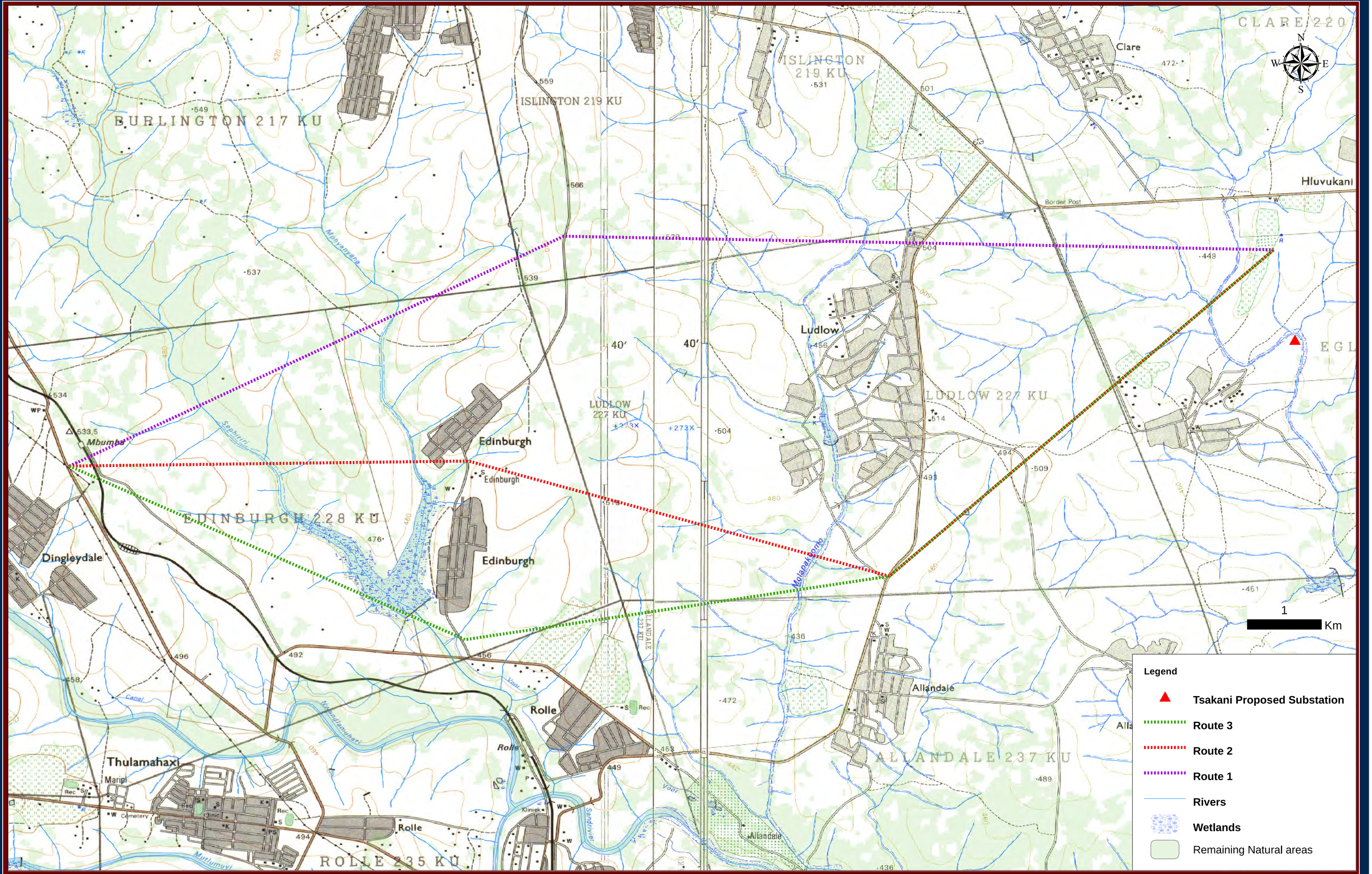
APPENDIX A

LOCALITY MAP



Proposed alternative route options

BA: Proposed Constructure of a 17km 132kV from existing Mbumbu Traction to new Tsakani Substation

Source: DWA 1: 50 000 Rivers, Surveys and Mapping, MCBP 2007

2 December 2011

SSI A DHV COMPANY
Linking People Promoting Growth

ANDOVER 210 KU

BURLINGTON 217 KU

R/217

ISLINGTON 219 KU

CLARE 220 KU

U)TRAC 132kV

1/217

2/217

X=24185.00
Y=-2727750.00
LAT: -24° 39' 14.4", LONG: 31° 14' 20.1"

X=28728.40
Y=-2727686.36

6/225

7/225

X=32878.00
Y=-2727948.00
LAT: -24° 39' 20.3", LONG: 31° 19' 29.2"

8/225

5/225

EGLINTON 225

4/225

2/225

3/225

1/228

X=18131.0000
Y=-27308.6.0000
LAT: -24° 41' 44.9", LONG: 31° 10' 44.9"

X=23018.90
Y=-2732375.00
LAT: -24° 40' 42.1", LONG: 31° 13' 30.5"

2/228

LUDLOW 227 KU

EDINBURGH 228 KU

R/228

X=23104.14
Y=-2733129.92
LAT: -24° 42' 8.8", LONG: 31° 13' 37.2"

X=28163.00
Y=-2732308.00
LAT: -24° 41' 42.3", LONG: 31° 15' 41.9"

LEYDALE 292 KU

1/292

MBUMBU TRAC-THULAMAHASHE 132kV

R/237

ALLANDALE 237 KU

1/235

2/235

2/238

ROLLE 235 KU

R/235

ROLLE TRAC-THULAMAHASHE 132kV

NEWFOREST 234 KU

R/234

3/235

DUMFRIES 245 KU

1/264

EXETER 264 KU

MERRY PEBBLE STREAM 246 KU

1/245

REFERENCE:

- 11kV Power Line
- 11kV Cable
- 22kV Power Line
- 22kV Cable
- 22/11kV Surveyed line
- 33kV Power Line
- 44kV Power Line
- 66kV Power Line
- 88kV Power Line
- 132kV Power Line
- 275kV Power Line
- 400kV Power Line
- 765kV Power Line
- Substation
- 22kV Bend pole
- 11kV Bend pole
- Toff pole
- 22kV Transformer
- 11kV Transformer
- 22kV Metering unit
- 11kV Metering unit
- Breaker
- Mini substation
- Voltage regulator
- Link
- Cable marker

- National roads
- Main roads
- Secondary roads
- Rivers
- Streams
- Contours
- Farm boundary
- Subdivisional farm boundary

Proposed Route 1 — 1. 15.48km

Proposed Route 2 — 2. 10.26km

Proposed Route 3 — 3. 17.05km

REV	REVISION DESCRIPTION	BY	CHKD	AUTH	DATE	PROJECT NO.

Eskom Distribution

AUTH:
DATE:
CHKD:
DATE:
SCALE :
DRAWN: A. Mthethwa
DATE: 09/05/2019

Network Investigation

Mbumbu SVS - NE-STM-1002-1494-00001

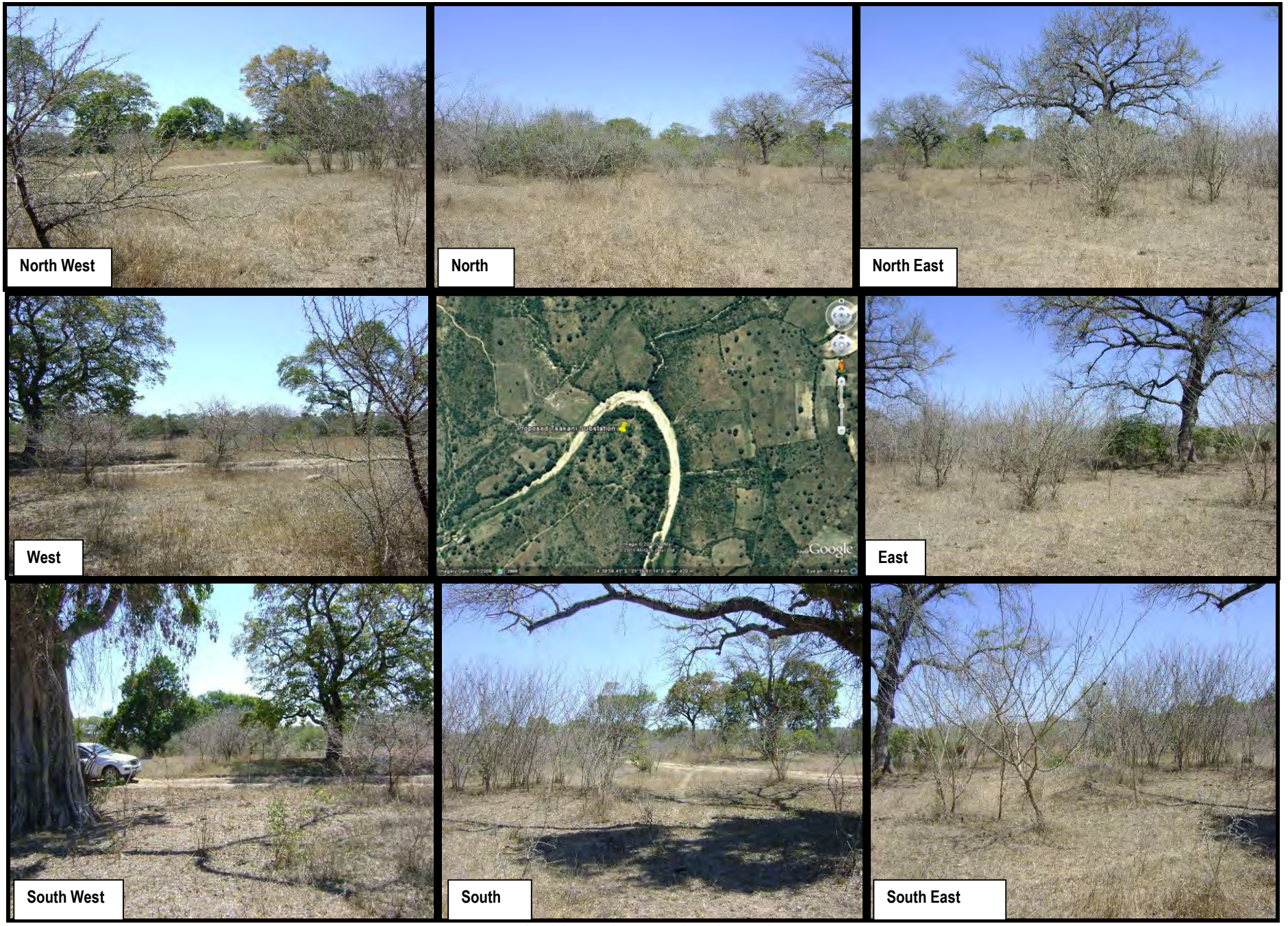
WG84/31

EXTRACT OF:

SET	SHEET	REVISION

APPENDIX B

PHOTOGRAPHS



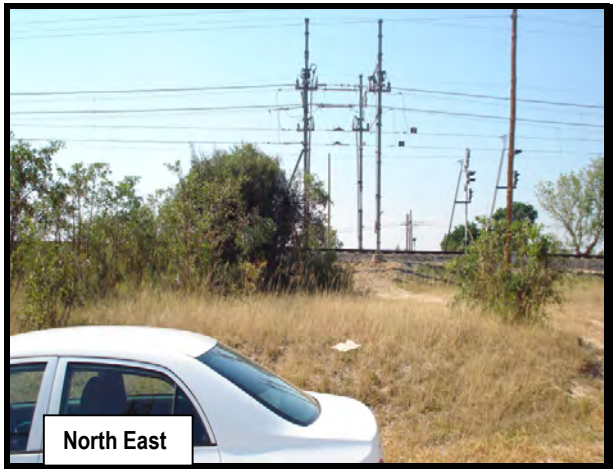
PROPOSED TSAKANI SUBSTATION

EXISTING MBUMBU TRACTION SUBSTATION

South West

South

South East



North East

North West

GREEN ALIGNMENT


North


East


South

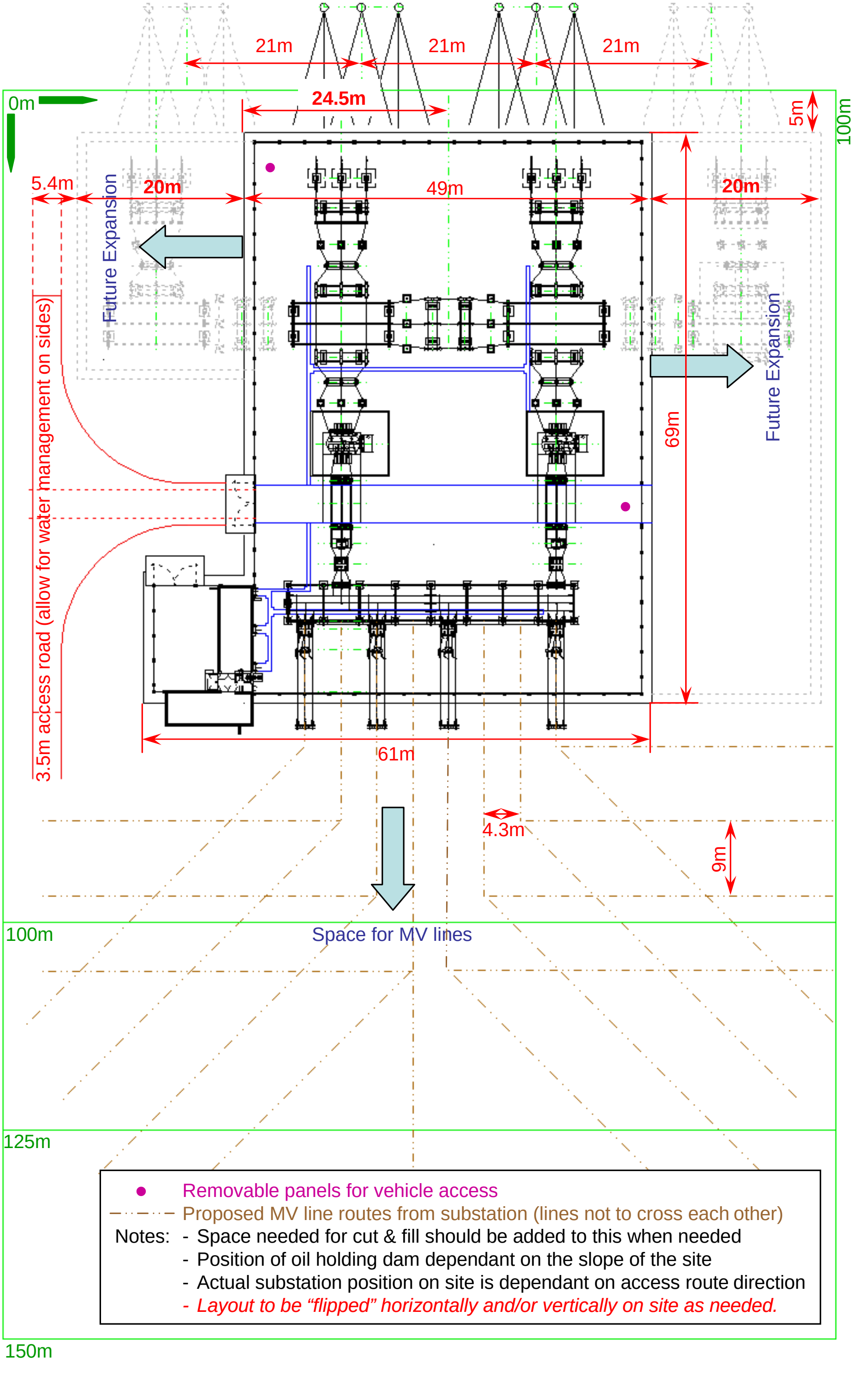

South East

RED ALIGNMENT

PURPLE ALIGNMENT

APPENDIX C

FACILITY ILLUSTRATION


21m
21m
21m
24.5m
0m
5m
100m
5.4m
20m
49m
20m
Future Expansion
3.5m access road (allow for water management on sides)
69m
61m
4.3m
9m
Future Expansion
Space for MV lines
100m
125m
150m
Removable panels for vehicle access
Proposed MV line routes from substation (lines not to cross each other)
Notes: - Space needed for cut & fill should be added to this when needed
- Position of oil holding dam dependant on the slope of the site
- Actual substation position on site is dependant on access route direction
- Layout to be “flipped” horizontally and/or vertically on site as needed.

APPENDIX D

SPECIALIST REPORTS

APPENDIX D1

AVIFAUNAL IMPACT ASSESSMENT

MBUMBU TO PROPOSED TSAKANI SUBSTATION 132KV POWER LINE

AVIFAUNAL IMPACT ASSESSMENT

OCTOBER 2011

Andrew Pearson
Endangered Wildlife Trust
011 486 1102
andrewp@ewt.org.za

EXECUTIVE SUMMARY

Eskom Distribution (Northern Region) has appointed SSI Engineers and Environmental Consultants (Pty) Ltd, to undertake the Basic assessment process for the proposed new 132kV power line from Mbumbu switching station to the proposed Tsakani substation, in Mpumalanga Province. Subsequently, the Endangered Wildlife Trust (EWT) was appointed to conduct an Avifaunal Specialist study.

In general terms, the impacts that could be associated with a project of this nature include: collision of birds with the overhead cables; electrocution; destruction of habitat; and disturbance of birds. The focal species for the study were determined, and are as follows**:** Saddle-billed Stork, Cape Vulture, White-backed Vulture, Lappet-faced Vulture, Martial Eagle, Tawny Eagle, Southern Ground Hornbill, Secretarybird, Marabou Stork, Kori Bustard and Black-bellied Bustard**.** In general, large, heavy flying birds are more vulnerable to collision with over-head powerlines, while perching Raptors are more vulnerable to electrocution, and red-listed members of both these groups occur in the area. By examining these focal species which could occur in the area, as well as assessing the availability of bird micro habitats, the possible impacts of the development were then assessed.

Sensitive avifaunal areas of the site were mapped, and were found to be associated with Rivers, Wetlands and undisturbed Woodland. These areas will require collision mitigation in the form of bird-flight diverters. To determine the exact spans requiring mitigation, an avifaunal walkthrough during the EMP phase of the project is recommended. Only “Bird Friendly” monopole structures, approved by the EWT, can be used as tower structures for this project.

It was concluded that the proposed power line can be built, on any of the three corridor options, provided that the various mitigation measures recommended in this report are implemented. From an avifaunal perspective however, the central Red Line Option is more preferred.

DECLARATION OF INDEPENDANCE

Specialist Investigator

Andrew Pearson is employed by the Endangered Wildlife Trust's Wildlife and Energy Programme as a specialist investigator for conducting avifaunal specific specialist reports. Andrew has a Four Year BSc in Conservation Ecology, certificates in Environmental Law, as well as five years experience in the environmental management field. The findings, results, observations, conclusions and recommendations given in this report are based on the author's best scientific and professional knowledge as well as available information.

Declaration of Independence

All specialist investigators specified above declare that:

- We act as independent specialists for this project.
- We consider ourselves bound by the rules and ethics of the South African Council for Natural Scientific Professions.
- We do not have any personal or financial interest in the project except for financial compensation for specialist investigations completed in a professional capacity as specified by the Environmental Impact Assessment Regulations, 2010.
- We will not be affected by the outcome of the environmental process, of which this report forms part of.
- We do not have any influence over the decisions made by the governing authorities.
- We do not object to or endorse the proposed developments, but aim to present facts and our best scientific and professional opinion with regard to the impacts of the development.
- We undertake to disclose to the relevant authorities any information that has or may have the potential to influence its decision or the objectivity of any report, plan, or document required in terms of the Environmental Impact Assessment Regulations, 2010.
- Should we consider ourselves to be in conflict with any of the above declarations, we shall formally submit a Notice of Withdrawal to all relevant parties and formally register as an Interested and Affected Party.

Terms and Liabilities

- This report is based on a short term investigation using the available information and data related to the site to be affected. No long term investigation or monitoring was conducted.
- The Precautionary Principle has been applied throughout this investigation.
- The specialist investigator, and the Endangered Wildlife Trust, for whom he/she works, does not accept any responsibility for the conclusions, suggestions, limitations and recommendations made in good faith, based on the information presented to them, obtained from these assessments or requests made to them for the purposes of this assessment.
- Additional information may become known or available during a later stage of the process for which no allowance could have been made at the time of this report.
- The specialist investigator withholds the right to amend this report, recommendations and conclusions at any stage should additional information become available.
- Information, recommendations and conclusions in this report cannot be applied to any other area without proper investigation.
- This report and all of the information contained herein remain the intellectual property of the Endangered Wildlife Trust.
- This report, in its entirety or any portion thereof, may not be altered in any manner or form or for any purpose without the specific and written consent of the specialist investigator as specified above.
- Acceptance of this report, in any physical or digital form, serves to confirm acknowledgment of these terms and liabilities.

Signed on the 24th October 2011 by Andrew Pearson in his capacity as specialist investigator for the Endangered Wildlife Trust's Wildlife and Energy Programme.

INTRODUCTION

Background

Eskom Holdings Ltd is proposing to construct a new 132kV power line from Mbumbu switching station to the proposed Tsakani substation, in the Mpumalanga Province. Eskom Distribution (Northern Region) has appointed SSI Engineers and Environmental Consultants (Pty) Ltd, to undertake the Basic assessment process for the proposed project. Subsequently, the Endangered Wildlife Trust (EWT) was appointed to conduct an Avifaunal Specialist study, and a site visit was conducted on the 22nd of September 2011.

This avifaunal study used a set methodology (discussed elsewhere) as well as various data sets. The focal species for the study were determined, and then, by looking at the focal species which could occur in the area, as well as assessing the availability of bird micro habitats, the possible impacts of the development were then assessed. In general terms, the impacts that could be associated with a project of this nature include: ***collision of birds with the overhead cables; electrocution; destruction of habitat; and disturbance of birds***.

Terms of reference

The following terms of reference were utilized for this study:

- Provide an assessment of the potential impacts on avifauna associated with the proposed construction of the 132 kV power line.
- Describe the current state of avifauna in the study area, outlining important characteristics which may be influenced by the proposed infrastructure or which may influence the proposed infrastructure during construction and operation.
- Identify Red Data species potentially affected by the proposed power lines and substation.
- Identify potential impacts (positive and negative, including cumulative impacts if relevant) of the proposed development on avifauna during construction and operation.
- Rate the significance of the impacts as per a standard set of criteria.
- Give a comparative assessment of the environmental impacts related to alternatives proposed.
- Identify mitigation measures for enhancing benefits and avoiding or mitigating negative impacts and risks.
- Identify and address any other aspects related to avifauna in the study area that should be incorporated into the reports.

METHODS

Methodology

In predicting the impacts of a proposed power line on birds, a combination of science, field experience and common sense is required. More specifically the methodology used to predict impacts in the current study was as follows:

- The various data sets discussed below under "sources of information" were collected and examined.
- The data was examined to determine the location and abundance of power line sensitive Red Data species as well as non-Red Data power line sensitive species in the study area.
- The area was visited, and thoroughly traversed, to obtain a first-hand perspective of the proposed route and birdlife, and to determine which bird micro-habitats are present and relevant to the study. This involved driving around in the study area, taking photographs, and walking certain accessible areas, to see as much as possible of the proposed substation sites and routes for the power line.
- A desk top examination, using Google Earth imagery was done to compare alternatives.
- The impacts of the proposed power line on birds were predicted on the basis of experience in gathering and analysing data on wildlife impacts with power lines throughout southern Africa since 1996 (see van Rooyen & Ledger 1999 for an overview of methodology), supplemented with first hand data.
- The impacts were assessed in a table, using pre-determined assessment criteria.
- Recommended mitigation measures for significant impacts were proposed.

Sources of information

The study made use of the following data sources:

- Bird distribution data of the Southern African Bird Atlas Project (SABAP – Harrison, Allan, Underhill, Herremans, Tree, Parker & Brown, 1997) obtained from the Avian Demography Unit of the University of Cape Town, in order to ascertain which species occur in the study area.
- The conservation status of all bird species occurring in the aforementioned degree squares was then determined with the use of The Eskom Red Data book of birds of South Africa, Lesotho and Swaziland (Barnes, 2000).
- The Southern African Bird Atlas Project 2 data for certain pentads in the study area was examined.

- Data from the Co-ordinated Waterbird Count (CWAC) project was also consulted to determine whether any CWAC sites exist in the study area (Taylor, Navarro, Wren- Sargent, Harrison & Kieswetter, 1999).
- The Important Bird Areas of southern Africa (IBA) project data (Barnes 1998) was consulted to determine its relevance to this project.
- A classification of the vegetation types in the study area was obtained from Mucina and Rutherford (2006).
- Information on the micro-habitat level was obtained through visiting the area and obtaining a firsthand perspective.
- Electronic 1:50 000 maps were obtained from the Surveyor General.
- Satellite Imagery of the area was studied using Google Earth ©2010.

Limitations & assumptions

This study made the assumption that the above sources of information are reliable. The following factors may potentially detract from the accuracy of the predicted results:

- The SABAP-1 data covers the period 1986-1997. Bird distribution patterns fluctuate continuously according to availability of food and nesting substrate. (For a full discussion of potential inaccuracies in ASAB data, see Harrison, Allan, Underhill, Herremans, Tree, Parker & Brown, 1997).
- The site visit was conducted in Spring, over which time various species may not have been present in the study area.
- During the site visit, it was not possible to access the entire length and all sections of the proposed Alternatives.
- Google Earth ©2010 Imagery may not always reflect the true situation on the ground, as some images may be outdated.
- Predictions in this study are based on experience of these and similar species in different parts of South Africa. Bird behaviour can't be reduced to formulas that will hold true under all circumstances. However, power line impacts can be predicted with a fair amount of certainty, based on experience gained by the authors through the investigation of hundreds of localities in southern Africa where birds have interacted with power lines since 1996.

DESCRIPTION OF AFFECTED ENVIRONMENT

Study area vegetation and land use

While this report is an avifaunal specialist report, vegetation and micro habitats are very important in determining avifaunal abundances and likelihood of occurrences. As such a map has been produced below (Figure 2) showing the vegetation classification of the broader area (Mucina & Rutherford, 2006). The study site consists entirely of “Granite Lowveld” vegetation type, which is also dominant in the broader study area, where elements of “Legogote Sour Bushveld” are also present. Both of these vegetation types form part of the Lowveld Bioregion, and represent elements of the greater Savanna Biome.

“Granite Lowveld” is found mainly in Limpopo and Mpumalanga Provinces and Swaziland It forms a north-south belt on the plains east of the escarpment from Thohoyandou in the north, interrupted in the Bolobedu area, continued in the Bitavi area, with an eastward extension on the plains around the Murchison Range and southwards to Abel Erasmus Pass, Mica and Hoedspruit areas to the area east of Bushbuckridge. Substantial parts are found in the Kruger National Park spanning areas east of Orpen Camp southwards through Skukuza and Mkuhlu. It is found at altitudes of 250–700m. “Legogote Sour Bushveld” occurs in Mpumalanga and Limpopo Provinces on the lower eastern slopes and hills of the northeastern escarpment from Mariepskop in the north through White River to the Nelspruit area extending westwards up the valleys of the Crocodile, Elands and Houtbosloop Rivers and terminating in the south in the Barberton area. It is predominantly found at higher altitudes ranging from 600m to 1100m.

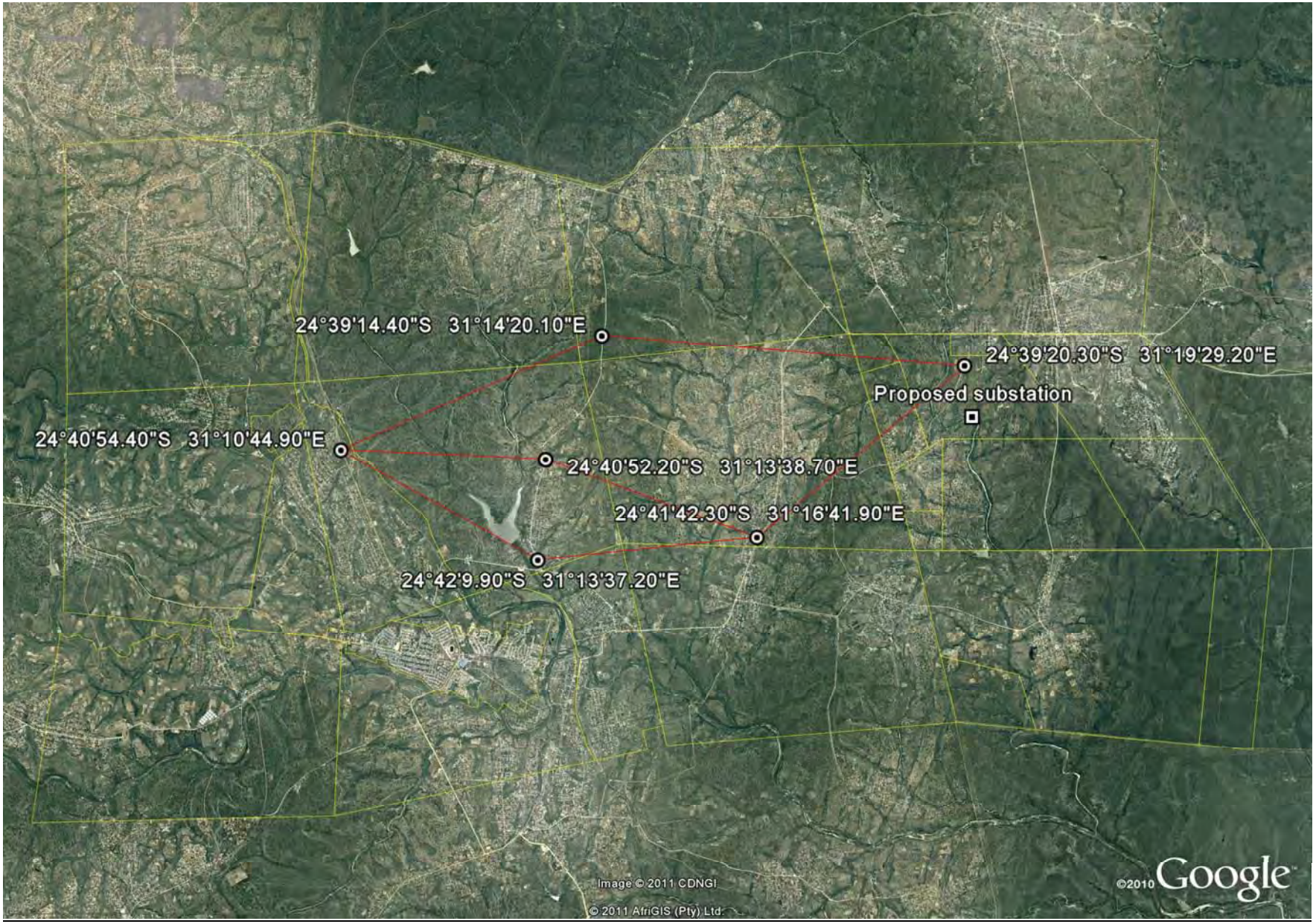


Figure 1: Google Earth image indicating the proposed site layout, as well as various GPS coordinates along the line options (Source: SSI).

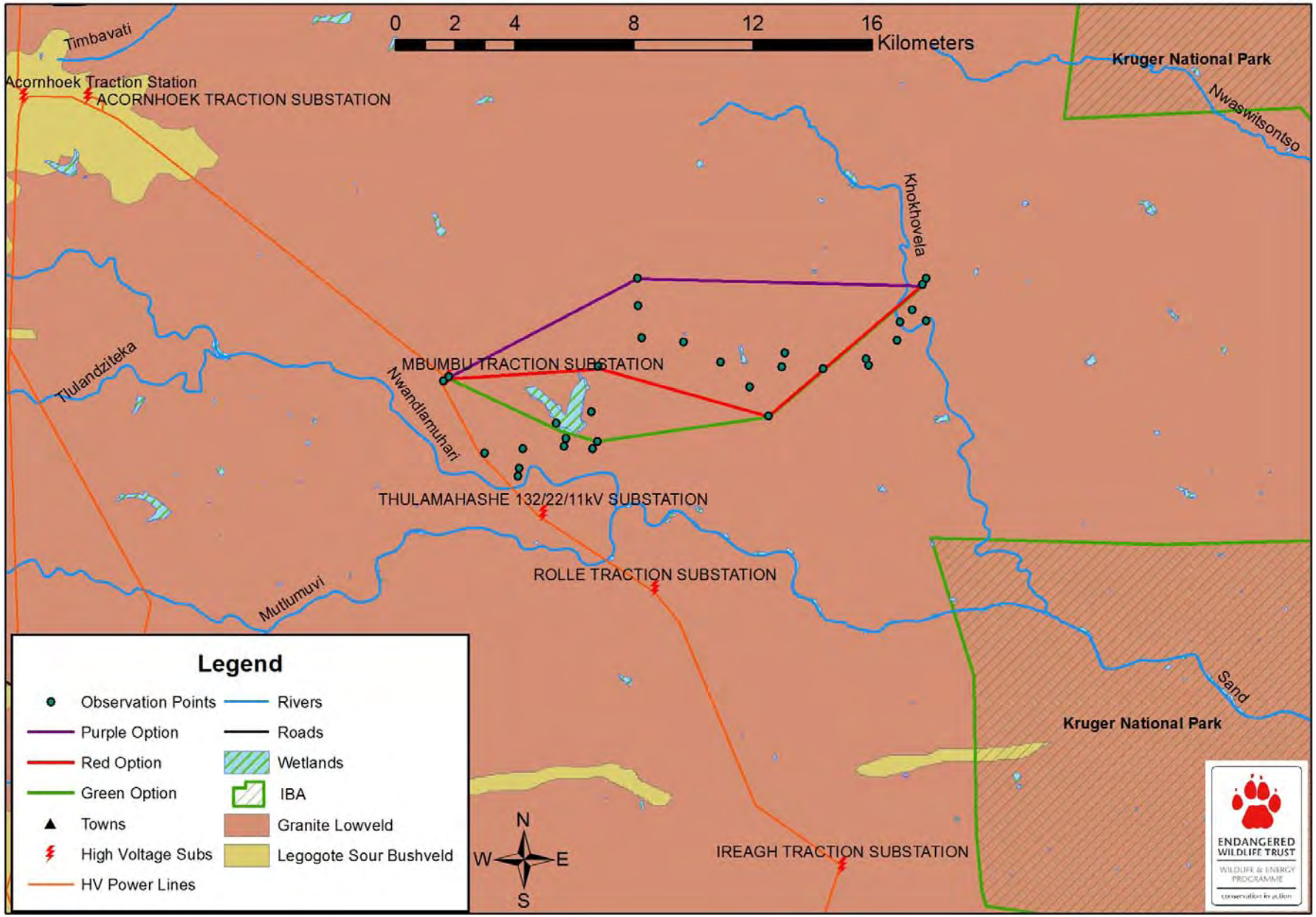


Figure 2: Map indicating existing high voltage electrical infrastructure, IBA's, Observation points, rivers and the vegetation classification for the study area according to Mucina & Rutherford, 2006.

Bird micro habitats

In addition to the description of vegetation, it is important to understand the habitats available to birds at a smaller spatial scale, i.e. micro habitats. Micro habitats are shaped by factors other than vegetation, such as topography, land use, food sources and man-made factors. Investigation of this study area revealed the following bird micro habitats.

Cultivated lands and pastures.

Cultivated lands can represent feeding areas for many bird species for the following reasons: through opening up the soil surface, land preparation makes many insects, seeds, bulbs and other food sources readily accessible to birds and other predators; the crop or pasture plants cultivated are often eaten by birds, or attract insects which are in turn eaten by birds; during the dry season arable lands often represent the only green or attractive food sources in an otherwise dry landscape.

However, there are no large areas of cultivated lands on site, but merely some small areas of rural subsistence agriculture. Some areas have been cleared of woody vegetation and pasture planted, for grazing by livestock. Relevant bird species that may be attracted to these areas include Secretarybird, Abdim's Stork and White Stork. More common species such as Francolins, Egrets, Herons and Ibises, will frequent these areas.

Figure 3: Some small scale arable lands and pastures in the study area.

Grasslands and open areas:

Grasslands represent a significant foraging and/or hunting area for many bird species. However, as the site is not within the Grassland Biome, no extensive areas of true "grasslands" exist. Patches of "grassy" areas are present though, especially in cleared areas and areas of over-grazing. Important bird species that may be found in the grassland patches of the study site are: Secretarybird, Southern Ground Hornbill, Kori Bustard and Black-bellied Bustard. The grassland patches are also a favourite foraging area for game birds such as francolins and Helmeted Guineafowl, as well as being hunting habitat for raptors such as Martial Eagle, African Marsh Harrier, Lesser Kestrel and Black-shouldered kite.

Figure 4: The patchy landscape is visible showing woodland areas as well as grassland patches, in areas that appear to have been cleared for agriculture and/or grazing.

Figure 5: “Grassy” open area on the study site, being grazed by livestock.

Dams:

Dams have become important attractions for various bird species in the South African landscape. Various waterfowl, such as Spur-winged geese, Egyptian geese, and numerous duck species, may frequent these areas and are vulnerable to collision with power lines. Various Storks may also frequent these water bodies, as well as fish eating raptors such as the Osprey and African Fish Eagle. Very few dams were observed in the study area, however there is one large man-made dam (see figure 6) approximately 3.5km south east of Mbumbu switching station, which is the largest open water body on the site.

Figure 6: A large dam observed on site.

Rivers or drainage lines:

Rivers in their true form represent important habitat for many species, including Black Stork, Yellow-billed Stork, Saddle-billed Stork, Ducks, Geese and a variety of other water birds. The wooded riparian habitat, as well as reed beds, alongside a river may provide habitat for various species such as the Hamerkop, African Darter, various cormorants, kingfishers, bee-eaters, robin-chats and numerous smaller species. Slow flowing sections of a river with overhanging vegetation supply habitat for African Finfoot, while rivers also represent feeding areas for fish eating raptors such as the African Fish Eagle. Sandbanks associated with large rivers provide habitat for various wading species including, Lapwings, Plovers, Stilts, and Sandpipers. Rivers and drainage lines also represent important flight paths for many species. The significant river on the site itself, over which all three line options will traverse, is the Khokhovela River, which is a tributary of the Sand River. On the site there are also smaller streams and drainage lines, such as those leading to and from the large dam discussed above. These may not always carry water; however these drainage lines may still serve as flight paths for several bird species. Other larger rivers in the broader study area are the Nwandlamuhari River (approximately 1.5km south and west of the Green Line option), and the Sand River (see the map in figure 2 for the location of these).

Figure 7: A stream on site showing reed bed habitat.

Figure 8: A Malachite Kingfisher observed in the same reeds as the figure above.

Woodland Savanna:

This is the most prevalent micro-habitat type, and is consistent with the major vegetation type (discussed above) on site, namely “Granite Lowveld”. It is present in varying levels of disturbance, as well as more woody areas and some savanna (woody and grassy

components present) areas. There are also riverine woodland areas, with large trees, associated with the Rivers, streams and drainage lines. Various species may occur in these micro-habitats, but the most likely species from table 1 below are: White-backed Vulture, Martial Eagle, Tawny Eagle and Southern Ground Hornbill. This habitat type, however, is more important to physically smaller bird species, which are less likely to interact directly with the proposed power lines. This micro-habitat type will also be important to physically smaller bird species, which are less likely to interact directly with the proposed power lines, such as Doves, Cuckoos, Drongo's, Wood-peckers, Barbets, Fly-catchers, Wattle Eyes, Robin-chats, and Shrikes.

Figure 9: Relatively undisturbed woodland on site.

Figure 10: A Martial Eagle, such as the one pictured above (with a Pied Crow to the right), will favour tall trees (and possibly any tall structure such as a pylon) for perching in Woodland Savanna.

Table 1 below shows the micro habitats that each Red Data bird species typically frequents in the study area. It must be stressed that birds can and will, by virtue of their mobility, utilise almost any areas in a landscape from time to time. However, the analysis in Table 1 represents each species' most preferred or normal habitats. These locations are where most of the birds of that species will spend most of their time – so logically that is where impacts on those species will be most significant.

Relevant bird populations

Southern African Bird Atlas Project 1

The primary data source used to determine the distribution and abundance of bird species in the study area was the Southern African Bird Atlas Project data (Harrison *et al*, 1997). This data was collected over an 11 year period between 1986 and 1997. Although it is now quite old, it remains the best long term data set on bird distribution and abundance available to us at present. This data was collected on the basis of quarter degree squares, which is also a relatively large spatial scale. The species recorded in the relevant quarter degree squares could have been recorded anywhere within these squares and not necessarily in the exact study area for the proposed developments. It does however provide a good indication of what could be found in the study area.

The proposed line options are situated in two quarter degree squares (QDGS's), 2431CA and 2431CB. Relevant red listed bird species (i.e. those vulnerable to either collision or electrocution such as raptors and large flying birds), are shown in the table below, as well as their relative abundance (i.e. report rate) in each QDGS. Using this data in combination with the assessment of the micro habitats available to birds in the area – an effective assessment of potential impacts of the proposed developments has been made as described elsewhere in the report.

Table 1: Relevant red listed species recorded in the quarter degree squares covering the study area (Harrison *et al* 1997)

Species	Cons. status	Report rate (%)		Preferred micro habitat	Likelihood of occurrence
		2431CA	2431CB		
Number of cards submitted		*42*	*74*		
Saddle-billed Stork	EN	4	51	Rivers, Lakes, Wetlands	Possible
Cape Vulture	VU	19	12	Grassland, Savanna, Hills and Ridges	Possible
White-backed Vulture	VU	29	76	Savanna woodland, Bushveld	Highly Likely
Lappet-faced Vulture	VU	5	64	Open woodland	Possible
White-headed Vulture	VU	5	32	Broad-leaved woodland	Possible
Hooded Vulture	VU	-	32	Woodlands	Possible
Martial Eagle	VU	5	66	Savanna, woodlands, semi-arid shrubland	Likely
Tawny Eagle	VU	14	73	Savanna, woodlands	Likely
African Marsh-Harrier	VU	2	-	Wetlands, grasslands	Unlikely
Southern Ground-Hornbill	VU	5	59	Savanna, Woodland, Grassland	Possible
Kori Bustard	VU	-	21	Open Savanna Woodland	Unlikely
Black Stork	NT	3	11	Rivers and Kloofs	Possible
Woolly-necked Stork	NT	5	32	Rivers, Wetlands, Coastal mudflats	Possible
African Openbill	NT	-	20	Rivers, Wetlands, Floodplains	Unlikely
Marabou Stork	NT	2	37	Savanna, Grassland	Possible
Yellow-billed Stork	NT	8	1	Rivers, Lakes, Estuaries	Possible
Greater Flamingo	NT	-	4	Shallow lakes, Salt Pans, Estuaries	Unlikely
Secretarybird	NT	7	74	Grassland, Open Savanna, Arable lands	Possible
African Pygmy-Goose	NT	-	8	Permanent waters with water-lilies	Unlikely
Black-bellied Bustard	NT	21	51	Open Grassland	Likely
White Stork	Bonn	1	15	Grassland, arable lands, wetland, dams	Possible
Abdim's Stork	Bonn	1	3	Grassland, Savanna woodland	Possible

CR = Critically Endangered; EN = Endangered; V = Vulnerable; NT = Near-threatened; Bonn = Protected Internationally under the Bonn Convention on Migratory Species. Report rates are essentially percentages of the number of times a species was recorded in the square, divided by the number of times that square was counted. It is important to note that these species were recorded in the entire quarter degree square in each case and may not actually have been recorded on the proposed site for this study.

Across both squares a total of 20 relevant Red Data species were recorded, comprising 1 Endangered, 10 Vulnerable and 9 Near-threatened. The White and Abdim's Storks, which are not listed, but are protected internationally through the Bonn Convention on Migratory species, were also recorded in both squares. The most important of these species for this study are the Saddle-billed Stork, Cape Vulture, White-backed Vulture, Lappet-faced Vulture, Martial Eagle, Tawny Eagle, Southern Ground Hornbill, Secretarybird, Marabou Stork and Black-bellied Bustard. These species are all reasonably abundant in the area and/or are vulnerable to collision with overhead power lines in South Africa, or electrocution. These species are thus the main focus of most of this study, and are added to the **Focal Species List** discussed below.

Southern African Bird Atlas Project 2

There was no data available for the pentads covering the study site (i.e. no cards had been submitted for the relevant pentads). However, SABAP 2 data for an adjacent pentad (2445_3120), which has 9 cards submitted, was examined for the relevant species discussed above, and is shown in table 2 below.

Table 2: Report rates from Southern African Bird Atlas Project 2, for relevant species.

	Pentad Report Rate (%)
	2845_3155
No Cards	*9*
Total Species	*233*
Saddle-billed Stork	-
Cape Vulture	11.1
White-backed Vulture	-
Lappet-faced Vulture	-
White-headed Vulture	-
Hooded Vulture	77.8
Martial Eagle	11.1
Tawny Eagle	22.2
African Marsh-Harrier	-
Southern Ground-Hornbill	-
Kori Bustard	-
Black Stork	-
Woolly-necked Stork	11.1
African Openbill	-
Marabou Stork	-
Yellow-billed Stork	11.1
Greater Flamingo	-

Secretarybird	-
African Pygmy-Goose	-
Black-bellied Bustard	-
White Stork	-
Abdim's Stork	-

Interestingly, 16 of the relevant species identified in the SABAP 1 data (i.e. Table 1), have not been recorded in the SABAP 2 data for the pentads examined, and are shown in bold in the table above. This however, does not necessarily mean that these species do not occur here, or that they have moved from the area, post SABAP1, but may merely be due to the low counting effort of the pentads, or selective micro habitat counting by the SABAP2 field counters. It must be noted though, that this pentad covers part of the Sabi Sand Reserve, and species such as Hooded Vulture, with a high report rate, may be far more scarce outside of the protected area, in the vicinity of the study site.

Coordinated Avifaunal Road-count (CAR) data

There are no CAR sites within the site or broader study area.

Coordinated Waterbird count (CWAC) data

There are no CWAC sites within the site or broader study area.

Important Bird Areas (IBA's)

The selection of Important Bird Areas (IBAs) is achieved through the application of quantitative ornithological criteria, grounded in up-to-date knowledge of the sizes and trends of bird populations (BirdLife International, 2011). The criteria ensure that the sites selected as IBAs have true significance for the international conservation of bird populations, and provide a common currency that all IBAs adhere to, thus creating consistency among, and enabling comparability between, sites at national, continental and global levels.

The site does not encompass any IBA's However; two are present in the broader area, namely the Kruger National Park, and the Blyde River Canyon IBA's. The latter is too far (<20km) from the site, and too different in terms of habitat, to be considered further in this study. The Kruger National Park however, is situated to the north, east and south of the study area, with its closest point being less than 8km from the study site, and this IBA is discussed in more detail below.

Kruger National Park (ZA001)

Kruger National Park (KNP) is situated on the southern portion of the Mozambique coastal plain in the lowveld of the Northern Province and Mpumalanga. The park is roughly rectangular in shape, stretching 320 km from north to south and 65 km from east to west. The park is known to support more than 490 bird species, about 55% of the species found in the southern African sub region. The diversity of birds can be attributed to the variety of habitats present and the ecotonal nature of the area. The park supports the healthiest populations of scavenging bird species (e.g. Vultures) in South Africa. The rivers, flood-plains, pans, dams and vleis are important for many wetland-dependent and associated birds, such as Black Stork, which breed in the gorges of the nearby Lebombo mountains, Woolly-necked Stork, African Openbill, Saddle-billed Stork and White-crowned Lapwing. Several wide-ranging species, which are now rare outside South Africa's large national parks, are locally common in KNP, including the country's largest populations of Marabou Stork, Hooded Vulture, White-backed Vulture, Lappet-faced Vulture, White-headed Vulture, Martial Eagle, Bateleur, Tawny Eagle, Kori Bustard and Southern Ground Hornbill. Cape Vulture regularly forage within the park (BirdLife International, 2011).

Personal observations

Appendix 1 shows the sightings list of birds observed on site, during the site visit. This list is merely for indicative purposes, and that the visit was conducted towards the end of winter, and this list represents incidental observations (which could be positively identified). Data from this table needs to be used with caution, as observations over such a short period, in one season, and in fairly similar weather conditions cannot be taken as a true indication of the presence of bird species in the area. In particular, the target species for this study are threatened, rare species, so the likelihood of seeing one during a two day period is limited. This study has therefore attached far more weight to the secondary data sources such as the bird atlas projects (SABAP1 and SABAP2) which collected data over a far longer period, and more diverse conditions. It must be noted that many "non Red Data" bird species also occur in the study area and could be impacted on by the power line. Although this impact assessment focuses on Red Data species, the impact on non Red Data species is also assessed, albeit in less detail. Furthermore, much of the mitigation recommended for Red Data species will also protect non Red Data species in the study area.

Focal Species List

Determining the focal species for this study, i.e. the most important species to be considered, is a four step process. Firstly, the micro-habitats available on site were identified. An analysis of the above existing avifaunal data represents the second step, i.e. which species occur in the area at significant abundances. The third step is to identify those species (which may be present based on the above two steps), and are more likely to be

impacted upon by the power-line. This step called on the vast experience of the EWT in evaluating and investigating electrical infrastructure impacts on birds (these impacts are discussed in more detail below). In general, large, heavy flying birds are more vulnerable to collision with over-head powerlines, while perching Raptors are more vulnerable to electrocution. The fourth and final step was to consider the species conservation status or other reasons for protecting the species. This involved primarily consulting the Red List bird species (Barnes 2000) as in Table 1.

The resultant list of 'target/focal species' for this study is as follows: Saddle-billed Stork, Cape Vulture, White-backed Vulture, Lappet-faced Vulture, Martial Eagle, Tawny Eagle, Southern Ground Hornbill, Secretarybird, Marabou Stork, Kori Bustard and Black-bellied Bustard. In some cases, these species serve as surrogates for other similar species (as mitigation will be effective for both), examples being Saddle-billed Stork for Black and Abdims Storks, and Martial Eagle for Bateleur. Assorted more common species will also be relevant to this study, but it is believed that the above target species will to a large extent serve as surrogates for these in terms of impact assessment and management.

ASSESSMENT OF IMPACTS

General description of impacts of power lines on birds

Because of its size and prominence, electrical infrastructure constitutes an important interface between wildlife and man. Negative interactions between wildlife and electricity structures take many forms, but two common problems in Southern Africa are electrocution of birds (and other animals) and birds colliding with power lines (Ledger 1983; Verdoorn 1996; Kruger 1999; Van Rooyen 1999; Van Rooyen 2000). Other problems are electrical faults caused by bird excreta when roosting or breeding on electricity infrastructure, (Van Rooyen & Taylor 1999) and disturbance and habitat destruction during construction and maintenance activities.

