Cruz	1	Alternative 1 corridor, and thus the power line in this corridor would cross fewer river systems. Examples of these are the Leeu and Koekemoers river systems which are relatively narrow where crossed by Alternative 1, with a greater number of tributaries higher up in the catchment (and which are also wider in extent) being crossed by Alternatives 2 and 3. Certain of the rivers in the Alternative 1 corridor run parallel to the direction of the power line alignment in this corridor (e.g. the Bloed River), thus being able to be avoided from being crossed. Lastly Alternatives 2 and 3 cross the mountainous areas within the Klein Roggeveld Mountains .
Agriculture	Johann Lanz Soil Scientist (Pri.Sci. Nat)	No preferred alternative	The most important agricultural parameters for assessing impacts in the context of the study area are slope steepness, land capability, grazing capacity, agricultural land use, and the occurrence of any agriculturally sensitive areas. A comparison of these parameters along the three proposed alternative routes shows negligible difference between them. Therefore, from an agricultural impact point of view, there is no preferred alternative for the power line route.
Social Impact assessment	Royal Haskoning DHV Luke Moore and Kim Moonsamy	2	The proposed development is supported by the Social Impact study and within recommendation to use Route 2, which would **have less minimal impact to the communities**.

Visual Impact Assessment	Axis landscape architects Gerhard Griesel	2	Alternative 2 is regarded as the most preferred alternative. Its alignment along the existing transmission line and transmission servitude is considered to cause the least impact on the landscape character due to the reduced sensitivity of the landscape along the roads and servitudes. The impact of Alternative 2 on visual receptors varies between residents, tourists and motorists. Alternative 2's great advantage lies in the less significant visual impact on tourists and residents as compared to the other alternatives. The public association with transmission lines and major public roads is a common perception, which makes the co-existence of these two features more acceptable.
Bat	Natural Scientific Services Kate Mac Ewan	2	The power line route alternative 2 appears to be the most preferable, as it parallels existing power line infrastructure along its entire length. Alternative 1 is the second most preferable route, as it follows the N1 for a considerable distance and traverses the least amount of climatically suitable habitat and cave roosting habitat for *R. aegyptiacus.*
Paleontology	Dr Durand	None preferred	None of the proposed routes for the transmission lines have a clear advantage above the others from a palaeontological perspective. Route 1 has a slight advantage above the others because runs over a significant distance of Ecca Group rocks which, except for the Whitehill Formation is relatively fossil poor. It is the only line, which passes over the *Eodicynodon* Assemblage Zone however. It is also important to mention that excavations are not necessarily detrimental to palaeontology. In many cases we would not have known of a fossil's existence if it were not

			for it being exposed during mining or construction. The success of the venture from a palaeontological perspective depends however on the diligence of the Environmental Control Officer and the quality of the surface survey.

Table 26: Advantages and disadvanages of the alternatives

Alternative	Advantage	Disadvantage
1	It has the least amount of drainage lines/riparian areas.	has areas of highest paleontological sensitivity.
2	1.Alternative 2 is the preferred alternative, the reason being that this alternative is situated next to the existing Droërivier – Hydra 2 400kV line (between Gamma and Droërivier substations), and the Droërivier- Muldersvlei 400kV line (between Droërivier and Kappa substations), which potentially reduces the risk of collisions. Placing the new line next to an existing transmission line could reduce the risk of potential collisions in the long term, because it creates a more visible obstacle to birds and the resident birds, particularly breeding adults, are familiar with an obstacle in that geographic location and may have learnt to avoid it. 2. alternative 2 is adjacent to an existing line 765 kv line: may reduce the need for new access roads and gates. 3. Reduce levels of disturbance and habitat destruction during construction. 4. Reduces visual and landscape impacts 5.The impact of Alternative 2 on visual receptors varies between residents, tourists and motorists. Alternative 2's great advantage lies in the less significant visual impact on tourists and residents as compared to the other alternatives. The public association with transmission lines and major public roads is a common perception, which makes the co-existence of these two features more acceptable.	In terms of the number of priority (sensitive) areas, as well as wide riparian areas. This is because they generally run closely in parallel to one another and thus cross the same river systems.