Electrocutions

Electrocution of birds on overhead lines is an important cause of unnatural mortality of raptors and storks. It has attracted plenty of attention in Europe, USA and South Africa (APLIC 1994; van Rooyen & Ledger 1999). Electrocution refers to the scenario where a bird is perched or attempts to perch on the electrical structure and causes an electrical short circuit by physically bridging the air gap between live components and/or live and earthed components (van Rooyen 2004). Electrocution is possible on 132kV lines, depending on the exact pole structure used. For this study, it is assumed that a bird friendly structure will be

used, and the detailed impact assessment below, is based on this assumption. Therefore, the impact of electrocution is likely to be of low significance for the proposed power line.

Collisions

Collisions are 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). Unfortunately, many of the collision sensitive species are considered threatened in southern Africa. The Red Data species vulnerable to power line collisions are generally long living, slow reproducing species under natural conditions. Some require very specific conditions for breeding, resulting in very few successful breeding attempts, or breeding might be restricted to very small areas. These species have not evolved to cope with high adult mortality, and therefore, consistent high adult mortality over an extensive period could have a serious effect on a population's ability to sustain itself in the long or even medium term. Many of the anthropogenic threats to these species are non-discriminatory as far as age is concerned (e.g. habitat destruction, disturbance and power lines) and therefore contribute to adult mortality, and it is not known what the cumulative effect of these impacts could be over the long term. Collisions with the proposed line of certain large flying bird species such Secretary Bird, Kori Bustard, various Stork species, and Southern Ground Hornbill, is a possibility.

Habitat destruction

During the construction phase and maintenance of substations and power lines some habitat destruction and alteration inevitably takes place. This happens with the construction of access roads, and the clearing of servitudes, as well as clearing vegetation at the substation site. 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 modification of habitat. Habitat destruction is anticipated to be of moderate significance in this study area.

Disturbance

Similarly, the above mentioned construction and maintenance activities impact on bird through disturbance, particularly during bird breeding activities. Disturbance of birds is anticipated to be of moderate significance.

Description of impacts of this proposed project

The possible impacts of the proposed power line include Collision, Electrocution, Habitat Destruction and Disturbance. These impacts were rated in the tables below, according to a fixed set of criteria as supplied by SSI. The rating is applicable to all alternatives.

Table 3: Assessment of operational phase impacts.

GENERAL AND SPECIALIST STUDY IMPACTS	SPATIAL SCALE	TEMPORAL SCALE (DURATION)	CERTAINTY SCALE (LIKELIHOOD)	SEVERITY/ BENEFICIAL SCALE	SIGNIFICANCE PRE-MITIGATION	MITIGATION MEASURES	SIGNIFICANCEAFTER MITIGATION
ISSUE: Avifauna							
IMPACT: Bird collision with overhead power line, Impact on Red Data and other species							
DIRECT IMPACTS							
	Localised	Long-term	May occur	Severe	Moderately negative	Mark the identified sections of line with anti collision marking devices on the earth wire to increase the visibility of the line and reduce likelihood of collisions. Marking devices should be spaced 10m apart. **The sections of line that pose a concern and require marking should be finalised in a site "walkthrough" by EWT once final route is decided and towers/pylons pegged.**	Low negative
IMPACT: Bird electrocution, Impact on Red Data and other species							
DIRECT IMPACT							
	Localised	Lon-term	May Occur	Severe	High Negative	A "Bird Friendly" monopole structure, with a bird perch (as per standard Eskom guidelines) should be used for the tower structures. **Any deviation should be reported to EWT as it will alter this impact rating.**	Low negative

Table 4: Assessment of impacts during construction phase.

GENERAL AND SPECIALIST STUDY IMPACTS	SPATIAL SCALE	TEMPORAL SCALE (DURATION)	CERTAINTY SCALE (LIKELIHOOD)	SEVERITY/ BENEFICIAL SCALE	SIGNIFICANCE PRE-MITIGATION	MITIGATION MEASURES	SIGNIFICANCEAFTER MITIGATION
ISSUE: Avifauna							
IMPACT: Disturbance of birds, Impact on Red Data and other species							
DIRECT IMPACTS							
	Localised	Short term	May Occur	Moderately severe	Moderate Negative	Strict control should be maintained over all activities during construction. It is difficult to mitigate properly for this as some disturbance is inevitable. **During Construction, if any of the "Focal Species" identified in this report are observed to be roosting and/or breeding in the vicinity, the EWT is to be contacted for further instruction.**	Low negative
IMPACT: Destruction or alteration of bird habitat, Impact on Red Data and other species							
INDIRECT IMPACTS:							
	Localised	Long-term	Definitely	Moderately severe	Moderate Negative	Strict control should be maintained over all activities during construction, in particular heavy machinery and vehicle movements, and staff. It is difficult to mitigate properly for this as some habitat destruction is inevitable.	Moderate negative

COMPARISON OF ALTERNATIVES

Three Line options have been proposed for consideration and can be seen in the Map in Figure 11 below.

Purple Option:

- This is the most northerly option.
- Does not follow existing infrastructure, and avoids human settlement for the majority of its length.
- Line option that passes through the greatest area of relatively undisturbed woodland (see area demarcated by the dotted red lines in the map below).

Red Option:

- This is the central line option.
- Runs east from Mbumbu, passing over the northern extremity of a large dam.
- For approximately 6.5 Km it follows the same corridor as the Green Option.
- For much of its length, it does not appear to follow any existing infrastructure.
- Passes through large areas of human habitation, as well as over-grazed and disturbed lands.

Green Option:

- This is the most southerly route option.
- From Mbumbu, it heads south east, passing on the southern shore of the large dam discussed above.
- For approximately 6.5 Km it follows the same corridor as the Red Option
- Does not appear to follow any existing infrastructure.
- Passes through large areas of human habitation, as well as over-grazed and disturbed lands.

In order to rank these alternatives a table was compiled and the corridors were given a rating on a scale of 1 to 10, with 1 being the least preferred and 10 being the most highly preferred option. A rating of 1 would indicate an option that passes through very sensitive areas, and should be discarded as an option.

Table 5: Preference rating for the 3 alternatives.

Line Option	**Preference Rating**
Purple	5
Red	8
Green	7

As can be seen from the discussions and table above, the Red Line option is slightly preferred over the Green Option, while the Purple Option is least preferred.

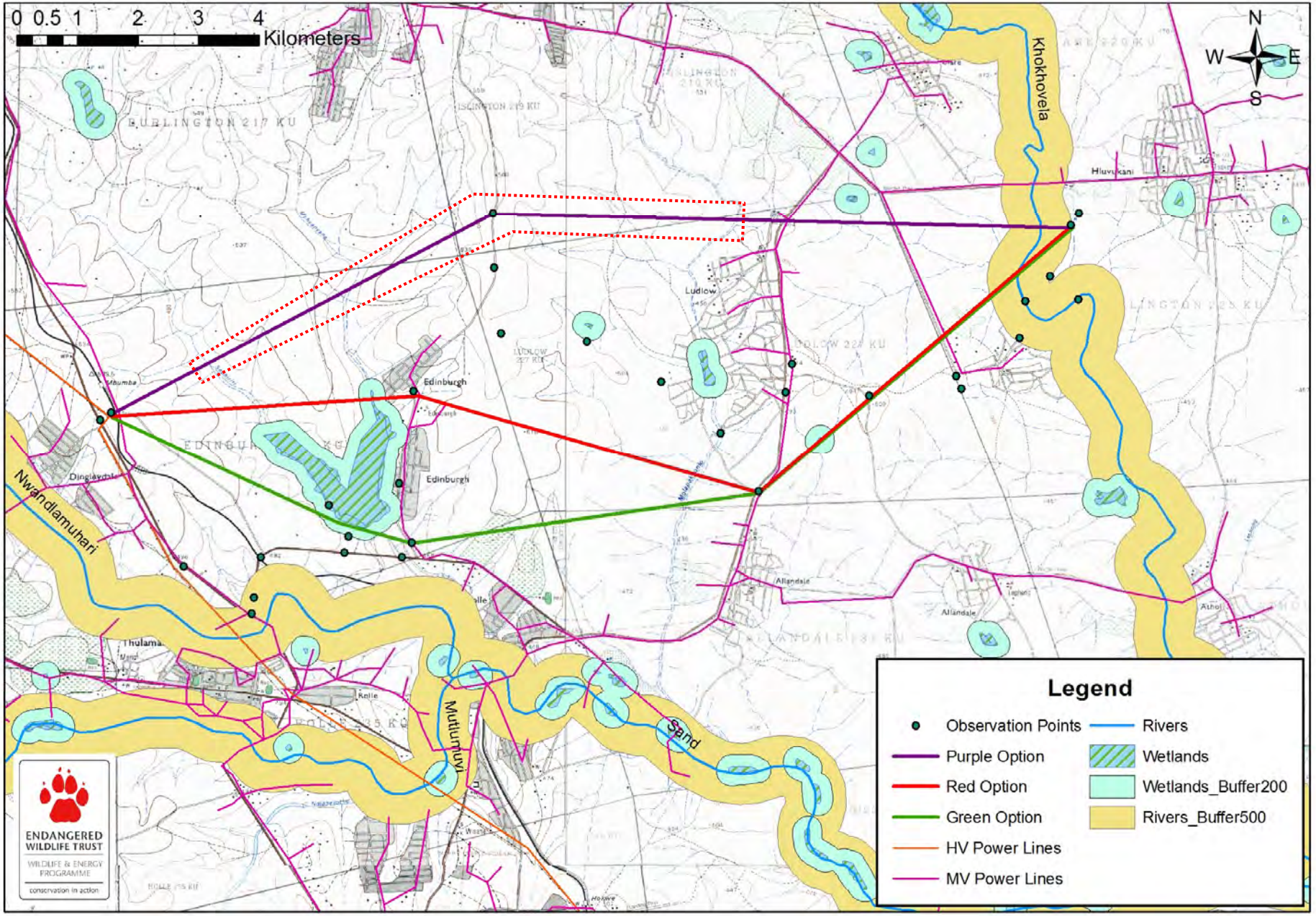


Figure 11: Map showing the Line Options as well as sensitive areas of the study site, associated with wetlands and rivers.

Identification of sensitive areas within the proposed site.

In general the site is moderately sensitive in terms of avifauna, based on the occurrence of a number of listed species in the study area, as well as the various micro-habitats available to avifauna. It is noted however, that certain areas are more attractive for certain bird species and therefore more sensitive, while others (e.g. over grazed areas, and areas closer to human habitation) are less attractive. The sensitive avifaunal zones are described and explained below.

The above map (Figure 11) shows the major rivers, which have been buffered by 500m. The map also shows the various wetlands and/or dams in the study area, which have been buffered by 200m. The importance of these micro-habitats to avifauna has been discussed in earlier sections of this report. Therefore, these wetland/dams buffer zones, as well as the buffer around the Rivers, are all regarded as ***High Sensitivity*** areas, and collision mitigation (as detailed in table 3), is recommended for any power lines running through these areas. As discussed above, the northerly Purple Option appears to pass through relatively undisturbed woodlands, as demarcated by the dotted red line in the map above. This area is also regarded as a **High Sensitivity** zone, requiring both collision (exact spans to be finalised in an avifaunal walkthrough (and electrocution mitigation as detailed elsewhere.

Unknown Sensitivity: These are all the remaining areas, where no obvious avifaunal features or patterns could be identified during the study, and it is likely that the majority of these areas could be designated as Low- Medium sensitivity. The majority of these areas will not require collision mitigation on lines passing through them. However, some areas could be designated as Medium to High sensitivity, in the future upon availability of new data and/or after additional site analysis. This is especially true for areas of woodland that could not be accessed during the site visit. These areas will be identified in the “avifaunal site walkthrough”, once the final line option has been decided upon.

IMPACT STATEMENT

In conclusion, the proposed power line can be built provided that the various mitigation measures recommended in this report are implemented. From an avifaunal perspective, the Red line option, which passes through disturbed areas and numerous human settlements, is slightly more preferred than the Green Option which passes through similar areas and microhabitats, and is also acceptable. Although the Purple option is also acceptable, it is the least preferred. Without Mitigation (i.e. if a bird friendly monopole structure is not used) electrocutions of large raptors (which appear abundant in the area) is expected to be the largest and most significant impact of the proposed development. Therefore, in terms of Avifauna, the development should not proceed unless a safe Pylon structure, approved by the EWT, is used. Collisions are also expected to be a large impact of this project and thorough line marking is required to mitigate for this. Sensitive areas (i.e. in the vicinity of Rivers, Dams, Wetlands and pristine Woodland) have been mapped, within which the above-mentioned collision mitigation must be implemented. An avifaunal walk through is recommended in order to, “fine tune” these sensitive zones, and to identify the exact spans of the line (once the preferred line option is chosen) for marking to mitigate against bird collisions. Provided that the high risk sections of the line are mitigated in the form of marking, the impact should be contained. The EWT, through its partnership with Eskom and ongoing international networking, is well aware of the room for improvement on the effectiveness of line marking devices. However, it is our view that currently available devices, although not 100 % effective, would provide an acceptable level of mitigation for this project. Provided that a bird-friendly monopole structure is used for all pylon structures in the project, as discussed elsewhere in the report, the impact of electrocution should be contained.

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APPENDIX 1: List of species observed during the site visit.

Seq	Common name	Taxonomic name
41	Pytilia, Green-winged	Pytilia melba
40	Apalis, Yellow-breasted	Apalis flavida
39	Barbet, Black-collared	Lybius torquatus
38	Camaroptera, Green-backed	Camaroptera brachyura
37	Flycatcher, Spotted	Muscicapa striata
36	Go-away-bird, Grey	Corythaixoides concolor
35	Helmet-Shrike, White-crested	Prionops plumatus
34	Heron, Grey	Ardea cinerea
33	Hoopoe, African	Upupa africana
32	Hornbill, African Grey	Tockus nasutus
31	Hornbill, Southern Yellow-billed	Tockus leucomelas
30	Ibis, Hadeda	Bostrychia hagedash
29	Oriole, Black-headed	Oriolus larvatus
28	Prinia, Tawny-flanked	Prinia subflava
27	Roller, Lilac-breasted	Coracias caudatus
26	Shikra, Shikra	Accipiter badius
25	Starling, Burchell's	Lamprotornis australis
24	Sunbird, White-bellied	Cinnyris talatala
23	Swallow, Lesser Striped	Hirundo abyssinica
22	Woodpecker, Golden-tailed	Campethera abingoni
21	Wood-Dove, Emerald-spotted	Turtur chalcospilos
20	Waxbill, Common	Estrilda astrild
19	Waxbill, Blue	Uraeginthus angolensis
18	Vulture, White-backed	Gyps africanus
17	Scrub-Robin, White-browed	Cercotrichas leucophrys
16	Puffback, Black-backed	Dryoscopus cubla
15	Lapwing, Blacksmith	Vanellus armatus
14	Kite, Yellow-billed	Milvus aegyptius
13	Kingfisher, Brown-hooded	Halcyon albiventris
12	Kingfisher, Malachite	Alcedo cristata
11	Guineafowl, Helmeted	Numida meleagris

10	Goose, Egyptian	Alopochen aegyptiacus
9	Egret, Cattle	Bubulcus ibis
8	Eagle, Martial	Polemaetus bellicosus
7	Drongo, Fork-tailed	Dicrurus adsimilis
6	Dove, Laughing	Streptopelia senegalensis
5	Crow, Pied	Corvus albus
4	Bulbul, Dark-capped	Pycnonotus tricolor
3	Bee-eater, Little	Merops pusillus
2	Batis, Chinspot	Batis molitor
1	Bunting, Golden-breasted	Emberiza flaviventris

APPENDIX D2

ECOLOGICAL ASSESSMENT

PRELIMINARY ECOLOGICAL ASSESSMENT SURVEY FOR THE PROPOSED MBUMBU-TSAKANI 17KM 132KV POWER LINE AND NEW TSAKANI SUBSTATION; NORTHERN REGION, ESKOM DISTRIBUTION DIVISION

BASIC ASSESSMENT REPORT

Compiled for: SSI ENGINEERS & ENVIRONMENTAL CONSULTANTS (Pty) Ltd

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1. BACKGROUND INFORMATION

Eskom Transmission is responsible for providing a high quality supply of electricity to meet the ever increasing needs of its end users. As a result, its infrastructure of power lines and substations are continuingly being established and expanded upon to support annual load growth. Eskom propose to provide sufficient capacity for the future and improve the reliability by building/constructing a new 17km 132kV loop-in and out Chikadee power line from the existing Mbumbu Switching Station to the new proposed Tsakani Substation.

Eskom Holdings Limited has, in line with the Environmental Impact Assessment Regulations, 2010, promulgated in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended, appointed SSI Engineers and Environmental Consultants as the independent consultant to undertake the BA for the proposed Mbumbu-Tsakani power line as well as Tsakani sub-station located in the Acornhoek area Mpumalanga Province. SSI Engineers and Environmental Consultants has appointed Mr. C.L. Cook as ecological specialist to investigate the potential ecological related impacts associated with the construction and operation of the proposed new 132kV Mbumbu-Tsakani power line as well as Tsakani sub-station.

The preliminary ecological survey focused on the describing the **basic ecological description of the current habitat integrity** of the proposed alternative alignments as well as available and sensitive habitats along the alignments with special reference to the current status of threatened plant and faunal species (amphibians, reptiles and mammals) occurring; or likely to utilize the areas within and immediately surrounding the proposed 132kV Mbumbu-Tsakani power line as well as Tsakani sub-station. The survey was supplemented by literature investigations; personal records, historic data and previous surveys conducted in the Acornhoek-Bushbuckridge areas as well as in similar habitats.

1.1 OBJECTIVES OF THE FAUNAL SURVEY/ HABITAT ASSESSMENT

- To provide a basic description of the vegetation fauna occurring on the proposed 132kV Mbumbu-Tsakani power line as well as new Tsakani sub-station.
- To provide a description of any threatened mammals, reptiles and amphibians occurring or likely to occur on the proposed 132kV Mbumbu-Tsakani power line as well as Tsakani sub-station.
- To describe the available habitats on the three 132kV Mbumbu-Tsakani power line alignments including areas of important conservation value or areas most likely to form important habitat for remaining threatened faunal species.
- To determine potential impacts of the development on the vegetation and fauna occurring along the proposed 132kV Mbumbu-Tsakani power line as well as Tsakani sub-station.
- To provide management recommendations to mitigate negative and enhance positive impacts of the proposed construction of the 132kV Mbumbu-Tsakani power line as well as Tsakani sub-station development.

1.2 SCOPE OF STUDY

- A preliminary mammal, bird reptile and amphibian survey recording sightings and/or evidence of existing fauna.
- An assessment of the ecological habitats, evaluating conservation importance and significance with special emphasis on the current status of threatened plant and animal species (Red Data Species), within the proposed 132kV Mbumbu-Tsakani power line as well as Tsakani sub-station and immediate adjacent areas.
- Literature investigations with which to augment field data were necessary.
- To rank the three alternative 132kV Mbumbu-Tsakani power line on the potential environmental impacts on associated fauna.
- Identification of potential ecological impacts that could occur as a result of the 132kV Mbumbu-Tsakani power line as well as Tsakani sub-station development and assess the significance of these, where possible.
- Investigate feasible and practical management recommendations that should be implemented to reduce or minimize the impacts, should the project be approved.
- Documentation of the findings of the study in a report.

2. METHODOLOGY

2.1 Predictive methods

A 1:50 000 map of the study area was provided showing existing infrastructure and the proposed three alternative alignments. This was used as far as possible in order to identify potential "hot-spots" along the corridors, e.g. Patches of undisturbed bushveld vegetation, river crossings, wetlands and dams and agricultural areas. Satellite imagery of the area was obtained from Google Earth was studied in order to get a three dimensional impression of the topography and land use.

2.2 Literature Survey

A detailed literature search was undertaken to assess the current status of threatened fauna that have been historically known to occur in the Acornhoek study area within which the alignments are located. The literature search was undertaken utilising *The Vegetation of South Africa, Lesotho and Swaziland* (Mucina & Rutherford 2006) as well as *National Red List of Threatened Plants of South Africa* (Raimondo *et al,* 2009) for the vegetation description. *The Mammals of the Southern African Subregion* (Skinner & Chimimba 2005) and *The Red Data Book of the Mammals of South Africa: A Conservation Assessment* (Friedmann and Daly (editors) 2004) for mammals. The *Atlas and Red Data Book of the frogs of South Africa, Lesotho and Swaziland* (Minter *et al.* 2004) for amphibians. The *Field Guide to the Snakes and other Reptiles of Southern Africa* (Branch 2001) and *South African Red Data Book-Reptiles and Amphibians* (Branch 1988) for reptiles.

2.3 Site Investigation Methodology

A preliminary assessment of the status, spatial requirements and habitat preferences of all priority species along the proposed Tsakani power line as well as Tsakani sub-station site as well as potential threats was conducted. For certain species, an estimate of the expected or historical distribution for the area could be extrapolated from published information and unpublished reports, while habitat and spatial requirements were generally derived from the literature. For other species, little of this information was readily available and conservation targets remain speculative. Species assessments will be updated when additional data becomes available and where appropriate, proposed conservation targets will be revised.

Two general habitat sensitivity scans were carried out on the 3rd and 4th of October 2011. These site visits did not entail intensive surveying or utilisation of any sampling methods and can rather be viewed as being an opportunity to identify sensitive faunal habitats along the proposed Tsakani power line as well as Tsakani sub-station site. It must be stressed that no comprehensive vegetation or faunal survey were conducted due to time as well as financial constraints; but merely a brief assessment of the current ecological status of the proposed three alternative alignments. By surveying the proposed alignments as well as immediate habitats adjacent to the proposed alignments for specialised habitats, as well as the remaining vegetation and specific habitats, one can make an assumption of the possible presence or absence of threatened plant and animal species.

All animals (mammals (larger), reptiles and amphibians) seen or heard; were recorded. Use was also made of indirect evidence such as animal tracks (footprints, droppings) to identify animals. The data was supplemented by previous surveys conducted in similar habitats, literature investigations, personal records and historic data. Different habitats were explored to identify any sensitive or specialized species. Habitats explored included Granite Lowveld **(SVI 3)** (Mucina & Rutherford 2006) bushveld in various forms of transformation and degradation (wood harvesting, sand mining, overgrazing, frequent fires, alien vegetation invasion), loosely embedded rock material, rivers including perennial and non-perennial rivers, artificially created dams, stumps, moribund termite mounds, abandoned animal burrows, trees and under lose bark material.

Mammal names are as used by Skinner and Chimiba (2005), reptile names by Branch (1998) and Alexander and Marais (2007) and amphibian names by Passmore and Carruthers (1995) and Minter *et.al.* (2004)

2.4 Uncertainties in predicting results

- Limitation to a base-line ecological survey for only 2days (16 hours) during the early summer months (October). Heavy rain as well as hail had fallen during the site visit on the 3rd October. The majority of dams had sufficient surface water and amphibians had initiated their short duration breeding activities. Certain of the non-perennial drainage lines contained surface water but not the larger systems around the proposed Tsakani sub-station. Limitation to a single season or base-line ecological survey for only 1 day (10 hours) during the early summer months (November) prior to sufficient rainfall.
- The majority of threatened plant and animal species are seasonal only emerging after sufficient early heavy summer rainfalls between November and December. Thus only those flowering plants that flowered at the time of the visit could be

identified with high levels of confidence.

- Some of the more rare and cryptic plant species may have been overlooked due to their inconspicuous growth forms. Many of the rare and endangered succulent species can only be distinguished (in the field) from their very similar relatives on the basis of their reproductive parts. These plants flower during different times of the year. Multiple visits to any site during the different seasons of the year could therefore increase the chances to record a larger portion of the total species complex associated with the area.
- The majority of threatened species are extremely seasonal only emerging after sufficient heavy early summer rainfall (November-March).
- The majority of threatened species are extremely secretive and difficult to observe even during intensive field surveys conducted over several seasons/ years.
- Limitation of historic data and available databases for the Acornhoek area.
- The presence of threatened species on site is assessed mainly on habitat availability and suitability as well as desk research (literature, personal records) and previous surveys conducted in similar habitats between 1997-2011).
- Certain areas of the proposed alignments are situated on private lands, which are fenced with restricted access; especially during nocturnal surveys.
- The majority of the red data atlases are outdated especially pertaining to reptiles as well as inadequate coverage of some areas by the atlases (SAFAP).

2.5 Gaps in the baseline data

- Little long-term, verified data of faunal species distribution on micro-habitat level along the proposed powerline alignments.
- Little long-term, verified data on impacts of existing lines in the study area on fauna.

3. VEGETATION AND FAUNAL HABITAT AVAILABILITY

Vegetation structure is generally accepted to be more critical in determining faunal habitat than actual plant composition. Therefore, the description of vegetation presented in this study concentrates on factors relevant to faunal species abundance and distribution, and does not give an exhaustive list of plant and tree species which occur in the study area. No comprehensive faunal surveys were conducted and species lists provided in the Appendix are of species most likely to occur on the site using habitat as an indicator of species presence.

3.1 Granite Lowveld (SVI 3)

The vegetation unit of the proposed Tsakani power line as well as Tsakani sub-station site is situated in **Granite Lowveld (SVI 3)** (Mucina & Rutherford 2006) which was previously classified as **Arid Lowveld** (40%), **Lowveld** (38%) (Acocks 1998) or **Mixed Lowveld Bushveld** (LR 19) (Low & Rebelo 1996).

Distribution

Limpopo and Mpumalanga Provinces, Swaziland and marginally in Kwazulu-Natal. A north-south belt on the plains east of the escarpment from Thohoyandou in the north, interrupted in the Bolobedu area, continued in the Bitavi area, with an eastward extension on the plains around the Murchison Range and southwards to Abel Erasmus Pass, Mica and Hoedspruit area east of Bushbuckridge. Substantial parts are found in the Kruger National Park spanning areas east of Orpen Camp southwards through Skukuza and Mkhulu, including undulating terrain west of Skukuza to the basin of the Mbyamiti River. Altitude varies between 250-700m (Mucina & Rutherford 2006).

Vegetation & Landscape Features

Tall shrubland with few trees to moderately dense low woodland on the dense sandy uplands with *Terminalia sericea*, *Combretum zeyheri* and *Combretum apiculatum* and ground layer including *Pogonathria squarrosa*, *Tricholaena monachne* and *Eragrostis rigidior*. Dense thicket to open savanna in the bottomlands with *Acacia nigrescens*, *Dichrostachys cinerea*, *Grewia bicolor* in the woody layer. The dense herbaceous layer contains the dominant *Digitaria eriantha*, *Panicum maximum* and *Aristida congesta* on fine-textured soils, while the brackish bottomlands support *Sporobolus nitens, Urochloa mosambicensis* and *Chlors virgata*. At seep lines, where convex topography changes to concave, a dense fringe of *Terminalia sericea* occurs, with *Eragrostis gummiflua* in the undergrowth (Mucina & Rutherford 2006). According to Bedenkamp et al. (1998), the proposed site is situated within the Mixed Lowveld Bushveld vegetation type. The landscape has been derived from gently undulating plains of sand convexities with intervening drainage lines (Tinley 1979).

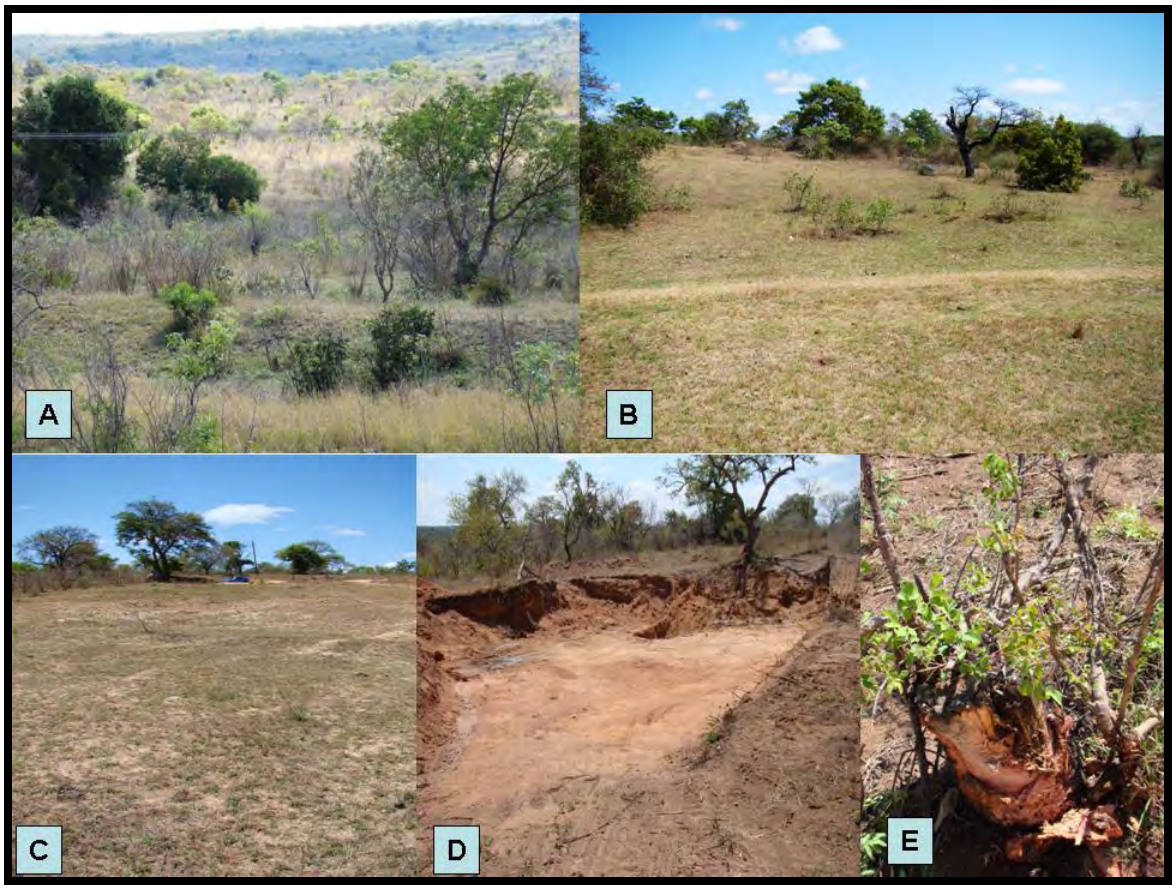

Figure1. A conglomerate of photographs displaying the current impacts of the vegetation along the alignments. A: The proposed study area is situated within habitats that have been degraded or totally transformed by various anthropogenic impacts; **B:** Overgrazing of the grass and forb layer by livestock including cattle and goats; **C:** Small-scale agricultural activities around the rural homesteads resulting in vegetation clearance and transformation by livestock; **D:** Several informal sand mining operations were observed adjacent to the proposed alignments. The sand mining activities result in the destruction of remaining tree, shrub and forb species. Access roads to the sand mining areas result in destruction of adjacent vegetation as well as increased access for wood harvesting activities. **E:** Several coppicing stumps of large indigenous tree species were observed along the alignment. Only the large Marula (*Sclerocarrya birrea* subsp.*caffra*), Common Wild Fig (*Ficus thonningii*) as well as the poisonous Tamboti (*Spirostachys africana*) are not utilised for wood harvesting

Geology and Soils

Geologically, the study area is located on granite-gneiss with volcanic, dolerite intrusions forming a grid of dykes and a large sill in the western areas. From north to south, the Swazian Goudplaats, Makhutswi Gneiss and the Nelspruit Suite (granite gneiss and migmatite), and further south the younger Mpuluzi Granite (Randian) form the major basement geology of the areas. Granitic rocks have weathered to form coarse sandy soils with a high infiltration rate and low clay forming potential (Venter et al. 2003). Clay soils with high sodium content are found in the depressions and footslopes, while nutrient-poor sandy soils are located on the crests. With these two positions at opposite ends of the landscape catena, a variety of vegetation types are described. The study site is located at the upper end of the landscape catena and includes the *Sclerocarya birrea/ Combretum herorense* sand savanna situated on the crests and hills on well-drained, granite-derived soils and dominated by broad-leafed woody species. The geology of the site comprises of granite rocks and the soil is mostly coarse, sandy and shallow, overlying granite, quartzite, sandstone or shale (Low & Rebelo, 1998).

Climate

Summer rainfall with dry winters and generally a frost-free region. Mean annual precipitation is around 350-650 mm per annum, falling in summer.

Conservation

This vegetation type is well represented in the region and currently a great portion falls within protected environments (Kruger National Park 17%) as well as private nature reserves including Selati, Klaserie, Timbavati, Mala Mala, Sabi Sand and Manyeleti and as such, its conservation priority is considered **Vulnerable**. More than 20% is transformed mainly by cultivation and by settlement development. Erosion is low to moderate especially around the illegal sand mining activities.

DOMINANT VEGETATION OBSERVED ALONG PROPOSED POWERLINE ALIGNMENTS

As the three alternative alignments of the Mbumbu-Tsakani powerline as well as new Tsakani substation are situated in a semi-rural/ agricultural environment the vegetation around the proposed alignments has been severely altered and transformed from its natural state. Certain sections of the proposed alignments contain elements of natural Granite Lowveld vegetation; but the majority of the alignments consist of Granite Lowveld vegetation in various stages of transformation and degradation. Due to time constraints as well as accessibility of sections of the purple alignment emphasis was placed on the green (preferred) and red alignments. The species recorded below are by no means a comprehensive list of species present on the site.

Tree and Shrub Species

Acacia nilotica, Dichrostachys cinera, Acacia nigrescens Acacia gerrardii, Acacia exuvialis, Bolusanthus speciosa, Bauhinia galpinii, Acacia tortilis, Gymosporia buxifolia, Gymnosporia glaucophylla, Combretum apiculatum, Ziziphus mucronata, Euclea divinorum, Combretum zeyheri, Grewia occidentails, Grewia moticola, Strychnos madagascariensis, Grewia flavescens, Diospyros lycioides, ***Sclerocarya birrea*** **subsp.** ***caffra****[*], Terminalia sericea, Schotia brachypetala, Peltophorum africanum, Acacia karoo, Ficus thonningi, Ficus ingens, Combretum molle,, Ximenia caffra,* ***Pterocarpus angolensis****, Combretum hereroense, Searsia* (*Rhus*) *lancea, Searsia chirindensis, Searsia pyroides*

Forb Species

Aptosimum lineare, Aptosimum procumbens, Aloe greatheadii, Indigofera daleoides, Bidens pilosa, Heliotropium ciliatum, Solanum sisymbriofolum, Cucumis africanus, Senecio gerrardii, Pentzia pilufera, Riccinus communis, Cheilanthes hirta, Protasparagus setaceus, Hypoxis obtusa, Merremia tridentate, Dicerocaryum eriocarpum, Ceratotheca triloba, Asclepias fruticosa, Momordica balsami, Solanum panduriforme, Commelina africana, Commelina erecta, Sida cordifolia, Ipomoea sinensis, Ipomea crassipes, Hibiscus trionum, Hypoxis hemeroca, Schizoglossum cordifolium, Asclepias physocarpa, Turbina oblongata, Cassia comosa, Evolvulus alsinoides, Aptosimum procumbens, Pterodiscus speciosus, Harpagophytum procumbens, Ledebouria ovatifolia, Blepharis subvolubilis, Barleria sp., Cucumis zeyheri, Cucumis metuliferus, Berkheya radula, Senecio coronatus, Senecio venosus,

[*] Protected tree species under the National Forests Act, 1998 (Act no. 84 of 1998).

Senecio isatidioides, Vernonia hirsute, Ageratum houstonianum, Helichrysum caespititium, Sonchus olaraceus,, Helichrysum umbraculigerum, Senecio latifolius, Stomatanthes africanus, Geigeria burkei, Indigofera sanguinea, Indigofera zeyheri, Tephrosia grandiflora, Pellaea viridise, Kalanchoe rotundifolia, Kalanchoe paniculata, Asparagus falcatus, Asparagus angusticladus, Bulbine abyssinica, Trachyandra saltii, Ledebouria floribunda, Anthericum longistylum, Chlorophytum bowkeri, Oxalis obliquifolia, Ornithogalum seineri, Ammocharis coranica.

Graminoids or Grass Species

Andropogon eucomus, Andropogon huillensis, Themeda triandra, Hyparrhenia tamba, Hyparrhenia filipendula, Schizachyrium sanguineum, Hemarthria altissima, Oropetium capense, Digitari eriantha subsp. eriantha, Tragus berteronianus, Setaria sphacelata, Setaria verticillata, Tristachya leucothrix, Aristida adscensionis, Eragrostris trichopora, Eragrostris gummiflua, Sporobolus fimbriatus, Panicum schinzii, Eragrostris lehmanniana, Eragrostris biflora, Poa annua, Sporobolus ioclados, Setaria megaphylla, Sporobolus pyramidalis, Miscanthus junceus, Diplanche fusca, Echinochloa colona, Trichoneura grandiglumis, Digitaria velutina, Aristida congesta, Hyparrhenia hirta, Digitaria sp., Sporobolus panicoides, Chloris gayana, Melinus repens, Eragrostis nindensis, Eragrostis capensis, Eragrostris racemosa, Eragrostris curvula, Themeda triandra, Panicum maximum, Chloris virgata, Pogonarthia squarrosa, Urelytrum agropyroides, Kyllinga alba, Cyperus fulgens Hetrapogon contortus, Eragrostis chloromelas, Eragrostis racemosa, Brachiaria sp., Eragrostis superba, Cymbopogon excavutus, Cymbopogon plurinodis, Cymbopogon validus, Dactyloctenium aegyptium, Digitaria longiflora, Urochloa mossambicensis.

Figure2: A conglomerate of photographs displaying the dominant tree species observed along the proposed powerline alignments. A: Marula (*Sclerocarya birrea* subsp. *caffra*) was observed along the alignments as well as access roads and villages; **B:** Common Cluster Figs (F*icus sycamorous*) was observed along the riparian zones along the streams and rivers; **C:** Red-leaved Fig (*Ficus ingens*) was observed on the rocky areas adjacent to the proposed Tsakani substation site as well as along the riparian zone of the perennial stream adjacent to the Red alignment middle point; **D:** Large-fruited Bushwillow (*Combretum zeyheri*) occurred within scattered localities along the alignments as well as **E:** Scented Thorns (*Acacia nilotica subsp. kraussiana*); **F:** Silver Cluster Leaf (*Terminalia sericea*) was observed in dense stands within the sandy soils adjacent to the alignments and **G:** Several fruiting Black Monkey-Orange (*Strychnos madagascariensis*) was observed adjacent to the alignments

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DOMINANT VEGETATION OBSERVED AROUND THE PROPOSED NEW TSAKANI SUBSTATION

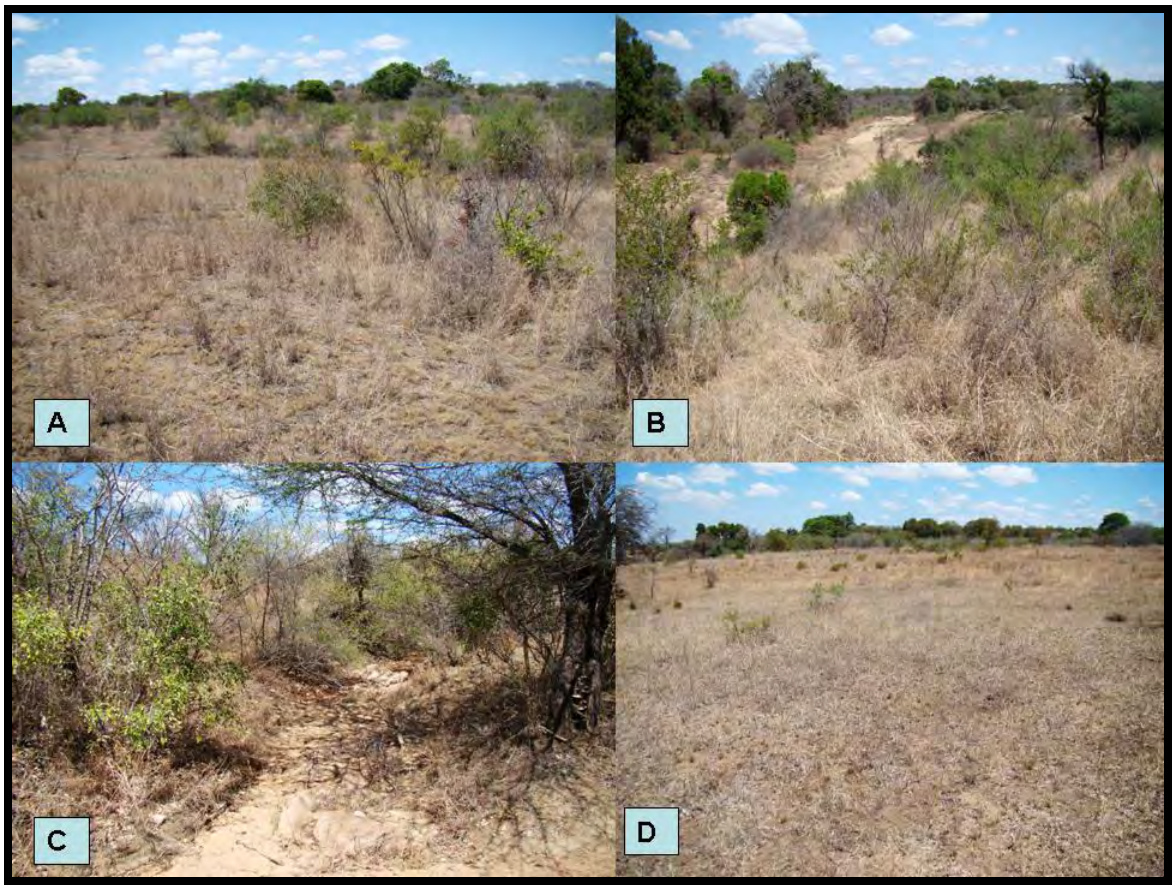


Figure3. A collage of photographs displaying the dominant vegetation around the proposed new Tsakani Substation site: A: The site is dominated by degraded as well as transformed bushveld. The site is surrounded by old agricultural lands, livestock enclosures (kraals). The majority of large tree species have been removed and the grass and forb layer is overgrazed. **B:** Remaining large indigenous tree species occur within the remnant patches of riparian vegetation to the east of the proposed substation site along the non-perennial Khokhovela River which is a tributary of the Sand River. Riparian tree species observed included *Ficus sycomorus, Spirostachys africana, Diospyros mespiliformis, Kigelia africana, Trichilia emetica, Phoenix reclinata, Schotia brachypetala, Lonchocarpus capassa*. **C:** A small non-perennial drainage line occurs to the south of the proposed substation site. The vegetation was denser along the riparian zone of the non-perennial drainage line although evidence of wood harvesting was noted all around the site. Riparian vegetation observed along the drainage line included *Ficus ingens, Carissa bispinosa, Euclea divinorum, Acacia nilotica* as well as dense stands of *Dichrostachys cinerea.*

Tree and Shrub Species

Acacia nilotica, Dichrostachys cinerea, Acacia nigrescens Acacia gerrardii, Acacia exuvialis, Bauhinia galpinii, Acacia tortilis, Gymosporia buxifolia, Gymnosporia glaucophylla, Combretum apiculatum, Ziziphus mucronata, Euclea divinorum, Combretum zeyheri, Grewia occidentails, Grewia moticola, Strychnos madagascariensis, Grewia flavescens, Diospyros lycioides, Sclerocarya birrea subsp. *caffra, Terminalia sericea, Schotia brachypetala, Ficus sycamorus, Ficus ingens, Combretum molle,, Combretum hereroense, Searsia* (*Rhus*) *lancea, Searsia chirindensis, Searsia pyroides Spirostachys africana, Diospyros mespiliformis, Kigelia africana, Trichilia emetica, Phoenix reclinata, Lonchocarpus capassa.*

Forb Species

Aptosimum lineare, Aptosimum procumbens, Aloe greatheadii, Arundo donax, Indigofera daleoides, Bidens pilosa, Heliotropium ciliatum, Solanum sisymbriofolum, Cucumis africanus, Senecio gerrardii, Pentzia pilufera, Riccinus communis*, Cheilanthes hirta, Protasparagus setaceus, Merremia tridentata, Dicerocaryum eriocarpum, Ceratotheca triloba, Asclepias fruticosa, Momordica balsami, Solanum panduriforme*, Commelina africana, Commelina erecta, Sida cordifolia, Ipomoea sinensis, Ipomea crassipes, Hibiscus trionum, Hypoxis hemeroca, Schizoglossum cordifolium, Asclepias physocarpa, Ledebouria ovatifolia, Cucumis zeyheri, Cucumis metuliferus, Senecio coronatus, Senecio venosus, Senecio isatidioides, Vernonia hirsute, Ageratum houstonianum, Helichrysum caespititium, Sonchus olaraceus,, Senecio latifolius, Stomatanthes africanus, Geigeria burkei, Indigofera sanguinea, Indigofera zeyheri, Tephrosia grandiflora, Pellaea viridise, Kalanchoe rotundifolia, Kalanchoe paniculata, Asparagus falcatus, Asparagus angusticladus, Bulbine abyssinica, Trachyandra saltii, Ledebouria floribunda, Anthericum longistylum, Chlorophytum bowkeri, Oxalis obliquifolia, Ornithogalum seineri.,*

Graminoids or Grass Species

Andropogon eucomus, Andropogon huillensis, Hyparrhenia tamba, Hyparrhenia filipendula, Schizachyrium sanguineum, Hemarthria altissima, Oropetium capense, Digitari eriantha subsp. eriantha, Tragus berteronianus, Tristachya leucothrix, Aristida adscensionis, Eragrostris trichopora, Eragrostris lehmanniana, Eragrostris biflora, Poa annua, Sporobolus ioclados, Setaria megaphylla, Echinochloa colona, Trichoneura grandiglumis, Digitaria velutina, Aristida congesta, Hyparrhenia hirta, Digitaria sp., Chloris gayana, Eragrostris curvula, Themeda triandra, Panicum maximum, Chloris virgata, Pogonarthia squarrosa, Urelytrum agropyroides, Hetrapogon contortus, Eragrostis chloromelas, Eragrostis racemosa, Brachiaria sp., Cymbopogon excavutus,

Cymbopogon plurinodis, Cymbopogon validus, Dactyloctenium aegyptium, Digitaria longiflora, Urochloa mossambicensis

Large areas adjacent to the proposed substation site are old or fallow agricultural lands as well as livestock enclosures. Extensive wood harvesting as well as vegetation clearance for agricultural activities occurs around the substation site. The frequent burning of the grassland vegetation as well as overgrazing by livestock including cattle and goats has altered the natural tree, shrub, forb and grass species composition. Remaining grass and forb species are dominated by species indicative of a disturbed or degraded habitat. Evidence of wood harvesting activities were noted along the non-perennial drainage line as well as riparian zone of the Khokhovela River. The vegetation on the proposed substation site is dominated by small shrubby *Acacia's* as well as secondary succession grasses. The vegetation becomes more natural towards the Khokhovela River. Remnant patches of large riparian tree species occur along the macro-channel banks of the river. A non-perennial drainage line occurs to the south of the proposed substation site. No rare or threatened plant species were observed around the proposed substation site or are likely to occur within these degraded habitats. The proposed substation must be appropriately positioned outside the riparian zone of the Khokhovela River as well as non-perennial drainage line. A buffer zone of 32m is required by DWA from the outer edge of the riparian zones of the non-perennial rivers.

DOMINANT VEGETATION AROUND VILLAGES

The vegetation around the villages comprises mostly of introduced exotic tree species such as *Eucalyptus grandis, Jacaranda mimosifolia, Melia azedarach, Ficus elastica, Schinus molle, Tipuana tipu, Tecoma stans, Senna didymobotrya, Nerium oleander, Plemeria obtusa, Catharanthus roseus* and small-scale cultivated maize lands as well as mango and avocado orchards.

Figure4: Alien invasive vegetation observed along the proposed alignments included: A: Lantana (*Lantana camara*) Category 1 Weed; **B:** Oleander (*Nerium oleander*) Category 1 Weed, **C:** Peanut Butter Cassia (*Senna didymobotrya*) Category 3 (proposed Category 1b NEMBA); **D:** Dense-thorned Bitter Apple (Solanum sisymbrifolium

Alien Invasive species

The following invasive plant and tree species should be physically removed from the proposed site if encountered.

Agave americana
Agave americana 'Marginata'
Arundo donax
Opuntia ficus-indica
Riccinus communis
Melia azedarach
Sesbania punicea
Lantana camara
Solanum elaeagnifolium
Tecoma stans

Schinus molle
Jacaranda mimosifolia

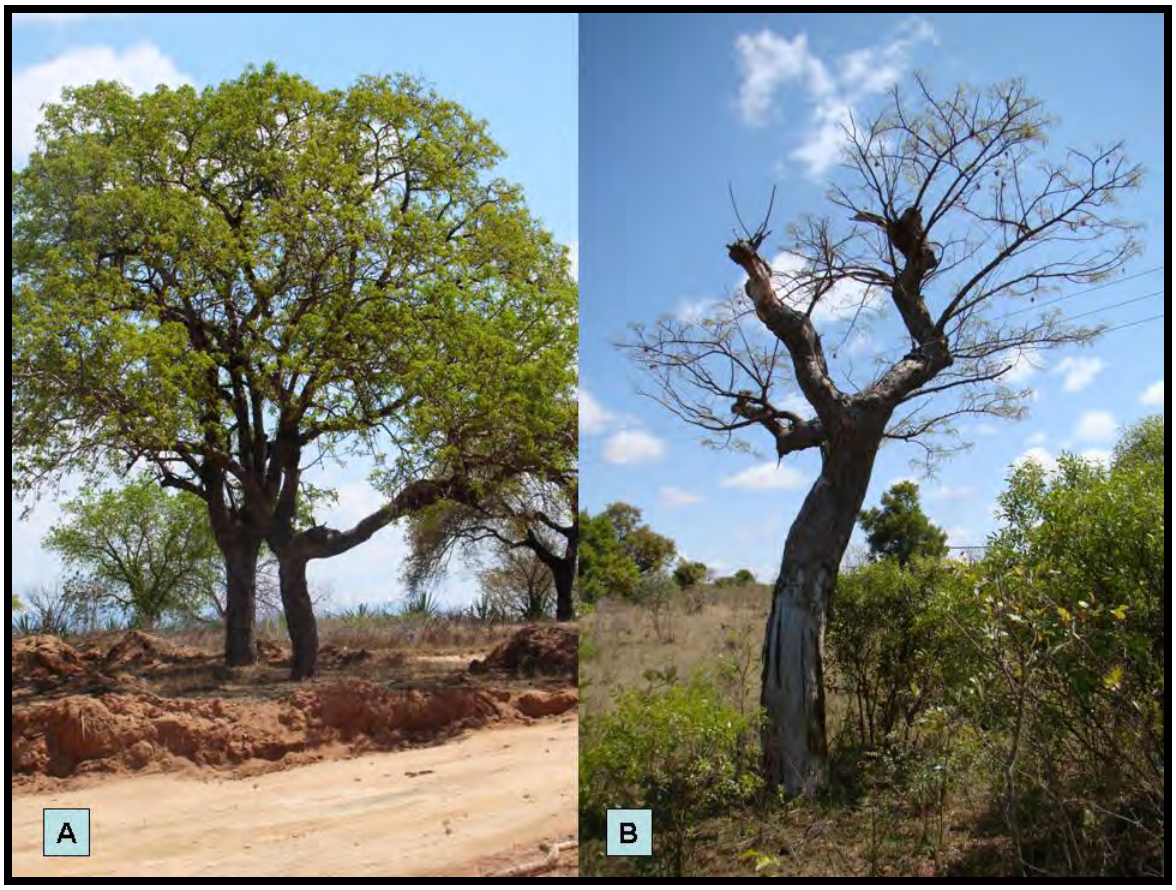


Figure5. Two protected tree species were observed within and surrounding the proposed powerline alignments. A: Several large as well as emerging Marula () were observed along the proposed alignment. **B:** A few scattered (uncommon) large Wild Teaks (*Pterocarpus angolensis*) were observed around the proposed alignments. This large specimen was observed to the south-east of the Mbumbu Sub-station. A permit will be required from the Department of Forestry for the removal of any protected tree species. Ideally the alignment of towers and powerline should be adjusted to prevent the destruction of any remaining large (>4m) indigenous tree species including the two protected tree species.

RED LISTED PLANT SPECIES AND PROTECTED TREE SPECIES

Table1. List of Protected Trees (South African National Botanical Institute, 2007) occurring within the 1/ 4 degree grid.

SCIENTIFIC NAME	FAMILY	COMMON NAME	RECORDED SPECIES
Breonadia salicina	Rubiaceae	Matumi	No specimens observed along streams or rivers (it's a facultative riparian (riverine) species.)
Elaeodendron transvaalensis	Celastraceae	Bushveld saffron	No specimens observed
Combretum Imberbe	Combretaceae	Leadwood	No specimens observed
Pittosporum viridiflorum	Pittosporaceae	Cheesewood	No specimens observed
Pterocarpus angolensis	Ceasalpiniaceae	Wild teak	Confirmed on site
Sclerocarya birrea subsp. *caffra*	Anacardiaceae	Marula	Confirmed on the site

No Red Data species were observed during the field survey. Several epiphytic orchids *Ansellia africana* were observed in trees and old stumps around certain homesteads. This epiphytic orchid is widespread in the area although the commercial '*muthi*' collectors pose a major threat in the area to remaining colonies. Given the disturbed nature of the area, it is unlikely that any Red Data species would occur at or in the vicinity of the proposed alignments. Two protected tree species was observed within all the proposed alignments with several large (>4m) Marula *Sclerocarya birrea* subsp. *caffra* noted. Several small emerging Marula were also observed along the alignments as well as around the proposed sub-station site. A few scattered Wild Teak (*Pterocarpus angolensis* were observed along the proposed alignments. Several large specimens were observed with the removal of the lower limbs. A permit will be required from the Department of Forestry for the removal of any protected tree species. Ideally the alignment of towers and powerline should be adjusted to prevent the destruction of any remaining large (>4m) indigenous tree species including the two protected tree species. All remaining Aloes (*Aloe greatheadii*), bulbous plants (geophytes) should be replanted if unearthed during the construction phase of the project.

4. RESULTS OF THE INITIAL FAUNAL SURVEY OR HABITAT ASSESSMENT

The preliminary faunal survey focused mainly on mammals, reptiles and amphibians of the study area. The survey focused on the current status of threatened animal species occurring, or likely to occur within the study area, describing the available and sensitive habitats, identifying potential impacts resulting from the development and providing mitigation measures for the identified impacts. Faunal data was obtained during a single site visit of the proposed alignment carried out mainly by vehicle as well as walking through sections of representative bushveld habitat and the substation site carried out on foot on the 3rd and 4th of October 2011. All animals (mammals (larger), reptiles and amphibians) seen or heard; were recorded. A separate specialist avifauna/bird survey was conducted for the proposed alignments. Use was also made of indirect evidence such as nests, feathers and animal tracks (footprints, droppings) to identify animals. Previous surveys, literature investigations; personal records and historic data supplemented the initial survey.

The literature search was undertaken utilising *The Vegetation of South Africa, Lesotho and Swaziland* (Mucina & Rutherford 2006) for the vegetation description. *The Mammals of the Southern African Subregion* (Skinner & Chimiba 2005) and *The Red Data Book of the Mammals of South Africa: A Conservation Assessment* (Friedmann and Daly (editors) 2004) for mammals. A Complete Gudie to the Frogs of Southern Africa (du Preez & Carruthers 2009) and the *The Atlas and Red Data Book of the frogs of South Africa, Lesotho and Swaziland* (Minter et al. 2004) for amphibians. *The Field Guide to the Snakes and other Reptiles of Southern Africa* (Branch 2001) and *South African Red Data Book- Reptiles and Amphibians* (Branch 1988) for reptiles.

The majority of vegetation adjacent to the proposed powerline alignments (especially green alignment) consists of completely transformed bushveld habitat with limited habitat diversity. The adjacent areas are utilised mainly for livestock grazing activities and suffers from extensive overgrazing, mostly from goats and cattle. Their grazing and trampling can encourage thicket growth by *Dichrostachys cinerea* by reducing grass cover. However, the opportunistic feeding patterns of goats can have a severe impact on both the composition and productivity of this ecoregion. In addition, goats are known to be more destructive than cattle at higher stocking densities (Skead 1988). High livestock densities also pose considerable threat to wildlife, since high numbers of domesticated animals generally cause a displacement of game, as there is less suitable habitat available. Furthermore, wild predators and scavengers such as the Black-backed Jackal, Caracal, Leopard and the White-backed Vulture have been eradicated by livestock

farmers who see these animals as a threat to their livelihoods. Poisoned carcasses are often used for this purpose; this method is indiscriminate and therefore poses considerable threat to all predators and scavengers; especially the threatened Vulture species. Poaching and illegal hunting (dogs) are further reducing the remnant faunal populations.

Given the disturbed nature of the area, it is unlikely that the powerline alignments or substation site will host a great variety of animal species or viable populations. The proposed alignments are situated between the agricultural and rural residential areas in transformed and degraded habitats and it is therefore unlikely that the area will support viable populations. Some Red Data species may occur in the area, but none were actually recorded (direct or indirect) within the powerline alignments or substation site during the brief field survey.

Figure6. A conglomerate of photographs displaying the current impacts on the vegetation as well as associated faunal species. A: The majority of vegetation adjacent to the proposed powerline alignments (especially green alignment) consists of completely transformed bushveld habitat with limited habitat diversity. The adjacent areas are utilised mainly for livestock grazing activities and suffers from extensive

overgrazing, mostly from goats and cattle. (**B:**) Their grazing and trampling can encourage thicket growth by *Dichrostachys cinerea* by reducing grass cover. **C:** Hunting with dogs as well as feral cats around the villages has a high impact on remaining faunal species. **D:** An existing irrigation/water furrow is situated adjacent to the dam along the green alignment and acts as a potential pit-fall trap for animal species migrating towards and away from the dam. **E:** Extensive dumping and littering occurs adjacent to the villages as well as several informal sand mining areas.

Existing Impacts on the fauna on and surrounding the site included:

- The proposed powerline alignments are situated mainly within degraded and transformed bushveld (fallow agricultural lands) which are dominated by completely transformed vegetation with limited habitat diversity.
- High levels of human disturbances associated with the existing villages and habitat degradation and transformation due to present agricultural activities occur adjacent to the alignments. This has resulted in impoverished habitats with limited faunal diversity.
- Existing villages, agricultural, sand mining as well as informal access roads and pedestrian and livestock pathways occur around the alignments.
- Previous and current agricultural activities (oldlands) have transformed large areas of bushveld habitat adjacent to the alignments as well as substation site.
- Extensive overgrazing by livestock (especially cattle and goats) result in limited vegetative or grass cover or refuge habitat for remaining faunal species.
- Wood harvesting results in destruction of important habitat for arboreal faunal species.
- Frequent burning of remaining patches of grasslands severely restricts vegetative cover and potential refuge habitat for remaining faunal species.
- Hunting with dogs as well as cats around the villages. Dogs and cats have a high impact on remaining faunal species.
- Introduction of exotic and alien vegetation.
- Deterioration in water quality within the surrounding rivers and streams.

Given the disturbed nature of the area, it is unlikely that the area will host a great variety of animal species or viable populations. The proposed powerline alignments bisect degraded bushveld (vegetation clearance, wood harvesting, sand-mining) as well as old transformed agricultural lands; situated in a rural village environs and it is therefore unlikely that the area will support viable wildlife populations. It is highly likely that significant populations of any Red Data species remain in the vicinity of the proposed alignment; none were actually recorded (direct or indirect) on the site during the survey.

Faunal species observed during the survey reflect common species of the area associated with human settlements and habitat transformation. The faunal data in no way provides comprehensive lists for mammals, birds, reptiles, amphibians present on the proposed site as the study was conducted with limited time constraints allocated for the study.

4.1 MAMMALS

Mpumalanga is faunally diverse with approximately 163 mammal species consisting of 98 smaller and 64 larger species. It is the objective of Mpumalanga Parks Board (MPB) to conserve all of these species *in situ.* The grassland and forest biomes sustain many endemic and red data mammal species. The grassland biome is one of the biomes in which Red Data Book (RDB) insectivore richness is concentrated (Gelderblom, Bronner, Lombard & Taylor, 1995). High mammalian species richness occurs in savannahs, which could be as a result of the wide variety of habitats available. In Mpumalanga Province, savanna areas with the availability of sufficient cover, karst areas, wetlands, pans and a well-managed mosaic of short and tall grassland, are habitats that significantly contribute towards the ecological requirements of certain mammal species.

Certain species in Mpumalanga, towards which conservation efforts for habitat protection should be directed, have been identified. Priority species can be used to flag or emphasise key habitats, which are of conservation concern. These species thus contribute towards identifying priority areas of conservation importance and in determining the conservation value of land. Anthropogenic land conversion and habitat degradation and fragmentation mainly due to agricultural and mining activities are major threats to the continued existence of endemic and threatened fauna in the province. Suitable habitat remains for larger mammal species to the north and east of the proposed alignments within several private game reserves.

It must be stressed that no actual mammal survey was undertaken due to time constraints and the extreme limitations that the results from a single site survey conducted during the summer months would pose. Instead fieldwork was augmented with previous surveys in similar habitats as well as published data. Although the majority of habitats along the proposed alignments are degraded or totally transformed into agricultural lands as well as sand mining operations the remaining bushveld habitat to the north as well as east (private and government nature reserves) offers favourable habitat for several mammal species including several threatened mammal species. The majority of larger mammals would have located suitable habitats away from the agriculture and sand mining activities, or have been destroyed by poaching and hunting.

An adult male kudu and common duiker were observed in the denser woodland vegetation around the purple alignment (miidlepoint). Evidence of Cape Clawless Otters (*Aonyx capensis*) as well as Marsh Mongoose (*Atilax paludinosus*) in the form of faeces or spraints as well as quills of Cape Porcupine (*Hystrix africaeustralis*) where also observed along the riparian zone of the perennial tributary around the red alignment middle point. Tree Squirrels (*Paraxerus cepapi*) were observed foraging adjacent to the Cluster Fig on the macro-channel banks of the Khokhovela River. Evidence (spoor) of several antelope species were observed along the informal dirt road around the proposed substation site including Bushbuck (*Tragelaphus scriptus*) and Common Duiker (*Sylvicarpa scrptus*). Slender Mongoose was observed running across the roads. Several rodent burrows (most likely Bushveld Gerbils) were observed in the old agricultural areas adjacent to the substation site. No major rocky outcrops were observed along the proposed alignments hence the lack of rupicolous mammal species such as Namaqua Rock Mouse and Rock Hyrax.

The Conservancies and privately owned nature reserves to the north and east of the alignments provides important habitat for several larger and smaller mammal species. Larger mammal species including Giraffe, Eland, Plains Zebra, Kudu, Impala, Wildebeest, Common Duiker, Grey Rhebok, Reedbuck, Blesbuck, Bushbuck, Warthogs, Red Hartebeest, African Elephant, Bushpigs, Antbears, Black-backed Jackal, Spotted Hyaena, Brown Hyaena, African Civet, Vervet Monkey, Common Warthog and Chacma Baboons. A list of mammal species observed on the site as well as species likely to occur on the site using habitat as an indicator of presence; is presented in the Appendix (see table 11).

Table2. Mammal species recorded during initial faunal survey.

COMMON NAME	**SCIENTIFIC NAME**
African (Common) Mole-rat	*Cryptomys hottentotus*
Scrub Hare	Lepus saxatilis
Slender Mongoose	*Galerella sanguinea*
Tree Squirrel	*Paraxerus cepapi*
Cape Clawless Otter	*Aonyx capensis*
Cape Porcupine	*Hystrix africaeaustralis*
Common Duiker	*Sylvicarpa grimmia*
Bushbuck	*Tragelaphus scriptus*
Kudu	*Tragelaphus strepsiceros*

HABITAT AVAILABLE FOR SENSITIVE OR ENDANGERED SPECIES

According to Skinner and Chimimba (2005) six mammal species of conservation importance or concern could possibly occur on the site using current distribution records and habitat requirements as an indicator of possible presence. These included Wild Dog (Endangered), Cheetah (Vulnerable), Lion (Vulnerable), Schreibers' Long-Fingered Bat (Vulnerable), White Rhinoceros (Lower Risk-Near-threatened), Ground Pangolin (Lower Risk-Near-threatened) and Brown Hyaena (Lower Risk-Near-threatened). The majority of species can be excluded due to lack of suitable habitat on the site. No actual observation or evidence of any sensitive or endangered mammals was recorded during the brief survey or are likely to occur within the powerline alignments or substation site. More comprehensive surveys undertaken over extended periods will deliver a more representative species list of mammal species likely to occur within the area.

4.2 AMPHIBIANS

Amphibian surveys by Jacobsen (1989), as well as recent and current surveys suggest that 51 species of amphibians currently occur in the Province of Mpumalanga. The present study concentrated mainly on Red Data species and species that are threatened or have relatively restricted distributions. Eight species are considered as important for setting conservation priorities. In Mpumalanga: *Vandijkophrynus* (*Bufo*) *gariepensis nubicolus* (Karroo toad), *Hadromophryne* (*Heleophryne*) *natalensis* (Cascade Frog/Natal Ghost Frog), *Hemisus guttatus* (Spotted shovel-nosed Frog), *Hyperolius semidiscus* (Yellow-striped Reed Frog); *Strongylopus wageri* (Plain Stream Frog), Giant Bullfrog (*Pycicephalus adspersus*), Greater Leaf-folding Frog (*Afrixalis fornasinii*) and Whistling Rain Frog (*Breviceps sopranus*).

The amphibian populations in Mpumalanga are faced with several environmental threats. Habitat destruction and alien vegetation resulting in fragmentation of populations is probably the major threats facing all frog species. Forestry and agriculture have already resulted in the rapid destruction and fragmentation of the habitat of populations of the species discussed here. Overgrazing and severe fires in the grassland catchment areas result in extensive silting up of streams and wetlands, threatening the breeding habitat of these frogs. The biphasic life cycle of most frogs, as well as their semi-permeable skin makes them particularly vulnerable to pollutants and other environmental stresses. Consequently frogs can be used as environmental bio-monitors to indicate the quality of the environment. Chemical pollution and acidification constitute a major threat to frog populations. Heavy metals such as aluminium, cadmium, copper, zinc and iron are all toxic to amphibians. It can be inferred from studies on fish that nickel, lead and manganese will also have deleterious effects on frog populations (Bishop 1996).

Herbicides and pesticides often cause developmental abnormalities or mortalities. A recent report has shown that widely used and apparently safe herbicides containing the active ingredient glyphosphate are extremely toxic to tadpoles and frogs (Bishop 1996). These herbicides are widely used in plantations, as well as in nature reserves for alien plant control and the making of firebreaks. Another threat to the continued survival of these frog species, is the damming of rivers, streams and wetlands. In many cases this action is followed by the introduction of alien fish species, with their associated parasites, for angling purposes in these dams. The preferred breeding habitat of five of the species discussed is natural, shallow, ephemeral pools and streams in palustrine wetlands. Deeper man-made dams and weirs alter and shrink the breeding habitat of these frogs considerably. Invasive predator fish species may also be a threat to the survival of the species.

No actual survey was undertaken due to extreme time constraints for an adequate herpetological survey. The majority of species in Mpumalanga Province are classified as explosive breeders completing their short duration reproductive cycle in the early summer months between (November-January). These frog species only emerge after the first heavy summer rainfalls and are dormant during the cold winter months. Explosive breeding frogs utilise ephemeral pans or inundated grasslands for their short duration reproductive cycles.

Figure7. Suitable breeding habitat for several frog species was observed within the seasonal pools situated within a perennial stream (red middle point). No surface water was present in the larger non-perennial rivers as well as several smaller drainage lines. No natural pans/depressions were observed during the site visit although several seasonally inundated depressions or old sand mining pits were observed adjacent to the alignments (especially the purple and red alignment)

Table3. Frog species recorded during the brief field survey.

COMMON NAME	SCIENTIFIC NAME
Guttural Toad	*Amietophrynus gutturalis*
Eastern Olive Toad	*Amietophrynus garmani*
Common Platanna	*Xenopus laevis*
Boettger's or Common Caco	*Cacosternum boettgeri*
Common River Frog	*Amietia angolensis*
Dwarf Puddle Frog	*Phrynobatrachus mababiensis*
Snoring Puddle Frog	*Phrynobatrachus natalensis*
Bushveld Rain Frog	*Breviceps adspersus*

As the survey was undertaken during the day only a small proportion of species were recorded. Heavy rains occurred within 24hours of the survey and resulted in the initiation of several explosive frog species. Comprehensive herpetological surveys can only be undertaken throughout the duration of the wet season (November-March). It is only during this period that accurate frog species lists can be compiled. The majority of amphibian species recorded calling within shallow pool situated within the perennial tributary or drainage line and included Common River Frog (*Amietia* (*Afrana*) *angolensis*); Common Platanna (*Xenopus laevis*) and Painted Reed Frog (*Hyperolius marmoratus taeniatus*). Several Dwarf Puddle Frogs (*Phrynobatrachus mababiensis*) were calling from the grassy banks and shallow edge of the tributary. Several road fatalities of Guttural Toad (*Amietophrynus gutturalis*) as well as Eastern Olive Toad (*Amietophrynus garmani*) were observed on the roads adjacent to the alignments.

Due to heavy precipitation during the previous 24 hours small, seasonally inundated grassland or pools were observed within old sand mining areas. Frog species recorded calling were Common Caco (*Cacosternum boettgerri*) as well as Snoring Puddle Frog (*Phrynobatrachus mababiensis*).

Figure8. A conglomerate of photographs displaying the frog species recorded adjacent to the proposed alignments. **A:** Snoring Puddle Frog (*Phrynobatrachus natalensis*), **B:** Guttural Toad (*Amietophrynus gutturalis*), **C:** Olive Toad (*Amietophrynus garmani*)*, **D:** Common River Frog (*Amietia angolensis*); **E:** Painted Reed Frog (*Hyperolius marmoratus taeniatus*); **F:** Russet-Backed Sand Frog (*Tompoterna marmorata*)**; G:** Bushveld Rain Frog (*Breviceps adspersus*). Photographs are not of actual specimens observed.

HABITAT AVAILABLE FOR SENSITIVE OR ENDANGERED SPECIES

Figure9. The Giant Bullfrog (*Pyxicephalus adspersus*) (left) occurs within limited localities within Mpumalanga Province. No suitable habitat remains within the area for Giant Bullfrogs although favourable habitat remains for the smaller African Bullfrog (*Pyxicephalus edulis*) (right).

Giant Bullfrog *(Pyxicephalus adspersus)*

As the largest southern African frog, it spends most of the year underground encased in a transparent cocoon, emerging only after heavy thunderstorms in summer. The Bullfrog breeds in shallow, temporary rain-filled pans and small wetlands in grassland and savanna (Passmore and Carruthers 1995), as well as in the Great Karroo (SAFAP). Although the species occurs widespread in southern Africa (Lambiris 1988), the populations in Mpumalanga are threatened by habitat degradation and fragmentation.

The predicted distribution of *P. adspersus* was determined using environmental variables such as elevation (800 to 1700 m a.s.l.) and mean annual rainfall of less than 750 mm. It is absent from high lying areas with high rainfall. These habitats are estimated to be more than 40% transformed. Loskopdam Nature Reserve is the only provincial protected reserve where the Giant Bullfrog was recorded (Jacobsen et al 1986). For this reason the species is considered **vulnerable** in the Mpumalanga Province.

The Giant Bullfrog is currently assigned as a **near-threatened** species (IUCN Red List category). Giant Bullfrogs have been recorded from the adjacent grid squares (Middleburg area) during previous surveys as well as during the South African Frog Atlas Project (SAFAP). Specimens recorded were of road fatalities, migrating adult males as well as potential breeding localities in the Middleburg area. Bullfrog density commonly varies within certain habitats (open grassland habitat). High densities are often

associated with specific microhabitats or patches (hygrophytic or aquatic ephemerophytic grass and sedge dominated temporary pans) that can be identified and randomly sampled. No suitable habitat remains along the proposed alignment as well as sub-station site for Giant Bullfrogs.

4.3 REPTILES

Most current knowledge of the reptiles of Mpumalanga is based on a survey done by N.H.G. Jacobsen (1989) providing a detailed account of all reptiles in the then Transvaal province. This survey resulted in descriptions of life histories, habitat requirements and conservation status and maps of the known distributions. Jacobsen's (1989) survey revealed that 154 reptiles occur in the Mpumalanga Province and of these, 86 species are threatened. However, many of these threatened reptiles have relatively wide distributions and thus this study was restricted to Red Data species and species that are largely restricted to Mpumalanga.

Reptile lists require intensive surveys conducted for several years. Reptiles are extremely secretive and difficult to observe during field surveys. The majority reptile species are sensitive to severe habitat alteration and fragmentation. Due to human presence in the area coupled with increased habitat destruction and disturbances around the alternative sites are all causal factors in the alteration of reptile species occurring on the site and surrounding areas. No major rock outcrops were observed on the site. Rock outcrops provide favourable refuges for certain snake and lizard species (rupicolous species). Trees including stumps; bark and holes in trees are vital habitats for numerous arboreal reptiles (chameleons, snakes, tree agamas, geckos and monitors).Several large termite mounds were observed along and around the proposed alignments. Termite mounds offer important refuges for numerous frog, lizard and snake species. Large number of species of mammal, birds, reptiles and amphibians feed on the emerging alates (winged termites). These mass emergences coincide with the first heavy summer rains and the emergence of the majority of herpetofauna. Termite mounds also provide nesting site for numerous snakes, lizards (varanids) and refuge habitats for several smaller mammals (shrews) and frogs. Trees including stumps, bark and holes are vital habitats for numerous arboreal reptiles (chameleons, snakes, agamas, geckos and monitors).

The indiscriminate killing of all snake species around the existing villages reduces reptile populations especially snake populations drastically. The frequent burning of the site will have a high impact on remaining reptiles. Fires during the winter months will severely impact on the hibernating species, which are extremely sluggish. Fires during the early

summer months destroy the emerging reptiles as well as refuge areas increasing predation risks.

Table4. List of reptile species recorded during brief field survey.

COMMON NAME	**SCIENTIFIC NAME**
Marsh or helmeted Terrapin	*Pelomedusa subrufa*
Striped Skink	*Mabuya striata punctatissima*
Flap-neck Chameleon	*Chamaeleo dilepis*
Delalande's Sandveld Lizard	*Nucras lalandii*
Yellow-throated Plated Lizard	*Gerrhosaurus flavigularis*
Nile Monitor	*Varanus niloticus*
Southern Tree Agama	*Acanthocerus atricolis*

Seven reptile species were recorded during the survey: Striped Skinks (*Trachylepis punctatissima*) was observed around the sheds as well as homestead. Spotted Sand Lizard (*Pedioplanis lineoocellata*), Flap-necked Chameleon (*Chamaeleo dilepis*), Yellow-throated Plated Lizard (*Gerrhosaurus flavigularis*) as well as Southern Tree Agama *Acanthocercus atricollis* and Ground Agama *Agama aculeate.distanti* were observed within the riparian zone of the perennial tributary. A Nile Monitor (*Varanus niloticus*) was flushed from the reed beds below the dam (green alignment) situated on the perennial tributary. No snake species were observed during field survey and populations are expected to be low due to high levels of human disturbance. A list of reptile species observed on the site as well as species likely to occur on the site using habitat as an indicator of presence; is presented in the Appendix see Table 12.

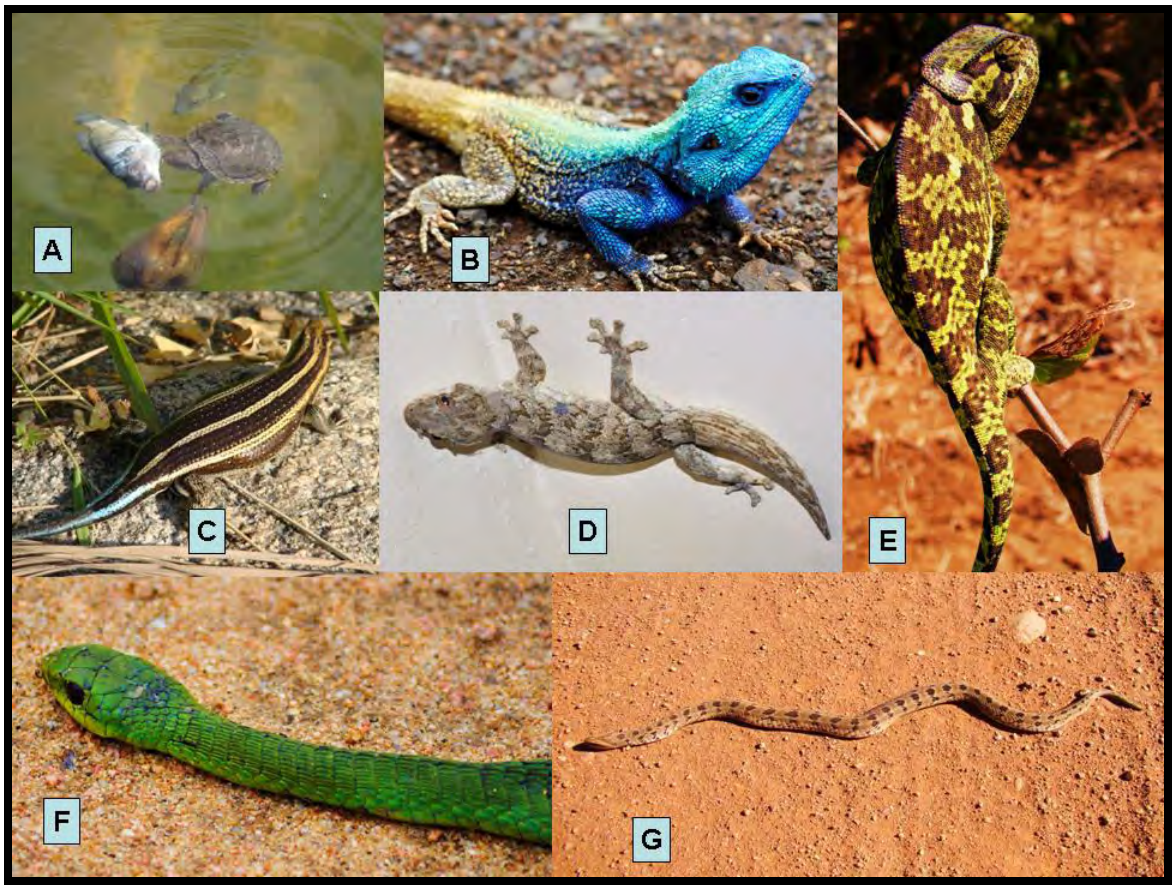


Figure10. A conglomerate of photographs of reptile species recorded (*) or likely to occur along the alignments. A: Marsh Terrapin (*Pelomedusa subrufa*); **B:** ***Southern Tree Agama (*Acanthocercus atricollis*); **C:** Rainbow Skink (*Trachylepis margaritifer*); **D:** Turner's Thick-toed Gecko (*Pachydactylus turneri*); **E:** ***Flap-necked Chameleon (*Chamaeleo dilepis*); **F:** Boomslang (*Dispholidus typus*) and **G:** Rhombic Night Adder (*Causus rhombeatus*).

HABITAT FOR SENSITIVE OR ENDANGERED SPECIES

Table5. Red data reptile species which have been recorded or suitable habitat exists on the site and immediate adjacent areas.

Common Name	Scientific Name	SA Red Data Status	IUCN STATUS
Southern African Python	*Python natalensis*	Vulnerable	*Vulnerable

*It is unlikely that pythons will retain this threat classification when reassessed using the latest IUCN criteria, since it appears to be relatively common in certain areas and has a widespread distribution (Alexander and Marais 2007).

Figure11. Southern African Python (*Python natalensis*) is protected in South Africa (SA RDB, Vulnerable**).** Pythons have been recorded from the east site as well as to the north within the private nature reserves. Photograph taken at Stanger in Kwazulu-Natal.

Southern African Python *(Python natalensis)*

The Southern African Python (*Python natalensis*) is protected in South Africa (SA RDB, Vulnerable) and their numbers have declined due to habitat destruction, killed for their skins (fashion), 'muti', illegally collected for pets and the pet industry. The majority of pythons are indiscriminately killed due to fear and ignorance or due to road fatalities. Pythons have been recorded from the surrounding areas especially within the conservation areas and private nature reserves.

Habitat and Ecology: Pythons live in a wide variety of habitats, but are most common in moist, rocky, well-wooded valleys. They are frequently found in and around water, in which they bask and ambush food. They are also excellent climbers. They hunt mainly at night or in the twilight, but can also be found basking, and occasionally even hunting during the day. The diet of juveniles consists mainly of small rodents and ground living birds, although they will also take fish and water or nile monitors (leguaans). The adults feed mainly on medium-sized mammals, including dassies, hares, cane rats, duikers, etc. The larger specimens will take larger mammals, and there are accurate, and often graphically illustrated, reports of Southern African Pythons killing and swallowing very large prey items. The largest recorded prey item for any large constrictor is that of a 59 kg impala swallowed by a 4.88 m African python (Rose, 1955). Other records include, among many others, a 6 m python consuming 6 goats (Taylor, 1981), a 5 m python that ate a pointer watchdog and two of her puppies (Jensen, 1980), and a 4.28 m python devouring a six-month old female impala (illustrated in Branch, 1984). F. W. Fitz Simons (1930) even records pythons killing leopards, and a python constricting a crocodile is illustrated in Halliday and Adler (1986).

The python is the only African snake large enough to consider humans edible, albeit very rarely. There are a number of anecdotal reports of human predation by pythons. In addition to the dangers of constriction, pythons have a mouthful of large, recurved and needle-sharp teeth that can deliver a powerful and lacerating bite. Adults are also irascible, and rarely settle well into captivity.

Man is now the python's main predator, killing them for food, 'muti', skins and, short-sightedly, to rid himself of a 'pest'. Other enemies include crocodiles, honey badgers or ratels, mongoose and meerkats, etc. Pienaar, *et al.* (1983) record a young python (825 mm) in the stomach of a Cape File snake. Pythons are often killed crossing roads, and when engorged with food they are especially vulnerable to attacks by packs of wild dogs and hyaenas.

Many African tribes prize python fat and skin for use in tribal medicines and witchdoctor's 'muti', whilst a large python represents a tasty and substantial food item (see photograph in Patterson and Bannister, 1987). All pythons, but particularly juveniles, are desired by the pet trade, and would find a ready market if not protected by law. Pythons are frequently electrocuted on the lower wires of electric fences which are erected around the increasing number of game farms.

No endangered reptile species were recorded during the brief field survey or are likely to occur within the proposed alignments or substation site. Extremely limited suitable habitat occurs within the remnant patches of riparian vegetation along the perennial and non-perennial rivers and streams for Southern African Python. No Southern African Pythons or evidence of pythons was observed during the brief field survey. Remaining Python populations would have been impacted on during the previous agricultural activities. As a precautionary measure an educational programme on Southern African Pythons should be implemented for the contractors of the project. If any pythons are discovered on the site the relevant conservation authorities should be informed and the python relocated in suitable habitat away from the alignments.

5. SENSITIVE HABITATS AROUND ALIGNMENTS

Due to habitat transformation surrounding the villages the remaining natural vegetation around the villages is of vital importance. This vegetation provides critical habitats for numerous plant and animal species. Animal species utilise the strip of vegetation around these areas for breeding, foraging, refuge, exploratory and migratory movements. All remaining large tree species should be retained wherever possible as they form vital habitat for numerous insectivorous predators, which control deleterious insect (grasshoppers), bird (queleas) and mammal (rodents) populations. Trees and stumps are vital habitats for numerous arboreal reptiles, birds and mammals; as they are used for refuge sites as well as foraging areas. Destruction of remaining tree species will result in decreased predators and increased populations of detrimental pest species, which could affect surrounding croplands. The majority of the site has little remaining agricultural potential because of the poor soil quality as well as limited water supply. Abundant pest animal species were also observed in the altered habitats.

KHOKHOVELA RIVER; PERENNIAL AND NON-PERENNIAL DRAINAGE LINES

Rivers are longitudinal ecosystems, and their condition at any point is a reflection of not only upstream activities, but also of those within adjacent and upstream parts of the catchment (O'Keefe 1986). Any impact on the riverine area within the study area is therefore also likely to impact on upstream and downstream areas.

The riparian zone comprises plant communities contiguous to and affected by surface and subsurface hydrological features of perennial or intermittent water bodies (rivers and streams). Riparian areas have one or both of the following characteristics: 1) distinctly different vegetative species than adjacent areas, and 2) species similar to adjacent areas but exhibiting more rigorous or robust growth form. The vegetation is dependant on the river for a number of functions including growth, temperature control, seed dispersal and germination and nutrient enrichment (Kemper, 2000). The vegetation comprises a distinct composition of species, often different from that of the surrounding terrestrial vegetation. Tree species are positioned according to their dependence or affinity for water, with the more water loving (mesic species) being located closest to the river channel, often with their roots in the water, and the less water loving terrestrial species further away from the river (Kemper, 2000).

Certain sections along the Khokhovela River as well as surrounding perennial and non-perennial drainage lines are more typical of the natural riparian vegetation, whilst others especially around existing villages have been severely altered due to riparian zone degradation. Impacts include the change in species composition due to:

- Reed encroachment
- Exotic species encroachment (*Melia azedarach, Lantana camara*)
- Encroachment of terrestrial species
- Loss of indigenous trees and shrubs
- Flooding of terrestrial and riparian vegetation.

Change in age structure of trees and shrubs due to loss of different size classes of shrubs and trees. There have been changes in the physical character of certain sections of the riparian zone mainly due to physical scars due to vegetation clearances, wood harvesting, erosion and restriction of riparian zone. Changes in the flow regime of the rivers will further impact the sensitive riparian zone upstream and downstream.

The riparian zone, of which vegetation is a major component, has a number of important functions including:

- Enhancing water quality in the river by the interception and breakdown of pollutants
- Interception and deposition of nutrients and sediments
- Stabilisation of riverbanks and macro-channel floor
- Flood attenuation
- Provision of habitat and migration routes for fauna and flora
- Provision of fuels, building materials and medicines for communities (if done on a sustainable basis!!)
- Recreational areas {fishing (rod and line not shade or gill nets); birdwatching; picnic areas etc.}

The entire riparian strips and its associated flora are sensitive and important habitats for numerous animal species. Trees are vital habitats for numerous arboreal animal species. Large numbers of birds were recorded in these woody habitats. The riparian vegetation plays a vital role in the re-colonization of aquatic macro-invertebrates. The majority of macro-invertebrates are only aquatic during their larval period and are terrestrial for their adult stages. Trees and shrubs provide vital refuge, foraging and migratory passages for species migrating to and away from the river. Fringing vegetation including trees, shrubs, reeds and forbs are vital habitats for numerous aquatic macro-invertebrates and fish species as well as for numerous animal species (reptiles, amphibians, birds and mammals).

All rivers and their associated riparian vegetation are sensitive habitats and disturbances and anthropomorphic induced impacts, activities around the Khokhovela River (substation site), perennial and seasonal tributaries should be strictly limited. Activities such as washing, uncontrolled cattle drinking areas, uncontrolled hunting and poaching, removal of riparian tree species, gill nets should be prevented as they will eventually result in the collapse of the aquatic ecosystem on which the nearby and downstream communities are dependent on for water supply.

All remaining large indigenous tree species (>4m) and shrubs (>2m) should be retained wherever possible and the towers and powerline alignment should be shifted to avoid remaining large tree species. Trees form vital habitats for numerous faunal species adapted to their arboreal habitat as well as playing a vital role in erosion stabilisation. Impacts on the sloping areas such as the macro-channel banks of the Khokhovela River must be strictly regulated preventing possible further deterioration of the environment. The soils of the site are highly erodable; extensive erosion could result without a protective vegetative layer. Habitats such as the remaining Granite Lowevld bushveld, scattered low-lying rock outcrops, trees, stumps, termitaria and leaf litter are all vital habitats for numerous animal species. The alignment should ideally avoid these sensitive micro-habitats for remaining faunal species.

6. EVALUATION OF THE PREFERRED ALIGNMENTS

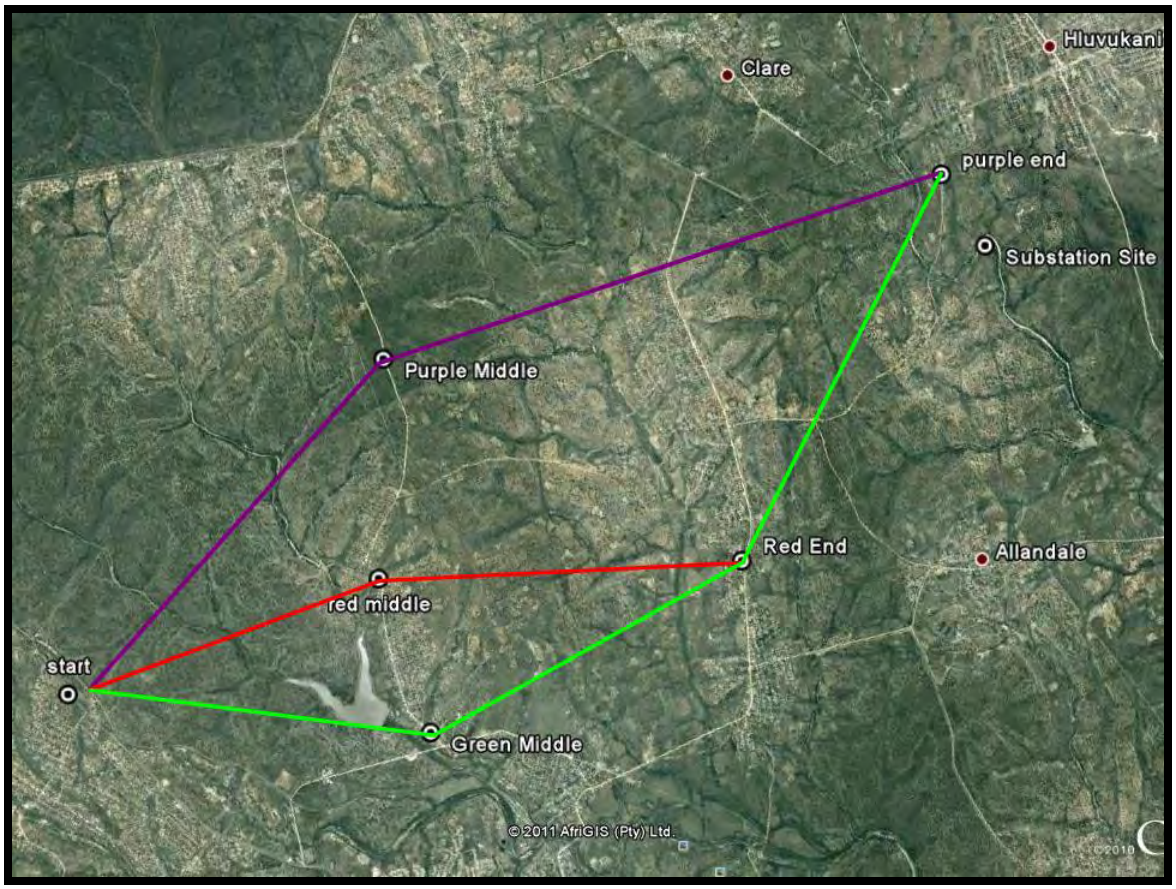
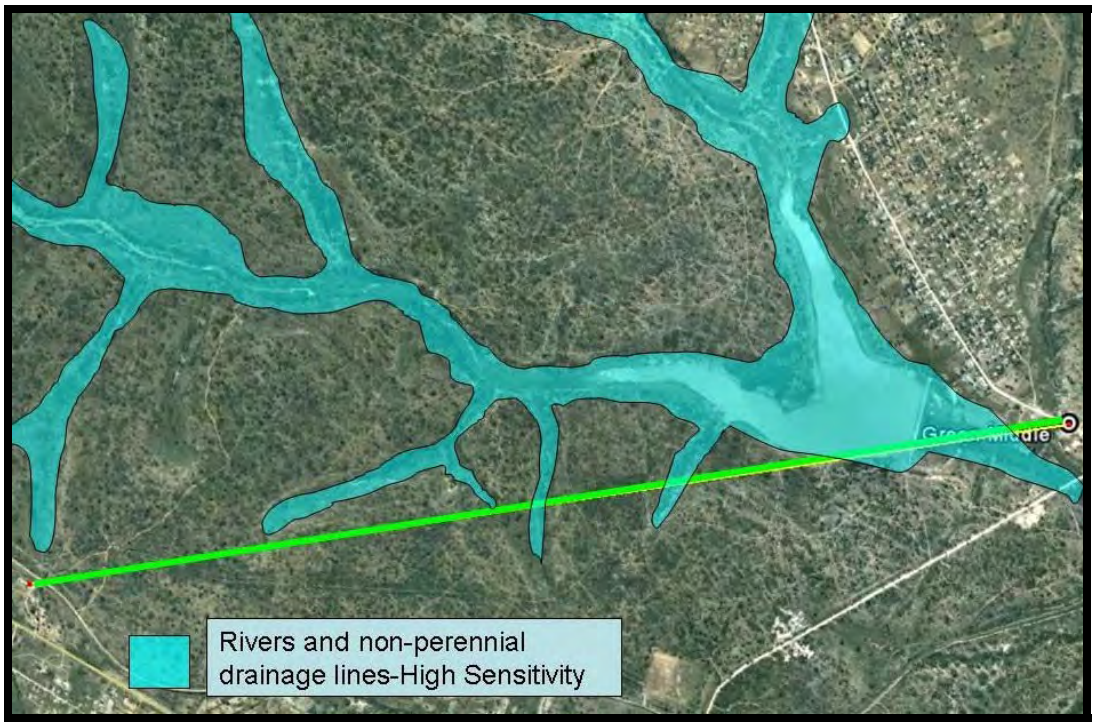


Figure12. A Google image of the three alternative alignments from the existing Mbumbu substation to the new Tsakani Substation. The preferred alignment from an ecological perspective is the green alignment followed by the red alternative; with the purple alignment being the least favourable.

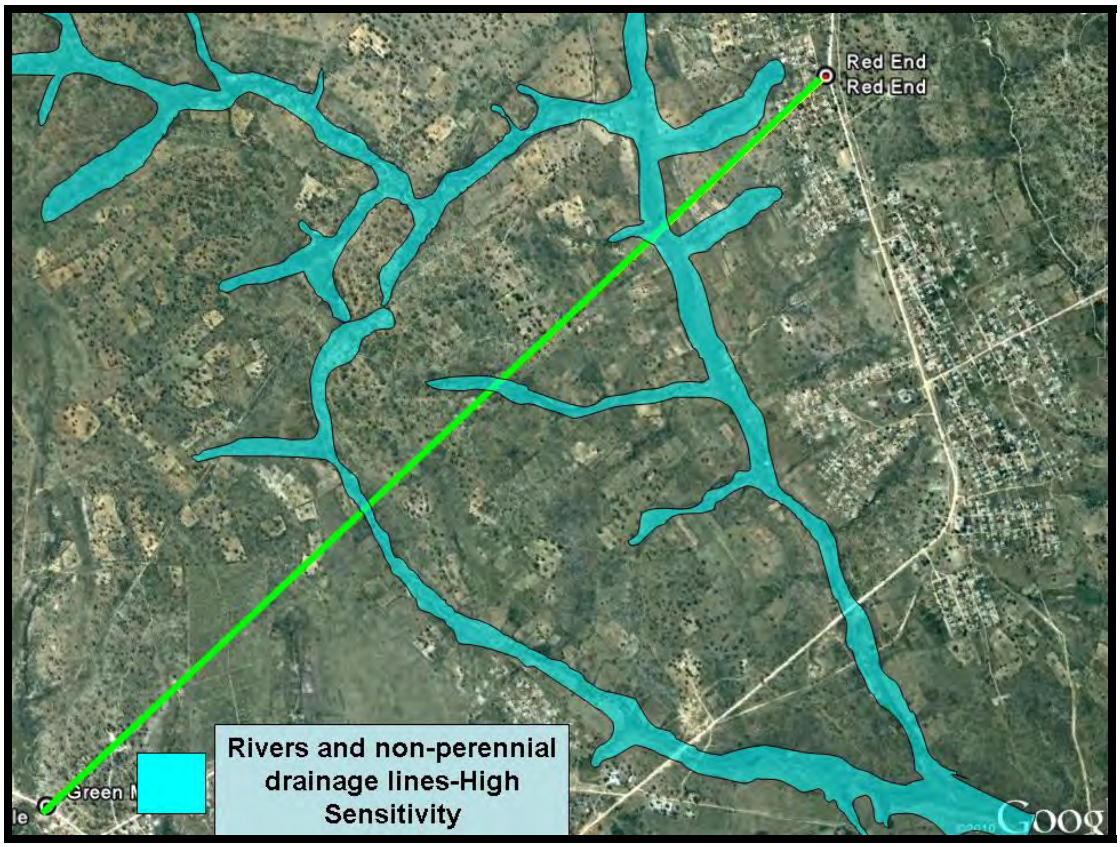
As mentioned previously, three potential alignments have been identified for the a new 17km 132kV loop-in and out Chikadee power line from the existing Mbumbu Switching Station. Factors considered in evaluating and determining the order of preference of the three corridors in terms of faunal impacts are listed and discussed below:

GREEN ALIGNMENT

Mbumbu Substation to Green Middle Point (opposite dam) (5.35 km)



Green Middle joins with the red alignment from the west (5.18 km).