3		1.Alternative 3 bisects the southern part of the IBA. The study area also overlaps partially with the Anysberg Nature Reserve, the closest potential corridor (alternative 3), is situated approximately 13km away. Located 20km south of Matjiesfontein and 20km southwest of Laingsburg, the Anysberg Nature Reserve is situated on the poorly known western fringe of the Little Karoo in a broad fynbos-Karoo transition zone. 2.Alternative 3 has a lot of bends and the more the bends the costly the route. 3.Alternative 3 should be excluded because of the high negative impacts of the introduction of new infrastructural corridors in fine grained, coherent and intact sensitive isolated cultural landscapes. There are no identified mitigations that would reduce impacts on these environments.

12. ENVIRONMENTAL IMPACT STATEMENT

From the view of the EAP(Environmental Assessment Paractitioner) the propsed Gamma to Kappa 2nd 765kV transmission powerline and the substation upgrades are economically, biophysically and socially beneficial, looking as well in the longrun where future demands will increase as well as maximize the purpose and need of the proposed development. Furthermore the project is not expected to have significant impacts on the biodiversity, social and economy , particularly if alternative 2 is used because it is running parallel the existing 1st 765 kV. If the mitigation measure stipulated on this report are adhered to during construction phase. Prior to construction phase of the project, negotiations for the servitude, tower positions and tower types should be done and agreed upon by the landowner and Eskom.

During public participations a number of concers were raised for example gate openings and lockings, animals, spead limit on the roads, and access arrangments and among others. Therefore, in agreement with Eskom , the landowners conditions will need to be adhered to during construction and operational phase of the powerline.

The Do nothing Alternative is undesirable as it does not meet the purpose and need of the client. It is not economically feasible because electricity users such as domestic uses, companies, farmers to name afew will be unable to avoid electricity intrruptions in the long run. The independent power producers will also be affected and would not benefit from future upgrades of the powerlines and substations. The findings of the specialist studies undertaken within this EIA to assessed both the benefits and potential negative impacts anticipated as a result of the proposed project conclude that:

- The significance levels of the majority of identified negative impacts can be mitigated and minimised by implementing the recommended mitigation measures listed in the EMPr, which includes the Eskom Management Guidelines for Transmission line servitudes.

By nature, the construction and operation of the 765kV Transmission power line will have a negative impact on the environment. However, when appropriate mitigation measures are implemented, the intensity of these impacts is reduced to a large extent.

The preferred alternative is Alternative 2 which starts at the Gamma substation and ends at the Kappa substation.

The impacts of the proposed power line in route Alternatives 1 and 3 have shown to be of medium and medium high significance in certain areas. Alternative 1 and 3 have ecological and more of heritage areas. Other key factors which were taken into consideration during the comparative assessment of alternatives include botanical, loss of use of productive agricultural lands to servitude requirements, the resulting consequences from loss of agricultural production job losses and the visibility of the power lines. The probability of agriculture is a major concern across the 3 alternative routes. Nevertheless, the intensity of the impact on A2 will be lower with regards to land use and also using the disturbed land from the 1st 765kV powerline.

The EAP therefore, recommends an Environmental Authorisation of Transmission power line and associated activities for Alternative 2 as compared to Alternatives 1 and 3 with the following conditions:

- Consultation with the affected telecommunications sector in order to address the traversing of telecommunication lines along or over masts and similar structures

- Where possible, use existing access roads as much as possible. The identification and construction of new access roads should be addressed by Eskom Transmission in consultation with the affected local municipalities. New access roads should benefit the movement of local people. Mitigation measures during post-construction must focus on the rehabilitation of the construction areas and access roads.

- Construction should take place outside the critical phases for agricultural operations, in particular during the final stages of pre-harvesting and/or during harvesting.

- Avoid agricultural land and preserve agricultural output by developing the Transmission line on low potential agricultural land and/or on boundaries of farms.

- Where possible, the servitude should be adjusted to avoid impacts on agricultural systems. If this is not possible, compensation must be paid for the disruption of loss of use of current and future irrigation systems, including costs incurred in the

relocation or re-establishment of systems.