Green (Red) Middle to end of alignment (6.4km)

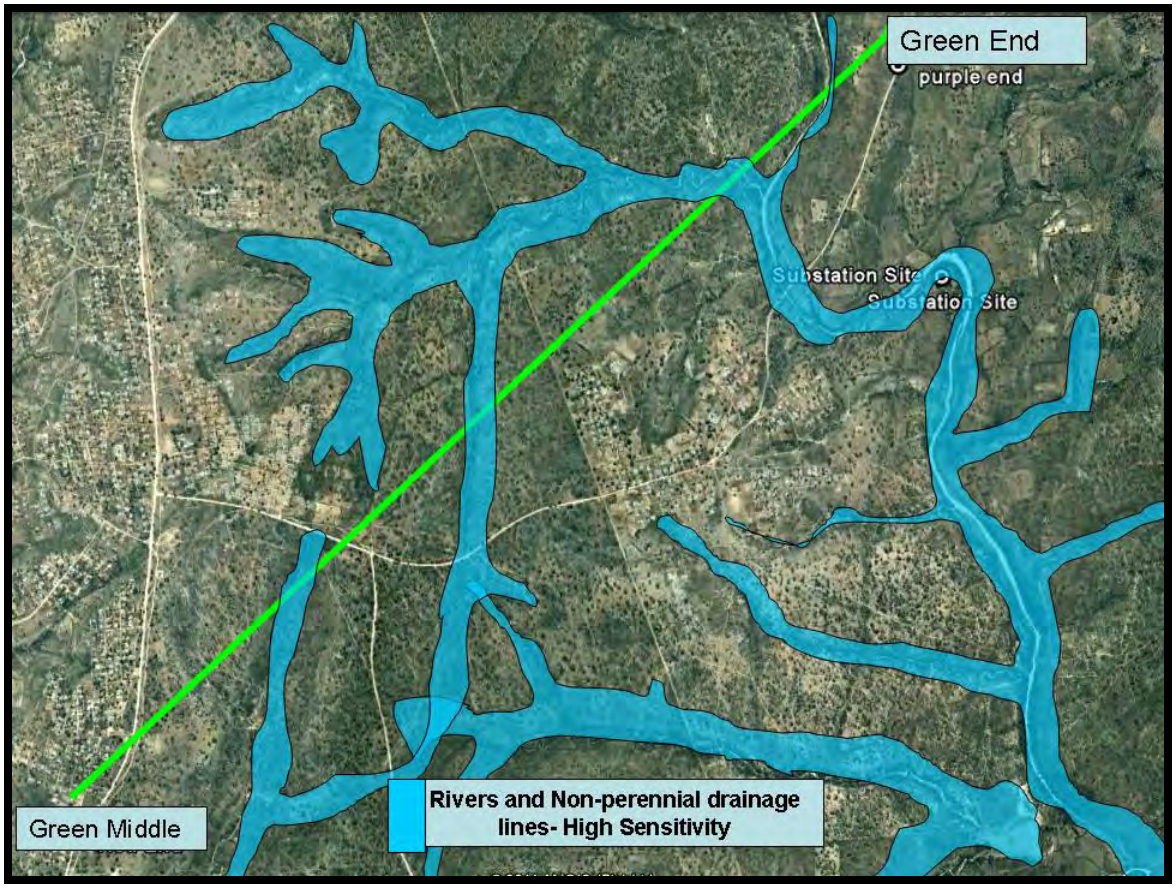
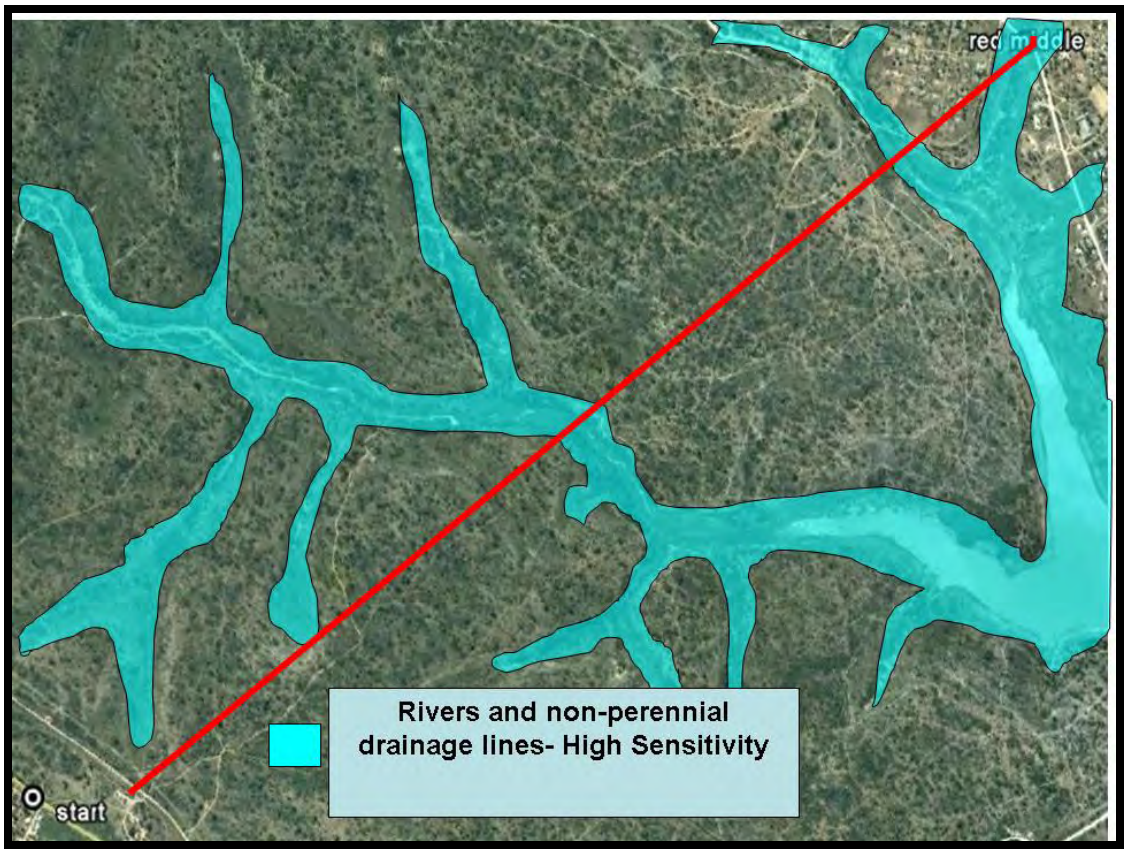


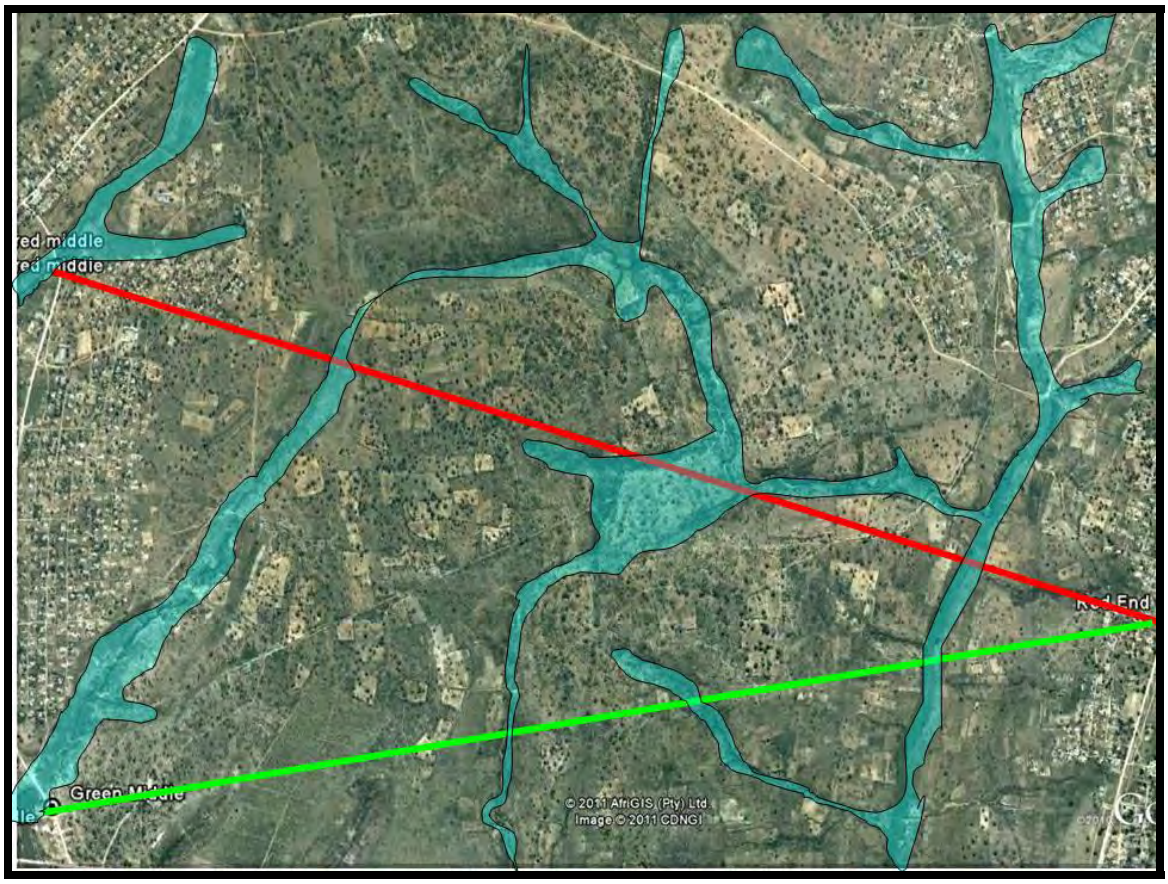
Figure13. A conglomerate of photographs displaying current impacts within and around the proposed green alignment. A: The green alignment exits the Mbumbu substation and heads in a south-easterly direction towards a large impoundment for approximately 5.35km. **B:** Several informal sand mining areas were observed to the east of the Mbumbu substation. Several large trucks were observed transporting sand from a large pit immediately to the east of the substation. **C:** The majority of riparian vegetation around the dam as well as non-perennial drainage lines has been removed and the vegetation has been degraded with only a few scattered large indigenous trees remaining. This will result in minimal vegetation clearance during construction activities as well as during the operational or maintenance phase. Ideally the final alignment of towers as well as powerline should be shifted around any large (>4m) indigenous tree species. **D:** A concrete irrigation trench/furrow restricts the migratory and dispersal movements of smaller animal species between the dam and the adjacent bushveld habitat. **E:** Existing Escom servitudes and lines as well as sand mining activities occur in the area. Several informal roads and tracks occur adjacent to the alignment especially for access to illegal sand mining operations in the area as well as wood harvesting. The vegetation has been impacted on by surrounding anthropogenic activities including extensive wood harvesting and overgrazing. Bush encroachment by *Dicrostachys cinerea*. Hunting with dogs was observed during site visitation.

The green alignment bisects several non-perennial drainage lines. The majority of the riparian vegetation along the rivers has been removed for wood harvesting although certain sections display a more natural species composition. All riverine areas including their associated riparian or hygrophilous vegetation along the seasonal drainage lines must be considered as sensitive habitats and activities must be strictly managed (see management recommendations). As the majority of the alignment is situated within degraded or transformed vegetation as well as existing powerline servitudes, access roads and informal tracks and livestock pathways with limited habitat diversity this significantly reduces the level of disturbance and habitat destruction. In addition, fauna in the immediate vicinity of the existing lines as well as adjacent sand mining areas would already be relatively tolerant of disturbance as a result of maintenance activities as well as sand mining activities. The green alignment is the **preferred alignment** for the vegetation as well as remaining fauna within the areas.

RED ALIGNMENT

Mbumbu Substation heads towards the east above the man-made dam for approximately 4.8km. The red middle point is situated within a valley bottom wetland or perennial drainage line.



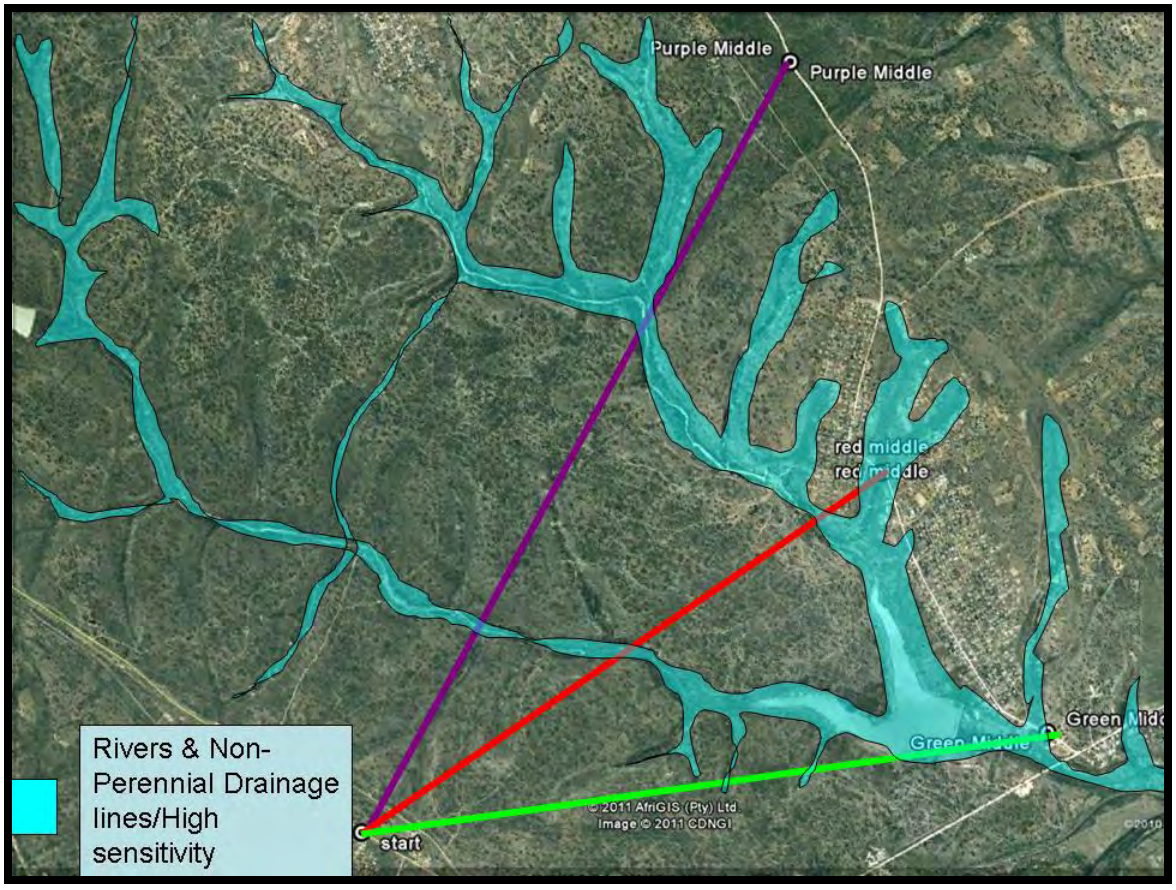


The red alignment shifts towards the south-east for approximately 5.30km to the green middle point. The red alignment joins up with the green alignment towards the north-east (new substation site) for 6.4km.

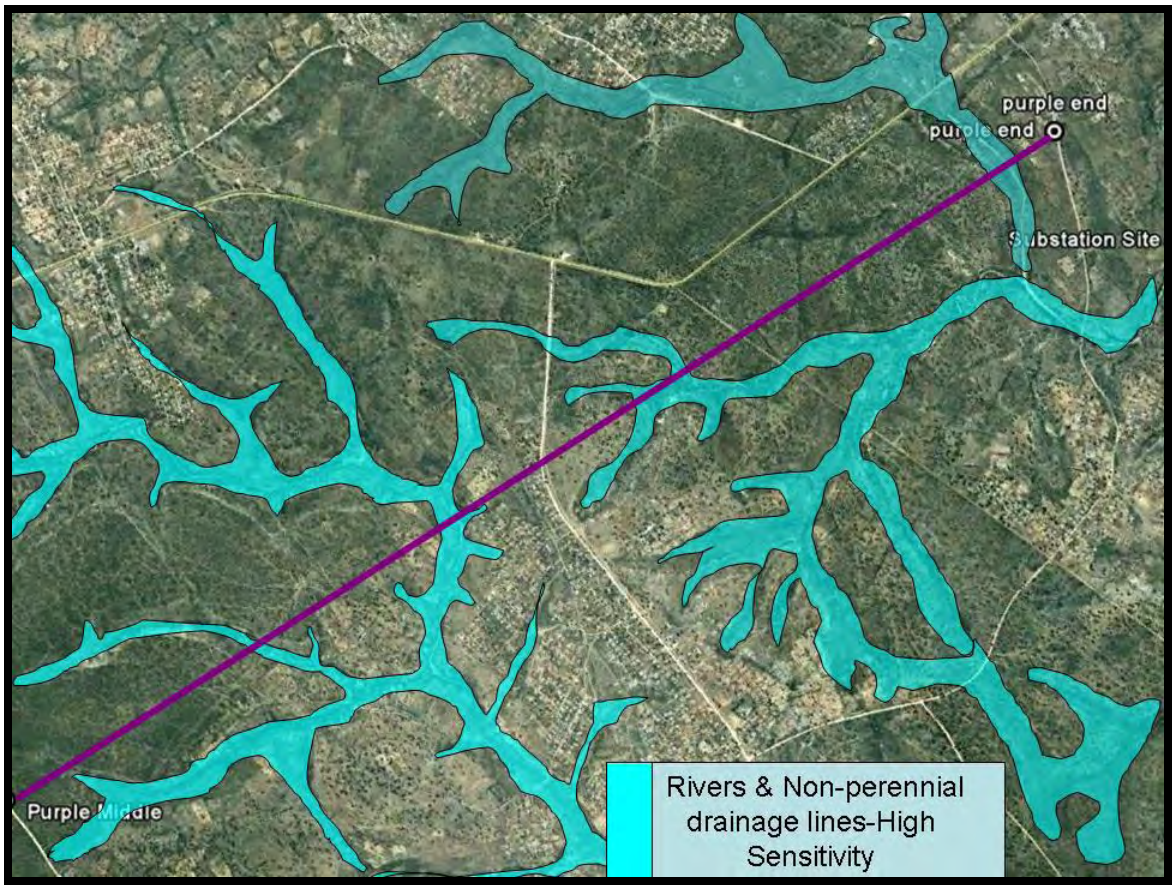
Although the majority of the vegetation along the red alignment has been transformed or degraded certain sections display a more natural species composition. The red middle point is situated within a perennial drainage line which contains hygrophilous vegetation, rocky macro-channel banks as well as remnant patches of riparian vegetation. For this reason the red alignment is the **second preferred alignment** from an ecological perspective.

Figure14. **A:** The red middle point is situated adjacent to a perennial drainage line or stream which contains hygrophilous vegetation as well as pools. The stream provides a valuable water source for remaining animal species in the areas as well as the adjacent community; **B:** Rocky macro-channel banks downstream from the red middle point offer suitable habitat for rupicolous associated animal species as well as unique vegetation; **C:** The perennial stream has sections of indigenous riparian tree species and must be considered as a sensitive habitat due to ecological functioning as well as a potential biological or dispersal corridor.

PURPLE ALIGNMENT



From the Mbumbu substation the alignment heads in a northerly direction for 6.79km. The vegetation displays a more natural species composition (more abundant large tree and shrub species) and has been less impacted on than the vegetation towards the south and east around the existing villages. Fewer impacts were observed due to limited access in the area. Fewer tracks and pathways occur in the areas and limited sand mining activities.



The purple alignment continues in a north-easterly direction for approximately 8.70km. The purple alignment bisects several non-perennial drainage lines as well as the Khokhovela River which must be considered as sensitive habitats.

Figure15. The purple alignment bisects Granite Lowveld bushveld which displays a more natural species composition as well as containing several larger tree species. Areas to the east of the purple middle point are fenced. The area currently contains fewer access roads as well as informal tracks which restricts which restricts access as well as anthropogenic activities such as wood harvesting, poaching and hunting as well as sand mining. For this reason the purple alignment is the **least preferred alignment** from an ecological perspective.

TSAKANI SUBSTATION SITE

The proposed 1ha Tsakani substation site is situated within transformed and degraded bushveld habitat adjacent to fallow agricultural lands and livestock enclosures. The Khokhovela River is immediately to the east of the proposed substation site. A non-perennial drainage line occurs to the south of the substation site. The substation must be sufficiently positioned outside the riparian areas of the Khokhovela River as well as non-perennial drainage line. DWA requires a 32m buffer zone from the outer edge of the riparian zones.

7. GENERIC DESCRIPTION OF POTENTIAL IMPACTS OF POWER LINES ON ASSOCIATED FAUNA

Because of their size and prominence, electrical infrastructures constitute an important interface between wildlife and man. Negative interactions between wildlife and electricity structures take many forms, but two common problems in Southern Africa are electrocution of birds (and other animals) and disturbance and habitat destruction during construction and maintenance activities.

7.1 Habitat destruction and disturbance

During the construction phase and maintenance of powerlines, some habitat destruction and alteration inevitably takes place. This happens with the construction of access roads, and the clearing of servitudes. 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 fauna breeding, foraging and roosting in or in close proximity of the servitude, both through modification of habitat and disturbance caused by human activity.

Mitigation and Recommendations

The following general recommendations are made to minimise the impacts of powerline construction on **threatened fauna**:

- Close site supervision must be maintained during construction.
- During the **CONSTRUCTION** phase workers must be limited to areas under construction and access to the undeveloped areas, especially the surrounding open areas must be strictly regulated (“no-go” areas during construction activities).
- Provision of adequate toilet facilities must be implemented to prevent the possible contamination of ground (borehole) water in the area. Mobile toilets must be provided in order to minimise unauthorised traffic of construction workers outside of the designated areas.
- All temporary stockpile areas including litter and dumped material and rubble must be removed on completion of construction. All alien invasive plant should be removed from the site to prevent further invasion.
- Access to the powerline servitude must be restricted. Access to the powerline servitude should ideally be fenced off and gated along the main access roads.

No quad-bikes, motorcycles or off road vehicles and illegal hunting as well as illegal sand mining should be permitted in the adjacent properties.

- Firearms or any other hunting weapons must be prohibited on site.
- Contract employees must be educated about the value of wild animals and the importance of their conservation.
- Educational programmes for the contractor's staff must be implemented to ensure that project workers are alerted to the possibility of snakes being found during vegetation clearance. The construction team must be briefed about the management of snakes in such instances. In particular, construction workers are to go through ongoing refresher courses to ensure that threatened snakes, such as African Rock Pythons, are not killed or persecuted when found.
- Severe contractual fines must be imposed and immediate dismissal on any contract employee who is found attempting to snare or otherwise harm wild animals.
- No animals should be intentionally killed or destroyed and poaching and hunting should not be permitted on the site.
- No specific recommendations are made for the protection of burrowing red data mammals. Consideration could be given to rescuing the animals where there burrows are found in advance of construction. This is not recommended as a general prescription since the chances of digging out live Aardwolf or Antbear are small. Aardwolf are likely to vacate their burrows in the face of the advancing construction. There is also a risk associated with capturing animals dug out of burrows, and holding them in captivity. If a section of many active burrows is found then mitigation could be considered (minor deviation to the powerline alignment or rescue operation for the animals).
- Prior to construction and vegetation clearance a suitably qualified Zoologist/Botanist or Ecologist should closely examine the proposed construction areas (tower supports) for the presence of any animal burrows (including spiders and scorpions), rocky outcrops, logs, stumps and other debris and relocate any affected animals to appropriate habitat away from the servitude or tower.

7.2 VEGETATION/FLORA

Protected or endangered species may occur along the line route. Special care should be taken not to damage or remove any such species unless absolutely necessary. Permits for removal must be obtained from Provincial Nature Conservation should such species be affected as well as the Department of Forestry for the removal of protected tree species namely the Marula (*Sclerocarrya birrea* subsp. *caffra*) as well as Wild Teak (*Pterocarpus rotundifolius*). All plants not interfering with the operation of the line shall be left undisturbed. Collection of firewood and traditional medicinal plants is strictly prohibited. No area should be cleared of trees, bushes and other vegetation for the purpose of a camping site.

Management objective

- Minimal disturbance to vegetation where such vegetation does not interfere with construction and operation of the line
- No unnecessary destruction to surrounding vegetation
- Protection of any protected or endangered plant species
- Prevention of litigation concerning removal of vegetation

Measurable targets

- Adequate protection of any endangered or threatened plant or tree species
- No litigation due to removal of vegetation without the necessary permits

Mitigation and recommendation

Remaining indigenous bulbous geophytes and Aloes should be retained or replanted wherever possible. Gardens or landscaped areas around the Tsakani Substation development should be planted with indigenous (preferably using endemic or local species from the area) grasses, forbs, shrubs and trees, which are water wise and require minimal horticultural practices. Where herbicides are used to clear vegetation, specimen-specific chemicals should be applied to individual plants only. General spraying should be prohibited.

All alien vegetation should be eradicated over a five-year period. Invasive species should be given the highest priority. No dumping of any materials in undeveloped open areas and neighbouring properties. Activities in the surrounding open undeveloped areas (especially open bushveld must be strictly regulated and managed.

The construction of the proposed Mbumbu-Tsakani 132kV powerline could result in limited opening-up of the vegetal cover during the construction phase. The opening up of existing vegetated areas, thereby creating corridors along which animals can move, may result in increased predation levels on small mammals, reptiles, amphibians, arachnids and scorpions along these corridors. The limitation of the disturbance of vegetation cover as well as rocky outcrops, logs, stumps, termite mounds within sensitive areas will ameliorate this impact. Impact will be short-long term depending on the amount of vegetation to be cleared. Excessive habitat destruction during construction could reduce the amount of habitat available. This impact is anticipated to be localised, of a long-term nature and of low significance, provided that appropriate mitigation measures are implemented (e.g. the limitation of vegetation clearance within sensitive areas especially riverine crossings).

7.3 REVEGETATION

Where necessary a suitable mixture of grass seed shall be used to re-seed damaged areas. Badly damaged areas shall be fenced in to enhance rehabilitation. Areas to be rehabilitated must be planted with a mixture of endemic pioneer grass species endemic to the area, as soon as the new growing season starts. To get the best results in a specific area, it is a good idea to consult with a vegetation specialist or the local extension officer of the Dept of Agriculture. Seed distributors can also give valuable advice as to the mixtures and amount of seed necessary to seed a certain area. Re-seeding, as well as fencing in of badly damaged areas, will always be at the discretion of the Environmental Control Officer, unless specifically requested by a Landowner.

Management objective

- Minimise damage to topsoil and environment at tower positions
- Successful rehabilitation of all damaged areas
- Prevention of erosion

Measurable targets

- No loss of topsoil due to construction activities
- All disturbed areas successfully rehabilitated within three months of completion of the contract
- No visible erosion scars three months after completion of the contract

A mixture of seed can be used provided the mixture is carefully selected to ensure the following:

a) Annual and perennial plants are chosen.
b) Pioneer species are included.
c) All the plants shall not be edible.
d) Species chosen will grow in the area without many problems.
e) Root systems must have a binding effect on the soil.
f) The final product should not cause an ecological imbalance in the area.

CONSTRUCTION PHASE

- Disturbed areas of natural vegetation as well as cut and fills must be rehabilitated immediately to prevent soil erosion.
- Re-seeding shall be done on disturbed areas as directed by the Environmental Control Officer.

7.4 Surrounding Farming Activities

Domestic Livestock

Construction activities must be planned carefully so as not to interfere with the calving and lambing season for most animal species. The Contractor's workforce will have to be very careful not to disturb the animals as this may lead to fatalities which will give rise to claims from the Landowners. Interference with any wildlife without the applicable permits shall not be allowed. The Contractor shall under no circumstances interfere with livestock without the Landowner being present. This includes the moving of livestock where they interfere with construction activities. Should the Contractors workforce obtain any livestock for eating purposes, they must be in possession of a written note from the Landowner. Speed limits must be restricted especially on farm roads (30km/hr) preventing unnecessary road fatalities of surrounding livestock.

Management objective

- Minimise disruption of surrounding farming activities
- Minimise disturbance of fauna
- Minimise interruption of breeding patterns of fauna

Measurable targets

- No hunting and poaching or intentional killing of animals (including snakes, scorpions, spiders)
- No stock losses where construction is underway
- No complaints from Landowners or Nature Conservation
- No litigation concerning stock losses and animal deaths

7.5 ACCESS ROADS

Planning of access routes must be done in conjunction between the Contractor, Eskom and the Landowner. All access to private farmland must be negotiated in advance with land-owners. All agreements reached shall be documented in writing and no verbal agreements should be made. The condition of existing access / private roads to be used shall be documented with photographs.

The Contractor shall properly mark all access roads. Markers shall show the direction of travel as well as tower numbers to which the road leads. Roads not to be used shall be marked with a "**NO ENTRY**" sign. Unnecessary traversing of agricultural and natural open land is discouraged. Where required, speed limits shall be indicated on the roads (30km). All speed limits shall be strictly adhered to at all time.

Vehicle access to the powerline servitude must as far as possible be limited to existing roads. If a new access roads need to be constructed it should follow cleared areas such as cattle pathways. The following mitigation should also be undertaken:

7.6 VEGETATION CLEARANCE

Management objective

- Minimise damage to surrounding vegetation
- Minimise damage to topsoil
- Successful rehabilitation of barren areas

Measurable targets

- No damage to vegetation outside the road servitude
- No loss of topsoil
- No visible erosion three months after completion of the contract
- All disturbed areas successfully rehabilitated three months after completion of the contract

The object of vegetation clearing is to trim, cut or clear the minimum number of trees and vegetation necessary for the safe mechanical construction and electrical operation of the distribution line. Only an 8m strip may be cleared flush with the ground to allow vehicular passage during construction. No scalping shall be allowed on any part of the servitude road unless absolutely necessary. The removal of all economically valuable trees or vegetation shall be negotiated with the Landowner before such vegetation is removed.
Vegetation clearing on tower sites must be kept to a minimum. Big trees with large root systems shall be cut manually and removed, as the use of a bulldozer will cause major damage to the soil when the root systems are removed. Stumps shall be treated with

herbicide. Smaller vegetation can be flattened with a machine, but the blade should be kept above ground level to prevent scalping. Any vegetation cleared on a tower site shall be removed or flattened and not be pushed to form an embankment around the tower.

No vegetation clearing in the form of de-stumping, scalping or uprooting shall be allowed on river- and stream banks (riparian zone). Vegetation shall only be cut to allow for the passage of the pilot-cables and headboard. Trees and vegetation not interfering with the statutory clearance to the conductors can be left under the line. Dense vegetation under the line which could cause a fire hazard, particularly in the middle third of the span in the vicinity of the lowest point of the conductors, will be considered as a separate case. With permission of the landowner, the total servitude under the line and up to 5m outside the outer phases should be cleared.

Protected tree species or plants shall not be removed unless they are interfering with a structure. Where such species have to be removed due to interference with a structure, the necessary permission and permits shall be obtained from Provincial Nature Conservation as well as Department of Forestry. The protected tree species must be identified by a suitable qualified botanist/ecologist prior to construction and vegetation clearance. All protected species not to be removed must be clearly marked and such areas fenced off if required.

Disturbed areas of natural vegetation as well as cut and fills must be rehabilitated immediately to prevent soil erosion.

The use of herbicides shall only be allowed after a proper investigation into the necessity, the type to be used, the long-term effects and the effectiveness of the agent. Eskom's approval for the use of herbicides is mandatory. Application shall be under the direct supervision of a qualified technician. All surplus herbicide shall be disposed of in accordance with the supplier’s specifications.

Upon completion of the stringing operations and before handover, the servitude must be inspected and all vegetation interfering with the safe operation of the line shall be removed / cut down. All alien vegetation in the total servitude and densifiers creating a fire hazard shall be cleared and treated with herbicides.

It is recommended that a contractor for vegetation clearing should comply with the following parameters:

- the contractor must have the necessary knowledge to be able to identify protected species as well as species not interfering with the operation of the line due to their height and growth rate.
- the contractor must also be able to identify declared weeds and alien species that can be totally eradicated.
- the contractor must be in possession of a valid herbicide applicators licence.

7.7 DANGEROUS ANIMALS

Numerous dangerous wild animals and arachnids and scorpions occur around the substation site and along the proposed loop-in-line and thus safety measures must be implemented to ensure the safety of the contractors and sub-contractors.

ARACHNIDS

During the construction phase care must be taken not to destroy any trap-door or baboon spider burrows. Prior to excavations a thorough inspection of the cleared areas must be undertaken to determine the presences of any baboon spider burrows, loosely embedded rocks or stumps in the proposed cleared areas. Several species of Baboon and Trapdoor species have been recorded in the area.

Conservation

Of the mygalomorphs, it is mainly the larger Baboon Spiders that are in great demand as pets and are consequently regarded as commercially threatened by the International Union for Conservation of International Trade in Endangered Species (CITES) (De Wet & Schoonbee 1991). The genera *Ceratogyrus, Harpactira* and *Pterinochilus* were added to schedule V11 of the Transvaal Provincial Nature Conservation Ordinance of 1983 as Protected Invertebrate Animals. Eskom must ensure that no baboon spiders are illegally collected or intentionally destroyed throughout all stages of the project.

Scorpions

Several species of scorpions are recorded from the area. These scorpions construct burrows or scrapes under rocks as well as found under loose bark, wood piles and other surface debris. The majority of these scorpions possess a painful sting they are not of medical importance except *Parabuthus spp.* which are amongst South Africa's most venomous scorpion species. Care should be taken when removing stumps, logs or rock material. Any scorpions encountered on the site should be left alone and allowed free access away from the activity or safely removed from the area. No scorpions should be intentionally killed. Standard precautions or safety measures includes wearing sturdy leather boots and gloves in the field and close inspection of sleeping areas and bedding, clothes, shoes etc. for any scorpions. Stings from mildly venomous scorpions cause localised pain and swelling, with little systematic reaction. The affected limb should be immobilized and an ice pack should be applied, if possible, to the site of the sting. The site of the sting should be cleaned and never cut open. Venom sprayed in the eyes (certain *Parabuthus* species are able to spray venom) produces an intense burning sensation and may result in temporary blindness if the eyes are not washed out thoroughly with clean water or some other neutral liquid such as milk

SNAKES

Several venomous snake species occur along the proposed route including Southern or Bibron's Burrowing Asp (*Actractaspis bibronii*), Mozambique Spitting Cobra (*Naja mossambica*), Snouted Cobra (Naja *annulifera*), Black Mamba (*Dendroaspis polylepis*), Puff Adder (*Bitis arietans*), Boomslang (*Dispholidus typus*), Common or Rhombic Night Adder (*Causus rhombeatus*). General avoidance of snakes is the best policy if

encountered. Snakes should not be harmed or killed and allowed free movement away from the area. Safety precaution measure must be implemented especially during the vegetation clearance phase which could result in encounters with several venomous snake species. Appropriate foot wear (sturdy leather boots) should be worn in the field.

7.8 POISONOUS PLANTS

The Oleander (*Nerium oleander*) and the Yellow Oleander (*Thevetia peruviana*) are both poisonous plants and are potentially lethal to livestock as well as humans. They are common within the rural homesteads situated adjacent to the proposed alignments. Two leaves and around 4 seeds of the Yellow Oleander can be fatal to a child.

7.9 Fire Prevention

The frequent burning of the vegetation will have a high impact on remaining reptile species. Fires during the winter months will severely impact on the hibernating species, which are extremely sluggish. Fires during the early summer months destroy the emerging reptiles as well as refuge areas increasing predation risks.

Management objective

- Minimise risk of veld fires
- Minimise damage to grazing
- Prevent runaway fires

Measurable targets

- No veld fires started by the Contractor's work force
- No claims from Landowners for damages due to veld fires
- No litigation

Mitigation and recommendations

No open fires shall be allowed on site under any circumstance. The Contractor shall have fire-fighting equipment available on all vehicles working on site, especially during the winter months.

7.10 Threatened animals

At a local scale the study site and surrounding areas comprises little or no suitable habitat for any threatened animal species.

Mitigation and recommendations

As a precautionary mitigation measure it is recommended that the developer and construction contractor as well as an independent environmental control officer should be made aware of the possible presence of certain threatened animal species (South African Python) prior to the commencement of construction activities. In the event that any of the above-mentioned species are discovered relevant conservation authorities should be informed and activities surrounding the site suspended until further investigations have been conducted.

8. IMPACT RANKING OF POTENTIAL IMPACTS TO ASSOCIATED FAUNA

The activities associated with a given development project may have impacts during the construction and/or operational phases. In this report, the assessment of impacts was divided into three phases associated with a project. These are i) the *status quo* or present situation taking consideration of existing impacts not associated with the proposed development, ii) the *construction phase* including surveying and other activities associated with the planning of the project, construction and all the activities associated with construction until the contractor leaves the site and iii) the *operational phase* which includes all activities associated with the operation and maintenance of the proposed development. The criteria against which the activities were assessed are presented below.

Assessment criteria

Extent of the impact:

The spatial scale of the impacts are described as either:

- local (i.e. within the boundaries of the alignment or site),
- regional (i.e. the impact could affect the greater Acornhoek area and other nearby towns and villages, conservation areas etc.), or
- national (i.e. South Africa)

Intensity of the impact

The intensity or severity of the impacts within the context of all the activities and other impacts associated with the project and is indicated as either:

- **low** (i.e. where the impact affects the environment in such a way that physical, biological, cultural, social and economic functioning and processes are not affected),
- **medium** (i.e. where the affected environment is altered but physical, biological, cultural, social and economic functioning and processes continue albeit in a modified way), or
- **high** (where physical, biological, cultural, social and economic functioning and processes are altered to the extent that they will temporarily or permanently cease).

Probability of occurrence

The likelihood of the impact actually occurring throughout or during any stage of the life cycle of the activity, is indicated as either:

- **improbable** (the possibility of the impact materialising is very low as result of design or historic experience),
- **probable** (there is a distinct possibility that the impact will occur and mitigation measures are required),
- **highly probable** (it is most likely that the impact will occur), or
- **definite** (the impact will occur regardless of the implementation of any prevention measures and mitigatory measures are required to contain the effect).

Duration of the impact

The life span of the impact is described as either:

- short term, the impact will either disappear with mitigation or will be mitigated through natural processes (0-5 years),
- medium term (6-15 years),
- long term (where the impact will last the entire operational life of the powerline, but would be mitigated by direct human action or by natural processes thereafter), or
- permanent (the impact will persist beyond the operational life of the powerline).

Significance of the impact

Based on a synthesis of the information contained in points i - iv above, the potential impacts are assessed in terms of the following significance criteria:

< **low** (i.e. where the impact would not have any influence on the decision to continue with the proposed project)

< **moderate** (i.e. where the impact should influence the decision to continue with the proposed development in the area unless it is effectively mitigated to acceptable levels),

< **high** (i.e. where the impact must influence the decision to continue with the proposed development regardless of any mitigation measures).

Table6. Summary table of ranking of potential impacts of the proposed green alignment on vegetation and associated fauna.

POTENTIAL IMPACT	INTENSITY	EXTENT	PROBABILITY OF OCCURENCE	DURATION	SIGNIFICANCE (WITHOUT MITIGATION)	SIGNIFICANCE (WITH MITIGATION)
Loss of Protected Tree species	Medium-Low	Localized along powerline and access roads servitude.	Highly Probable	Short-Long Term during construction and maintenance	Medium-Low	Low
Loss of Faunal Habitat	Medium-High	Localized along powerline and servitude.	Definite	Short-long term	Medium-High	Medium-low
Threatened Fauna	Medium-Low	Local	Probable	Short-Long Term during construction and maintenance	Medium	Low
Increased Human Presence	Medium-Low	Local	Highly Probable	Short-Long Term during construction and maintenance	Medium	Low
Vegetation Clearance	Medium-low	Local	Definite	Short-term during construction and maintenance	Medium	Low
Re-vegetation	Medium-Low	Local	Probable	Short duration	Medium	Low
Disturbances to Livestock	Medium-Low	Local	Probable	Short-Long Term Duration	Medium-Low	Low
Fire	Medium-High	Local and adjacent bushveld areas	Probable	Short-Long Term Duration	Medium-High	Low

Table7. Summary table of ranking of potential impacts of the proposed red alignment on vegetation and associated fauna.

POTENTIAL IMPACT	INTENSITY	EXTENT	PROBABILITY OF OCCURENCE	DURATION	SIGNIFICANCE (WITHOUT MITIGATION)	SIGNIFICANCE (WITH MITIGATION)
Loss of Protected Tree species	Medium-Low	Localized along powerline and access roads servitude.	Highly Probable	Short-Long Term during construction and maintenance	Medium-Low	Low
Loss of Faunal Habitat	Medium-High	Localized along powerline and servitude.	Definite	Short-long term	Medium-High	Medium-low
Threatened Fauna	Medium-Low	Local	Probable	Short-Long Term during construction and maintenance	Medium	Low
Increased Human Presence	Medium-Low	Local	Highly Probable	Short-Long Term during construction and maintenance	Medium	Low
Vegetation Clearance	Medium-low	Local	Definite	Short-term during construction and maintenance	Medium	Low
Re-vegetation	Medium-Low	Local	Probable	Short duration	Medium	Low
Disturbances to Livestock	Medium-Low	Local	Probable	Short-Long Term Duration	Medium-Low	Low
Fire	Medium-High	Local and surrounding grassland areas	Probable	Short-Long Term Duration	Medium-High	Low

Table8. Summary table of ranking of potential impacts of the proposed purple alignment on vegetation and associated fauna.

POTENTIAL IMPACT	INTENSITY	EXTENT	PROBABILITY OF OCCURENCE	DURATION	SIGNIFICANCE (WITHOUT MITIGATION)	SIGNIFICANCE (WITH MITIGATION)
Loss of Protected Tree species	Medium-High	Localized along powerline and access roads servitude.	Highly Probable	Short-Long Term during construction and maintenance	Medium-High	Medium-Low
Loss of Faunal Habitat	Medium-High	Localized along powerline and servitude.	Definite	Short-long term	Medium-High	Medium
Threatened Fauna	Medium-Low	Local	Probable	Short-Long Term during construction and maintenance	Medium	Low
Increased Human Presence	Medium-High	Local	Highly Probable	Short-Long Term during construction and maintenance	Medium-High	Medium-Low
Vegetation Clearance	Medium-High	Local	Definite	Short-term during construction as well as maintenance	Medium-High	Medium-Low
Re-vegetation	Medium-Low	Local	Probable	Short duration	Medium	Low
Disturbances to Livestock	Medium-Low	Local	Probable	Short-Long Term Duration	Medium-Low	Low
Fire	Medium-High	Local and surrounding grassland areas	Probable	Short-Long Term Duration	Medium-High	Low

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APPENDIX

Table9. List of frog species recorded during current and previous surveys and of species likely to occur on and surrounding the site. Due to habitat degradation and transformation on the site as well as possible deterioration in water quality from adjacent villages as well as pesticide, fertilizer and herbicide runoff entering rivers from the agricultural lands; actual species lists will contain far fewer species**.**

Common Name	Scientific Name	Breeding Habitat
African Bullfrog	*Pyxicephalus edulis*	Temporary shallow depressions and floodplain areas of the vlei. Also requires undisturbed open veld for foraging and sandy soils for burrowing.
Tremolo Sand Frog	*Tomopterna cryptotis*	Temporary rain pools, pans and floodplain areas
Natal Sand Frog	*Tomopterna natalensis*	Temporary and semi-permanent seepage and mud pools.
Russet-backed Sand Frog	*Tomopterna marmorata*	Seasonal mud pools, small ponds and flooplain areas
Knocking Sand Frog	*Tomopterna krugerensis*	Seasonal mud pools, small ponds and flooplain areas.
*Common Caco	*Cacosternum boettgeri*	Temporary marshes, ditches and grass inundated to a depth of about 2cm.
Red-Legged Kassina	*Kassina maculata*	Well vegetated pans, vleis, marshes and dams
Bubbling Kassina	*Kassina senegalensis*	Semi-permanent vleis, pans and shallows around dams.
Brown-backed Tree Frog	*Leptopelis mossambicus*	Shallow pans, pools and streams
Grey Tree Frog	*Chiromantis xerampelina*	Temporary rain pools, pans and floodplain areas
Red Toad	*Schismaderma carens*	Semi-permanent dams & ponds with water depth of more than one metre.
*Eastern Olive Toad	*Ametiophrynus (Bufo) garmani*	Permanent or semi-permanent bodies of water, quiet backwaters of rivers, natural or man-made in open wooded savannah.

*Guttural Toad	*Ametiophrynus* (*Bufo*) *gutturalis*	Permanent and semi-permanent ponds and backwaters in open habitat.
Flat-backed Toad	*Ametiophrynus* (*Bufo*) *maculatus*	Breeding habitat is riverine as is almost always associated with medium and large rivers.
Raucous Toad	*Amietophrynus rangeri*	Permanent or semi-permanent bodies of water, natural or man-made.
Northern Pygmy Toad	*Bufo fenoulheti*	Temporary pools on flat rocky outcrops or seasonal rain pools
*Common Platanna	*Xenopus laevis*	Permanent or semi-permanent bodies of water, natural or man-made.
Tropical Platanna	*Xenopus muelleri*	Permanent or semi-permanent bodies of water, natural or man-made.
*Common River Frog	*Afrana angolensis*	Present in all major rivers as well as permanent standing water and floodplain areas.
Banded Rubber Frog	*Phrynomantis bifasciatus*	Shallow ponds or inundated grass in savanna and *Acacia* veld.
*Dwarf Puddle Frog	*Phrynobatrachus mababiensis*	Shallow stagnant water amongst emergent vegetation on the edges of grassy pans, vleis, marshes and in the back-waters of slow streams.
*Snoring Puddle Frog	*Phrynobatrachus natalensis*	Pools or marshy area associated with the vlei
Plain Grass Frog	*Ptychadena anchietae*	Shallow pools (seasonal), inundated grassland areas of the vlei and dams.
Broad-banded Grass Frog	*Ptychadena mossambica*	Shallow pools (seasonal), inundated grassland areas of the vlei and dams, floodplains of rivers.
Sharp-nosed Grass Frog	*Ptychadena oxyrhynchus*	Shallow pools (seasonal), inundated grassland areas of the vlei and dams
*Bushveld Rain Frog	*Breviceps adspersus*	Eggs deposited in a subterranean chamber about 30cm below surface.
Mottled Shovel-nosed Frog	*Hemisus marmoratus*	Construct extensive tortuous tunnels in low muddy areas close to the edge of pools
Golden Leaf-folding Frog	*Afrixalus aureus*	Margins of seasonal pools and pans

*Painted Reed Frog	*Hyperolius marmoratus*	Temporary pools, pans and vleis as well as permanent bodies of water such as dams, marshes, reedbeds on sluggish rivers and streams.
Water Lily Frog	*Hyperolius pusillus*	Shallow pans, ponds, vleis and dams with water lilies *Nymphaea sp.*
Tinker Reed Frog	*Hyperolius tuberilinguis*	Reedbeds on wetlands and rivers

*recorded during brief field survey.

Table10. List of reptile species recorded during previous surveys as well as current survey. Due to habitat degradation and transformation and limited refugial habitat; actual species lists will contain far fewer species.

COMMON NAME	**SCIENTIFIC NAME**
Marsh or helmeted Terrapin	*Pelomedusa subrufa*
Leopard Tortoise	*Geochelone pardalis*
Savannah Hinged Tortoise	*Knixys beliana*
Cape Skink	*Trachylepis capensis*
*Striped Skink	*Trachylepis punctatissima*
*Five lined or Rainbow Skink	*Trachylepis margaritifer*
Wahlberg's Snake-eyed Skink	*Panapsis wahlbergii*
Variable Skink	*Tarchylepis varia*
Cape Rough-scaled Lizard	*Ichnotropis capensis*
*Flap-neck Chameleon	*Chamaeleo dilepis*
Transvaal Thick-toed gecko	*Pachydactylus affinis*
Cape Thick-toed Gecko	*Pachydactylus capensis*
Cape Dwarf Gecko	*Lygodactylus capensis*
Delalande's Sandveld Lizard	*Nucras lalandii*
Bushveld Lizard	*Heliobolus lugubris*
*Yellow-throated Plated Lizard	*Gerrhosaurus flavigularis*
Black-lined Plated Lizard	*Gerrhosaurus nigrolineatus*
Common Rough Scaled Lizard	*Ichnotropis squamulosa*
Ornate Sandveld Lizard	*Nucras ornata*
*Nile Monitor	*Varanus niloticus*
Rock or White-throated Monitor	*Varanus albigularis*

Southern Tree Agama	*Acanthocerus atricolis*
*Ground Agama	*Agama aculeata aculeate*
Southern or Bibron's Burrowing Asp	*Atractaspis bibronii*
Herald or red-lipped Snake	*Crotaphopeltis hotamboeia*
Shield-nose Snake	*Aspidelaps scutatus*
Mole Snake	*Pseudapsis cana*
Rhombic Night Adder	*Causus rhombeatus*
Puff Adder	*Bitis arietans*
Snouted Cobra	*Naje annulifera*
Mozambique Spitting Cobra	*Naja mossambica*
Eastern Tiger Snake	*Telescopus semiannulatus*
Common Egg Eater	*Dasypeltis scabra*
Brown Water Snake	*Lycodonomorphus rufulus*
Brown House Snake	*Lamprophis fuliginosus*
Cape Wolf Snake	*Lycophidion capense*
Spotted Skaapsteker	*Psammophylax rhombeatus*
Striped Skaapsteker	*Psammophylax tritaeniatus*
Black-headed Centipede Eater	*Aparallactus capensis*
Spotted Bush Snake	*Philothamnus semivariegatus*
Boomslang	*Dispholidus typus*
Spotted Harlequin Snake	*Homoroselaps lacteus*
Southern Stiletto Snake	*Atractaspis bibronii*
Short-snouted Whip Snake	*Psammophis brevirostris*
Crossed Whip Snake	*Psammophis crucifer*
Spotted Rock Snake	*Lamprophis guttatus*
Common Brown Water Snake	*Lycodonomorphus rufulus*
Sundevall's Shovel-snout	*Prosymna sundevalli*
Green Water Snake	*Philothamnus hoplogaster*
Common Slug-eater	*Duberria lutrix*
Common Wolf Snake	*Lycophidion capense*
Delalande's Beaked Blind Snake	*Rhinotyphlops lalandei*
Bibron's Blind Snake	*Typhlops bibronii*
Long-tailed Worm Snake	*Leptotyphlops longicaudatus*
Peter's Worm Snake	*Leptotyphlops scutifrons*
Incognito Worm Snake	*Leptotyphlops icognitus*
Jacobsen's Worm Snake	*Leptotyphlops jacobseni*

* observed during brief field survey

Table11. Mammal species recorded during initial faunal survey and supplemented with previous field surveys conducted in similar habitat (1998-2011). Due to habitat degradation and transformation as well as high levels of poaching and hunting actual species lists will contain far fewer species.

COMMON NAME	**SCIENTIFIC NAME**
Rusty Pipistrelle	*Pipistrellus rusticus*
Transvaal free-tailed Bat	*Tadarida ventralis*
Egyptian free-tailed Bat	*Tadarida aegyptiaca*
Cape Serotine Bat	*Eptesicus capensis*
Schreibers' Long-Fingered Bat	*Miniopterus schreibersii*
Geoffroy's Horseshoe Bat	*Rhinolophus clivosus*
House Mouse	*Mus musculus*
Short-snouted Elephant-Shrew	*Elephantulus brachyrynchus*
*Scrub Hare	*Lepus saxatilis*
African (Common) Mole-rat	*Cryptomys hottentotus*
Woodland Dormouse	*Graphiurus murinus*
Rock Dormouse	*Graphiurus platyops*
Spiny Mouse	*Acomys spinosissimus*
Single Striped Mouse	*Lemniscomys rosalia*
Four-striped Grass Mouse	*Rhabdomys pumilio*
Desert Pygmy Mouse	*Mus indutus*

Pouched Mouse	*Saccostomus campestris*
Natal Multimammate Mouse	*Mastomys natalensis*
Southern Multimammate Mouse	*Mastomys coucha*
Namaqua Rock Mouse	*Micaelamys namaquensis*
Angoni Vlei Rat	*Otomys angoniensis*
Vlei Rat	*Otomys irroratus*
Grey Climbing Mouse	*Dendromus melanotis*
Chestnut Climbing Mouse	*Dendrobus mystacalis*
African Marsh Rat	*Dasymys incomtus*
House Rat	*Rattus rattus*
*Bushveld Gerbil	*Tatera leucogaster*
Swamp Musk Shrew	*Crocidura mariquensis*
Tiny Musk Shrew	*Crocidura fuscomurina*
Reddish-Grey Musk Shrew	*Crocidura cyanea*
Lesser Grey-brown Musk Shrew	*Crocidura silacea*
South African Ground Squirrel	*Xenus inauris*
Striped Polecat	*Ictonyx striatus*
Small-spotted Genet	*Genetta genetta*
South African Large-spotted Genet	*Genetta tigrina*
Marsh Mongoose	*Atilax paludinosus*

Dwarf Mongoose	*Helogale parvula*
Yellow Mongoose	*Cynictis penicillata*
*Slender Mongoose	*Galerella sanguinea*
White-Tailed Mongoose	*Ichneumia albicauda*
Lesser Bushbaby	*Galago moholi*
Black-backed Jackal	*Canis mesomelas*
Cape Porcupine	*Hystrix africaeaustralis*
Springhare	*Pedetes capensis*
Caracal	*Felis caracal*
Striped Polecat	*Ictonyx striatus*
*Common Duiker	*Sylvicarpa grimmia*
Steenbok	*Raphicerus campestris*
*Chacma Baboon	*Papio cynocephalus ursinus*
*Vervet Monkey	*Ceropithecus aethiops*
Common Warthog	*Phacochoerus africanus*
*Greater Kudu	*Tragelphagus Strepsiceros*
Bushbuck	*Tagelaphus scriptus*
Impala	*Aepyceros melampus*

*observed during brief field survey

APPENDIX D3

WETLAND DELINEATION AND SENSITIVITY ASSESSMENT

E02.PTA.000343

October 2011

Aquatic Technical Report: Wetland/Riparian Resource Delineation and Sensitivity Assessment for the proposed construction of a 132kV power line between the Mbumbu-traction and new Tsakani substation, Mpumalanga

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DOCUMENT DESCRIPTION

Client: ESKOM Distribution Northern Region

Project Name:
Aquatic Technical Report: Wetland/Riparian Resource Delineation and Sensitivity Assessment for the proposed construction of Mbumbu-Tsakani 17KM 132kV powerline, Mpumalanga.

SSI Environmental Reference Number:
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Authority Reference:

Compiled by:
Earl Herdien
Date:
August 2011
Location:
Cape Town

Reviewer:

Prashika Reddy

_____

Signature

Approval:

Malcolm Roods

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Signature

Cover page photo courtesy of Earl Herdien

EXECUTIVE SUMMARY

The Water Specialist Consulting Service of SSI Environmental was authorized to undertake a wetland delineation assessment to determine a status quo for significant aquatic resources which may potentially be impacted by the proposed construction of a 17km 132kV powerline from the existing Mbumbu traction to a new Tsakani substation in Mpumalanga province. In addition, maintenance impacts and recommendations for potential impacts related to the construction of the proposed development were assessed and discussed as part of compliance related to the National Environmental Management Act (No 107 of 1998: Environmental Impact Assessment Regulations and the National Water Act (No 36 of 1998).

This document presents the considerations for 3 three powerline route alternatives associated with aforementioned project, in the format of the results of a contexualised desktop assessment, relevant in situ aquatic assessments, contexualised wetland delineations, potential and expected impact assessments and related mitigation measures and recommendations.

In summary, small seasonal and permanent channel bottom wetlands linked to seasonal and perennial streams were found along all the proposed development paths and assessed as moderately to highly impacted states for habitat integrity; and fair to good states for associated ecosystem goods and services. Modified seasonal tributaries of the Sand River were classed as a D/E – highly impacted – for habitat integrity; were classed as an E for riparian vegetation quality; and had a low importance and sensitivity rating, with an exception to its high erosion vulnerability potential. The only true perennial system found in the study area was the Sepheriri River and was classed as in a fair condition for habitat integrity; high importance for ecological importance and sensitivity and in a fair condition for its riparian vegetation quality.

The impacts associated to the proposed development is expected to be limited, due to the fact that the development constructions must take place outside the 1:100yr floodline and 32m NEMA listing notice setback.

Summary of the impacts of the proposed project and its alternatives

Impacts	Extent	Intensity	Duration	Probability	Weighting Factor	Significance rating	Mitigation efficiency	Mitigated aspects
Loss of wetland habitat/bank modification	Regional (**3**)	M (**3**)	Permanent (***5***)	Highly likely (***4***)	H (***5***)	M-H (***60***)	M/H (***0.4***)	L (***14.4***)
Water	Local (***2***)	L (***1***)	Mid term	Possible	L/M (***2***)	L/M (***32***)	L/M (***0.7***)	L (***15***)

quality impairment			(***3***)	(***2***)				
Flow modification	Local (***2***)	L (***1***)	Long term (***4***)	Possible (***2***)	M (***3***)	M (***45***)	M (***0.5***)	L/M (***19.5***)
Loss of biodiversity	International ***(5)***	M ***(3)***	Long term (***4***)	Highly likely (***4***)	M/H (***5***)	M/H (***80***)	H (***0.2***)	L/M ***(25)***

From the results of the aquatic status quo, the delineation assessment and the associated impact assessment, it is recommended that the powerline alternative for the northern routes are preferred, with no development construction within any wetland areas. This implies the compliance to at least a 50m buffer from stream edge on each side of all perennial rivers and wetlands, as well as compliance of at least a 32m setback for all other identified seasonal river and wetland features within this delineation assessment.

The impact of the proposed development (any preferred alternative) is expected to be limited, due to the proposed development being undertaken outside the wetland floodlines and will encourage adherence to the following mitigation measures:

- *The wetland buffer zone and development setback should be established in the identified mapped area, where no construction vehicles should dredge and/or work within 32m of wetland edges for all identified water features. Limited disturbance should be allowed within the zone and as far as possible it should be rehabilitated with vegetation characteristic of the areas biodiversity.*
- *If possible, the undertaking of construction should take place during the dry season when development activities are near the rivers and associated wetlands.*
- *The rehabilitation and re-vegetation of disturbed areas must take place concurrently and/or pre- construction of the proposed development. Only appropriate indigenous riparian vegetation may be used for rehabilitation and re-vegetation within the study area and wetland buffer areas (preferably indigenous plants represented in the reserve to the north and those existing in the wetland areas).*
- *Clearing or felling of all alien invasive trees should take place during construction*
- *If clearing of woody debris and hard rubble on site and in the wetland buffer should be undertaken, it should be carried-out without significantly altering the condition and health of the associated water feature*
- *The intensity of storm water run-off should be reduced where possible through encouraging paving and surfaces that allow for greater infiltration.*

- *Any structure within the wetland buffer should as far as possible not disturb the aquatic habitat or alter the flow patterns in the stream. Approval should be obtained from the Department of Water and Environmental Affairs for any such activities*
- *Activities that lead to elevated levels of turbidity must be minimised. Bulldozing and the use of other mechanical machinery in the wetland buffer zone should also be prevented within the wetland zones as far as possible.*

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1. PROJECT DESCRIPTION

1.1 Background

The Water Specialist Consulting Service of SSI Environmental Consultants was authorized to undertake wetland delineation and wetland related impact assessments to determine current status of significant aquatic resources potentially impacted by the proposed construction of a 17km 132kV powerline from the existing Mbumbu traction to a new Tsakani substation in Mpumalanga Province. In addition, maintenance impacts and recommendations for potential impacts related to the construction of the proposed development will be identified, assessed and discussed. Three potential development routes were provided by the client as development alternatives and will be evaluated to determine a preferred development route in relation to a "minimum" potential impact reference state for aquatics health resources within the proposed development footprint.

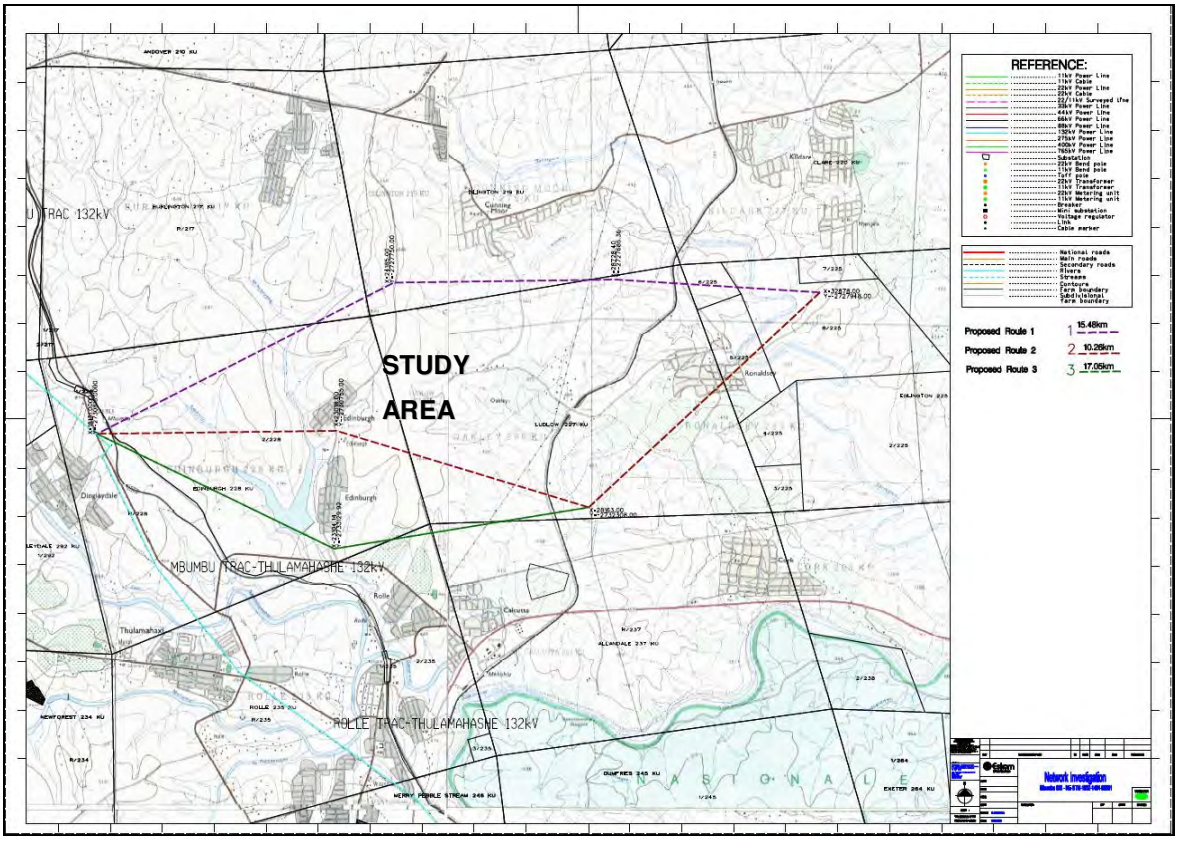


Figure 1: Modified Topographical map of the study area and surroundings. digitised lines are the proposed development routes (from Project Planning Reports).

1.2 Terms of Reference

This freshwater assessment was compiled in order to help in decision-making regarding potential impacts on the freshwater receiving environment for the proposed development of an estimated 17km 213kV ESKOM powerline from the existing Mbumbu traction to a new Tsakani substation in Mpumalanga Province (hereafter referred to as the proposed development). The agreed upon work programme was divided into the following tasks:

Task: Freshwater delineation assessment and identification of impacts from the proposed development and the provision of recommended mitigation measures

- Conduct a situation assessment based on existing information for the area and contexualisation of the proposed development
- Conduct a freshwater assessment, which includes mapping and descriptions of the freshwater features in the proposed development footprint, as well as floodline delineations, assessments of importance, conservation value, sensitivity and current state of the freshwater/wetland features within and related to the development footprint.
- Evaluate the proposed development activities for the various alternatives, the potential impacts, and propose mitigation measures
- Write up findings and recommendations for the Basic Assessment submission to the relevant authorities

1.3 Assumptions and limitations of the Study

Limitations and uncertainties often exist within the various techniques adopted to assess the condition of ecosystems. The following limitations apply to the techniques and methodology utilized to undertake this study:

- Analysis of the freshwater ecosystems was undertaken according to nationally developed methodologies as defined by DWA (Department of Water Affairs) and/or DEA (Department of Environmental Affairs.
- Recommendations are made with respect to the adoption of buffer zones within the development site, based on wetlands' functioning and site characteristics. These recommendations are based on professional opinion and best practise guidelines, due to the lack of a standard formal methodology for buffer zone determination within South Africa.

1.4 Use of the Report

This report reflects the professional judgment of its author. The full and unedited content of this should be presented to the client. Any summary of these findings should only be produced in consultation with the author.

2. OVERVIEW OF DEVELOPMENT PROPOSALS

2.1 Review of the Study Area

The study area is found in the rural setting of Bushbuckridge Municipality within the Ehlanzeni District Municipality of Mpumalanga. The village of Edinburg in the central-west and Ludlow in the central-east of the proposed development area are the major residential townships related to the study area surroundings and will be serviced by the proposed development's electrification service. The need for ESKOM's proposed development has already been identified in Bushbuckridge Municipal Integrated Development Plan of 2010 and is intended to provide the municipal power supply to the already developed and upgraded water and town maintenance bulk-services as well as future bulk-services of the local municipal region (WWTW, boreholes, lighting, village electrification and private industry uses).

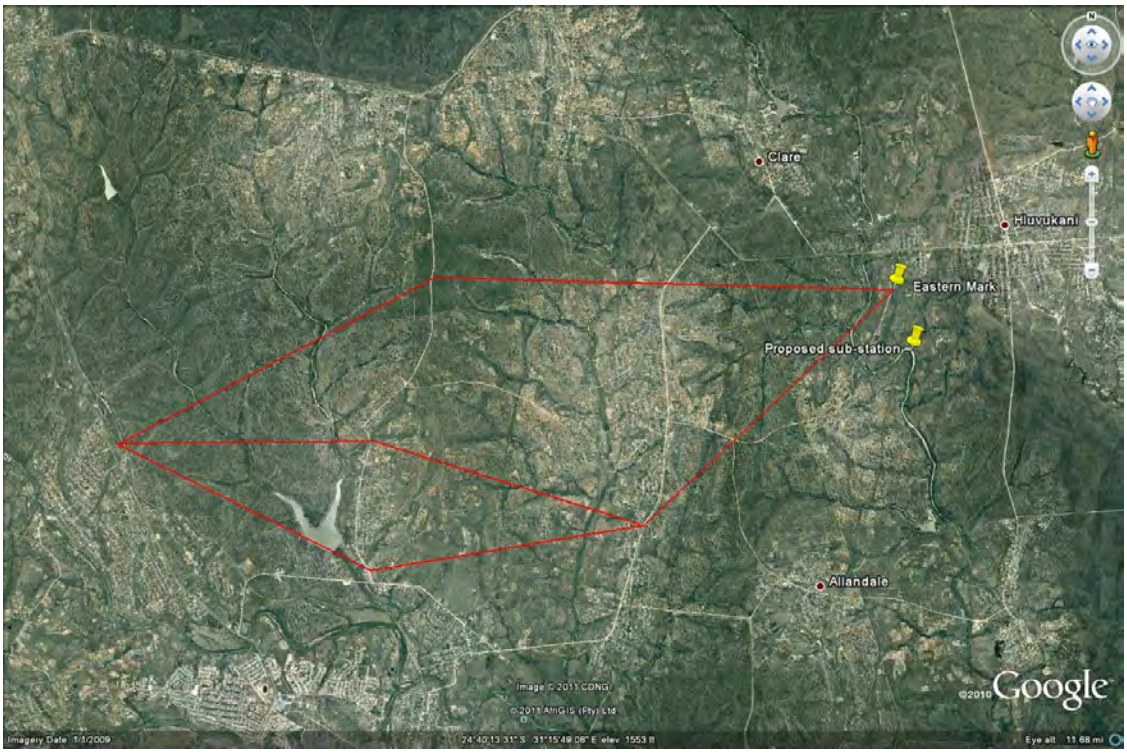


Figure 2: Digitised satelite image of the study area (Earth Google 2011)

2.2 Activity Description

2.2.1 Preferred Alternative

The engineers intend to implement a strategic development plan based on feasibility studies and various other technical studies relevant to the scope of the proposed development (i.e. social, environmental and/or economical impact studies); which are either complete or in the process of completion. Based on the outcome of specialist studies, the development concept will be adapted accordingly and incorporate any significant developmental constraints received from these specialist studies in an environmentally sustainable manner for engineering quality and development authorisation purposes. Also in this regard, and in compliance to relevant development legislative requirements (i.e. National Environmental Management Act of 1998), a desired development alternative will be selected from the 3 proposed identified routes. In addition, Eskom plans to construct a Substation which will be located to the West of the Khokhovela river and to the North East of the Red and Green alternative alignments.

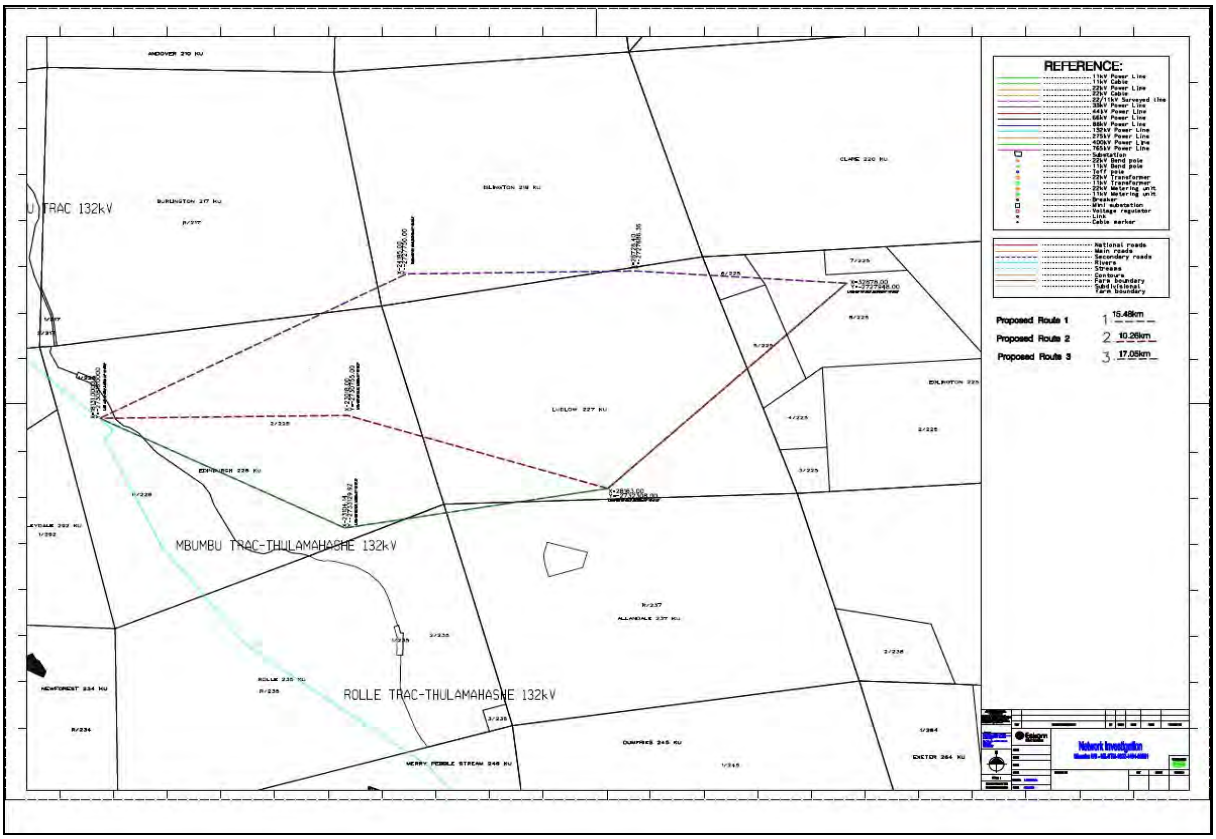


Figure 3: Development concept of the prefered development alternatives (Earth Google 2011)

2.2.2 "No-go" alternative

The No Go alternative is assumed to mean no development on the site, and the maintenance of the current *status quo*. This will not be in the best interest of the client and public, as infrastructural upgrades

and development in relation to governing service delivery bodies within this region has already invested their trust into this development becoming realised.

3. DESKTOP ECOLOGICAL ASSESSMENT OF THE STUDY AREA

3.1 Visual Characteristics

The natural topography of the study site is largely flat-undulating with a “valley” situated in the western extent of the proposed development route and modified into a dam on the Sephiriri River. Drainage features (channeled and unchanneled hillslope wetlands, seasonal and perennial streams) are found on throughout the proposed development site. Draining features found within the development site is largely stormwater generated seasonal aquatic features and sub-surface hillslope features draining into the Sand River in the south. On the eastern extent of the development, drainage is largely found on a sub-surface level as well stormwater related flows form the Ludlow township discharging into the seasonal Molapakgsma River catchment. The general visual characteristic of the study area is rural (gravel roads, little bulk service infrastructures), with lowveld bushveld predominant amongst game farming and subsistent farming. Only 2 significant townships are found in the study area, namely, Edinburg and Ludlow. Thulamahaxi is found just south-west of the proposed development line.

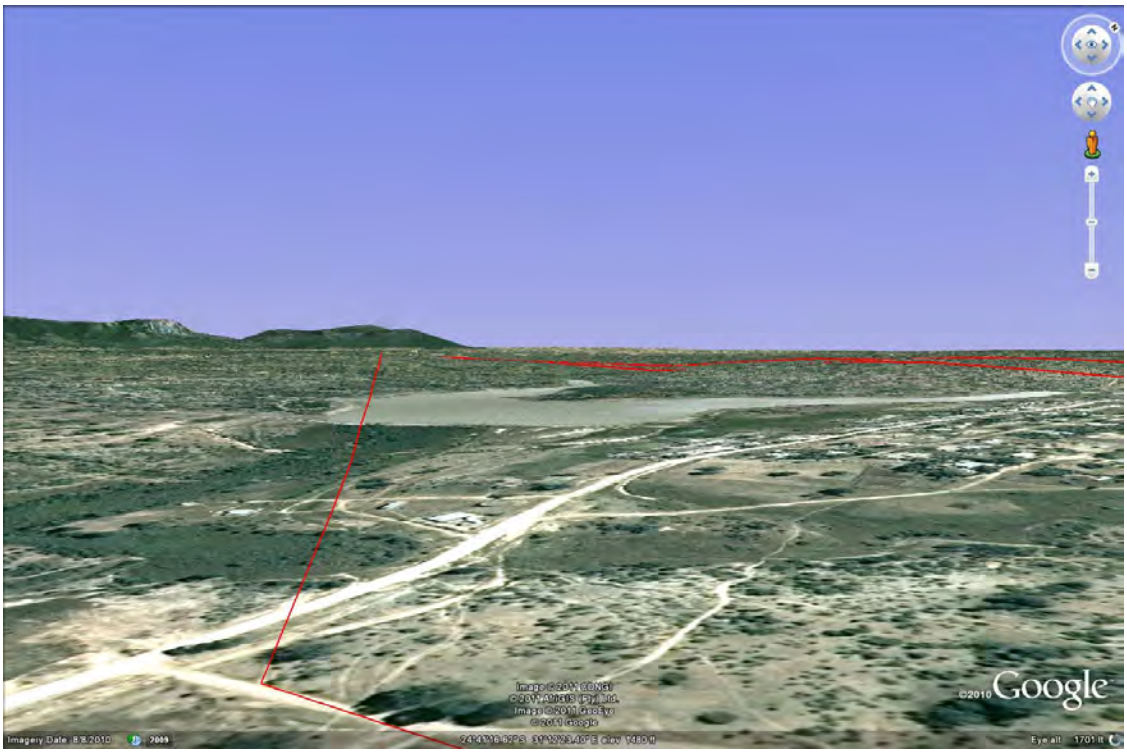


Figure 4: Digitised map representing the study area Topography (Google Earth 2011)

Figure 5: Picture of the Natural surroundings

3.2 Climate

The Sabi-Sand region normally receives about 557mm of rain per year, with most rainfall during mid-summer. The average image displays the regions lowest rainfall (2mm) in July and the highest (113mm) in January. The monthly distribution of average daily maximum temperatures image displays average midday temperatures for the region ranging from 23.9℃ in June to 30.2℃ in January. The region is the coldest during June when the mercury drops to 8℃ on average during the night.

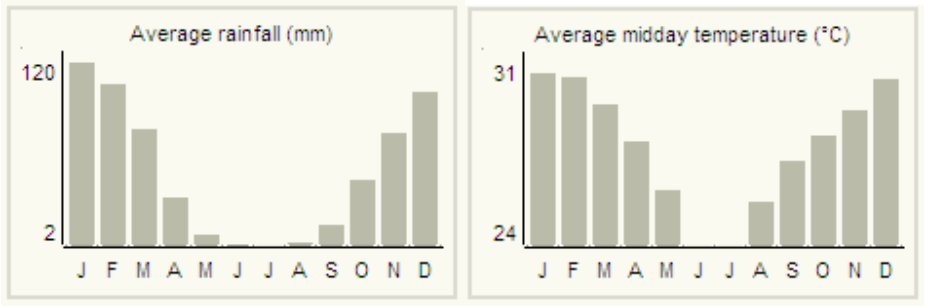


Figure 6: Monthly rainfall and temperatures (SA Explorer 2011)

3.3 Geology and Soil

The geology of the study site can be described as sandstone, mudstone and basalt, with biotite granite outcroppings around koppies in the west and south west. Soils in general consist of high clay content with variations in sand across the plains and loam across drainage zones. Soils classes are catorgorised as follows: Red and yellow soils with low to medium base status; Greyish, sandy soils; and soils with minimal development, usually shallow, on hard or weathering rock, with or without intermittent diverse soils (Lime generally present in part or most of the landscape). In general, the low base status, restricted soil depth, excessive or imperfect drainage status of these soils implies high erodibility and sensitivity to change. Sources of organic material loading are related to alien invasive vegetation and cattle disturbances.

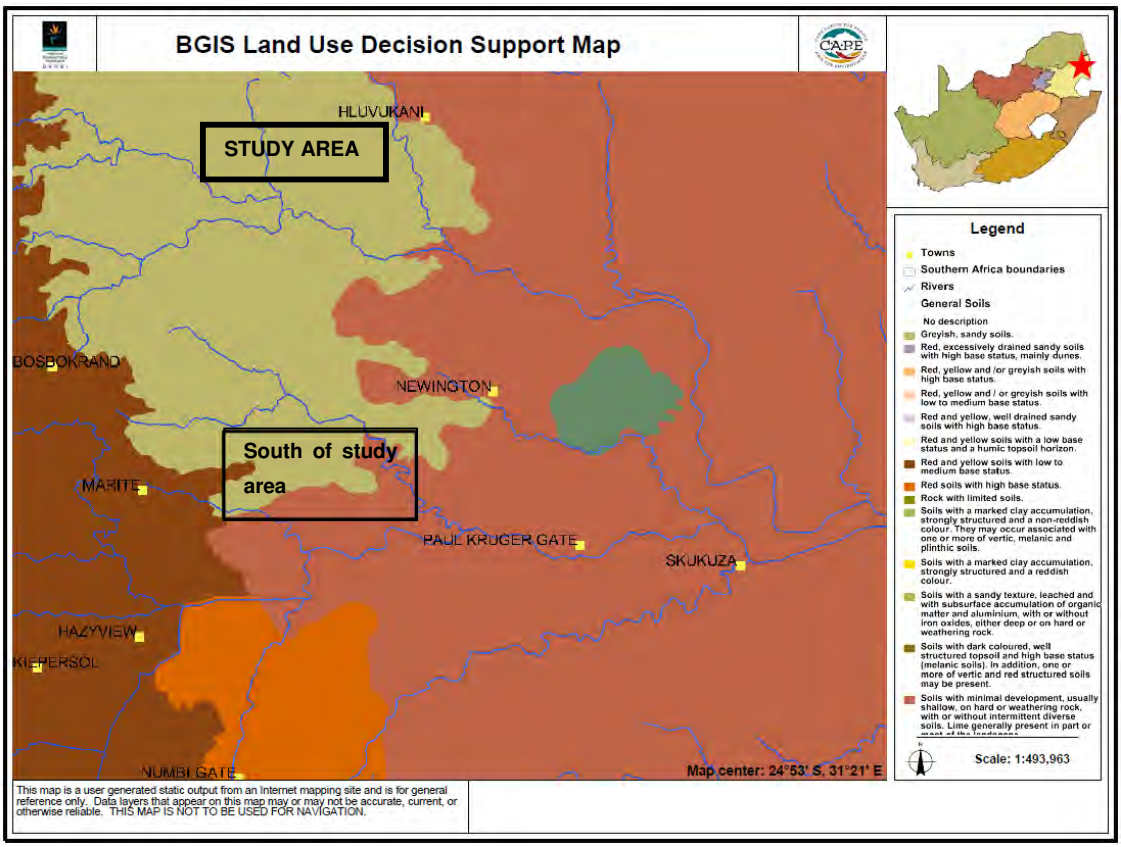


Figure 7: Geology and soils map for the study area (SANBI BGIS 2011)

3.4 Flora

The general vegetation type within the region falls within the Savanna biome. The proposed development area and its surroundings is dominated by the Mixed Lowveld Bushveld – Gabbro Grassy Bushveld. This vegetation has a vulnerable Ecosystem Status. Pockets of Endangered Granite Lowveld Bushveld, more specifically Legogote Sour Bushveld is also found on in the study surroundings.

Mala Mala Game Reserve, Kruger National Park (Paul Kruger Gate) and the Sabie-sand Game Reserve are found within close proximity to the study site.

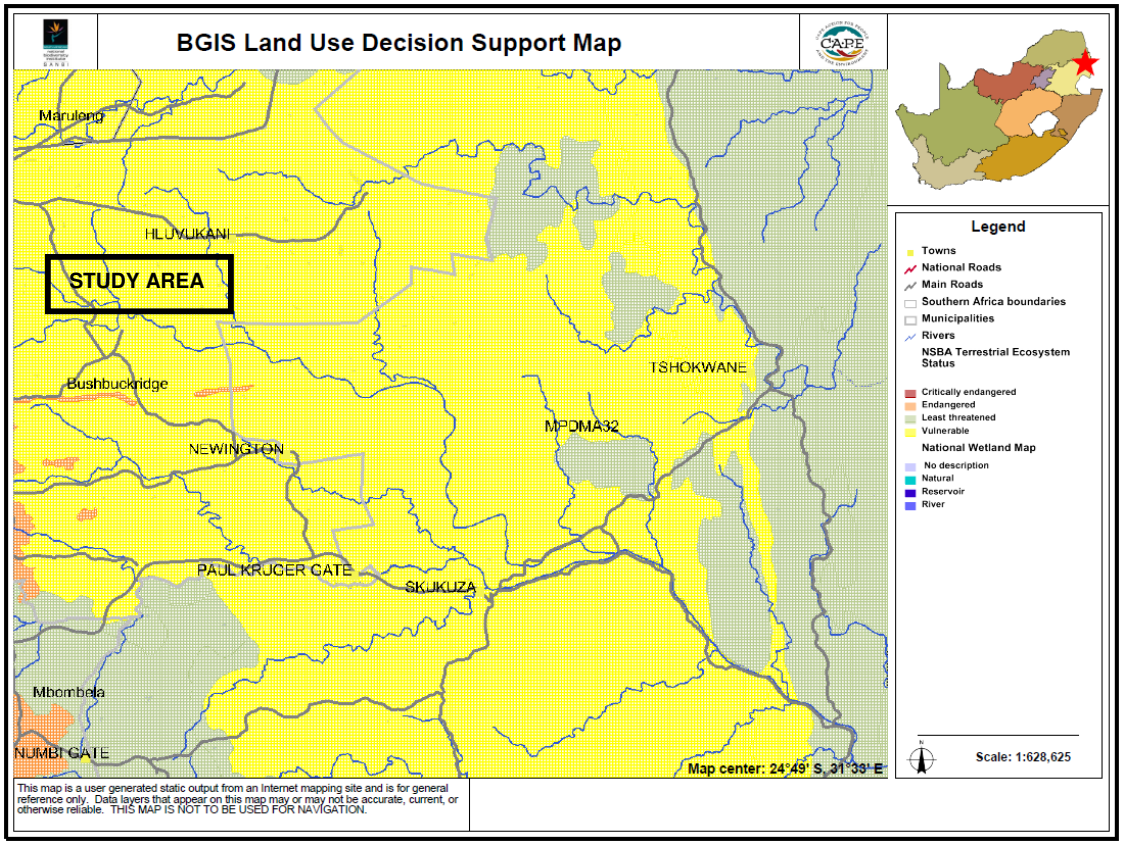


Figure 8: National Biodiversity Assessment map of the study area (SANBI BGIS 2011)

3.5 Fauna

Fauna was merely assessed on an ad hoc basis. No significant features were found on site in relation to biodiversity significance, however this will be further investigated in the ecological survey. It must be noted that this area has significant game and game park related resources (situated within Kruger Park and local reserve peripheries). This refers to common knowledge in the vicinity about tortoise, snakes, crocodile, skinks, buck, rhino, bush-babies and birds.

3.6 Aquatic features

The study area falls within ecoregion 5.06 (low altitude plains with moderate relief). The Sephiriri River Catchment is the major perennial river within the proposed development footprint and is a tributary of the Sand River Catchment forming a confluence with the Klein-Sand just south of the study area and contributes to the greater Sabie-Sand River catchment. The Molapakgomo / Molapakgsma River and Khokhovela River are the significant seasonal river catchment in the study area and drains several wetland seeps, channeled-valley bottoms and stormwater into the Sand River.

Due to the high eco-system goods and services relation to rural livelihood support within this area, as well as the significant conservation areas in the surroundings; the rivers found in the study and surroundings have a direct negative ecological health relationship to unprotected areas versus protected areas. As a result, the river systems are in a good to natural state in the downstream protected area regions (Game reserves, Kruger National Park) and are in a fair to poor condition in the upstream stock, game and subsistence farming areas. Of importance is the Sand River, which is classed as critically endangered under the National Spatial Biodiversity Assessment of SANBI. Other ratings include: the Sabie-sand (endangered status at south-east vicinity).

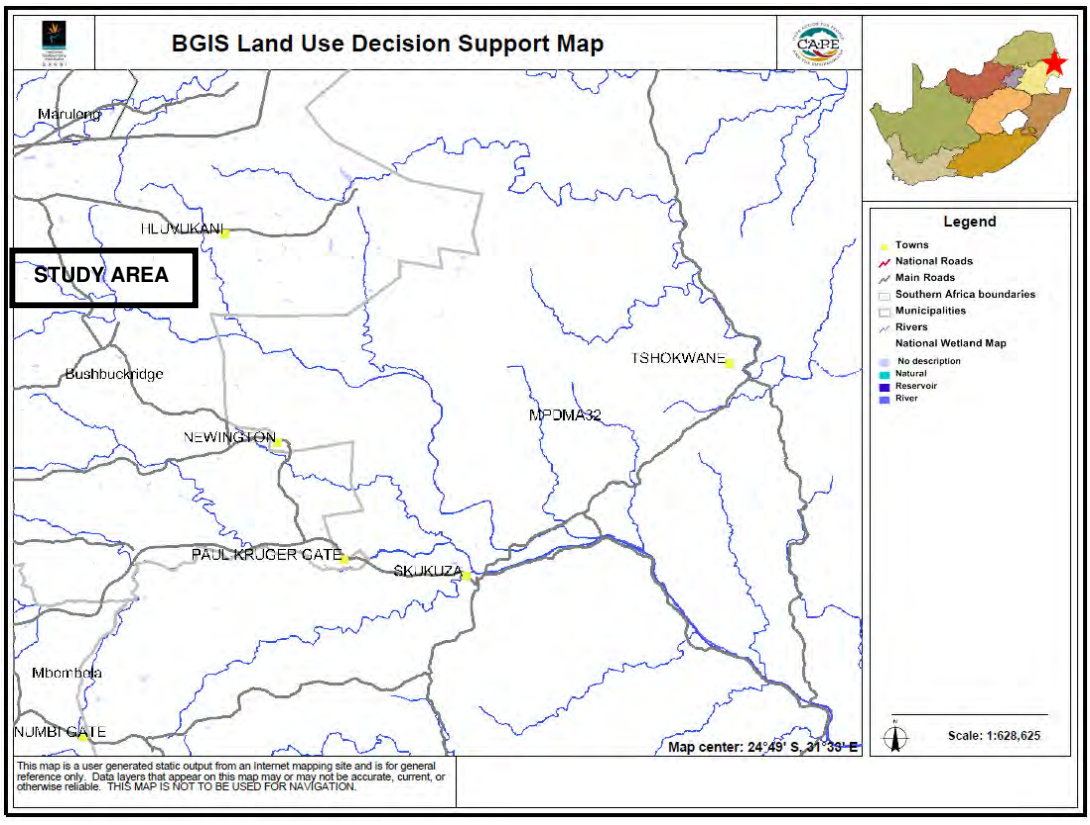


Figure 9: Digitised map of aquatic features in the study area (SANBI BGIS 2011)

3.7 Land use

The land use practice in the vicinity ranges from medium-high-density residential use in the study area with the agricultural holdings and low-density residential uses in the extended surroundings.

4. INVESTIGATIVE ASSESSMENTS OF WETLAND SYSTEMS IN THE STUDY AREA

4.1. Wetland Delineation

4.1.1 Relevant Legislation

- Environment Conservation Act, 1989 (ECA), Act No. 73 of 1989.
- National Water Act, 1998 (NWA), Act No. 36 of 1998.
- National Environmental Management: Biodiversity Act, 2004 (NEMBA), Act No.10 of 2004
- Conservation of Agriculture Resources Act, 1983 (CARA) Act No. 43 of 1983
- National Environmental Management Act (NEMA) EIA Regulations 2010

In terms of NEMA's EIA Regulations and the National Water Act, any development within the 1:50 year floodline and 32m from the stream margin will trigger the authorisation need of a water use licence as well as a basic assessment or full environmental impact assessment. This wetland delineation will provide a reference to wetland features which may be potentially impacted by the proposed development and also provide a reference for development implementation so as to minimise and negate development impacts and to recommend an environmentally sound guideline for the processing of this Basic Assessment.

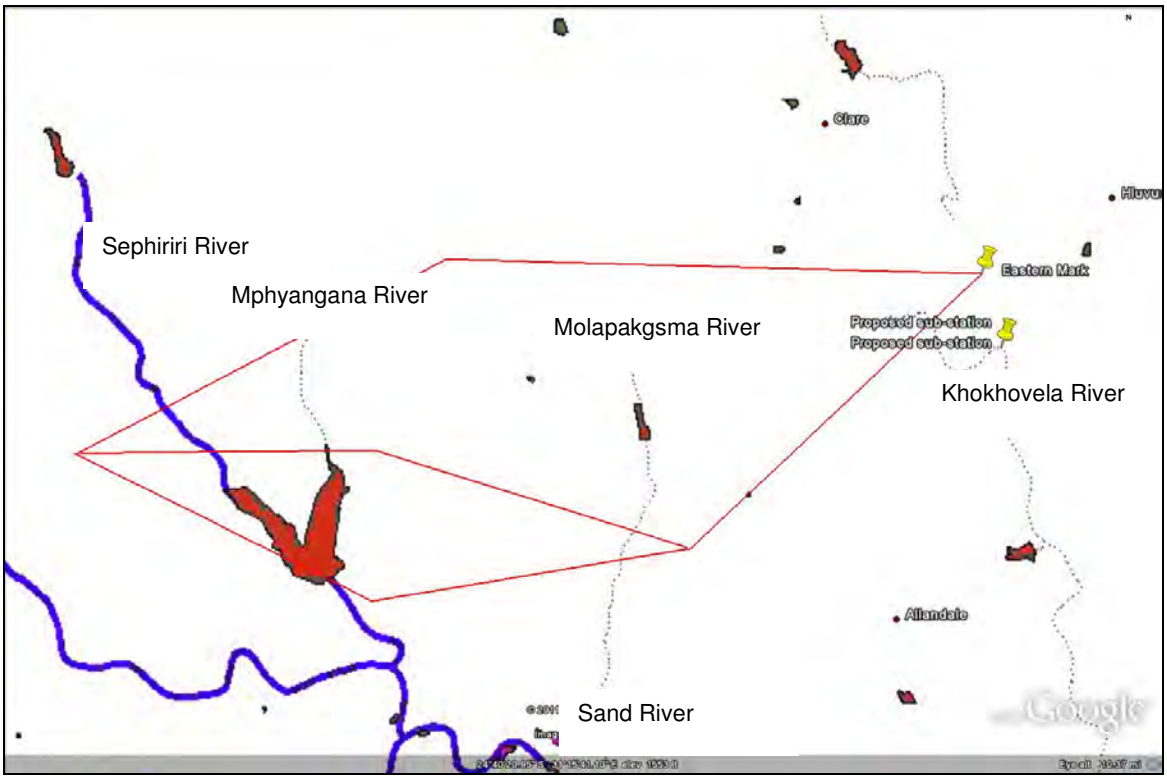


Figure 10: Digitised map of selected sampling points for aquatic features in the study area (SANBI BGIS 2011; Google Earth 2011)

4.1.2 Soil Classification

Wetland delineation was done according to DWAF's "*A practical field procedure for identification and delineation of wetlands and riparian areas"* (2005). A broad vegetation survey was conducted in the different zones delineated. The different terrain units such as hillslopes, footslopes, floodplains, valley bottoms, drainage lines, and streams were determined and the soil of the proposed site was surveyed for terrain unit classification purposes.

Soil classification is becoming a readily important facet to the understanding of the receiving environment. As a result, the need for a standardized method for the classification of soils is imminent and includes hydrological, vegetation and soil indicators in its holistic delineation process. Landscape position, vegetation type, soil form and moisture are key factors in the classification process of soil (DWAF 2005).

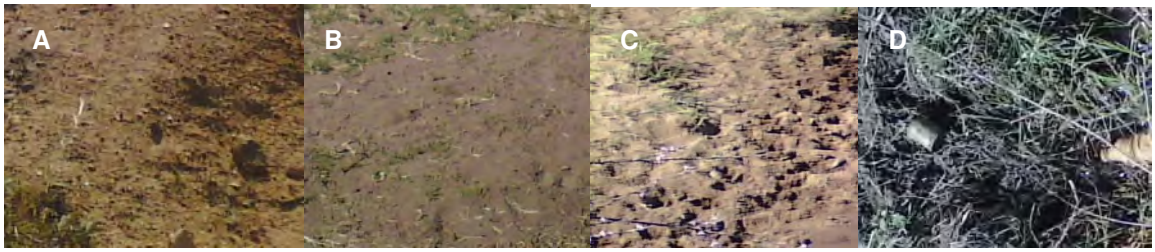


Figure 11: Photographs taken of the commonly found hygromorphic soil surface appearances found on site visit

Photo A is the reference sandy-clay and predominant soil type found in the study site. Photo B is the sandy residential soils. Photo C is the perched sandy residential soils. Photo D is the loamy sandy soils found in the residential drainage channels (hillslopes and channeled valley bottoms).

Table 1: Soil classification of the study site

Soil Profile Type	Escourt – thick orthic A and/or G-horizon on scattered residual granite and granite bedrock horizons
Landscape position	Fairly flat with gentle to moderate slope as one moves towards the east
Vegetation	Hydromorphic vegetation present (Phragmites australis and Cyperus spp.)
Soil form	The system and comprise a mixture of low chroma clays and sands with mottling at various depths
Soil wetness	Soil have high clay content and water retention on the surface level. Water draining at a moderate velocity on top of this clay profile from north-west to south, as well as central across the plain to the south and north-west. Damming points are associated with seasonal streams, hillslopes, valley bottoms and perennial systems.

4.1.3 Wetland Vegetation Description

The vegetation surveyed across the site was transformed Dolomite and Granite Grassland. No real community structure or vegetation community zones could be discerned apart from in the annual aquatic floodlines where vegetation was riparian in class. In terms of the terrestrial and transitional aquatic high water zones, the predominant feature was weedy grasses kikuyu and buffalo (*Penniseteum clandestinum* and *Stenotaphrum secundatum)* mixed with weedy forbs and perennials. Common grasslands were predominant with a good representation of indigenous trees across the banks and plains.

In terms of the wetlands: two distinct wetlands or wetland vegetation communities were found indicating zones of seasonal and permanent wetness in the soil profile. The first wetland community is small scale un-clustered mosaic transformed vegetation community driven by kikuyu grass, common reeds and rush populations and is considered to be seasonal wetlands. These wetlands are found where the water table

is higher than the soil surface and where slight depressions occur in the landscape as a result of the high water table. The second wetland community is part of the perennial Sephiriri and Sand Rivers (in the west and south). These have distinct riparian zones: margins (dense reed and sedge-beds), wetbanks (reed and riparian shrub and tree avenues) and drybank (opportunistic reeds, riparian trees, terrestrial grassland mosaic).

Table 2: Species list of vegetation surveyed in the study area

Species name	Growth form	Veg Class
Acacia saligna	t	Alien
Arundo donax	sed	Alien
Acacia spp.	t	Terrestrial
Cyperus denudatus	sed	Wetland
Cynoden dactylon	g	Weed
Eucvalyptus sp.	t	Alien
Euclea divinorim	t	Terrestrial
Ficus thonningii	t	Terrestrial
Ficus spp.	t	Terrestrial
Grewia sp.	s	Terrestrial
Juncus spp.	per	Wetland
Maytenus hetrophylla	t	Terrestrial
Penniseteum clandestinum	g	Weed
Penniseteum setaceum	g	Weed
Pinus sp.	t	Alien
Sclerocarya birrea	t	Terrestrial
Stenotaphrum secondatum	g	Weed

*The growth form is either (t) tree, (s) shrub, (sed) sedge/reed, (per) perenial, (suc) succulent, (ann) annual, (her) herb, (cre) creeper or (g) grass.

Figure 12: Picture of flat depression wetland on the southern route (Typha sp., marginal sedge and grass indicators)

Figure 13: Picture of a modified river (dam)

4.1.4 Wetland Mapping

DWA Wetland delineation techniques utilise a four wetland indicator process to provide an estimate of the class, character and extent of a wetland. They are: landscape position (must be perched, flat or depressed), vegetation (must be hydrophilic), soil form (must compliment an existing wetland type) and soil wetness (water table must be within 50cm of soil profile and active mottling must be high).

Although some of the wetlands surveyed may have had artificial origins, the wetland classification conditions were met in the previous sections and the extent of the three-wetland types (seasonal and perennial rivers; channeled hill-slope and valley-bottoms; and the seasonal and perennial depressions) can now be mapped. Sub-surface water movement through the property is consistent with the wetland patterns discerned in the site investigation. Floodlines were mapped according to the 3 proposed development routes and assessed in terms of type, current status and sensitivity for impact assessment considerations.

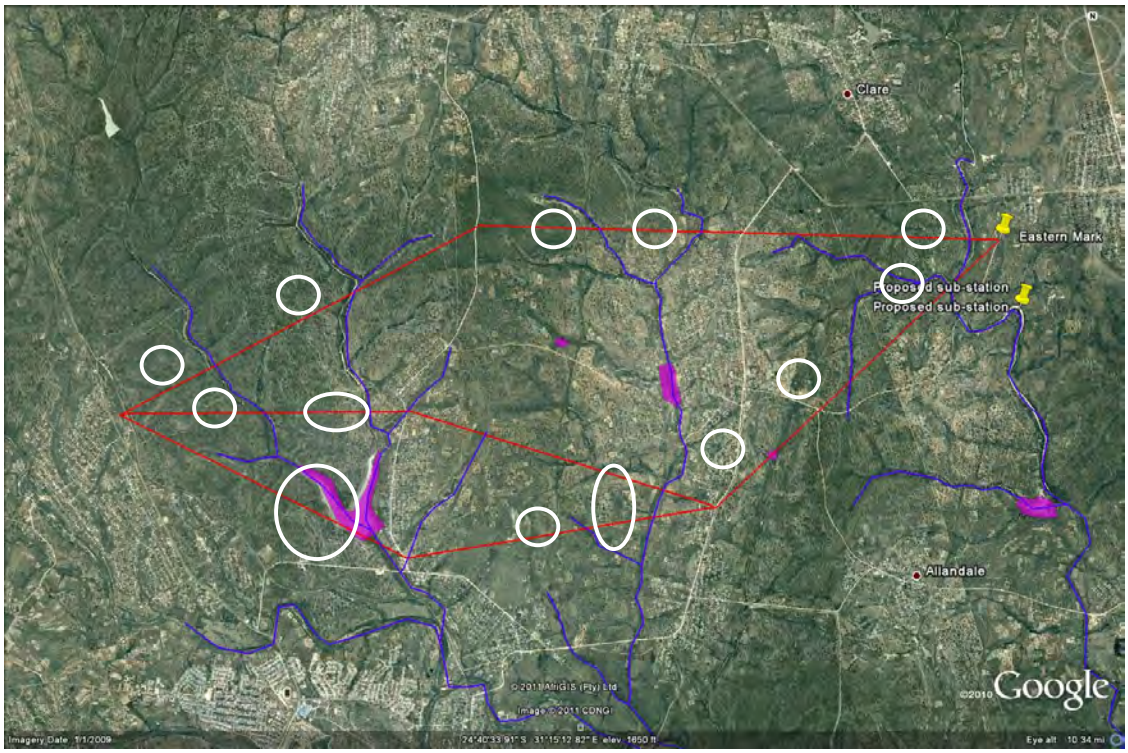


Figure 14: Wetland and drainage line map for the proposed development site (From Delineation Assessment in Appendix 1)

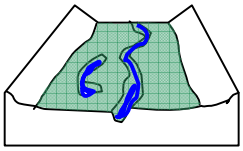
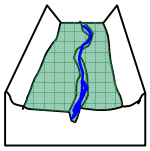
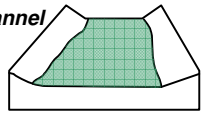
The delineation maps displayed at least 13 areas of significant water resources which will potentially be impacted by the proposed development. In total, the proposed development belt crosses 1 significant perennial stream in the west (Sephiriri River) and 3 significant seasonal streams – Mphyangana River,

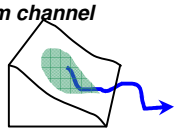
Mokapakgsma River and the Khokhovela River – moving east. In terms of wetlands, only 2 wetlands are crossed by the proposed development: the dam on the Sephiriri River and a flat depression on the central and southern proposed development routes. However, it is expected that all the seasonal streams become numerous channelled valley bottom wetlands during its drier seasons.

4.2 Wetland Health

Wetland Health will only be discussed in terms of the seasonal and perennial depressions and valley-bottoms. Table 3 below describes valley bottom systems.

Table 3: Wetland hydro-geomorphic types typically supporting inland wetlands in South Africa

Hydro-geomorphic types	Description	Source of water maintaining the wetland[1]	
		Surface	Sub-surface
Floodplain 	Valley bottom areas with a well defined stream channel, gently sloped and characterized by floodplain features such as oxbow depressions and natural levees and the alluvial (by water) transport and deposition of sediment, usually leading to a net accumulation of sediment. Water inputs from main channel (when channel banks overspill) and from adjacent slopes.	***	*
Valley bottom with a channel 	Valley bottom areas with a well defined stream channel but lacking characteristic floodplain features. May be gently sloped and characterized by the net accumulation of alluvial deposits or may have steeper slopes and be characterized by the net loss of sediment. Water inputs from main channel (when channel banks overspill) and from adjacent slopes.	***	*/ ***
Valley bottom without a channel 	Valley bottom areas with no clearly defined stream channel, usually gently sloped and characterized by alluvial sediment deposition, generally leading to a net accumulation of sediment. Water inputs mainly from channel entering the wetland and also from adjacent slopes.	***	*/ ***

Hydro-geomorphic types	Description	Source of water maintaining the wetland[1]	
		Surface	Sub-surface
Hillslope seepage linked to a stream channel 	Slopes on hillsides, which are characterized by the colluvial (transported by gravity) movement of materials. Water inputs are mainly from sub-surface flow and outflow is usually via a well defined stream channel connecting the area directly to a stream channel.	*	***
Isolated Hillslope seepage 	Slopes on hillsides, which are characterized by the colluvial (transported by gravity) movement of materials. Water inputs mainly from sub-surface flow and outflow either very limited or through diffuse sub-surface and/or surface flow but with no direct surface water connection to a stream channel.	*	***
Depression (includes Pans) 	A basin shaped area with a closed elevation contour that allows for the accumulation of surface water (i.e. it is inward draining). It may also receive sub-surface water. An outlet is usually absent, and therefore this type is usually isolated from the stream channel network.	*/ ***	*/ ***

[1] Precipitation is an important water source and evapotranspiration an important output in all of the above settings

Water source: * Contribution usually small

*** Contribution usually large

*/ *** Contribution may be small or important depending on the local circumstances

 Wetland

4.2 Wetland Habitat Integrity

The Present Ecological Status (PES) Method (DWAF 2005) was used to establish the integrity of the wetlands in the study area and was based on the modified Habitat Integrity approach developed by Kleynhans (DWAF, 1999; Dickens *et al*, 2003). The table below displays the criteria and results from the assessment of the habitat integrity of the wetlands. These criteria were selected based on the assumption that anthropogenic modification of the criteria and attributes listed under each selected criterion can generally be regarded as the primary causes of the ecological integrity of a wetland. The habitat integrity assessment confirms modifications to the system and results in a **D-classed assessment** for modification impacts on the seasonal depression systems and a **C-classed assessment** for the valley-bottom system. The major attributing factor to the D-Classed assessment is due to seasonal depression system is sensitivity to change.