- A clear and efficient communication channel must be established between Eskom and the agricultural sector including farm owners.
- Encourage and allow local businesses to provide products and services such as sanitation, catering and goods and services to instigate the benefits of the construction of the power line, especially in the communities.
- The Contractor shall employ unskilled and low skilled staff from the local areas and will not import them from outside the study area. A labour desk shall be installed at each town to source the relevant staff.
- Clearing of the full servitude should be avoided. If stripping is required, then vegetation stripping should be undertaken in a manner where the edges are organic or curvilinear rather than straight or sharp edged.
- A clear and efficient communication channel must be established between Eskom and planning authorities (Local and Regional spheres) in order to address potential incompatibilities with present and future land use.
- Avoid bird sensitive areas and, where the need is indicated, use bird flappers and bird guards on conductors and towers, respectively.
- The Contractor will appoint an Environmental Officer and a Social Officer as per the requirements in the EMPr.
- Appoint an independent and suitably experienced Environment Control Officer to ensure that all construction activities including access roads, working areas and tower assembly sites comply with the mitigation measures and or management actions.
- If feasible, all construction activities should take place during the drier periods of the year.
- Construction personnel must be inducted on wild animal awareness and safety,

including issues such as poaching.

- Develop a Fire Safety and Response Plan to deal with accidental fires and to address training requirements and reporting procedures.
- Fires must be restricted to designated areas and designed to limit the risk of spreading to the surrounding environment.
- A speed limit of 40km/h has been set for access roads and off-road activities.
- Construction activities must be restricted to daylight from 06:00 to 18:00 Monday to Friday, 06:00 to 13:00 on Saturdays and no work on Sundays or public holidays. No construction should take place at night.
- All bush clearing activities should be considered in terms of slope (steepness) and soil type
- All waste material must be collected at designated temporary waste disposal areas and transported to a licensed municipal site for disposal.
- Keep construction activity-related noise and lighting to a minimum.
- For cultural heritage resources, mitigation will vary from sampling, surveying, mapping and excavations to determine the significance of the impact.
- Avoid or minimise visual impacts on tourism-related cultural heritage sites if found on site.
- No disturbance to cemeteries. In cases where human remains are found outside a recognised cemetery site during construction, the SAPS and the relevant provincial heritage authority must be informed immediately,
- All mitigation measures as included in the EMPr shall be implemented.

13. GENERAL CONCLUSION

An EIA has been undertaken to provide the relevant environmental authorities with sufficient information for the purpose of making an informed decision. The comparative assessment of the specialist findings showed that the route alternatives are all potentially feasible with adequate mitigation measures in place. **The comparative assessment of specialist findings highlighted <u>Alternative 2 as preferred</u> over 1 and 3.**

Table 27: Preference rating

Rating Preference	Avifauna	Flora and fauna	Heritage	Botanical	Wetland	Social Impact	Visual	Bat	Palaeontology	Tourism	Agriculture
1	2	1	2	2	1	2	2	2	N/A	2	N/A
2	3	2	1	1	2	Routes 1 and 2	1	1	N/A	3	N/A
3	1	3	3	3	3	3	3	3	N/A	1	N/A

14. RECOMMENDATIONS

During the course of the EIA process, numerous specialists were commissioned to assess the various impacts resulting from the construction of the 2nd 765kV Transmission power line between the Gamma and Kappa substations. A detailed PPP was conducted to inform the EIA process and to obtain comments and concerns on the proposed project. Key I&APs were consulted to comment to enable an open discussion between all parties involved to ensure that the development results in the least significant impacts on the receiving environment.

Final route selection has been based on the specialist findings and public input, however, the over-riding impact of certain alternatives appears to be financially based (for the proponent as well as affected parties).

Mitigation measures for the numerous impacts that have been identified are detailed in this report and the individual specialist reports. These mitigation measures have been included in the EMPr. The following specific conditions should be included in the Environmental Authorisation for **Alternative Route 2:**

- All construction and maintenance activities should conform to generally accepted environmental best practice guidelines at all times. In particular, construction camps should preferably be placed in the towns and not close to natural vegetation so as to minimize the impact of illegal activities such as hunting, snaring, firewood collection.
- During the walk down the specialist should attempt to identify any breeding pairs of raptors (or any other bird species) and report them to Eskom so that during the construction phase adequate recommendations are made with respect to minimising the impact on these birds,
- The raptor nests should not require any management and should be left alone as far as possible,
- All sections of power line crossing drainage lines should be marked, only on the one relevant span.
- Power lines crossing or adjacent to any dams or open water sources should be marked,