Table 4: Habitat integrity assessment criteria for palustrine wetlands (Dickens et al, 2003)

Criteria & Attributes	Relevance
	Consequence of abstraction, regulation by impoundments or increased runoff from human settlements or agricultural land. Changes in flow regime (timing, duration, frequency), volumes, velocity which affect inundation of wetland habitats resulting in floralistic changes or incorrect cues to biota. Abstraction of groundwater flows to the wetland.
	Consequence of impoundment resulting in destruction of natural wetland habitat and cues for wetland biota.
	From point or diffuse sources. Measured directly by laboratory analysis or assessed indirectly from upstream agricultural activities, human settlements and industrial activities. Aggravated by volumetric decrease in flow delivered to the wetland.
	Consequence of reduction due to entrapment by impoundments or increase due to land use practices such as overgrazing. Cause of unnatural rates of erosion, accretion or infilling of wetlands and change in habitats.
	Results in desiccation or changes to inundation patterns of wetland and thus changes in habitats. River diversions or drainage.
	Consequence of infilling, ploughing, dykes, trampling, bridges, roads, railway lines and other substrate disruptive activities that reduce or change wetland habitat directly in inundation patterns.
	Consequence of desiccation of wetland and encroachment of terrestrial plant species due to changes in hydrology or geomorphology. Change from wetland to terrestrial habitat and loss of wetland functions.
	Direct destruction of habitat through farming activities, grazing or firewood collection affecting wildlife habitat and flow attenuation functions, organic matter inputs and increases potential for erosion.
	Affects habitat characteristics through changes in community structure and water quality changes (oxygen reduction and shading).
	Presence of alien fauna affecting faunal community structure.
	Overgrazing, over fishing, etc.

Table 5: Wetland habitat integrity assessment (score of 0=critically modified to 5=unmodified)

Criteria & Attributes	Seasonal Depression	Channeled Valley bottoms
Hydrologic		
Flow Modification	1.5	3
Permanent Inundation	2	4
Water Quality		
Water Quality Modification	2	3
Sediment Load Modification	2	3
Hydraulic/Geomorphic		
Canalisation	3	3
Topographic Alteration	3	3
Biota		
Terrestrial Encroachment	2	3
Indigenous Vegetation Removal	2	3.5
Invasive Plant Encroachment	2	3.5
Alien Fauna	3.5	3
Over utilisation of Biota	3	2
Total Mean	**2.4**	**3.1**
Category	**D**	**C**

Table 6: Relation between scores given and ecological categories

Scoring Guidelines Per Attribute*	Interpretation of Mean* of Scores for all Attributes: Rating of Present Ecological Status Category (PESC)
	CATEGORY A >4; nmodified, or approximates natural condition.
	CATEGORY B >3 and <4; argely natural with few modifications, but with some loss of natural habitats.
	CATEGORY C >2 and <3; oderately modified, but with some loss of natural habitats.
Largely modified - score=2.	CATEGORY D <2; largely modified. A large loss of natural habitats and basic ecosystem functions has occurred.

Scoring Guidelines Per Attribute*	Interpretation of Mean* of Scores for all Attributes: Rating of Present Ecological Status Category (PESC)
Seriously modified – rating=1.	CATEGORY E >0 and <2; seriously modified. The losses of natural habitats and basic ecosystem functions are extensive.
Critically modified – rating=0.	Modifications have reached a critical level and the system has been modified completely with an almost complete loss of natural habitat

4.3 Ecosystem Services

The assessment of the ecosystem services supplied by the identified wetlands was conducted according to the guidelines as described by Kotze *et* al (2005). The characteristics scored for this wetland according to the general levels of services provided is notably important and requires management to the wetlands to ensure that they can continue to provide the valued goods and services:

Table 7: Goods and services assessment results for wetlands

Goods and services	Seasonal Depressions	Linked Valley-bottoms
Flood attenuation		
Stream flow regulation		
Sediment trapping		
Phosphate trapping		
Nitrate removal		
Toxicant removal		
Erosion control		
Carbon storage		
Maintenance of biodiversity		
Water supply for human use		
Natural resources		
Cultivated foods		
Cultural significance		
Tourism and recreation		
Education and research		

Table 8: Level of service ratings

Service rating	Score
Low	0
Moderately low	1
Intermediate	2
Moderately high	3
High	4

4.4 Summary

1. Seasonal depression systems had a more impacted current status than valley-bottom systems. This was largely due to seasonal depression systems sensitivity and seasonality status, which related to its small size and structural integrity (not limited to accessibility disturbance).
2. Valley-bottom systems were larger bodies of water which were found to be more robust in structure and susceptibility to direct human disturbance (limited to construction and pollution activities).
3. From a goods and services point of view, valley-bottoms are regarded as important refugia for biota, but seasonal depressions were regarded more important for genetic corridors fitness as they have the ability to host unique biota. Significant services that both wetland systems provide includes water services, pollutant trapping and flood attenuation.
4. From a delineation point of view, development around delineation references should be done outside of the wetland buffer areas (See Wetlands Delineation Mapping Assessment Appendix).

5. INVESTIGATIVE ASSESSMENTS OF RIVER SYSTEMS IN THE STUDY AREA

Several seasonal drainage channels were found on the proposed development site, which were found to be tributaries of the Sephiriri River and the Molapakgsma River. Most of these channels are utilised as stormwater conduits for the developed areas and as artificial damming points for direct land-use. The Sephiriri River was the only significant perennial system transected by the proposed development route and is of great concern as this river system is regarded as irreplaceable by SANBI's National Biodiversity Assessment: Aquatic Biodiversity Sub-catchment. This river is a significant feature of the Sand River and the associated Kruger Park and is regarded as an important biodiversity corridor.

Table 9: Geomorphological and Physical features of the River Tributary

Valley Form	Floodplain
Lateral mobility or entrenchment	Confined
Channel form	Simple (macro-channel)
Channel pattern	Single thread: low-medium sinuosity
Channel type	Bedrock/boulder with transported Sand
Channel modification	medium to high (bank modification, water abstraction, flow modification and water quality impairment)
Riparian zone	35m - 50m (Sephiriri); 5 - 35m (Molapakgsma River Seasonal tributaries)
Riparian vegetation	Good buffer at Sephiriri River; no buffers at Sand-River Seasonal tributaries
Instream aquatic vegetation	Cyperus spp. and Phragmites australis.
Habitat	4-types – Good instream vegetation habitat; homogenous sandy runs and pools; and good riffle habitat

The Index for Habitat Integrity (IHI), Riparian Vegetation Index (RVI) and Site Characterisation Assessment's were utilised to provide information on the ecological condition of the Sephiriri River and Seasonal tributaries of the Molapakgsma River.

From the Delineated Wetland and Drainage line map (See Wetlands Delineation Mapping Assessment Appendix), the river assessments to follow will be grouped into perennial Sephiriri River and Seasonal Tributaries of the Sand River found in the study area, such as the Molapakgsma River and Khokhovela River catchments.

5.1. Habitat Integrity/Site Characterisation

The evaluation of Habitat Integrity (HI) provides a measure of the degree to which a river has been modified from its natural state. The methodology (DWAF, 1999) involves a qualitative assessment of the number and severity of anthropogenic perturbations on a river and the damage they potentially inflict upon the system. These disturbances include both abiotic and biotic factors, which are regarded as the primary causes of degradation of a river. The severity of each impact is ranked using a six-point scale with 0 (no impact), 1 to 5 (small impact), 6 to 10 (moderate impact), 11 to 15 (large impact), 16 to 20 (serious impact) and 21 to 25 (critical impact).

The Habitat Integrity Assessment is based on assessment of the impacts of two components of the river, the riparian zone and the instream habitat. Assessments are made separately for both components, but data for the riparian zone are interpreted primarily in terms of the potential impact on the instream component.

The estimated impact of each criterion is calculated as follows:

Rating for the criterion/maximum value (25) x weight (percent)

The estimated impacts of all criteria calculated in this way are summed, expressed as a percentage and subtracted from 100 to arrive at an assessment of habitat integrity for the instream and riparian components respectively. The total scores for the instream and riparian zone components are then used to place the habitat integrity of both in a specific habitat category.

Figure 15: Picture of a seasonal stream in the study area

Table 10: Index of Habitat Integrity Assessment results and criteria assessed at the sites

INSTREAM HABITAT INTEGRITY	Seasonal Sand Tribs	Sephiriri River	Comment
Water Abstraction (Impact 1 - 25)	16	8	Run-of-river upstream catchment abstraction
Flow Modification ((Impact 1 - 25)	14	10	Abstraction related damming impacts
Bed Modification (Impact 1 - 25)	9	6	Bulldozing within bed at the monitoring sites as well as at river crossings
Channel Modification (Impact 1 - 25)	4	6	Some alteration of banks or past channel straightening
Water Quality (Impact 1 - 25)	12	9	Adjacent residential and farming impacts
Inundation (Impact 1 - 25)	4	2	Some inundation as a result of dug pools
Exotic Macrophytes (Impact 1 - 25)	2	1	When stagnant
Exotic Fauna (Impact 1 - 25)	5	3	Very likely to be some in such a large river with related disturbance pressures (rural human livelihood)
Rubbish Dumping (Impact 1 - 25)	7	1	Some dumping of rubble (township interaction)
Instream Habitat Integrity Score	**53**	**77**	
Integrity Class	**D**	**B/C**	
RIPARIAN ZONE HABITAT			

INTEGRITY			
Vegetation Removal (Impact 1 - 25)	12	5	Some vegetation removal due to livestock grazing
Exotic Vegetation (Impact 1 - 25)	10	8	Limited alien plant invasion due natural corridor protection
Bank Erosion (Impact 1 - 25)	7	3	Bank erosion due to removal of indigenous vegetation within flood margins (bank erosion also present as natural process)
Channel Modification (Impact 1 - 25)	7	6	Some bank modification by farming related activities
Water Abstraction (Impact 1 - 25)	14	8	See comment above
Inundation (Impact 1 - 25)	3	2	See comment above
Flow Modification (Impact 1 - 25)	14	10	See comment above
Water Quality (Impact 1 - 25)	12	9	See comment above
Riparian Zone Habitat Integrity Score	**35**	**74**	
Integrity Class	**E**	**B/C**	

The instream habitat integrity of both the Sephiriri River and the Sand River tributaries were in a good to fair condition. Impacts were related to direct human disturbance as a result of ecosystem water use (dam, surrounding subsistence farming activities and cumulative water use impacts). The riparian habitat integrity of the Sephiriri River was good due to its proximity to protection parks. However, the Sand River Seasonal tributaries riparian zones were highly modified, as a result of its high sensitivity and vulnerability statues as well as its positioning within the township residential and commerce zones. As a result of the lacking riparian vegetation buffer appropriate for bank stability and flood attenuation these seasonal systems will continue to degrade and is in current largely used for stormwater services. Major impact sources from the habitat integrity assessment are water abstraction, stormwater impacts and channel modification. The integrity results may be pronounced more than what it should be, as a result of seasonal rivers natural bleak appearance.

Table 11: Habitat Integrity categories (From DWAF, 1999)

CATEGORY	DESCRIPTION	SCORE (% OF TOTAL)
A	Unmodified, natural.	90-100
B	Largely natural with few modifications. A small change in natural habitats and biota may have taken place but the ecosystem functions are essentially unchanged.	80-90
C	Moderately modified. A loss and change of natural habitat and biota have occurred but the basic ecosystem functions are still predominantly unchanged.	60-79
D	Largely modified. A large loss of natural habitat, biota and basic	40-59

CATEGORY	DESCRIPTION	SCORE (% OF TOTAL)
	ecosystem functions has occurred.	
E	The loss of natural habitat, biota and basic ecosystem functions is extensive.	20-39
F	Modifications have reached a critical level and the biotic system has been modified completely with an almost complete loss of natural habitat and biota. In worst instances, basic ecosystem functions have been destroyed and changes are irreversible.	0

5.2. Ecological Importance and Sensitivity

EIS considers a number of biotic and habitat determinants surmised to indicate either importance or sensitivity. The determinants are rated according to a four-point scale. The median of the resultant score is calculated to derive the EIS category.

Table 12: Definition of the four-point scale used to assess biotic and habitat determinants presumed to indicate either importance or sensitivity

Four point scale	Definition
1	One species/taxon judged as rare or endangered at a local scale.
2	More than one species/taxon judged to be rare or endangered on a local scale.
3	One or more species/taxon judged to be rare or endangered on a Provincial/regional scale.
4	One or more species/taxon judged as rare or endangered on a National scale (i.e. SA Red Data Books)

Table 13: Ecological importance and sensitivity categories (DWAF, 1999)

EISC	General description	Range of median
Very high	Quaternaries/delineations that are considered to be unique on a national and international level based on unique biodiversity (habitat diversity, species diversity, unique species, rare and endangered species). These rivers (in terms of biota and habitat) are usually very sensitive to flow modifications and have no or only a small capacity for use.	>3-4
High	Quaternaries/delineations that are considered to be unique on a national scale based on their biodiversity (habitat diversity, species diversity, unique species, rare and endangered species). These rivers (in terms of biota and habitat) may be sensitive to flow modifications but in some cases may have substantial capacity for use.	>2-≤3
Moderate	Quaternaries/delineations that are considered to be unique on a provincial or local scale due to biodiversity (habitat diversity, species diversity, unique species, rare and endangered species). These rivers (in terms of biota and habitat) are not usually very sensitive to flow modifications and often have substantial capacity for use.	>1-≤2
Low/ marginal	Quaternaries/delineations that are not unique on any scale. These rivers (in terms of biota and habitat) are generally not very sensitive to flow modifications and usually have substantial capacity for use.	≤1

Table 14: Results of the EIS assessment for the Sand-River Seasonal Tributaries and the Sephiriri River at the assessed sites

	Sand-River Tributaries	Sephiriri River
Biotic Determinants		
Rare and endangered biota	1	3.5
Unique biota	1	3.5
Intolerant biota	1	3.5
Species/taxon richness	1.5	4
Aquatic Habitat Determinants		
Diversity of aquatic habitat types or features	2.5	4
Refuge value of habitat type	1	4
Sensitivity of habitat to flow changes	3	3
Sensitivity of flow related water quality changes	3	3
Migration route/corridor for instream and riparian biota	3.5	4
National parks, wilderness areas, Nature Reserves, Natural Heritage sites, Natural areas, PNEs	1	3.5
RATINGS	**1.85**	**3.6**
EIS CATEGORY	**Low to Moderate**	**Very High**

As expected, the Sand-River Tributaries scored poor in general and only scored good for its sensitivity status as a result of its corridor service potential. The Sephiriri River system assessed is deemed very important as a result of its high species richness, its diverse aquatic habitats and associated refugia, as well as its corridor service potential for species genetic fitness conservation.

5.3. Riparian Vegetation

Riparian zones, as well as the impact assessment of riparian zones, rely exceedingly on the interpretation of characteristic riparian vegetation: its function to stream condition and bank structure. Considerations making this assessment encourages the rating of bank zonation, riparian vegetation cover (in particular indicator and canopy species), riparian vegetation abundance, riparian vegetation recruitment rates, the population structure of the riparian zone captured and the species *alpha* and *beta* diversity. In turn, the facets that drives riparian zone ecology, is assessed with a perceived reference state. This reference state is usually a pristine benchmark or one that has the least heterogeneous factors impacting on its natural functionality (DWAF 2007). However, the purpose of this assessment will not be to determine the impacts on the riparian zone to the reference state, but to provide some suggestions on the degree of change the existing land-uses has placed this already impacted river segment.

Table 15: Summary of the Riparian Vegetation Index Assessments

Sample Location and impact description	RVI summary
Sand River Seasonal Tributaries Largely Modified. A significant loss and change of natural habitat, biota and some basic ecosystem functions are extensively modified.	RVI = [(EVC)+((SI x PCIRS)+(RIRS))] RVI = [(6)+((1.25(1x0.7))+(1)))] RVI = **7.875 E – *Poor***
Sephiriri River Modified. Some loss and change of natural habitat, but biota and basic ecosystem functions are good.	RVI = [(EVC)+((SI x PCIRS)+(RIRS))] RVI = [(9)+((2(1x0.3))+(4)))] RVI = **13.6 C – Fair**

The major impacts found in this assessment for the Sand-River Seasonal Tributaries are: Loss of a good riparian buffer; vegetation transformation due to a lack of riparian buffer (weedy grasses invasion); direct residential and farm related practices (stock and Irrigation farming, pollution and vegetation removal); and over-abstraction practice (irrigation and stock farming). Localised water quality problems were also found where side pools were stagnant. These impacts can be discussed via referring to the conditions of the respective riparian zones in the context of the degree of change from the riparian reference state for the whole sampling area:

In terms of the Sephiriri River, impacts associated with this system were related to past disturbance to the marginal riparian zone (lack of good marginal vegetation) and their representation over the riparian zones (structural integrity and good community structure). Erosion was moderate along meanders and at a bridge road construction. Also, localised water quality impairment by roads stormwater was found entering the river directly.
Below follows a summary of riparian zone descriptions as assessed in field:

Marginal Zone:

Sand-River Seasonal Tributaries: The riparian marginal zone was largely covered by exposed cobble and boulders (low-flow conditions) with good riparian sedge species *Cyperus spp.* and *Phragmites spp.* (occupied a scattered clump distribution in areas where subsurface streamflow was very close to the surface and at scattered pools). Invading weedy grass species *Stenotaphrum secondatum* (buffalo), *Cynodon dicotylon* (common grass) and *Pennisetum clandestinum* and *P. seraceum* (kikuyu grass) represented most of the sedge and grass vegetation found across this zone and is a good indicator of consistent short to mid-term persistent disturbances. Of concern is the opportunity for alien tree invasion to this zone (due to open space for colonisation), as some port-jackson (*Acacia saligna)* was found in some areas.

Sephiriri River: The riparian margin was largely eroded with exposed sand evidence and continuous clumps of common-reed (*Phragmites australis)* instream sedge monostands. This distribution is largely indicative of water quality impairment and low-flow conditions.

Lower Zone/ Wetbank:

Sand-River Seasonal Tributaries: The wetbank zones of these systems were largely non-existent and characterised secondary succession weedy grass species amidst densely distributed surrounding terrestrial vegetation. In most cases where the system was very small, grass from surrounding stock farms would cover the whole riparian zone and result in a non-descript drift within a depression.

Sephiriri River: The wetbank zone of this river was comprised of a very good riparian buffer of at least 15m on average. This zone was largely comprised of riparian trees with some alien gum and port Jackson trees occupying very low densities (*Eucalyptus spp.* and *Acacia salgna*)

Upper Zone/Dry bank:

Sand-River Seasonal Tributaries: The primary feature of this zone was weedy grass*es* and rural surroundings (residential, bushveld, roads and farming).

Sephiriri River: The primary feature of this zone was good terrestrial vegetation, with the exception of the Ronaldsey township to the west of the river.

Summary

- The Riparian vegetation type classed highly transformed for the *Sand-River Seasonal Tributaries;* and fair to good for the *Sephiriri River*
- Direct disturbance pressures are the associated impacts of the *Sand-River Seasonal Tributaries;* whereas the *Sephiriri River* had vegetation compositional and structural integrity concerns
- No endangered or rare biota was found in this assessment, but the *Sephiriri River* is classed as highly important for conservation purposes.

Table 16: Intermediate River Vegetation Index categories (from Kemper, 2001)

RVI Score	Assessment class	Description
19-20	A	Unmodified, natural.
17-18	B	Largely natural with few modifications. A small change in natural habitats and biota may have taken place, but the ecosystem functions remains unchanged.
13-16	C	Modified. A loss and change of natural habitat, biota and basic ecosystem functions have occurred.
9-12	D	Largely modified. A moderate to large loss of natural habitat, biota and basic ecosystem functions have occurred.
5-8	E	The loss of natural habitat, biota and basic ecosystem functions are extensive.
0-4	F	Modifications have reached a critical level and the system has been modified completely with complete loss of habitat and biota. In the worst instances, the basic ecosystem functions have been destroyed to the extent that changes are irreversible.

Table 17: The river health categories

Category	Ecological Perspective	Management Perspective
Natural (N)	No or negligible modification	Relatively little human impact
Good (G)	Biodiversity and integrity largely intact	Some human-related disturbance but ecosystems essentially in a good state
Fair (F)	Sensitive species may be lost, with tolerant or opportunistic species dominating	Multiple disturbances associated with the need for socio-economic development
Poor (P)	Mostly tolerant species; alien invasion, disrupted population dynamics; species are often diseased	High human densities or extensive resource exploitation

6. ASSESSMENT OF IMPACTS AND RECOMMENDED ACTIONS

6.1 Legislative and regulatory requirements

This development aims to be in alignment with the guidelines and principals of the National Spatial Development Perspective, the Development Facilitation Act, the Comprehensive Rural Development Programme Framework, the Water Services Information Reference Framework, Ehlanzeni Integrated Development Plan, the National Water Act and the National Environmental Management Acts.

6.1.1 NEMA (Act No. 107 of 1998) and Environmental Impact Assessment Regulations, 2010

In terms of undertaking an EIA process and in terms of compliance with NEMA, the proposed development does involve 'listed activities', as defined by NEMA (Listed activities are activities, which may have potentially detrimental impacts on the environment and therefore require environmental authorisation from the relevant authorising body) as the proposed development does fall within 32 meters of the River and wetland margins.

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

The National Water Act guides the management of water in South Africa as a common resource. The Act aims to regulate the use of water and activities, which may impact on water resources through the categorisation of 'listed water uses' encompassing water extraction and flow attenuation within catchments as well as the potential contamination of water resources, where the Department of Water Affairs (DWA) is the administering body in this regard.

In terms of the definitions provided by the NWA, activities potentially triggered under this proposed development included under Sections 21c (impeding or diverting the flow of water in a watercourse) and Section 21i (altering the bed, bank, course or characteristics of a watercourse). Infilling of floodplains is also considered by DWA to be a Section 21(i) activity although we would contend that this is not necessarily the case and depends on the definition of "bed", "banks" and "watercourse". Listed activities require the approval of DWA in the form of a Water Use Licence application. Obtaining a Water Use License can be a lengthy process taking 12 to 18 months to complete.

Section 22(3) of the National Water Act allows for a responsible authority (DWA) to dispense with the requirement for a Water Use License if it is satisfied that the purpose of the Act will be met by the grant of a license, permit or authorisation under any other law. This provision is rarely used but should be

discussed with DWA and provincial environmental Officials to ascertain whether compliance is necessitated, as the proposed development does fall within the 1:50yr or 1:100 floodlines.

6.2 Description of impacts

This section provides an assessment of the impacts to freshwater ecosystems that are likely to be associated with proposed development as described above.

- **Impact - loss of wetland habitat and bed/bank modification:** The loss of wetland habitat is unlikely to occur, but some modification to the bed or banks of freshwater system is likely to occur as part of the construction phase of the proposed development (general direct disturbance, loss of buffer vegetation).

  Significance of impacts without mitigation: high negative impact – Localised loss of wetland habitat and bed/bank modification is not a favorable impact. In addition, activities during and after the construction, will provide an opportunity for invasive alien plants to proliferate in areas that are already in a disturbed condition and possibly cause pollution to the freshwater system outside the development belt. It is recommended that development take place with precaution and outside the recommended wetland system buffers.

  Proposed mitigation: A buffer refers to an area around an aquatic feature such as the wetland. Buffers serve to reduce the levels of sediment and pollutants directly entering the wetland. A buffer zone of at least 32m should therefore be adopted for all identified “Sand River Seasonal Tributaries”; and a buffer of at least 50m should be adopted in the Sephiriri River System, to protect the wetlands found on site, from the impacts associated with the proposed development. In relation to the Sephiriri River, the proposed development infrastructure is also at a flood risk should it develop within the floodlines as this river has significant flooding potential.

  Significance of impacts after mitigation: Low to medium impact

- **Impact - water quality impairment:** There is a potential associated with the development for impairment of the stormwater quality to occur, namely sedimentation and construction related effluent disturbance during the construction phase.

  Significance of impacts without mitigation: medium impact

  Proposed mitigation: The water quality impacts during the construction phase in particular should be addressed through the Environmental Management Programme, which is implemented by an on-site Environmental Officer. Runoff from the construction site, is proposed to be prevented from directly entering wetlands and associated water features (except where gradient is not feasible).

Wetland buffer areas should be maintained to reduce the impact of runoff from the developed site's activities after the construction phases of the development.

Significance of impacts after mitigation: low negative to limited.

- **Impact - flow modification:** This impact relates to that already discussed under habitat loss above.

  Significance of impacts without mitigation: high negative impact

  Proposed mitigation: The hydrological impacts on the wetland, is negated if constructing outside of floodlines.

  Significance of impacts after mitigation: Low negative impact

- **Loss of terrestrial and wetland biodiversity:** The loss of terrestrial and wetland biodiversity is expected to occur in localised areas (especially during the construction phase). The natural vegetation around the wetland areas impacted by the development is expected to recover in the mid term as a result of the small development footprint of the proposed development.

  Significance of impacts without mitigation: highly negative impact

  Proposed mitigation: The construction of the development must not utilise heavy construction vehicles where possible in proximity to the wetlands. All alien vegetation should be cleared off the property and landscaping using the neighboring parks and reserves plant species is encouraged. It is believed that this area will naturally recover from the direct (dust, pollution) and indirect (change in passive infiltration of the vicinity) disturbances. The trimming of bulrush and reeds should be allowed if densities are too high.

  Significance of impacts after mitigation: Low impact

- **Cumulative impacts**

  With effective implementation of the recommended mitigation measures, the condition of the wetlands and rivers found within the proposed development footprint should be maintained at an acceptable level.

7. SUMMARY OF KEY FINDINGS

Table 18: Summary of the impacts of the proposed project and its alternatives

Impacts	Extent	Intensity	Duration	Probability	Weighting Factor	Significance rating	Mitigation efficiency	Mitigated aspects
Loss of wetland habitat and bed/bank modification	Regional (**3**)	M (**3**)	Permanent (***5***)	Highly likely (***4***)	H (***5***)	M-H (***60***)	M/H (***0.4***)	L (***14.4***)
Water quality impairment	Local (***2***)	L (***1***)	Mid term (***3***)	Possible (***2***)	L/M (***2***)	L/M (***32***)	L/M (***0.7***)	L (***15***)
Flow modification	Local (***2***)	L (***1***)	Long term (***4***)	Possible (***2***)	M (***3***)	M (***45***)	M (***0.5***)	L/M (***19.5***)
Loss of biodiversity	International ***(5)***	M ***(3)***	Long term (***4***)	Highly likely (***4***)	M/H (***5***)	M/H (***80***)	H (***0.2***)	L/M ***(25)***

Where: (H=high, M=medium , L=low)

Significance Rating (WOM) = (Extent + Duration + Intensity + Probability) * Weighting Factor

Significance Rating (WM) = (Significance Rating Without Mitigation) * Mitigation Efficiency

Table 19: Description of assessment parameters with their respective weightings

Extent	Duration	Intensity	Probability	Weighting Factor (WF)	Significance Rating (SR)	Mitigation Efficiency (ME)	Mitigated Aspects (MA)
Footprint 1	Short term 1	Low 1	Probable 1	Low 1	Low 0-19	High 0,2	Low 0-19
Site 2	Short to medium 2		Possible 2	Low to medium 2	Low to medium 20-39	Medium to high 0,4	Low to medium 20-39
Regional 3	Medium term 3	Medium 3	Likely 3	Medium 3	Medium 40-59	Medium 0,6	Medium 40-59
National 4	Long term 4		Highly Likely 4	Medium to high 4	Medium to high 60-79	Low to medium 0,8	Medium to high 60-79
International 5	Permanent 5	High 5	Definite 5	High 5	High 80-100	Low 1,0	High 80-100

With the effective implementation of an EMP and the recommended mitigation measures, the condition of the wetlands and rivers found within the proposed development footprint should be maintained at an acceptable level.

8. CONCLUSIONS

Although all three proposed development routes cross wetlands and rivers, the results of the undertaken aquatic delineation assessments and the associated impact assessment, recommends that the powerline alternative for the northern route is preferred, with no development construction within any wetland areas. This implies the compliance to at least a 50m buffer from stream edge on each side of the Sephiriri River system and the compliance of at least a 32m setback for all other identified aquatic features within this delineation assessment. The motivation for not supporting the central and southern proposed powerline routes is due to the fact that these routes cross more wetland features than the northern route.

In the instance where any activity is necessitated to be undertaken within the floodzones, riparian buffer or wetland areas, an appropriate Department of Water Affairs (DWA) and/or Department of Environmental Affairs (DEA) official should be notified so as to facilitate the activity. Construction activities related to development within floodlines, riparian buffers or wetland areas will require the authorisation of a National Water Act (1998) section 21 c and i water use license. In addition, it is recommended that compliance with a developed and approved DEA Environmental Management Programme (EMPr) be undertaken throughout the life-cycle of this proposed development (for construction and maintenance phases). It is likely that impacts associated with habitat loss and water quality impairment can be rehabilitated and prevents long-term negative ecosystem health impairment.

The impact of the proposed development (preferred alternative) is expected to be limited, due to the proposed development being undertaken outside the wetland floodlines and will encourage adherence to the following mitigation measures:

- The wetland buffer zone and development setback should be established in the identified mapped area, where no construction vehicles should dredge and/or work within 32m of wetland edges for all identified water features (wetlands and Sand River Seasonal Tributaries). For the Sephiriri River in the eastern extent of the proposed development, a buffer of at least 50m on each side of the river edge should be adopted as a no-go area. Limited disturbance should be allowed within the zone and as far as possible it should be rehabilitated with vegetation characteristic of the areas biodiversity.
- If possible, the undertaking of construction should take place during the dry season when development activities are near the rivers and associated wetlands.
- The rehabilitation and re-vegetation of disturbed areas must take place concurrently and/or prior to construction of the proposed development. Only appropriate indigenous riparian vegetation may be used for rehabilitation and re-vegetation within the study area and wetland

buffer areas (preferably indigenous plants represented in the reserve to the north and those existing in the wetland areas).

- Clearing or felling of all alien invasive trees should take place during construction
- If clearing of woody debris and hard rubble on site and in the wetland buffer should be undertaken, it should be carried-out without significantly altering the condition and health of the associated water feature
- The intensity of storm water run-off should be reduced where possible through encouraging paving and surfaces that allow for greater infiltration.
- Any structure within the wetland buffer should as far as possible not disturb the aquatic habitat or alter the flow patterns in the stream. Approval should be obtained from the Department of Water and Environmental Affairs for any such activities
- Activities that lead to elevated levels of turbidity must be minimised. Bulldozing and the use of other mechanical machinery in the wetland buffer zone should also be prevented within the wetland zones as far as possible.

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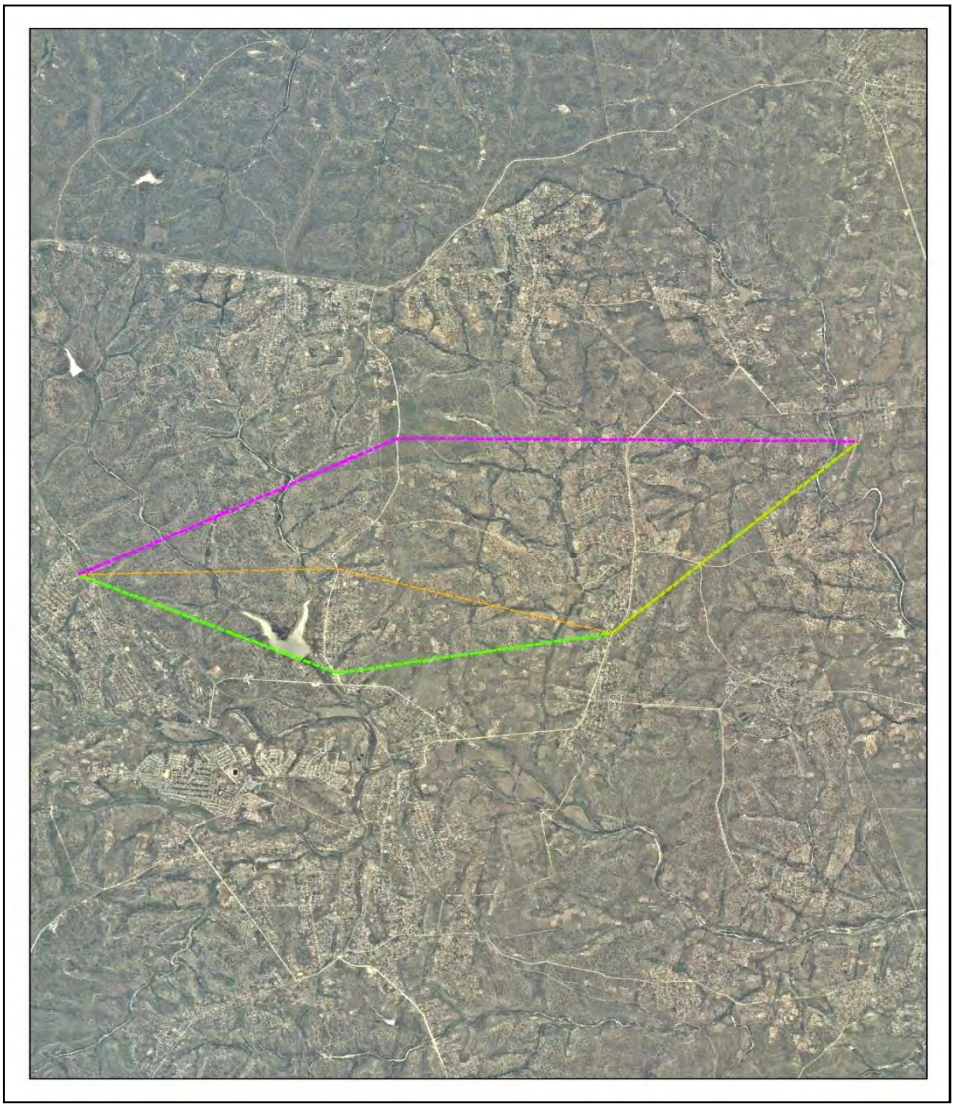
APPENDIX D4

VISUAL IMPACT ASSESSMENT

Eskom Mbumbu Tsakani Power Line

visual impact assessment study

November 2011



a report prepared by

SSI
A DHV COMPANY
ENGINEERS AND ENVIRONMENTAL CONSULTANTS
Linking People, Promoting Growth

Eskom Mbumbu Tsakani Power Line

visual impact assessment study

November 2011

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GLOSSARY

Aesthetics	Relates to the pleasurable characteristics of a physical environment as perceived through the five senses of sight, sound, smell, taste, and touch
Adverse visual impact	Any modification in land forms, water bodies, or vegetation, or any introduction of structures, which negatively interrupts the visual character of the landscape and disrupts the harmony of the basic elements (i.e., form, line, color, and texture).
Basic elements	The four design elements (form, line, color, and texture) which determine how the character of a landscape is perceived.
Contrast	Opposition or unlikeness of different forms, lines, colors, or textures in a landscape. Therefore degree to which project component differs visually from its landscape setting.
Form	The mass or shape of an object or objects which appear unified, such as a vegetative opening in a forest, a cliff formation, or a water tank.
Integration	The degree to which a development component can be blended into the existing landscape without necessarily being screened from view.
Key viewing locations	One or a series of points on a travel route or at a use area or a potential use area, where the view of a management activity would be most revealing.
Landscape character	The arrangement of a particular landscape as formed by the variety and intensity of the landscape features and the four basic elements of form, line, color, and texture. These factors give the area a distinctive quality which distinguishes it from its immediate surroundings.
Landscape features	The land and water form, vegetation, and structures which compose the characteristic landscape.
Line	The path, real or imagined, that the eye follows when perceiving abrupt differences in form, color, or texture. Within landscapes, lines may be found as ridges, skylines, structures, changes in vegetative types, or individual trees and branches
Mitigation measures	Methods or procedures designed to reduce or lessen the adverse impacts caused by management activities.
Rehabilitation	A management alternative and/or practice which restores landscapes to a desired scenic quality.
Scale	The proportionate size relationship between an object and the surroundings in which the object is placed.
Texture	The visual manifestations of the interplay of light and shadow created by the variations in the surface of an object or landscape.
Visual modification	A measure of the visual interaction between a development and the landscape setting within which it is located.
Viewshed	The creation of a computer generated viewshed to define the extent to which the planned infrastructure is visible from key viewing locations.
Visual Sensitivity	The degree to which a change to the landscape will be perceived in an adverse way
Visual Impact	A measure of a joint consideration of both visual sensitivity and visual modification

1. INTRODUCTION

1.1 Background

Visual, scenic and cultural components of the environment can be seen as a resource, much like any other resource, which has a value to individuals, to society and to the economy of the region. In addition, this resource may have a scarcity value, be easily degraded, and is usually not replaceable.

The manner in which the built environment is developed has an immense impact on the intrinsic and systemic value of that environment. Thus developmental integrity is determined by the level of sensitivity practiced in integrating development into the environment in which it is to be located.

The study area is located in Mpumalanga province is about 120km from Nelspruit the site of the existing Mbumbu substation (Figure 1).

The following components are included as part of this visual assessment:

- The creation of a computer generated viewshed to define the extent to which the planned infrastructure is visible from key viewing locations.
- A site inspection to identify the viewshed for the planned activities and potentially sensitive viewing locations within the vicinity.
- Characterisation of the existing visual landscape in terms of topography, existing land use and vegetation.
- Assessment of the potential visual impacts of the planned activities on sensitive receptors.
- Development of mitigation and management measures.

1.2 Existing operations

Eskom Distribution infrastructure already exists in the area including the Mbumbu substation.

1.3 The Project

This visual assessment evaluates the potential visual impact of the following planned infrastructure:

- The construction of a 17km 132kV overhead power line linking the existing Mbumbu Traction and the new proposed Tsakani substation. Three alignment alternatives are being considered by Eskom Distribution and will be evaluated during the visual impact assessment process to determine the best environmentally practicable alignment (Figure 2).

Figure 1: Locality map

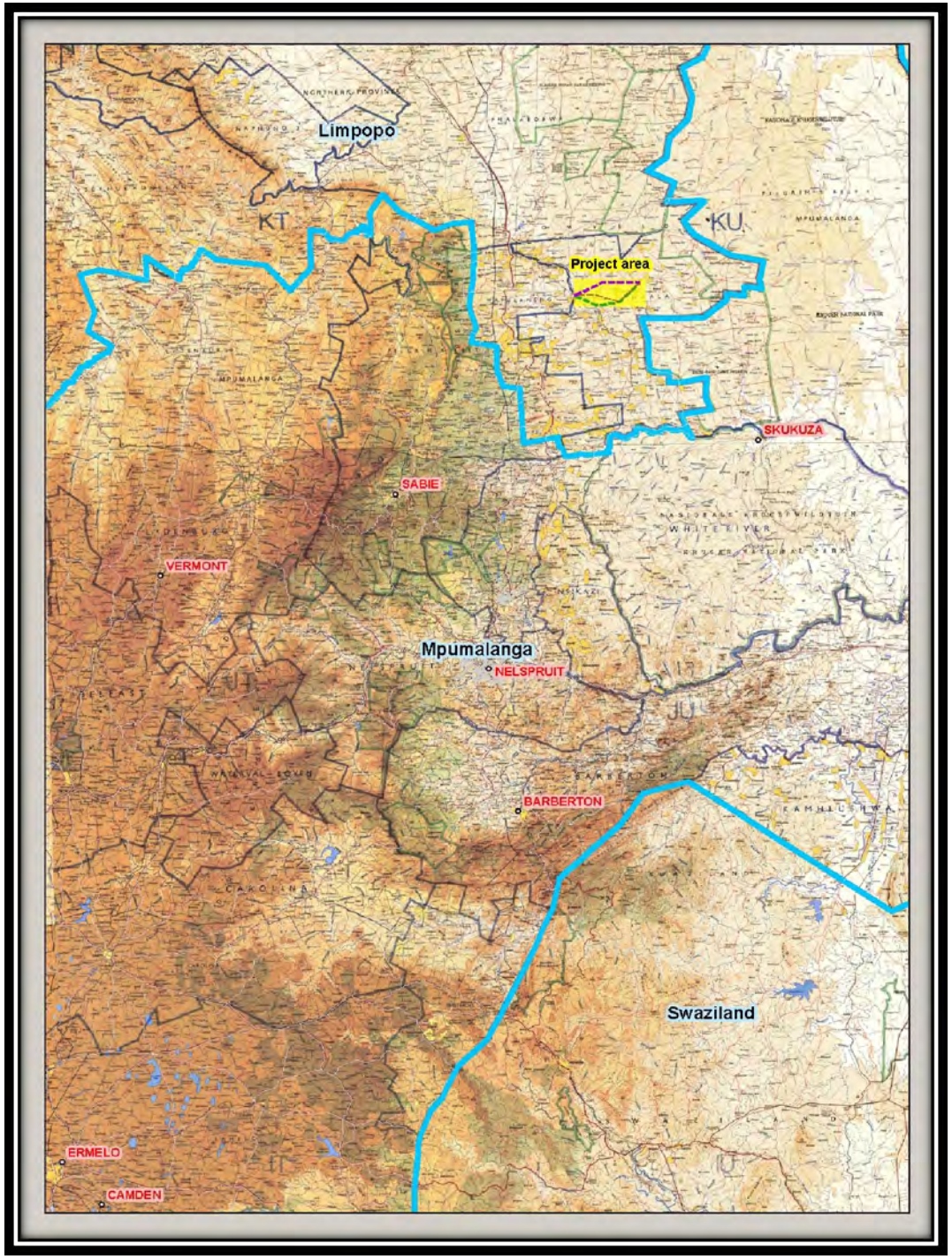


Figure 2: Aerial map

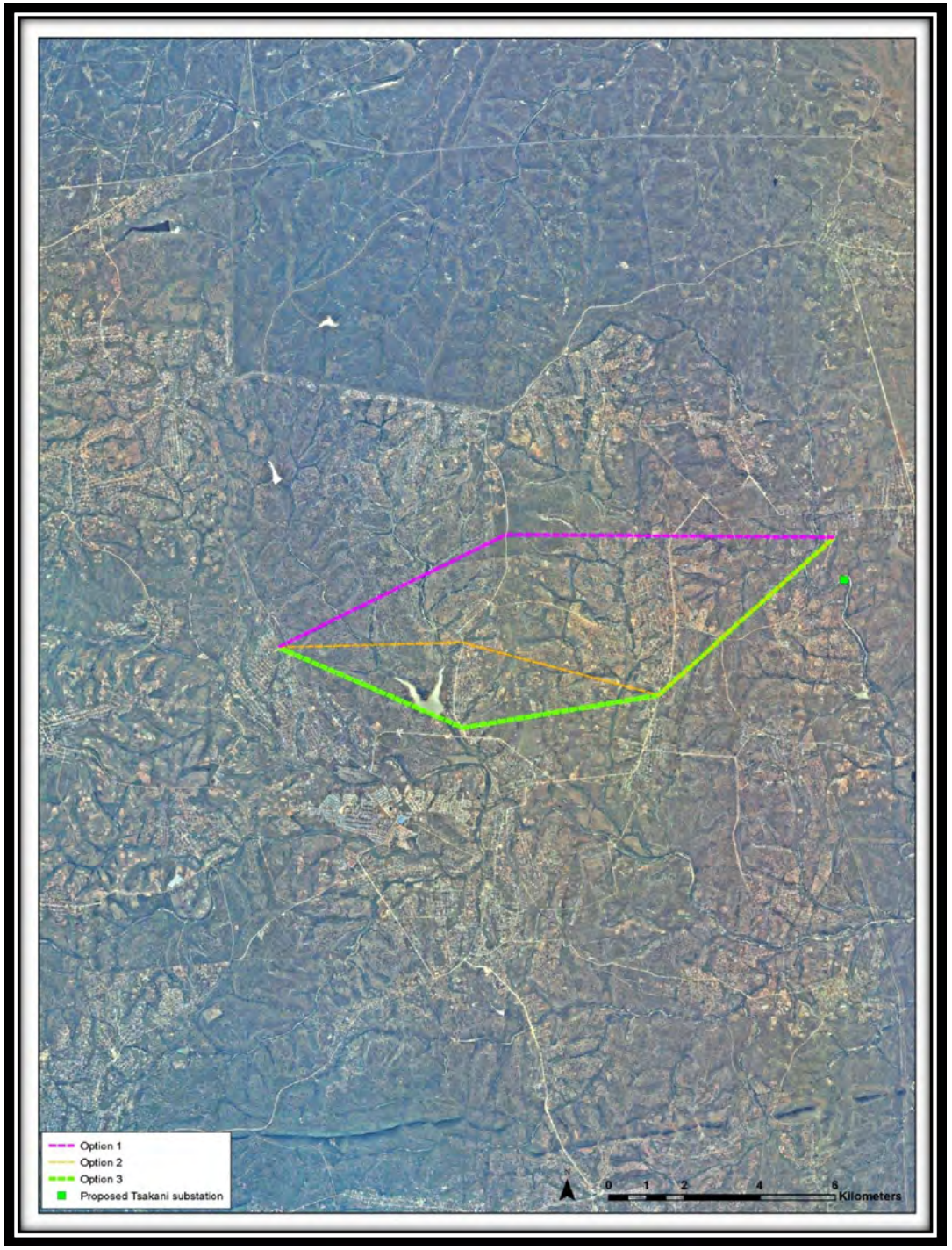


Figure 3: Transport infrastructure

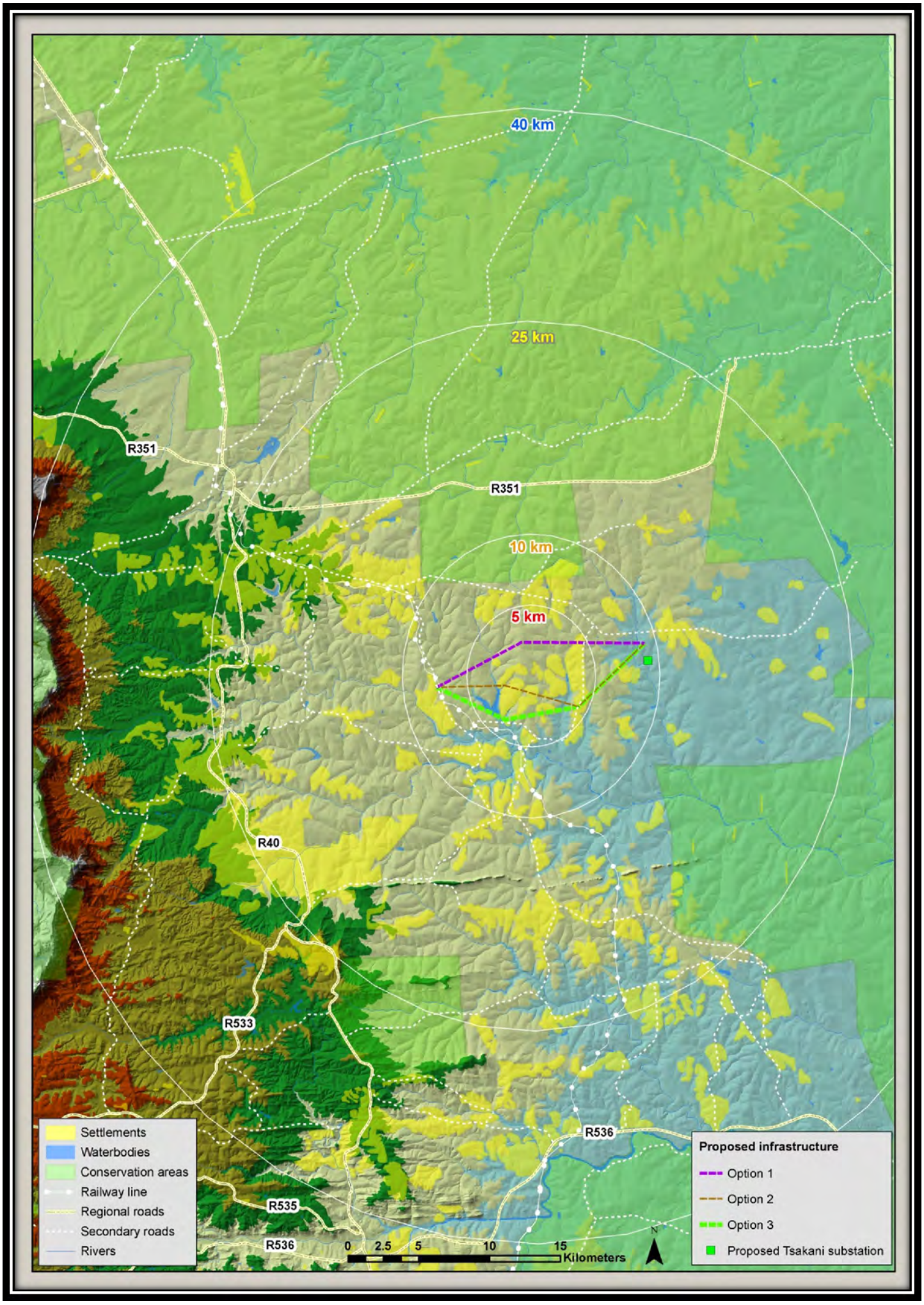


Figure 4: Topography

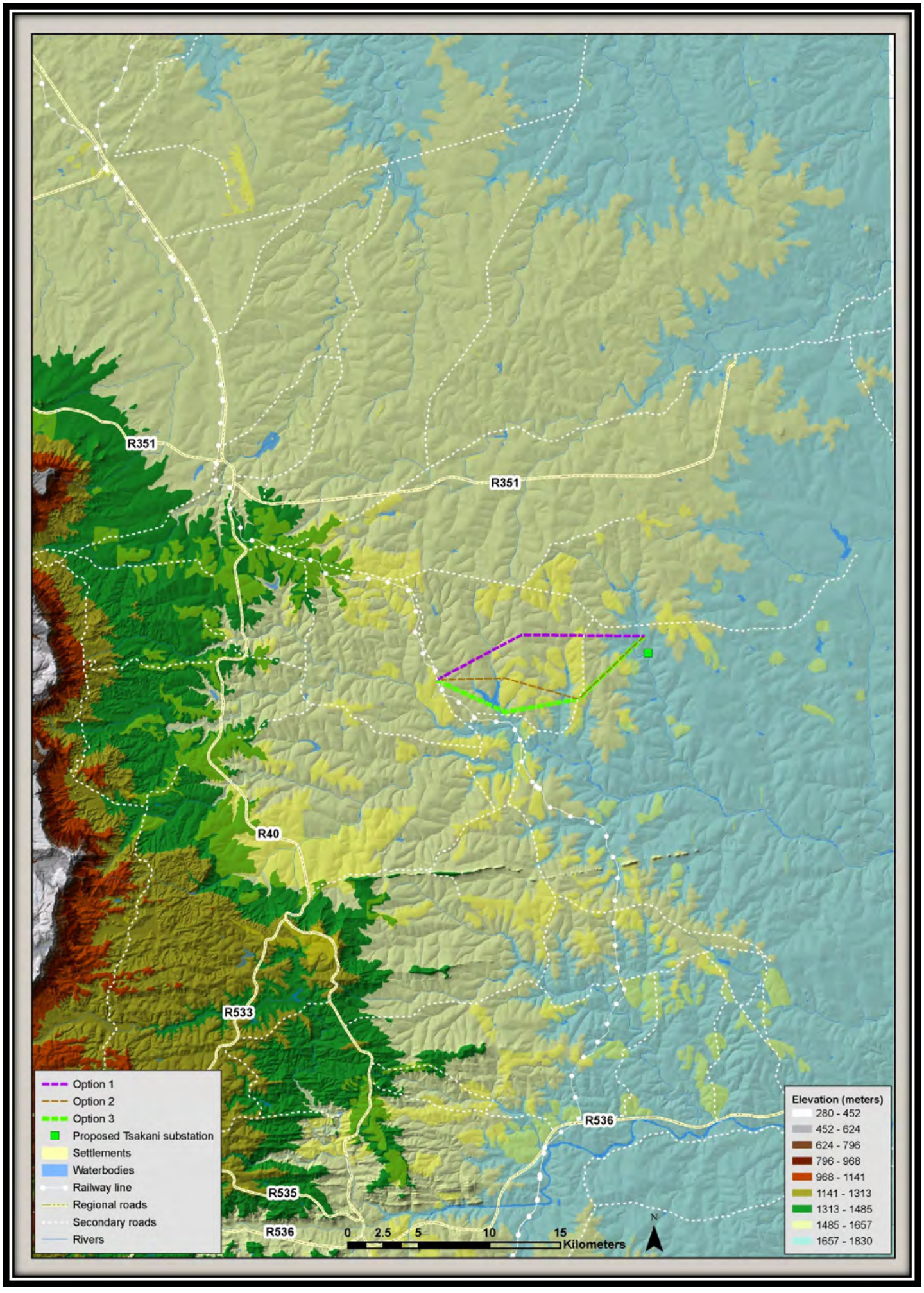
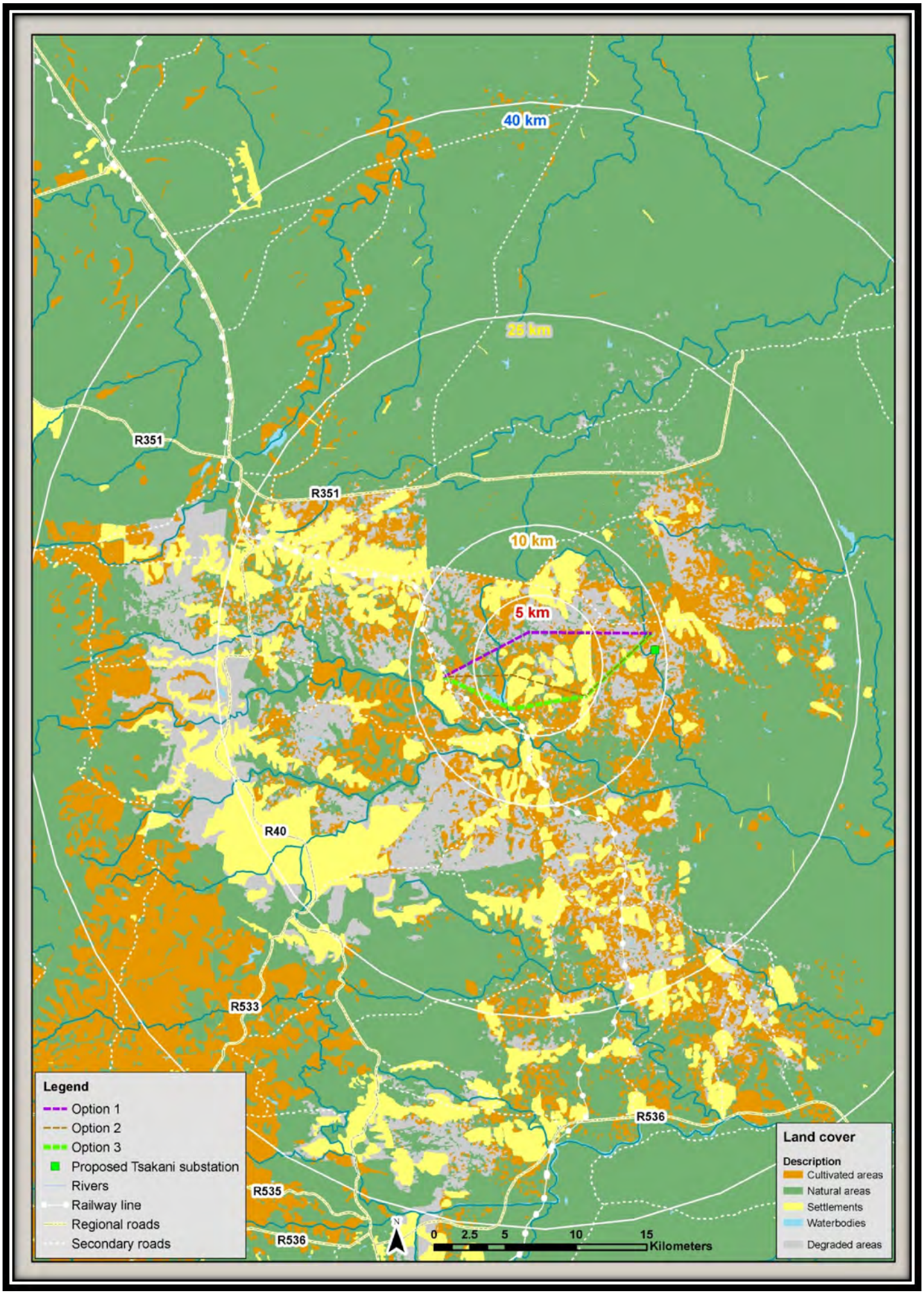


Figure 5: Land cover



1.4 Description of the Project surrounds

The project area is located in Mpumalanga province approximately 120km north of Nelspruit (Figure 1). One main road (R40) provides general access to the project area and access to the proposed power line is by secondary roads and minor dirt roads (Figure 3). The power lines being considered fall predominantly within a rural area characterised by settlements and open spaces (Figure 2).