including one span either side,

- Since it would be impractical to mark the power line through all the natural vegetation areas to mitigate for collision of species, it is rather suggested that the power line be patrolled annually and areas where collisions have occurred can then be marked reactively,
- Marking of the power line should be according to the technical specifications,
- Due to the sensitivity of the wetland areas, the difficulty in distinguishing them from the surrounding habitat, and their apparent absence from the land cover and land use data sets - it will be necessary for the Specialist to conduct a final “walk through” assessment once the exact alignment has been surveyed and each tower position has been pegged. This will allow the identification of exact spans of line that will need to be marked with a suitable marking device.
- Avoid sensitive habitats, as defined in the sensitivity assessment, when planning the power line route;
- Avoid populations of species of special concern, when planning power line route
- Use water sprayers to reduce dust emissions off road surfaces,
- Ensure effective fire control at camp and construction sites of construction crew,
- Raise awareness of necessity for fire control,
- Institute management system to react to veld fires that do occur
- Use existing access roads as service and construction roads, where possible,
- Avoid medium to tall vegetation in planning the power line route,
- Assess the planned pylon sites individually for sensitive ecological, wetland and heritage features;
- If it is necessary to cross potentially sensitive areas, then attempt to do so in a manner that will cause the least amount of fragmentation,

- Rehabilitate disturbed areas following construction and monitor erosion in areas previously disturbed until the vegetation has suitably re-established,
- Don't translocate topsoil from one area to another or bring in topsoil from other areas,
- It is recommended that a Community Management and Monitoring Committee (CMMC) be established. This committee would serve as a communication channel between the community and Eskom. Members of the committee should include representatives from environmental groups, civil society, ward councillors, government departments, construction teams and Eskom. Such a committee will play an important role in executing the proposed mitigation measures. It is anticipated that most social impacts pertaining to the power line will be experienced in the pre- construction and construction phases, with minimal impacts in the operational and decommissioning phases.
- An Environmental Officer must be appointed to ensure contractors conduct themselves in an appropriate way and to make sure that the EMPr and the conditions of the Environmental Authorisation implemented.
- It would be recommended that an entire professional team be assembled to assess tower positions for any sensitivity in order to develop a specific tower EMPr.

Recommendations pertaining to the substation works are as follows:

- Using existing access routes as much as possible during construction and maintenance of the substation.
- Limit disturbance to vegetation and rehabilitate disturbed vegetation as quickly as possible.
- The identification of the protected tree species should be confirmed before any management measures are proposed. If necessary, relevant permits must be obtained in order to relocate or destroy this individual specimen. All measures to relocate this specimen must be investigated as opposed to simply destroying it. This Environmental Impact Report presents the relevant information to the Department of Environmental Affairs and the Western Cape Department of Tourism, Environment for the purpose of

decision-making. Authority on the approval and development of the proposed activity as well as the final route alignment selection lies solely in the hands of the delegated decision maker. Nzumbululo Heritage Solutions, as independent consultants, primary involvement in the EIA process is to provide the relevant authority with access to all relevant information and in relation to the proposed activity.

15. CONCLUDING AND FINAL REMARKS

Introduction

This section concludes the Draft Environmental Impact Assessment Report for the proposed construction of 2nd 765kV power line running for approximately ±370km from Gamma to Kappa Substations in Western and Northern Cape Province. The proposed location of the power line is in an area, which has already been disturbed especially the first part of the project is concentrated with residential areas.While the other part of the study area consists of commercial farming with a mixture of sheep, cattle and crop cultivation, the preliminary study data does not anticipate permanent barriers to the proposed development. Some sections of the study area contain subsistence farming. As such, several localities along the power line route and project area are directly affected by the proposed development. Nonetheless, the proposed new power line will provide electricity to the local people and farmers and future developments in Western and Northern Cape Provinces. It is of critical importance that the proposed power line be considered for approval as proposed subject to all applicable legislative and regulatory conditions being met.

Final Remarks

The power line route is located in an area of medium to high visual quality, and every effort should be made to minimize any further disturbances on the cultural landscape. Where they exist, heritage resources such as graves sites, buildings would be protected or avoided during the proposed development. However, given that there are other significant linear developments existing in the area (power lines, railway lines, telecommunication and dirt small access roads in some areas in the farming areas, etc), and other substation sites, the proposed development will result in similar impacts to the existing infrastructure or landscape in the area.

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NZUMBULULO

Tel: 27 11 021 4937 / 015 291 3661 Email: info@nzumbululo.com Web: www.nzumbululo.com