1.5 Objectives of the Visual Assessment

This technical report is a visual assessment of the potential impacts of the planned infrastructure on the existing landscape and values of the area. The report identifies the visual character of the existing landscape as well as the planned infrastructure.

2. ASSESSMENT METHODOLOGY

2.1 Background

Visual and scenic resources are by their nature difficult to assess or quantify as they often have cultural or symbolic meaning. Assigning values to visual resources is a subjective process. The phrase, "beauty is in the eye of the beholder," is often quoted to emphasize the subjectivity in determining scenic values.

Designers have used the basic design elements of form, line, colour, and texture to describe and evaluate landscapes for hundreds of years. Modifications in a landscape which repeat the landscape's basic design elements are said to be in harmony with their surroundings. Modifications which do not harmonize often look out of place and are said to contrast or stand out in unpleasing ways. These basic design elements and concepts have been incorporated into the methodology to lend objectivity, integrity, and consistency to the visual impact assessment process. By adjusting planned infrastructure designs so that elements repeat, visual impacts can be minimised.

The methodology is designed to separate the existing landscape and the planned infrastructure into their features and elements and to compare each part against the other in order to identify those parts which are not in harmony. Then, ways are sought to bring them back into harmony. An understanding of basic design principles and how they relate to the appearance of planned infrastructure s is essential in order to minimize visual impacts.

The methodology is a therefore a systematic process to measure contrast in order to analyse potential visual impact of proposed planned infrastructure s and activities. It is not intended to be the only means of resolving these impacts. It should be used as a guide, tempered by common sense, to ensure that every attempt is made to minimize potential visual impacts. The basic philosophy underlying the methodology is: The degree to which a management activity affects the visual quality of a landscape depends on the visual contrast created between a planned infrastructure and the existing landscape.

2.2 General method

This section outlines the methodology used to assess the visual impact of the planned infrastructure. The methodology to determine the level of visual impact of the planned infrastructure, involves in the first instance, a consideration of the existing visual environment. This includes a consideration of existing landscape setting and how the planned infrastructure is seen from various viewing locations. In this way the visual character of the landscape as well as visual sensitivity of the various viewing locations can be determined.

Secondly, the visual effect of the planned infrastructure is determined by considering the visual characteristics of the planned infrastructure in the context of the landscape within which it is seen.

A combined consideration of both visual sensitivity and visual effect determines impacts and gives some direction on mitigation strategies.

The key factors considered during the assessment included:

- Sensitive land uses (e.g. residential areas, public roads and natural/recreation areas); and
- The visual form, scale and colour of the development.

The methodology employed during the preparation of this visual assessment was as follows:

- Characterisation of the existing landscape and visual setting
- Undertaking a computerised viewshed analysis
- Identification of points with potential views of the planned infrastructure
- Examination of the main components and activities of the planned infrastructure
- Qualitative assessment of impacts, including:
    - visual modification at key viewpoints – *How does the proposed development contrast with the landscape character of the surrounding setting?;*
    - visual sensitivity at key viewpoints – *How sensitive will viewers be to the proposed development?*; and
- Development of mitigation and management measures.

The methodology employed by this visual assessment is based on the United States Department of Agriculture - Forestry Service and Bureau of Land Management Visual Resources Management methodologies. The Guideline for involving visual and aesthetic specialists in EIA processes (Republic of South Africa, Provincial Government of the Western Cape) was also used.

2.3 Existing Visual Environment

The evaluation of the existing visual environment consists of the assessment of both the landscape setting, and key viewing locations within it, as described below.

2.3.1 Landscape Setting

The landscape setting can be defined in terms topography, vegetation, hydrology and land use features. These elements define the existing visual character of the landscape with which the planned infrastructure interacts.

2.3.2 Key Viewing Locations

Viewing locations are those areas where people are likely to obtain a view of the planned infrastructure. These viewing locations have different significance based on numerous factors, collectively evaluated though land use and viewing distance to the planned infrastructure.

The selection of the key viewing locations is their location within the defined viewshed where they would have a clear view of the planned infrastructure. Factors that should be considered in selecting the key viewing locations are:

- ***Angle of observation*** - The apparent size of a project is directly related to the angle between the viewer's line-of-sight and the slope upon which the planned infrastructure is to take place. As this angle nears 90 degrees (vertical and horizontal), the maximum area is viewable.
- ***Number of viewers*** - Areas seen and used by large numbers of people are potentially more sensitive. Protection of visual values usually becomes more important as the number of viewers increase.
- ***Length of time the project is in view*** - If the viewer has only a brief glimpse of the planned infrastructure, the contrast may not be of great concern. If, however, the planned infrastructure is subject to view for along period, as from an overlook, the contrast may be very significant.
- ***Distance from the project*** - The longer the viewing distances, the lower the visual sensitivity
- ***Relative planned infrastructure size*** - The contrast created by the project is directly related to its size and scale as compared to the surroundings in which it is place.
- ***Season of use*** - Contrast ratings should consider the physical conditions that exist during the heaviest or most critical visitor use season, such as tree defoliation during the winter, leaf colour in the fall, and lush vegetation and flowering in the spring.
- ***Critical viewpoints***, e.g. views from communities, major roads

2.4 The Project

The planned infrastructure will have certain visual characteristics associated with the extension of mining operations. These elements will express themselves in terms of form, shape, line, colour and to a lesser extent texture. An understanding of this visual character will provide an appreciation of how various mine elements will be seen in the landscape.

2.5 The impact analysis

The analysis of the interaction between the existing visual environment and the planned infrastructure provides the basis for determining visual impacts and mitigation strategies. This is completed by defining the visual effect of the planned infrastructure and visual sensitivity of viewing locations to determine impact.

2.5.1 Visual Modification

Visual modification is a measure of the level of visual contrast and integration of the planned infrastructure with the existing landscape.

An existing landscape has certain visual characteristics expressed through the visual elements of form, shape, line colour and texture. A development such as electricity distribution infrastructure has different visual characteristics that will create contrast with the existing landscape. However, in this case, existing electricity distribution infrastructure are part of the existing landscape, so to an extent, the visual effects of the planned infrastructure borrow visual character from these operations, reducing visual modifications.

The degree to which the visual characteristics of the planned infrastructure contrast with the existing landscape will determine the level of visual modification. For example a newly created mine will have a high visual modification due to strong contrast. An extension of operations in an existing mine will have a lesser visual modification. A successfully rehabilitated mine area will also have a lower visual modification due to limited contrast with the existing landscape.

In a similar way, a project is said to be integrated with the existing landscape based on issues of scale, position in the landscape and contrast. High visual integration is achieved if a development is dominated by the existing landscape, is of small scale and / or of limited contrast.

The level of visual modification generally decreases with distance, and is categorised as follows:

- *Negligible (or very low) level of visual modification* – where the development is distant and/or relates to a small proportion of the overall viewscape.
- *Low level of visual modification* - where there is minimal visual contrast and a high level of integration of form, line, shape, pattern, colour or texture values between the development and the landscape. In this situation the development may be noticeable, but does not markedly contrast with the landscape.
- *Moderate level of visual modification* - where a component of the development is visible and contrasts with the landscape, while at the same time achieving a level of integration. This occurs where surrounding topography, vegetation or existing modified landscape provide some measure of visual integration or screening.
- *High level of visual modification* - where the major components of the development contrast strongly with the existing landscape and demand attention

The following factors must be considered when applying visual modification categories:

- ***Distance*** - The contrast created by a planned project is less as viewing distance increases.
- ***Angle of Observation*** - The apparent size of a project is directly related to the angle between the viewer's line-of-sight and the slope upon which the project is to take place. As this angle nears 90 degrees (vertical and horizontal), the maximum area is viewable.
- ***Length of Time the project Is In View*** - If the viewer has only a brief glimpse of the project, the contrast may not be of great concern. If, however, the project is subject to view for along period, as from an overlook, the contrast may be very significant.
- ***Relative Size or Scale*** - The contrast created by the project is directly related to its size and scale as compared to the surroundings in which it is place.
- ***Season of Use*** - Contrast ratings should consider the physical conditions that exist during the heaviest or

- most critical visitor use season, such as tree defoliation during the winter, leaf colour in the fall, and lush vegetation and flowering in the spring.
- ***Light Conditions*** - The amount of contrast can be substantially affected by the light conditions. The direction and angle of lighting can affect colour intensity, reflection, shadow, from, texture, and many other visual aspects of the landscape. Light conditions during heavy periods must be a consideration in contrast ratings.
- ***Recovery Time*** - The amount of time required for successful re-vegetation should be considered. Recovery usually takes several years and goes through several phrases (e.g., bare ground to grasses, to shrubs, to trees, etc.). It may be necessary to conduct contrast ratings for each of the phases that extend over long time periods. Those conducting contrast rating should verify the probability and timing of vegetative recovery.
- ***Spatial Relationships*** - The spatial relationship within a landscape is a major factor in determining the degree of contrast.
- ***Atmospheric Conditions*** - The visibility of planned infrastructure s due to atmospheric conditions such as air pollution or natural haze should be considered.
- ***Motion*** - Movement such as waterfalls, vehicles, or plumes draw attention to a project.
- ***Form*** - Contrast in form results from changes in the shape and mass of landforms or structures. The degree of change depends on how dissimilar the introduced forms are to those continuing to exist in the landscape.
- ***Line*** - Contrasts in line results from changes in edge types and interruption or introduction of edges, bands, and silhouette lines. New lines may differ in their sub-elements (boldness, complexity, and orientation) from existing lines.
- ***Colour*** - Changes in value and hue tend to create the greatest contrast. Other factors such as chroma, reflectivity, colour temperature, also increase the contrast.
- ***Texture*** - Noticeable contrast in texture usually stems from differences in the grain, density, and internal contrast. Other factors such as irregularity and directional patterns of texture may affect the rating.

2.5.2 Visual Sensitivity

Visual sensitivity is a measure of how critically a change to the existing landscape is viewed by people from different land use areas in the vicinity of a development.

In this regard, residential, tourist and / or recreation areas generally have a higher visual sensitivity than other land use areas including industrial, agricultural or transport corridors, because land uses (such as residential), use the scenic amenity values of the surrounding landscape and may be used as part of a leisure experience and often over extended viewing periods.

Landscapes are subdivided into 3 distanced zones based on relative visibility from travel routes or observation points. The 3 zones are:

- ***Foreground-Middleground Zone*** - This is the area that can be seen from each travel route for a distance of 5 to 8 kilometres where management activities might be viewed in detail. The outer boundary of this distance zone is defined as the point where the texture and form of individual plants are no longer apparent in the landscape. In some areas, atmospheric conditions can reduce visibility and shorten the distance normally covered by each zone.
- ***Background Zone*** - This is the remaining area which can be seen from each travel route to approximately 24 kilometres. Do not include areas in the background which are so far distant that the only thing discernible is the form or outline. In order to be included within this distance zone, vegetation should be visible at least as patterns of light and dark.
- ***Seldom-Seen Zone*** - These are areas that are not visible within the foreground-middleground and background zones and areas beyond the background zones.

Landuse areas are generally characterised in terms of low, moderate or high visual sensitivity, as follows:

- ***Low visual sensitivity*** - industrial areas, local roads, mining and degraded areas
- ***Moderate visual sensitivity*** - tourist roads, major roads, sporting or recreational areas and places of work
- ***High visual sensitivity*** - rural residences, recreation areas, conservation areas, scenic routes or trails

Visual sensitivity may range from high to low, depending on the following additional factors:

- ***The visual absorption capacity (VAC)*** - The potential of the landscape to conceal the proposed project.

- ***Viewing distance*** - Viewing distance from the residential, tourist and / or recreation areas to visible areas of the project. The longer the viewing distances, the lower the visual sensitivity
- ***General orientation*** - General orientation of residences to landscape areas affected by a project. Residential, tourist and / or recreation areas with strong visual orientation towards the Planned infrastructure (i.e. those with areas such as living rooms and / or verandas orientated towards it), will have a higher visual sensitivity than those not orientated towards the Planned infrastructure , and which do not make use of the views toward the Planned infrastructure .
- ***Type of Users*** - Visual sensitivity will vary with the type of users. Recreational sightseers may be highly sensitive to any changes in visual quality, whereas workers who pass through the area on a regular basis may not be as sensitive to change.
- ***Amount of Use*** - Areas seen and used by large numbers of people are potentially more sensitive. Protection of visual values usually becomes more important as the number of viewers increase.
- ***Public Interest*** - The visual quality of an area may be of concern to local or national groups. Indicators of this concern are usually expressed in public meetings, letters, newspaper or magazine articles, newsletters, land-use plans, etc. Public controversy created in response to proposed activities that would change the landscape character should also be considered.
- ***Adjacent Land Uses*** - The interrelationship with land uses in adjacent lands can affect the visual sensitivity of an area. For example, an area within the viewshed of a residential area may be very sensitive, whereas an area surrounded by commercially developed lands may not be visually sensitive.
- ***Special Areas*** - Management objectives for special areas such as natural areas, wilderness areas, conservation areas, scenic areas, scenic roads or trails frequently require special consideration for the protection of the visual values. This does not necessarily mean that these areas are scenic, but rather that one of the management objectives may be to preserve the natural landscape setting. The management objectives for these areas may be used as a basis for assigning sensitivity levels.

2.5.3 Visual Impact

The visual impact of the planned infrastructure has been determined by considering both visual effect and visual sensitivity, which when considered together determine impact levels. The way in which the visual parameters of visual sensitivity and visual effect are cross referenced and resultant impacts is illustrated in Table 1.

Visual Sensitivity

Visual Modification	H	M	L
H	H	H	M
M	H	M	L
L	M	L	L
VL	L	VL	VL

Level of Visual Impact

VL = Very Low
L = Low
M = Moderate
H = High

Table 1
Visual impact matrix

2.6 Application of Methodology

There are numerous locations in the vicinity of the planned infrastructure that will be visually impacted to various levels. For the purposes of the visual impact assessment, a number of sites within key sectors of the planned infrastructure boundaries were selected as representative key viewing locations.
These sites were selected with reference to field assessment, aerial photograph and viewshed analysis to determine the visibility of the planned infrastructure.

Whilst there will be some variation in the impacts on specific viewing locations, an overall assessment of the visual impact on the selected locations will be representative for the majority of views experienced.

2.6.1 Visibility

For a visual impact to be experienced, landscape alterations resulting from the project need to be visible. Visibility of the planned infrastructure from adjoining view locations was determined by viewing into the planned infrastructure boundaries from a range of potential viewpoints. This was further assisted through the production of computer generated seen area maps (i.e. viewshed maps). The viewshed defines the extent to which the property is visible to the surrounding areas. A Digital Elevation Model (DEM) was generated making use of 2 meter contours for the planned infrastructure area. Existing structures and vegetation was not considered during the viewshed analysis.

2.6.2 Visual Sensitivity

The visual sensitivity of various viewing areas was determined by review of aerial photography, plans of the planned infrastructure, viewshed maps and topographic plans of the surrounding areas. This included the consideration of land use, viewing distances and the general level of screening available from topography, buildings and vegetation. The assigned sensitivities within each sector were also evaluated based on field study and other study data

2.6.3 Visual modification

The visual modification of the planned infrastructure on external viewpoints is illustrated in a number of photos taken from various key viewpoints within key sectors of the viewshed around the planned infrastructure boundary.

2.7 Mitigation measures

Visual impact mitigation strategies are developed for both on site and off site situations to ensure that visual modifications and / or visibility / visual sensitivity factors are decreased to achieve impact mitigation.

3. EXISTING ENVIRONMENT

3.1 Introduction

This section of the report establishes the visual character of the existing environment. This is needed to establish the change created by the planned infrastructure and provides a base line against which visual modification is measured.

3.2 Landscape Character

The landscape setting can be defined in terms topography, vegetation, hydrology and land use features. These elements define the existing visual character of the landscape with which the planned infrastructure interacts. The planned infrastructure and surrounding areas are comprised of the following topographical features and landscape units with varying levels landscape quality (Figure 4, 7):

- Mountains
- Undulating hills
- Valleys

The vegetation communities are not very pronounced within the project area and the vegetation is therefore structurally uniform throughout the area, comprising of Granite Lowveld Bushveld. This vegetation can be described variously as dense bush and trees on the uplands, open tree savanna in the bottomlands, and dense riverine woodland on the river banks. Most of the area surrounding the project area has been disturbed and severely impacted by human activity (over-grazing by livestock, collection of vegetation for various uses, settlements and cultivation) (Figure 2, 5, 6, 7).

Figure 6: Disturbed area

Figure 7: Topography & vegetation

4. PROJECT DESCRIPTION

4.1 Introduction

The visual effect of the planned infrastructure is determined by considering the visual characteristics of the planned infrastructure in the context of the landscape within which it is seen. The visual assessment evaluates the potential visual impact of the following planned infrastructure:

- The construction of a 17km 132kV overhead power line linking the existing Mbumbu Traction and the proposed Tsakani substation.

4.2 Planned infrastructure

The planned infrastructure includes the following components:

- The construction of a 17km 132kV overhead power line linking the existing Mbumbu Traction and the new proposed Tsakani substation. Three alignment alternatives are being considered by Eskom Distribution and will be evaluated during the visual impact assessment process to determine the best environmentally practicable alignment (Figure 2).
- Distribution line conductors are strung on in-line (suspension) towers and bend (strain) towers. The structures proposed to be used for the 132 kV distribution line for the project are 132 kV steel monopole structures (Figure 8).
- The servitude width for a 132 kV distribution line is 22 m (11 m on either side of the centre line of the power line). The minimum vertical clearance to buildings, poles and structures not forming part of the power line must be 3.8 m, while the minimum vertical clearance between the conductors and the ground is 6.7 m. A minimum 8m (4m either side of the centre line of the power line) wide strip is to be cleared of all trees and for stringing purposes only. If any tree or shrub in other areas will interfere with the operation and/or reliability of the distribution line it will be trimmed or completely cleared. The type of terrain encountered, as well as the underlying geotechnical conditions determines the choice of foundation. The actual size and type of foundation to be installed will depend on the soil bearing capacity (actual sub-soil conditions). Strain structures require more extensive foundations for support than in-line suspension structures, which contribute to the cost of the construction of the line. The minimum working area required around a structure position is 20m × 20m
- Foundations will be mechanically excavated where access to the pole position is readily available. The same applies to the pouring of concrete required for the setting of the foundations. Prior to erecting the poles and filling of the foundations, the excavated foundations will be covered in order to safeguard unsuspecting animals and people from injury. All foundations are back-filled, stabilised through compaction, and capped with concrete at ground level. Composite insulators are used to connect the conductors to the towers.
- Glass and porcelain have previously been used to connect the conductors for many years, and are the most common. They are, however, heavy and susceptible to breakage by vandals, as well as contamination by pollution. Composite insulators have a glass-fibre core with silicon sheds for insulation. Composite insulators are lightweight and resistant to both vandalism and pollution.
- Composite (Long rod type) insulators with silicone based weather shed material will be used for strain assemblies. Composite horizontal line post insulators will be used for the intermediate structures and on the jumper supports. 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 distribution line lif

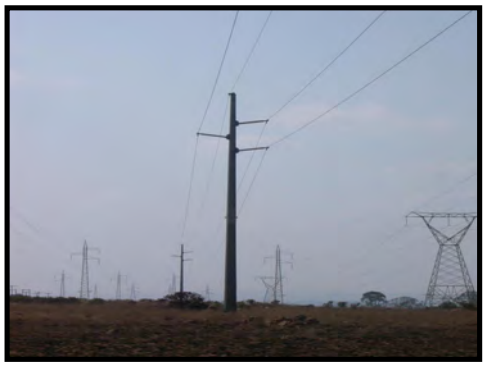
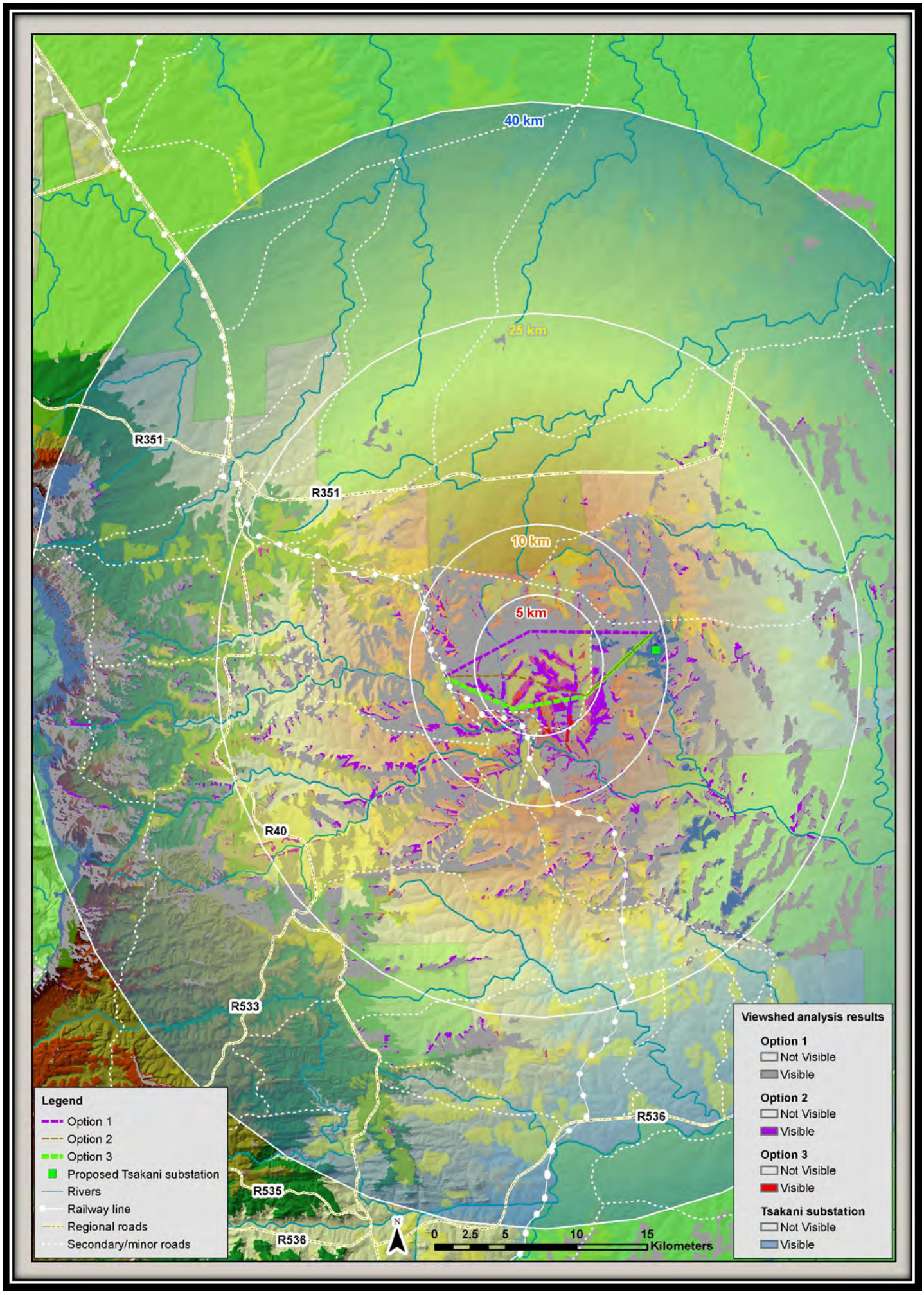


Figure 8: 132Kv steel monopole structure

Figure 9: Viewshed analysis



5. IMPACT ASSESSMENT

5.1 Introduction

This section defines the visual impact that is experienced from various view locations around the project areas. The visual impact levels are a final determinant for mitigation strategies outlined in Section 8. The visual impact will vary according to the visual modification of the planned infrastructure, its visibility and the visual sensitivity of areas from which it is seen. The potential sensitive viewing locations around the planned activities include rural residences, roads, protected areas (nature reserves, national parks and private nature reserves).

The main issues to consider in the assessment of visual impacts are:

- The number of sensitive viewing locations, and
- The level to which the planned infrastructure is visible – if they are not seen, then there is no impact.

Table 2
Location of sensitive viewing locations

Sensitive viewing location	Figure
Regionla roads: R40, R351, R533, R535, R536	3
Secondary roads and minor dirt roads	3
Railway line	3
Protected areas	3
Settlements	3

Table 3
Summary of visual assessment

Planned infrastructure	Figure	Visual sensitivity	Visual modification level	Impact	Impact after rehabilitation	Preferred option
Option 1	2, 5, 9	L	M	L	L	√
Option 2	2, 5, 9	H	M	H	M	x
Option 3	2, 5, 9	H	M	H	M	x
Tsakani substation	2, 5, 9	L	M	L	L	√

5.2 Option 1

The viewshed analysis from the identified sensitive viewing locations and field verification indicates that the Option 1 and associated infrastructure will be visible in the foreground-middleground zone (0-10km) from secondary/minor roads and settlements. Visibility reduces dramatically in the background and seldom seen zones that in turn decreases the visual modification created by the infrastructure due to the increased viewing distance. The viewshed analysis indicates that Option 1 will be visible in some small areas within conservation areas but due to the increased viewing distance (background and seldom seen zones) the visual sensitivity and modification will be low. The Option 1 corridor cuts through an area that is dominated by natural degraded areas with a few cultivated areas. It is also cut through a smaller portion of settlements compared to Options 2 & 3 and will only be visible from a few minor dirt roads within settlements and linking the various settlements. Visibility from any of the regional roads is very limited due to the roads falling predominantly in the background and seldom seen zones. Moderate levels of visual absorption of the infrastructure will be achieved due to topography, larger areas of degraded vegetation remaining and fewer cultivated areas in the alignment corridor.

5.3 Option 2

The viewshed analysis from the identified sensitive viewing locations and field verification indicates that the Option 2 and associated infrastructure will be very visible in the foreground-middleground zone from secondary/minor roads and settlements. Visibility reduces dramatically in the background and seldom seen zones that in turn decreases the visual modification created by the infrastructure due to the increased viewing distance. The viewshed analysis indicates that Option 2 will be visible in some small areas within conservation areas but due to the increased viewing distance (background and seldom seen zones) the visual sensitivity and modification will be low. The Option 2 corridor cuts through an area that is dominated by cultivated and degraded areas with very few natural areas left. It is also cut through a several settlements and will be visible from several minor dirt roads within settlements and linking the various settlements. Visibility from any of the regional roads is very limited due to the roads falling predominantly in the background and seldom seen zones. Low levels of visual absorption of the infrastructure will be achieved due to smaller areas of degraded vegetation that can conceal some of the infrastructure and higher levels of exposure to settlements and agricultural areas in this alignment corridor.

5.4 Option 3

The viewshed analysis from the identified sensitive viewing locations and field verification indicates that the Option 3 and associated infrastructure will be very visible in the foreground-middleground zone from secondary/minor roads and settlements. Visibility reduces dramatically in the background and seldom seen zones that in turn decreases the visual modification created by the infrastructure due to the increased viewing distance. The viewshed analysis indicates that Option 3 will be visible in some small areas within conservation areas but due to the increased viewing distance (background and seldom seen zones) the visual sensitivity and modification will be low. The Option 3 corridor cuts through an area that is dominated by cultivated and degraded areas with very few natural areas left. It is also cut through a several settlements and will be visible from several minor dirt roads within settlements and linking the various settlements. Visibility from any of the regional roads is very limited due to the roads falling predominantly in the background and seldom seen zones. Low levels of visual absorption of the infrastructure will be achieved due to smaller areas of degraded vegetation that can conceal some of the infrastructure and a higher level of exposure to settlements and agricultural areas in this alignment corridor.

5.5 Tsakani substation

The viewshed analysis and field verifications indicate that the substation will be visible within the foreground-middleground and the background and seldom-seen zones. There are very few minor roads close to the substation and visibility from these roads will be very limited. The substation will not be visible from any of the regional roads. The viewshed analysis indicates that the substation will be visible in some small areas within conservation areas but due to the increased viewing distance (background and seldom seen zones) the visual sensitivity and modification will be low. The substation is situated in an area that is dominated degraded natural areas and some cultivation. The substation will be situated in a low laying (valley) area surrounded by predominantly degraded vegetation and some cultivated areas. The visibility of the substation from minor roads and settlements will therefore be limited due to the landscapes ability to conceal the infrastructure (visual absorption capacity).

6. VISUAL MITIGATION AND MANAGEMENT

6.1 Introduction

This section of the report outlines visual mitigation strategies that will complement existing mitigation measures. The mitigation measures in relation to reducing visual impact can be categorised as:

- On site treatments to reduce visual effects; and
- Treatments at viewer locations to reduce visual sensitivity

On site treatments involve rehabilitation of land forms and land cover, while viewer location treatments involve a range of treatments to screen views, filter views and or re-orientate primary views.

Onsite treatments might include:

- Visual and ecological planting patterns of indigenous vegetation to achieve landscape patterns that emulate in part existing mixes of tree and grass cover in the surrounding landscape.
- Minimising exposure of work areas to sensitive receptors; and
- Preparing an internal landscape plan for rehabilitation areas

At viewer location treatments include:

- Landscape design and plantings for affected locations. This will require appropriately qualified person to visit the effected locations and develop a landscape plan to screen or filter views to the project areas.

Design fundamentals are general design principles that can be used for all forms of activity or development, regardless of the resource value being addressed. Applying the following three fundamentals will assist with mitigation measures:

- Proper siting or location
- Reducing unnecessary disturbance
- Repeating the elements of form, line, colour and texture of the surrounding landscape

Design strategies are more specific activities that can be applied to address visual design problems. The following strategies will not necessarily applicable to every proposed activity or project:

- Colour selection
- Earthwork
- Vegetative manipulation
- Structures
- Reclamation/restoration
- Linear alignment design considerations

The fundamentals and strategies mentioned above are all interrelated, and when used together, can help resolve visual impacts from proposed activities or developments.

6.1 Mitigation measures

The following mitigation should be considered when constructing the proposed infrastructure for this project to reduce the visual impact:

Linear alignments

The visual impact of linear projects such as the construction of power lines depends largely on where it is located and how it is molded to the natural terrain. Proper location cans often contribute significantly to the reduction of line and colour impacts, making other measures either unnecessary or less costly and easier to accomplish.

Finding the best route for linear alignments involves:

- Identifying and analyzing all possible corridor alignments and selecting the one most feasible for the proposed project.
- Locating the proposed project within the selected corridor after a thorough analysis of all environmental, socioeconomic, and engineering factors.

The following should be considered during the determination of an alignment:

- Topography is a crucial element in alignment selection. Visually, it can be used to subordinate or hide manmade changes in the landscape. Projects located at breaks in topography or behind existing tree groupings are usually of much less visual impact than projects located on steep side slopes. By taking advantage of natural topographic features, cut and fill slopes can be greatly minimized.

- Topographic breaks frequently exhibit a natural line element that the proposed alignments can repeat or blend with to strengthen the design. This line element is partly established by a visual shadow zone, which will further aid in reducing the contrast of the project.
- Hydrological conditions can strongly affect the visual impact of buried and surface construction. The risks of surface and subsurface erosion within the corridor should be analyzed and evaluated.

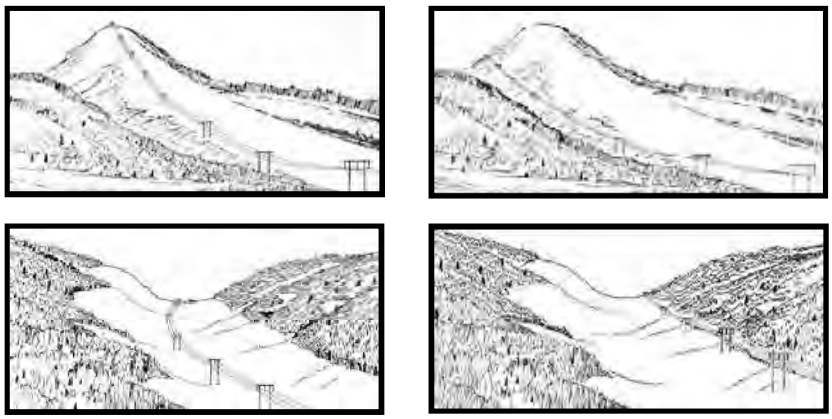


Figure 10: Focal points in the landscape should be avoided where possible because the human eye is attracted to these pints first

Figure 11: New disturbance should be avoided and the natural lines in the landscape should be followed where possible

Vegetation manipulation

- Partial clearing of the limits of construction rather than clearing the entire area – leaving islands of vegetation results in a more natural look.
- Use irregular clearing shapes.
- Feathering/thinning the edges of the cleared areas. Feathering edges reduces strong lines of contrast. To create a more natural look along an edge, a good mix of tree/shrub species and sizes should be retained.
- Establishing limits of disturbance that reflect the minimum area required for construction.
- Locating construction staging and administrative areas in less visually sensitive areas.

Colour selection

- Natural surfaces are usually well-textured and have shade and shadow effects that darken them. Surfaces of structures are usually smooth and reflect light even if dull-finished paint is used. Colours on smooth structures therefore need to be two or three shades darker that the background colours to compensate for shadow patterns created by naturally textured that make colours appear darker
- Use earth-tone paints and stains. Colours that blend with or are in harmony with the existing colours of the surrounding earth, rocks and vegetation are usually more visually pleasing and attract less attention that colours that are chosen to match the colour of the sky.
- Galvanized steel on structures should be darkened to prevent glare. Low luster paints should be used wherever possible to reduce glare.
- The colour selection for all structures should be made to achieve the best blending with the surrounding landscape in the winter and summer.

- Select paint finishes with low levels of reflectivity
- Screening the structure from view through the use of natural landforms and vegetation

Structures

- Minimizing the number of structures and combining different activities in one structure where possible.
- Attempt to repeat the form, line, colour and texture of the surrounding landscape to reduce the contrast between the landscape and the proposed infrastructure.
- Using natural stone in wall surfaces if possible.
- Burying all or part of the structure.

Earthwork

- Hauling in or hauling out excessive earth cut or fill in sensitive viewing areas.
- Bending slopes to match existing landforms.
- Retaining existing rock formations, vegetation, drainage, etc., whenever possible.
- Toning down freshly broken rock faces through the use of asphalt emulsions, rock stains, etc.
- Protecting roots from damage during excavations.
- Avoiding soil types that will generate strong contrasts with the surrounding landscape when they are disturbed.
- Prohibiting dumping of excess earth/rock on downhill slopes.

APPENDIX D5

CULTURAL AND HERITAGE RESOURCES IMPACT ASSESSMENT

AFRICAN HERITAGE CONSULTANTS CC

2001/077745/23

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21October 2011

CULTURAL HERITAGE RESOURCES IMPACT ASSESSMENT FOR THREE ALTERNATIVE POWER LINES FROM THE EXISTING MBUMBU TRACTION SUBSTATION TO THE PROPOSED TSAKANI SUBSTATION THAT WILL RUN THROUGH THE FOLLOWING FARMS: BURLINGTON 217KU; ISLINGTON 219KU; EDINBURG 228KU; LUDLOW 227KU; EGLINGTON 225KU, MPUMALANGA PROVINCE

DEFINITION

The broad generic term *Cultural Heritage Resources* refers to any physical and spiritual property associated with past and present human use or occupation of the environment, cultural activities and history. The term includes sites, structures, places, natural features and material of paleontological, archaeological, historical, aesthetic, scientific, architectural, religious, symbolic or traditional importance to specific individuals or groups, traditional systems of cultural practice, belief or social interaction.

PROTECTED SITES IN TERMS OF THE NATIONAL HERITAGE RESOURCES ACT, ACT NO. 25 OF 1999

The following are the most important sites and objects protected by the National Heritage Act:

- Structures or parts of structures older than 50 years.
- Archaeological sites and objects.
- Paleontological sites.
- Meteorites.
- Ship wrecks.
- Burial grounds.
- Graves of victims of conflict.
- Public monuments and memorials.
- Structures, places and objects protected through the publication of notices in the Gazette and Provincial Gazette.
- Any other places or objects, which are considered to be of interest or of historical or cultural significance.
- Geological sites of scientific or cultural importance.
- Sites of significance relating to the history of slavery in South Africa.

- Objects to which oral traditions are attached.
- Sites of cultural significance or other value to a community or pattern of South African history.
- These sites may not be altered, damaged, destroyed or developed without prior approval of the South African National Heritage Resources Agency (SAHRA).

TERMS OF REFERENCE

The following comprise the objectives of this cultural and heritage resources impact assessment.

- To review existing information, desktop survey and pre-assessment.
- To record all heritage resources as defined in the South African Heritage Resources Act (Act 25 of 1999).
- To conduct field and site assessments of all of the known heritage resources in the area as well as searching the entire 1ha for heritage resources.
- To record oral traditions and history.
- To document and map all heritage resources.
- To assess and evaluate all significant heritage resources found.
- To compile an impact assessment of the proposed site.

METHODOLOGY

The site was visited and inspected on foot. All appropriate documents on the area were studied.

RESULTS

Three alternative power lines roots were inspected for the project. All three lines start at S24° 40' 54.0" & E31° 10' 44.9".The lines end at S24° 39' 21.3" & E31° 19' 29.2". The proposed site of the substation at S24° 39' 59.4" & E31° 19' 38.4" was also inspected on foot. See attached maps.

1. Purple Route

The purple line runs from the starting point in a north eastern direction through Lowveld bushveld vegetation – see photograph

Starting point of all three proposed routes

Then it crosses two streams and the dirt road at S24° 39' 14.4' & E31° 14' 20.1" – see photograph.

From here the line will run east to the end destination at S24° 39' 21.3" & E31° 19' 29.2". Along this section of the route it will also run through bushveld vegetation but will also cross some old fields where maize and sorghum was planted – see photograph.

End destination of all 3 proposed power lines

No important cultural heritage resources or graves were found along this route.

2. Red Route

The red power line route starts at the same point as the other two lines and runs through thick Lowveld bushveld. At S24° 40' 52.2" & E31° 13' 38.7" it crosses the road near a stream and some nearby houses – see photograph

From here it runs in a south easterly direction mainly across old maize fields to S24° 41’ 42.3” & E31° 16’ 41.9” where it joint the green line – see photograph.

No important cultural heritage resources or graves were observed along this route.

3. Green Route

This route starts at the same point as the purple and red routes but follows a more southerly direction crossing a large dam to S24° 42’ 9.9: & E31° 13’ 37.2” – see photograph

From here it follows an easterly direction till it joins the red line at S24° 41’ 42.3” & E31° 16’ 41.9”. Along this section the route runs through an informal settlement area and across old fields see photograph

The power line will end at the same spot as the purple line at S24° 39’ 20.3” & E31° 19’ 29.2”. This last section also runs through bushveld and old fields -see photograph on purple line

No important cultural heritage resources or graves were found along this route.

4. Proposed Substation site

The proposed site for the new substation lies near the river bed. The area is typical river vegetation with large trees and shrubs at S24° 39’ 59.4” & E31° 19’ 38.4”. ***The site was inspected on foot and no important cultural heritage resources or graves were found.*** The site was photographically recorded north, northeast, east, southeast, south, southwest, west, and northwest – see photographs.

North

North East

East

South East

South

Southwest

West

Northwest

CONCLUSION

No important cultural heritage resources or graves are present on any of the three alternative routes. From a heritage point of view it does not really matter which route is preferred.

RECOMMENDATIONS

There is no objection to the construction of any of the three investigated routes given for the Mbumbu – Tsakani power line.

If during construction any cultural heritage resources or graves are unearthed all work has to be stopped until the site has been inspected and mitigated by a cultural heritage practitioner.

SITE INFORMATION

Owners contact details:

Eskom is still negotiating with the land owners for use of the land.

Developers contact details:

Ms. Cynthia Nong
Eskom Holdings Limited
Eskom Distribution – Northern Region
PO Box 1567, Nelspruit, 1200
Tel: 013 755 9615
Cell: 073 359 8322
Fax: 086 661 4515
Email: Cynthia.Nong@eskom.co.za

Consultants contact détails:
Phyllis Kalele
Environmental Consultant
SSI Engineers and Environmental Consultants
Tel: 012 367 5916
Fax: 012 367 5878
Email: phyllisk@ssi.co.za

Type of development (e.g. low cost housing project, mining etc.)
17km 132kV power line

Whether rezoning and/or subdivision of land is involved:
Not Applicable

Full location of Province, Magisterial District/Local Authority, property (e.g. farm, erf name and number:
Bushbuckridge Local Municipality]
Ehlanzeni District Municipality
Mpumalanga Province

FARM NAME	NUMBER	PORTION
Burlington	217KU	0
Burlington	217KU	1
Burlington	217KU	2
Islington	219KU	0
Edinburgh	228KU	0
Edinburgh	228KU	2
Ludlow	227KU	0
Ludlow	227KU	3
Eglington	225KU	0

Location map must have the polygon of the area to be surveyed on it and full geographical coordinates for all relevant points and where applicable indication of the area to be developed (footprint):

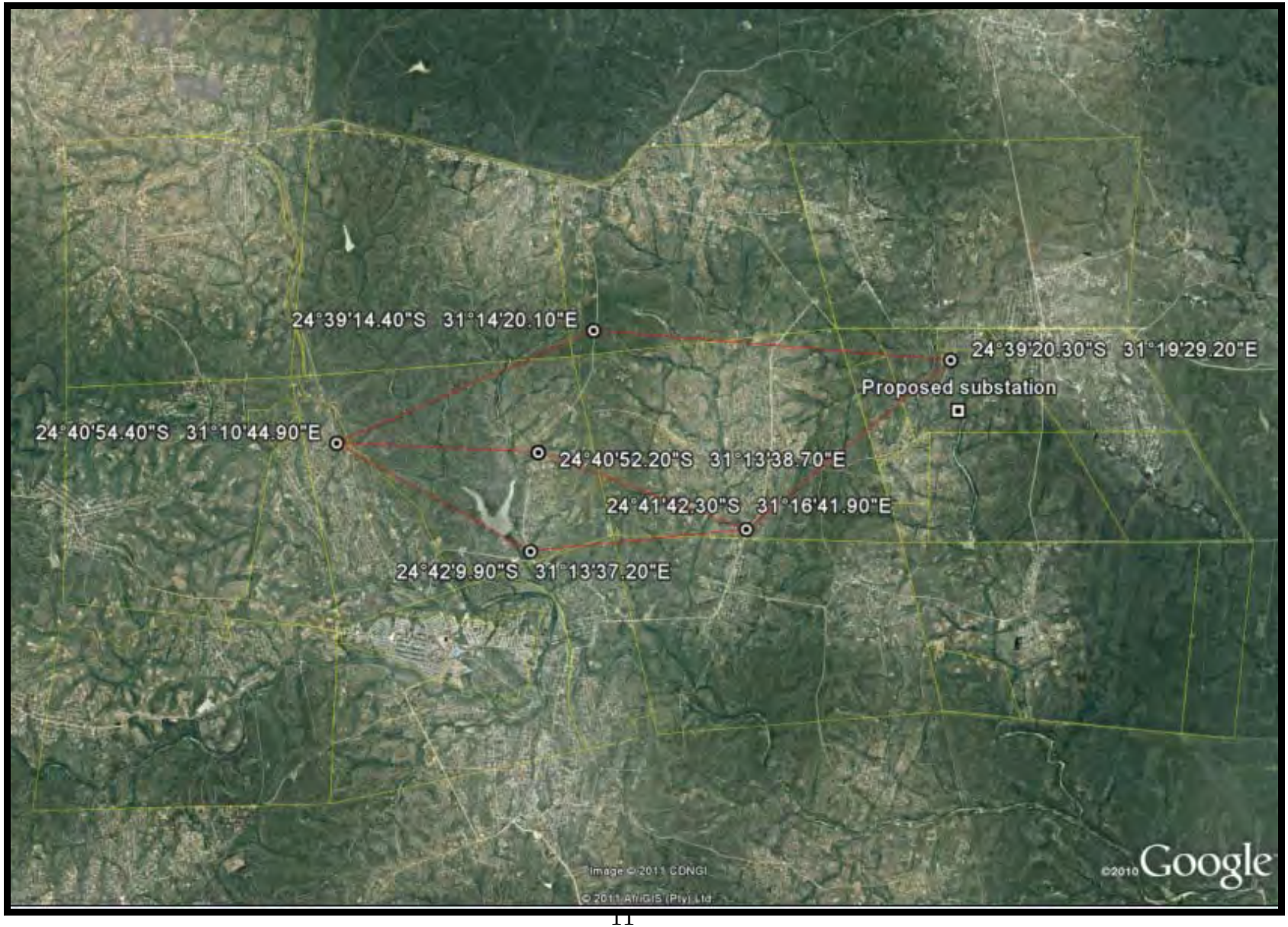
See attached

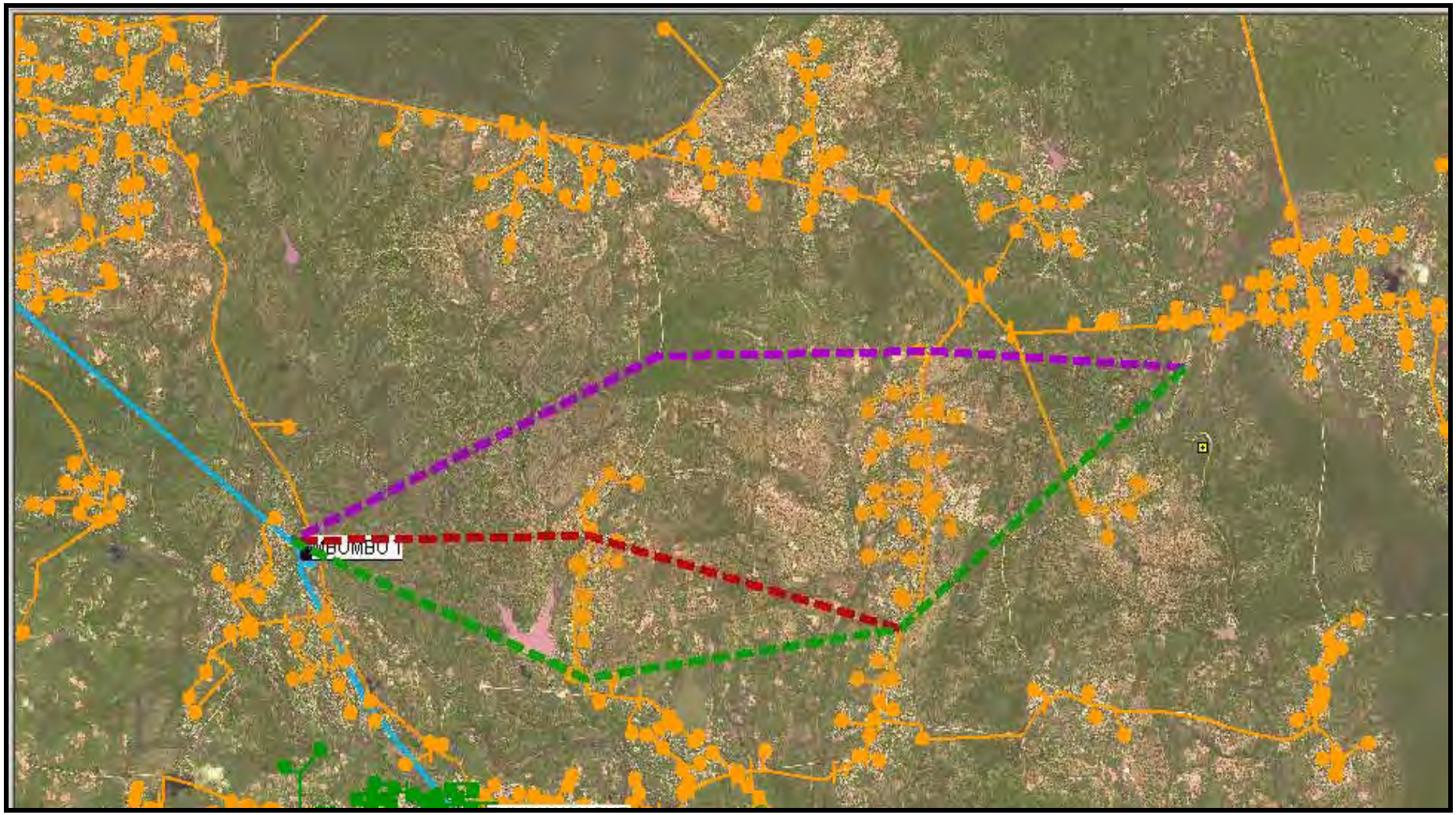
If possible an aerial photograph of the specific area showing the location of all site.

See Attached

REFERENCES

- 1/50 000 Maps: 2431 CA, CB, CC & CD
- Archaeological database of the National Cultural Museum Pretoria
- Google Maps


24°39'14.40"S 31°14'20.10"E
24°39'20.30"S 31°19'29.20"E
Proposed substation
24°40'54.40"S 31°10'44.90"E
24°40'52.20"S 31°13'38.70"E
24°41'42.30"S 31°16'41.90"E
24°42'9.90"S 31°13'37.20"E
Image © 2011 CDNGI
© 2011 AfriGIS (Pty) Ltd
©2010 Google


MBUMBU

APPENDIX E

PUBLIC PARTICIPATION

APPENDIX E1

NOTIFICATION TO I&APS AND BID

October 2011

Dear Interested and Affected Party,

BASIC ASSESSMENT FOR THE PROPOSED CONSTRUCTION OF A 17 KM 132kV POWER LINE FROM THE EXISTING MBUMBU TRACTION TO THE NEW TSAKANI SUBSTATION, BUSHBUCKRIDGE LOCAL MUNICIPALITY, MPUMALANGA PROVINCE (DEA REF: 12/12/20/2374)

Notice is hereby given in terms of the National Environmental Management Act, 1998 (Act No 107 of 1998) as amended and the Environmental Impact Assessment Regulations (2010) that Eskom Distribution-Northern Region has submitted an application for environmental authorisation to the Department of Environmental Affairs (DEA).

Eskom Distribution intends to carry out activities listed under GN R.544 (Listing Notice 1) and GN R.546 (Listing Notice 3). The proposed project will entail the following:

- The establishment of a new 132 kV power line between the existing Mbumbu traction to the proposed new Tsakani substation, a distance of approximately 17 km.
- The construction of a new 10,000m^2 substation in Tsakani

SSI Environmental Consultants have been appointed as the independent environmental assessment practitioner (EAP), to undertake the Basic Assessment study and Public Participation (PP) process for this proposed project. Therefore, SSI Environmental would like to invite you, as an interested and/or affected party (I&AP), to become actively involved in the PP process.

Please find attached herewith the project Background Information Document (BID) which provides you with more information regarding the proposed project and PP process to be undertaken. Also attached is a registration and comment form for you to complete, in order to be registered as an I&AP on the project database and to receive further information.

WHO SHOULD YOU CONTACT?

Phyllis Kalele
SSI Environmental Consultants
PO Box 25302
Monument Park 0105, Pretoria.
Tel: 012 367 5800
Fax: 012 367 5878
E-mail:phyllisk@ssi.co.za

SSI Environmental would like to thank you in advance, for taking part in the public participation process and is looking forward to receiving your valuable comments relating to the proposed project.

Regards,
Phyllis Kalele.

BASIC ASSESSMENT PROCESS

CONSTRUCTION OF A NEW 132 kV POWER LINE FROM THE EXISTING MBUMBU TRACTION SUBSTATION TO THE PROPOSED NEW TSAKANI SUBSTATION, MPUMALANGA PROVINCE

OCTOBER 2011

BRIEFING PAPER

WHAT DOES THIS DOCUMENT TELL YOU?

This document aims to provide you, as an Interested and Affected Party (I&AP), with background information regarding the proposed construction of a new 132 kV power line from the existing Mbumbu traction substation to the proposed new Tsakani substation in Mpumalanga. The document also provides information regarding the Basic Assessment (BA) process to be undertaken. Furthermore, the document advises how you can become involved in the project, receive information and/or raise issues, which may concern and/or be of interest to you. The sharing of information forms the basis of the public participation process and offers you the opportunity to become actively involved in the project from the outset. Public participation plays an important role in informing the basic assessment process as input from I&APs ensures that all potential issues are considered within the study.

WHAT IS THE PROPOSED PROJECT ALL ABOUT?

In order to be able to adequately provide for the growing electricity demand, Eskom Distribution proposes to construct the following:

- A new 132 kV line from the existing Mbumbu traction substation to the proposed Tsakani substation.
- The construction of the new Tsakani substation (1ha) to supply power to the surrounding communities.

The structures proposed to be used for the 132 kV distribution line are the 132 kV steel monopole structures (see **Figure 1**). These poles weigh approximately 1200 kg each and vary in height from approximately 17.4 m to 21 m. The size of the footprint depends on the suspension and angle strain pole used as bend / strain structures. The average span between two towers is 200 m, but can vary between 250 m and 375 m depending on the ground profile and the terrain to be spanned.

The self-supporting structure (suspension pole) is typically used along the straight sections of the power line, while the guyed intermediate or guyed suspension and angle strain structures are used where there is a bend in the power line alignment.

Figure 1: Monopole structures

ALTERNATIVES

In terms of the EIA Regulations (2010), feasible alternatives are required to be considered within the BA process. All identified, feasible alternatives are required to be evaluated in terms of social, biophysical, economic and technical factors. Two alternatives will be considered for the establishment of the 132 kV distribution line and proposed Tsakani substation in the (see the attached Locality Map).

WHAT ARE THE POTENTIAL ENVIRONMENTAL IMPACTS ASSOCIATED WITH THE PROPOSED PROJECT?

The potential environmental impacts associated with the project have been identified. As part of the Basic Assessment, these potential impacts will be assessed through the following specialist studies:

- **Ecological survey**
- **Wetland assessment**
- **Avifaunal assessment**
- **Heritage assessment**
- **Visual assessment**

WHY ARE ENVIRONMENTAL STUDIES NEEDED?

In terms of the Environmental Impact Assessment (EIA) Regulations Government Notice. R. 543, R. 544 and R. 546 of 2010 published in terms of Section 24(5) read with Section 44 of the National Environmental Management Act (NEMA) (Act No 107 of 1998), Eskom requires authorization from the Department of Environmental Affairs for the undertaking of the proposed project. Activities under Government Notice R. 544 and R. 546

(also referred to as Listing Notice 1 and 3 respectively) may have a detrimental effect on the environment, hence a BA process, as prescribed in the EIA Regulations (2010) will have to be undertaken.

A Basic Assessment is an effective planning and decision-making tool, which allows for the identification of potential environmental consequences associated with a proposed project, and its management through the planning process.

Eskom has appointed SSI Environmental, as the independent Environmental Assessment Practitioner (EAP), to undertake environmental studies to identify and assess all potential environmental impacts associated with the proposed project. As part of these environmental studies, all I&APs will be actively involved through a public participation process.

PUBLIC PARTICIPATION PROCESS

It is important that relevant I&APs are identified and involved in the public participation process (see **Figure 2**) from the outset of the project. To ensure effective public participation, the process includes the following steps:

STEP 1: Advertise the EIA Process (local press)
STEP 2: Register I&APs and key stakeholders on the database (on-going)
STEP 3: Consultation with, and transfer of information to I&APs through focus group meetings and public meetings
STEP 4: Invite I&AP comment and input on the BAR (40-day comment period)
STEP 5: Record all comments, issues and concerns raised by I&APs within a Comments and Responses Report, which will form an integral part of the final BAR

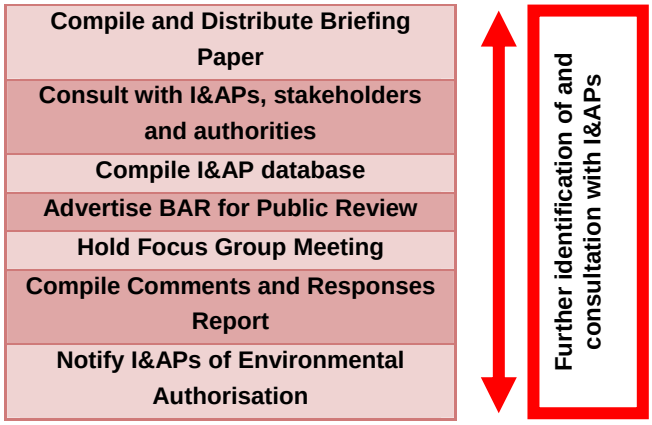


Figure 2: Public Participation Process

COMMENTS AND QUERIES

Direct all comments, queries or responses to:
SSI Environmental
Phyllis Kalele

PO Box 25302, Monument Park 0105

Phone: 012-367 5800

Fax: 012-367 5878

E-mail: phyllisk@ssi.co.za

BASIC ASSESSMENT AND ENVIRONMENTAL MANAGEMENT PROGRAMME FOR THE PROPOSED CONSTRUCTION OF A NEW 132 KV POWER LINE FROM THE EXISTING MBUMBU TRACTION SUBSTATION TO THE PROPOSED NEW TSAKANI SUBSTATION
PUBLIC PARTICIPATION PROCESS

REGISTRATION AND COMMENT FORM

Please **complete** in full and return to:

Phyllis Kalele

PO Box 25302, Monument Park, 0105 ☎ Phone: (012) 367 5800

E-mail:phyllisk@ssi.co.za Fax: (012) 367 5878

TITLE (Prof/Mr/Mrs)		FIRST NAME	
SURNAME			
CAPACITY (Landowner, member etc.)			
ORGANISATION (if applicable)			
POSTAL ADDRESS		POSTAL CODE	
TEL:		CELL:	
FAX:		E-MAIL:	

1. What is your main area of interest with regards to the proposed project?

..... …….

..... …….

2. Are there any concerns you would like to raise, at this stage, regarding the proposed project?

..... …….

..... …….

3. Are there any additional role-players whom we should involve in the process? **YES/NO**

If **"yes"**, please provide us with their contact details (Name, address & telephone no):

..... …….

..... …….

NAME:	**SIGNATURE:**

THANK YOU FOR YOUR TIME

ANDOVER 210 KU

BURLINGTON 217 KU

R/217

ISLINGTON 219 KU

CLARE 220 KU

U)TRAC 132kV

1/217

2/217

X=24185.00
Y=-2727750.00
LAT: -24° 39' 14.4", LONG: 31° 14' 20.1"

X=28728.40
Y=-2727686.36

6/225

7/225

X=32878.00
Y=-2727948.00
LAT: -24° 39' 20.3", LONG: 31° 19' 29.2"

8/225

5/225

EGLINTON 225

4/225

2/225

3/225

1/228

X=18131.0000
Y=-27308.6.0000
LAT: -24° 41' 44.9", LONG: 31° 10' 44.9"

X=23018.90
Y=-2732375.00
LAT: -24° 40' 42.1", LONG: 31° 13' 30.5"

2/228

LUDLOW 227 KU

EDINBURGH 228 KU

R/228

X=23104.14
Y=-2733129.92
LAT: -24° 42' 8.8", LONG: 31° 13' 37.2"

X=28163.00
Y=-2732308.00
LAT: -24° 41' 42.3", LONG: 31° 15' 41.9"

LEYDALE 292 KU

1/292

MBUMBU TRAC-THULAMAHASHE 132kV

R/237

ALLANDALE 237 KU

1/235

2/235

2/238

ROLLE 235 KU

R/235

ROLLE TRAC-THULAMAHASHE 132kV

NEWFOREST 234 KU

R/234

3/235

DUMFRIES 245 KU

1/264

EXETER 264 KU

MERRY PEBBLE STREAM 246 KU

1/245

REFERENCE:

- 11kV Power Line
- 11kV Cable
- 22kV Power Line
- 22kV Cable
- 22/11kV Surveyed line
- 33kV Power Line
- 44kV Power Line
- 66kV Power Line
- 88kV Power Line
- 132kV Power Line
- 275kV Power Line
- 400kV Power Line
- 765kV Power Line
- Substation
- 22kV Bend pole
- 11kV Bend pole
- Toff pole
- 22kV Transformer
- 11kV Transformer
- 22kV Metering unit
- 11kV Metering unit
- Breaker
- Mini substation
- Voltage regulator
- Link
- Cable marker

- National roads
- Main roads
- Secondary roads
- Rivers
- Streams
- Contours
- Farm boundary
- Subdivisional farm boundary

Proposed Route 1 — 1. 15.48km

Proposed Route 2 — 2. 10.26km

Proposed Route 3 — 3. 17.05km

REV	REVISION DESCRIPTION	BY	CHKD	AUTH	DATE	PROJECT NO.

Eskom Distribution

AUTH:
DATE:
CHKD:
DATE:
SCALE :
DRAWN: A. Mthethwa
DATE: 09/05/2019

Network Investigation

Mbumbu SVS - NE-STM-1002-1494-00001

WG84/31

EXTRACT OF:

SET	SHEET	REVISION

APPENDIX E2

I&AP DATABASE

Project:	Basic Assessment and Environmental Management Programme: Proposed Construction of a 17km 132kV powerline from the existing Mbumbu traction to the new Tsakani Substation, Mpumalanga Province.
Applicant:	Eskom Distribution
Name	Company / Organization
NGO's	
Andrew Rossaak	WESSA: Regional Chairperson
Caroline Ah Sheni Verdoorn	Birdlife South Africa
N Machete	SAHRA
Dr. Sharon Pollard	Association for Water and Rural Development (AWARD)
GOVERNMENT AUTHORITIES	
Ms. Noma Mdhluli	MDEDET-Ehlanzeni District Municipality
Ms. Robyn Luyt	MDEDET-Ehlanzeni District Municipality
Mr. H.M. Mbatha	MDEDET-Enhlanzeni District Municipality: Municipal Manager
Mr. Emmanuel Motlaleng	MDEDET-Ehlanzeni District Municipality: Environmental Officer
Mrs. Nare Evelyn Khosa	MDEDET-Ehlanzeni District Municipality: Environmental Health Officer
Miss Funeka Bongweni	Municipal Health Services, Enhlanzeni District Municipality: Deputy Manager
Anna-Marie van Brakel	Mpumalanga Department of Health
B.T Mokoena	MMC-Environment
Mr P Mnisi	Ehlanzeni District Municipality Department of Municipal Health and Environmental Management: Manager
Dr M. Kgaphola	Mpumalanga Department of Agriculture, Rural Development and Land Administration-Ehlanzeni South
Ms. P.N.Z. Mpangane	Mpumalanga Department of Agriculture, Rural Development and Land Administration-Ehlanzeni North

Silence Mathebula	Mpumalanga Department of Agriculture, Rural Development and Land Administration-Ehlanzeni North and South
Mr. JM van Aswegen	Department of Water Affairs: Director
Mr. Howard Shabangu	Department of Water Affairs
Sam Maluleke	Economic Development, Environment and Tourism: Regional Director
Ms. Ningi Mlangeni	Mpumalanga Department of Social Development
Mr. Wilson Makaringa	Mpumalanga Parks and Tourism Agency: Regional Director
Mr. Kgopana Mathew Mohlasedi	Mpumalanga Department of Public Works, Roads and Transport: Head of Department
	LOCAL MUNICIPALITY
CLR Renias Khumalo	Bushbuckridge Local Municipality: Executive Mayor
CLR Flomina Ntimba	Social Development: Bushbuckridge Local Municipality
Ms. Hellen Nonyane	Bushbuckridge Local Municipality
Mr Andries Mnisi	Bushbuckridge Local Municipality: Acting Municipal Manager
Mr. B.T. Mokoena	MMC-Environment-Bushbuckridge Local Municipality
Thandi Maphane	Ward Councillor: Ronaldsey
Ms. Lydia Mabunda	Ward 36 Councillor: Edinburgh "B", Rolle "A" and "B", Allandale
Mr. Rodgers Tshobede	Ward 31 Councillor: Thulamahashe
Charles Monareng	Ward 3 Councillor: Calcutta "A"
Ruth Busisiwe Raganya	Ward 18 Councillor: Tsakani

Enas Selowe	Ward 22 Councillor: Dingleydale
Phumaphi Bongco	Ward 24 Councillor: Cunningmoore, Oakley
Johan Mthabine	Ward 26 Councillor: Kildare
Tutani Makaringe	Ward 29 Councillor: Rolle
Cutberry Mthisi	Ward 30 Councillor: Ludlouw, Islington, Burlington
Difani Mashabane	Ward 33 Councillor: Hluvukani
Mkoli Mnisi	Ward 34 Councillor: Clare
Luther Mhaule	Ward 35 Councillor: Ronaldsey, Cunningmoore "B", Kildare "B"
	LANDOWNERS
Mr. Mish Khoza	Department of Agriculture, Rural Development and Land Administration
Mr Andries Mnisi	Acting Municipal Manager-Bushbuckridge Local Municipality
Mr. Kobus Human	Portfolio Manager-Transnet Property
Mr. I. Sibuyi - Chairman	Amashangana Tribal Authority
Mr. I. J. Mnisi - Chairman	Mnisi Tribal Authority

APPENDIX E3

NEWSPAPER ADVERTISEMENT

" Deploy police officers outside their own communities"

- Shongwe

Tumelo Dibakwane
newsroom@langanews.com

Mpumalanga Community Safety, Security and Liaison MEC Vusi Shongwe has called on SAPS Management to explore at possibilities of deploying police officers outside their own communities in order to minimize chances of colluding with criminals and not arresting them.

Shongwe said that there is likelihood that when officers are stationed in their own localities, they may find it difficult to deal with crime suspects they know. Shongwe was speaking during a Joint Forum Meeting (JMF), between SAPS management in the province and the department held in White River yesterday.

He said that when the officers are deployed in communities where they are not known, they would work without any fear or favour and this will assist in strengthening the war against crime.

"If we take them to where they are not known, chances of them being corrupted or not investigating cases thoroughly are minimized." said Shongwe.

He said that sometimes the unwillingness of officers to decisively confront criminal elements could be attributed to the fact they personally know some of the criminals.

Shongwe has further called on SAPS to support Community Police Forums (CPF) because without it, the war against crime will not be won.

Bushbuckridge Rape victim follow-up

The teenage who witnessed her mother being raped is now receiving counselling.

The 15 year old girl who witnessed her mother's rape, as reported in Bushbuckridge News' 20 January issue, is receiving counselling at an undisclosed clinic.

The young girl told Bushbuckridge News that she decided to go for counselling after she realized that her mother was not willing to act on the matter.

"I have tried everything I can but my mother is determined not do anything about this, I still don't understand what kind of a mother she is" said the victim's daughter.

She also said that she now lives in fear after seeing the two criminals on streets.

> "The victim still refuses to press charges and says that she will deal with the criminals "in my own way,"

"Since I saw them again I have sleepless night because I think they can still come back, I even moved out of my mother's house and I am staying with my aunt"

The teenager pleads with the community to convince her mother to take action against the two criminals.

The victim still refuses to press charges and says that she will deal with the criminals "in my own way,"

NOTICE OF BASIC ASSESSMENT FOR THE PROPOSED CONSTRUCTION OF A 17 KM 132kV POWER LINE FROM THE EXISTING MBUMBU TRACTION TO THE NEW TSAKANI SUBSTATION, BUSHBUCKRIDGE LOCAL MUNICIPALITY, MPUMALANGA PROVINCE (DEA REF: 12/12/20/2374)

Notice is hereby given in terms of the National Environmental Management Act, 1998 (Act No 107 of 1998) as amended and the Environmental Impact Assessment Regulations (2010) that Eskom Distribution - Northern Region has submitted an application for Environmental Authorisation to the Department of Environmental Affairs (DEA).

Eskom Distribution intends to carry out activities listed under GN R.544 (Listing Notice 1) and GN R.546 (Listing Notice 3). The proposed project will entail the establishment of a new 132 kV power line between the existing Mbumbu traction to the proposed new Tsakani substation, a distance of approximately 17 km. In addition, a new substation will be constructed covering an area of 1 ha.

Consequently, Eskom Distribution - Northern Region intends to undertake a Basic Assessment (BA) Process and submit a BA report in support of the proposed project.

NOTICE OF AVAILABILITY OF DRAFT BASIC ASSESSMENT REPORT FOR PUBLIC REVIEW

All I&APs are hereby notified that the draft Basic Assessment Report (BAR) will be available for public comment from **27 January 2012** to **10 March 2012**. The draft BAR will summarise key environmental issues identified to date and will be available at the following places:

- Offices of Bushbuckridge Local Municipality, Thulamahashe Region (Stand No. 541, Section C, Thulamahashe Shopping Complex).
- Offices of SSI Environmental (78 Kalkoen Street, Monument Park, Pretoria).
- SSI Environmental website ( ).

NOTICE OF PUBLIC MEETING

All I&APs are hereby invited to attend a public meeting to be held on **25 February 2012**. Attendance at the public meeting is encouraged, as the project team will be on-hand to provide you with further details regarding the project as well as to receive relevant information. Details of the public meeting are as follows:

- **Date: Saturday, 25 February 2012**
- **Location: Regional Chambers, Thulamahashe Regional Office next to Thulamahashe Shopping Complex**
- **Time: 09h00 for 09h30**

Should you wish to attend the public meeting, please RSVP as soon as possible to the contact person provided below.

A visit to the proposed site will be conducted on Friday, 24 February 2012. Meeting point for departure will be the Thulamahashe Stadium at 14h00; should you wish to attend the site visit, kindly make your own transport arrangements.

WHO SHOULD YOU CONTACT?

SSI Environmental Consultants is the appointed independent Environmental Assessment Practitioner (EAP), undertaking the required Basic Assessment and Public Participation process for the project. To register as an Interested and Affected Party (I&AP) and to obtain more details about the project, please submit your name, contact information and interest in the project to:

Phyllis Kalele
SSI Environmental
Tel: 012 367 5800
Fax: 012 367 5878
Email: phyllisk@ssi.co.za

SSI
A DHV COMPANY

SHOUT

Prince Modipane from Alexandria, Marite

Things are not going well, look at me now, I am trying to work but it's hard. I don't want to steal but sell stuff on the streets but even then there are restrictions; security guards don't want us to work in the shopping complexes even though we work so we can spend our money in their shops.

Where is the freedom now?

Lacey Mnisi from Alexandria

I feel great about the country, President Zuma is a good president and even though there are not enough jobs, I think things will be better in the future.

Puseletso Monare from Violet Bank

I feel negative about the state of the country right now. All government does is promise us work but no jobs are available. The worst feeling is when men take advantage of us women when we apply for jobs because they demand sex and say we can't get work without sleeping with them first.

Staff Reporter

STATE OF THE NATION ADDRESS

President Jacob Zuma will deliver the State of the Nation address on February 09.

What do you hope to see changing or improving in 2012 and according to you, what is the state of our country and do you believe in our future?

Alicia Khoza, pupil from Alexandria Primary School

I think if we go to school and study hard and pass then we can build our own bright future.

Thobile Mkhonto from Mandela

Says things are not going well, "we don't have job opportunities and in the case of government jobs, if you don't have family in the government, then forget it."I also think the social grant makes young girls fall pregnant and this leads to more problems such as HIV/ Aids infections and sugar daddies." If things go on this way, we wont have a bright future in this country.

DEAR Sis Fiki

Accident has changed my marriage

My husband and me were involved in an accident in 2006 while he was driving. I got seriuously hurt and the doctors had to have my leg amputated. After the accident, my husband was very supportive. RAF has paid me and things were all good because I had money and I still do but things are becoming hard. My husband doesn't look at me the same way he used to. Sometimes he doesn't even eat the food I cook for him. I tried changing my look but things are not the same. How do I save my marriage?

Dear Anonymous

Both of you should have gone to therapy after the accident; clearly, the accident was traumatic and changed the way you live your lives. Yes things were bound to change. You might find that he still loves you but the only thing that's making him to behave that way is guilt. The only way you can deal with this is through open and honest communication. Therapy can help you deal with the effects of the accident and help you come to a decision about your marriage.In the meantime, take care of yourself and try to be as strong as possible.

Good luck.

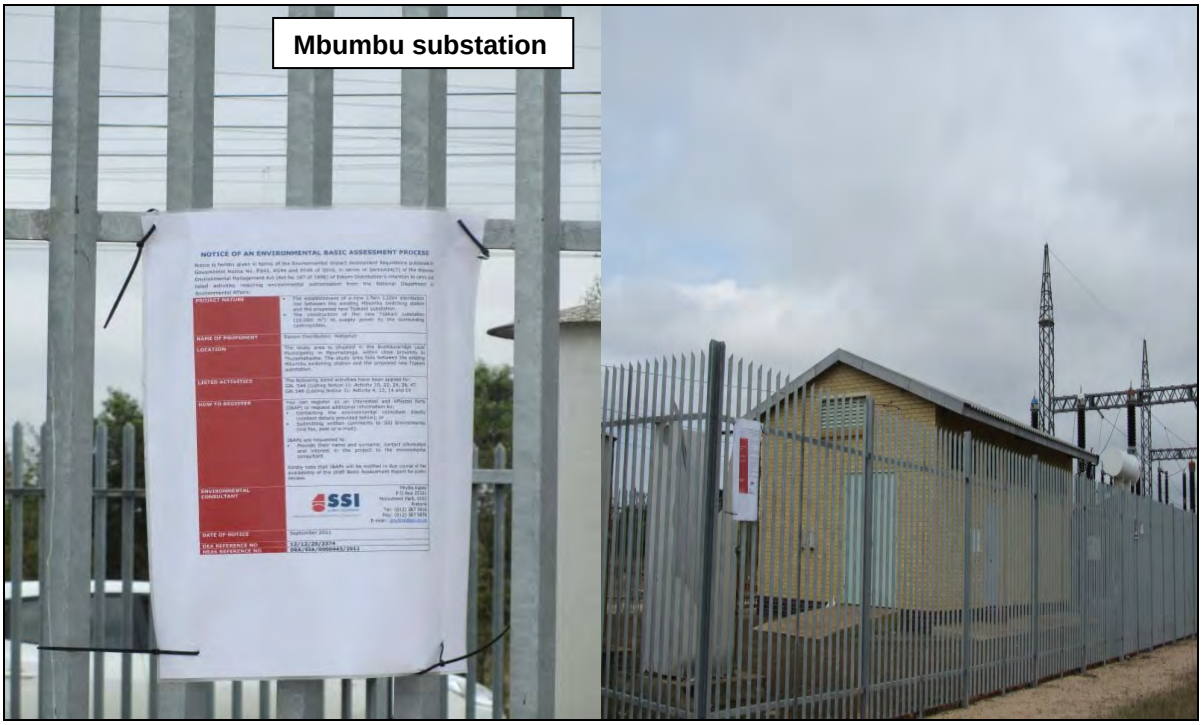
APPENDIX E4

SITE NOTICES

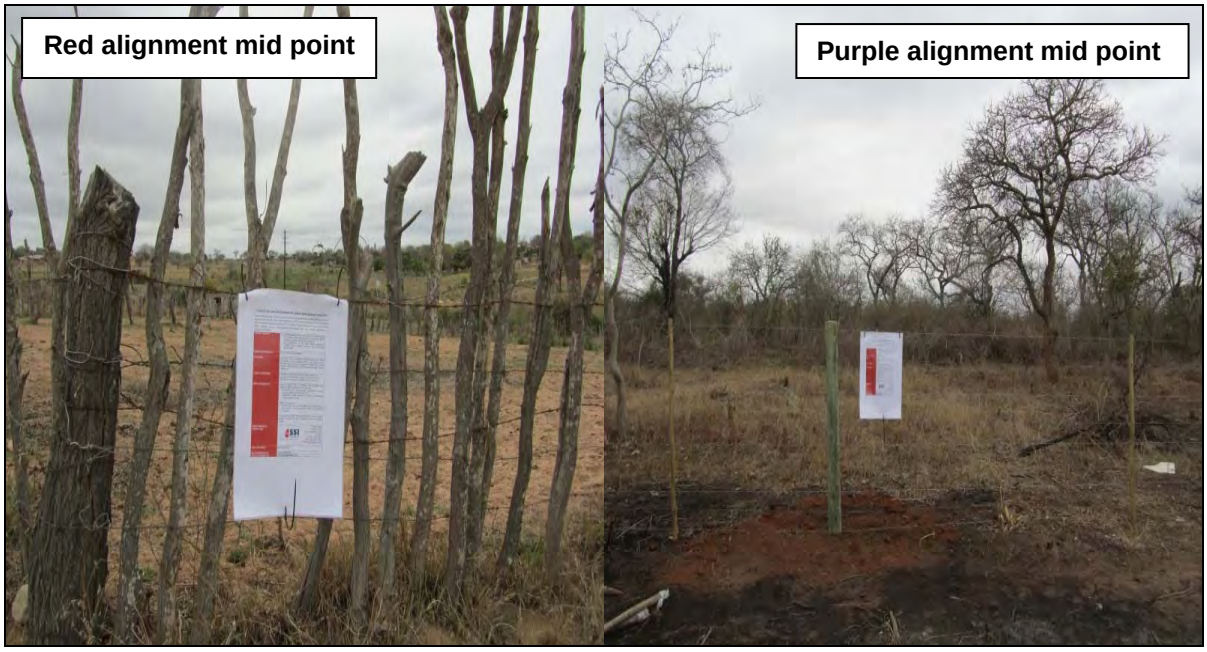
NOTICE OF AN ENVIRONMENTAL BASIC ASSESSMENT PROCESS

Notice is hereby given in terms of the Environmental Impact Assessment Regulations published in Government Notice No. R543, R544 and R546 of 2010, in terms of Section24(5) of the National Environmental Management Act (Act No 107 of 1998) of Eskom Distribution's intention to carry out listed activities requiring environmental authorisation from the National Department of Environmental Affairs:

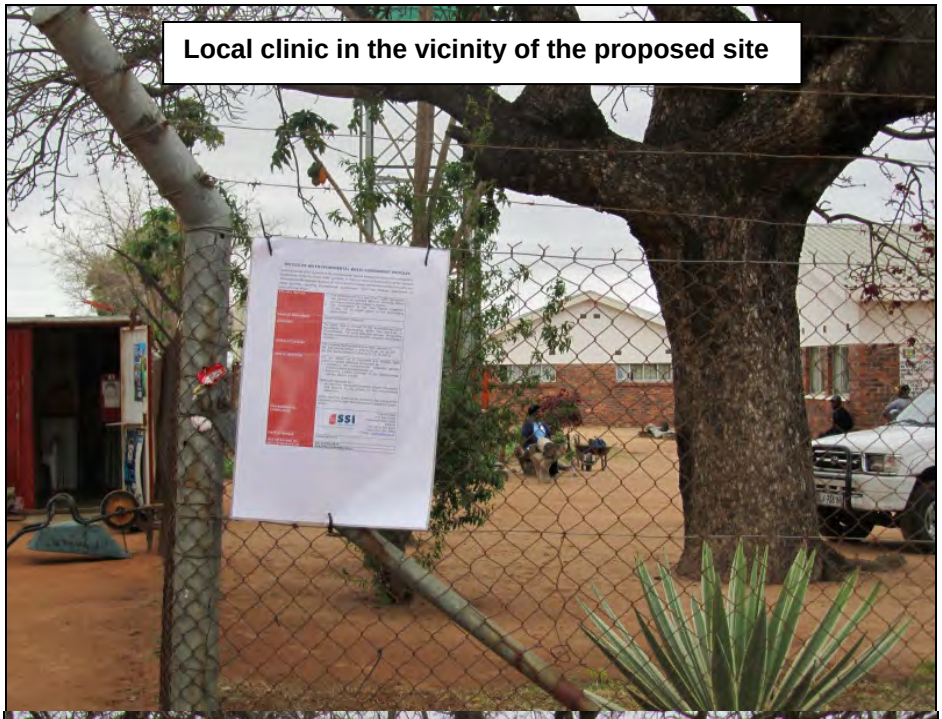
PROJECT NATURE	▪ The establishment of a new 17km 132kV distribution line between the existing Mbumbu switching station and the proposed new Tsakani substation. ▪ The construction of the new Tsakani substation (10,000 m^2) to supply power to the surrounding communities.
NAME OF PROPONENT	Eskom Distribution -Nelspruit
LOCATION	The study area is situated in the Bushbuckridge Local Municipality in Mpumalanga, within close proximity to Thulamahashe. The study area falls between the existing Mbumbu switching station and the proposed new Tsakani substation.
LISTED ACTIVITIES	The following listed activities have been applied for: GN. 544 (Listing Notice 1): Activity 10, 22, 24, 26, 47 GN 546 (Listing Notice 3): Activity 4, 13, 14 and 19
HOW TO REGISTER	You can register as an Interested and Affected Party (I&AP) or request additional information by: ▪ Contacting the environmental consultant directly (contact details provided below), or ▪ Submitting written comments to SSI Environmental (via fax, post or e-mail). I&APs are requested to: ▪ Provide their name and surname, contact information and interest in the project to the environmental consultant. Kindly note that I&APs will be notified in due course of the availability of the draft Basic Assessment Report for public review.
ENVIRONMENTAL CONSULTANT	SSI A DHV COMPANY ENGINEERS AND ENVIRONMENTAL CONSULTANTS Phyllis Kalele P O Box 25302 Monument Park, 0105 Pretoria Tel: (012) 367 5916 Fax: (012) 367 5878 E-mail: phyllisk@ssi.co.za
DATE OF NOTICE	September 2011
DEA REFERENCE NO	**12/12/20/2374**
NEAS REFERENCE NO	**DEA/EIA/0000443/2011**


Mbumbu substation
NOTICE OF AN ENVIRONMENTAL BASIC ASSESSMENT PROCESS
SSI

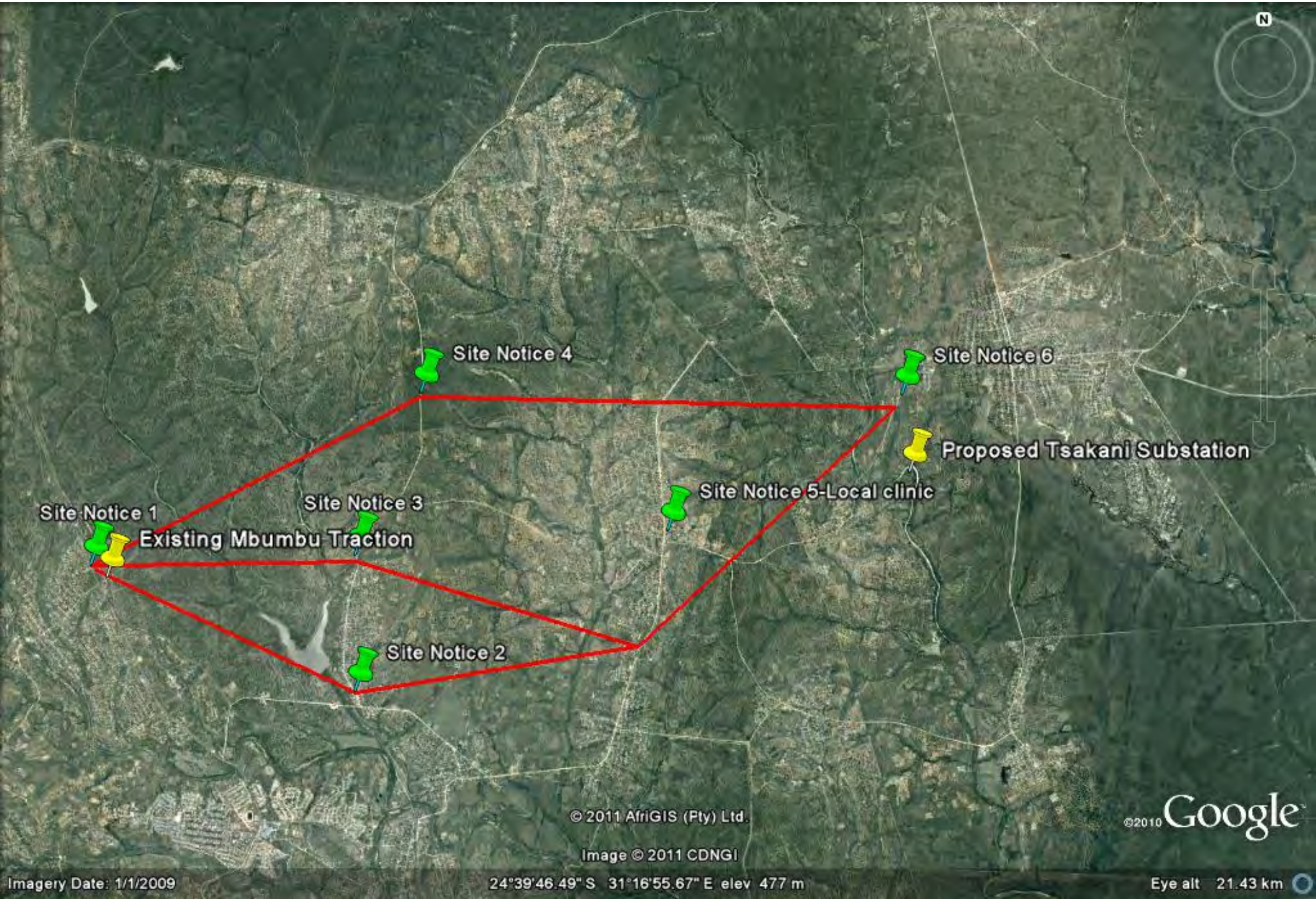

Green alignment mid point
SSI


Red alignment mid point
Purple alignment mid point


End of purple & green alignment



Local clinic in the vicinity of the proposed site


Site Notice 4
Site Notice 6
Proposed Tsakani Substation
Site Notice 5-Local clinic
Site Notice 1
Existing Mbumbu Traction
Site Notice 3
Site Notice 2
© 2011 AfriGIS (Pty) Ltd.
Image © 2011 CDNGI
©2010 Google
Imagery Date: 1/1/2009
24°39'46.49" S 31°16'55.67" E elev 477 m
Eye alt 21.43 km

APPENDIX E5

COMMENTS AND RESPONSES REPORT

BASIC ASSESSMENT FOR THE PROPOSED CONSTRUCTION OF A 132Kv POWER LINE FROM THE EXISTING MBUMBU TRACTION SUBSTATION TO THE NEW TSAKANI SUBSTATION, BUSHBUCKRIDGE MUNICIPALITY, MPUMALANGA PROVINCE

COMMENT AND RESPONSE REPORT

JUNE 2012

ISSUES / COMMENT	RAISED BY	RESPONSE
1. Environmental		
A detailed document is required addressing the following issues: • Dust control • Noise control • Waste Management • Water pollution control • Ablution facilities for personnel • Approved building plan for local authority	Ms. Nare Evelyn Khosa Environmental Health Practitioner Ehlanzeni District Municipality Cell: 082 850 5189 Email: ekhosa@ledc.co.za Emailed 1 November 2011	The draft Environmental Management Programme (EMPr) attached as Appendix F of the final Basic Assessment Report (BAR) addresses dust, noise, waste management, water pollution as well as ablution facilities for construction personnel. Building plans will be finalised prior to construction. The revised draft Basic Assessment Report was sent to the Ehlanzeni District Municipality on 25 April 2012.
Ehlanzeni District Municipality has no objection to the proposed development on condition that the following requirements are complied with during the construction / installation of the power lines: **i. Water Supply** Potable water for drinking and cleaning must be provided for the construction workers. **ii. Toilet Facilities** Temporary toilets must be provided for the construction workers. If chemical toilets are used, the contents thereof must be disposed in an approved sewage treatment works, permission of which must be obtained from the relevant local municipality. **iii. Waste Management** a) Wastewater generated at the site must be disposed of	Ms. Dudu Masondo Planning, Municipal Health & Environmental Management Ehlanzeni District Municipality Tel: 013 759 8500 Cell: 082 849 5994 Email: dmasondo@ledc.co.za Emailed: 9 March 2012	Prior to construction, an appropriate contractor will be appointed and an area will be identified for the establishment of a construction camp. The construction camp will have potable drinking water for construction workers. The contractor shall install mobile chemical toilets on site that will be emptied regularly by the service provider and disposed off at an appropriate treatment facility. The appropriate waste management measures are included in Section 5.13 of the EMPr. The appropriate air quality management measures are included in Section 5.9 of the EMPr. The appropriate noise management measures are included in

ISSUES / COMMENT	RAISED BY	RESPONSE
into septic tanks and French drains to prevent surface and ground water pollution. b) Refuse generated at the site must be collected, stored in closeable refuse bins and disposed of in an approved landfill site. c) Hazardous waste (used oil, diesel, petrol, paraffin, cement etc.) must be collected, stored in appropriate containers and disposed off in an approved facility. **iv. Air Quality Management** a) Dust generation on the roads and the construction site must be appropriately and satisfactorily mitigated. **v. Noise Management** a) Noise that will be generated by machines, vehicles and any other sources must be appropriately and satisfactorily mitigated. **vi. Management of chemicals** A properly constructed storage facility must be provided where chemicals and other hazardous materials will be kept under lock and key.		Section 5.10 of the EMPr. The appropriate management measures for the handling of hazardous chemicals are included in Section 5.14 of the EMPr.
It is indicated in the Basic Assessment report that, for all three alternatives, the farms Oakley 285 KU and Ronaldsey 283 KU will be traversed by the proposed power line. However, according to our records, these farms do not fall within the proposed routes. Our records also show that these two farms are located within 10km of the Kruger National Park, in which case activities listed in GNR 546 may be applicable. The affected farms must be verified. 1. This Department would not support any construction activities within the identified wetland areas, or within 50 m from the edge of the Sephiriri River. It is recommended that such restrictions must be applied when the proposed development is considered for approval. 2. The following additional conditions are also	Ms. Robyn Luyt Environmental Impact Management MDEDET Tel: 013 766 4826 Email: rluyt@mpg.gov.za Emailed: 22 March 2012	None of the routes will traverse farms Oakley 285 KU and Ronaldsey 283 KU and the BAR has been amended accordingly. Thank you for pointing out the discrepancy. Additionally, the ecological assessment survey established that none of the servitudes for the proposed red and green alternatives traverses sensitive geographical areas that would trigger Listing Notice 3 activities even though activities 4, 13, 14 and 19 were applied for. The BA report (under assessment of impacts) and EMPr (under construction phase) specifies that a buffer zone of 50 m should be adopted for the Sephiriri river and 32 m for other wetlands / Sand river seasonal tributaries. No construction activities will be allowed within these buffers.

ISSUES / COMMENT	RAISED BY	RESPONSE
recommended: a) The applicant must appoint an independent ECO that will have the responsibility of monitoring and reporting on compliance with the conditions of the environmental authorisation as well as monitoring and reporting on the implementation of the approved EMP. b) The ECO must be appointed before the start of the construction and the Department must be notified of such an appointment for communication purposes. c) The ECO must accompany the surveyor on site to ensure that no pylons are located within any wetland / watercourse / stream bank, or any sensitive rocky outcrops. d) The ECO must oversee all vegetation clearing operations and the identification and protection / relocation / removal of plant species of conservation importance. e) Prior to the commencement of construction, the ECO must identify any breeding bird species that may be affected by the construction of the powerline, and case specific recommendations must be made accordingly so that breeding is not negatively impacted in any way. f) The ECO must remain employed until all rehabilitation measures as well as site clean-up are completed and the site is handed over to the applicant by the contractor for operation. g) Before construction activities may commence, plant species of conservation importance (i.e. protected species, red data species and endemic species) must be identified and marked and left undisturbed, and where disturbance cannot be avoided, permits for their damage, relocation or removal must be obtained from the relevant authority. Commencement for the purposes of this condition includes bush clearing. h) Scalping of vegetation on any part of the servitude is prohibited. The ECO must accompany the contractor responsible for vegetation clearing to ensure that conditions pertaining to protected plant species and the clearing of vegetation are complied with. i) De-stumping, scalping or uprooting of riparian vegetation		The recommended additional conditions are noted and the EMPr has been updated to address the conditions that are not included. The EMPr is attached under Appendix F of the final BAR.

ISSUES / COMMENT	RAISED BY	RESPONSE
or wetland vegetation is prohibited, and no vegetation clearing is permitted across ravines and gullies. j) The contractor responsible for vegetation clearing must have a valid herbicide applicators license, and the application of herbicide may only take place after consultation with the ECO. k) All towers must be fitted with the standard Eskom Bird Perch pr Perching Bracket to provide safe perching substrate at the top of the pylons well clear of dangerous hardware. l) 'High risk sections' (i.e. sections of the line within 250 m of a watercourse / wetland / dam) of the earth wire must be marked with a suitable anti-collision marking device in order to increase its visibility and reduce bird collisions. m) Breeding sites of birds must be kept intact, and breeding pairs may not be disturbed in any way. n) No temporary road crossings may be constructed through any watercourse or wetland.		
2. Social Issues		
The main area of interest in the project is the health and safety of the community. Requested a visit to the development site and thereafter, concerns will be raised.	Ms. Funeka Bongweni Deputy Manager: Municipal Health Services Ehlanzeni District Municipality Cell: 082 521 2628 Email: fbongweni@ledc.co.za Emailed: 7 October 2011	A site visit with the concerned I&AP was conducted on 24 February 2012.
Construction workers must be provided with appropriate personal protective equipment. Education and training on the use of such equipment must be given to the construction workers.	Ms. Dudu Masondo Planning, Municipal Health & Environmental Management Ehlanzeni District Municipality Tel: 013 759 8500 Cell: 082 849 5994 Email: dmasondo@ledc.co.za Emailed: 9 March 2012	The Contractor will provide staff with the necessary training and appropriate PPE.
3. General		
The I&AP requested a notification to be sent to an additional role player (see below) who should be involved in the EIA process:	Ms. Funeka Bongweni Deputy Manager: Municipal	A notification of the Public Participation Process was sent to the I&AP on 7 October 2011 as requested.

ISSUES / COMMENT	RAISED BY	RESPONSE
• Anna-Marie van Brakel Mpumalanga Department of Health Cell: 013 755 5100	Health Services Ehlanzeni District Municipality Cell: 082 521 2628 Email: fbongweni@ledc.co.za Emailed: 7 October 2011	
Education and Training Education and training on handling of chemicals and other hazardous materials, health and hygiene and environmental management must be given to all construction workers including management.	Ms. Dudu Masondo Planning, Municipal Health & Environmental Management Ehlanzeni District Municipality Tel: 013 759 8500 Cell: 082 849 5994 Email: dmasondo@ledc.co.za Emailed: 9 March 2012	The Contractor will also ensure that his/her staff are made aware of the health risks associated with any hazardous substances used and provide staff with the necessary training. MSDSs will also be kept on site. The Contractor will also provide construction staff with the appropriate protective clothing / equipment.
His main area of interest is the site selected for the proposed Tsakani substation. His concern is that from the site visit conducted on 24 February 2012, there were no members of the affected parties / individuals groups to give their views during the discussions that were held. The proposed site of the substation (which is still subject to be negotiated for approval) is within the expanding agricultural land of the nearby community. This therefore means that the community around the proposed site need to be consulted and a certain portion needs to be reserved/remain untouched for the purpose. There should be an agreement between the farmers (particularly Farmers Association) and the developer with regards to the available left piece of land which is currently covered by the “Circle bos” species. The following additional role-players should be involved in the process: Hluvukani region municipal office, Community Development Forum, Community Police Forum, Land Care committee, Headman (Induna), ward councillor and the Farmers Committee.	Mr. Silence Mathebula DARDLA – Thulamahashe District Office Tel: 072 796 1729 Email: silencemathebula@yahoo.com Emailed: 9 March 2012	A meeting was conducted with the Mnisi Tribal Authority (TA) (the TA that governs the area of the proposed Tsakani substation) Headmen and Chief Mnisi on 18 May 2012. SSI Environmental and Eskom informed the TA about the proposed project and they assured us that the proposed site is available for the project and they welcome the entire proposed development wholeheartedly.

ISSUES / COMMENT	RAISED BY	RESPONSE
Bushbuckridge local municipality is challenged with providing electricity in some villages due to overloaded substations. Hence the construction of the new substation is recommended as it will reduce electrification backlogs and it will benefit the community.	Ms. Helen Nonyane Manager: Environmental Management Bushbuckridge Local Municipality Tel: 013 795 5630 Fax: 086 241 6765 Faxed: 18 May 2012	The main goals of constructing the power line and substation are to: • Split the current overloaded power lines in the area. • Provide sufficient capacity for new clients and improve the reliability of energy supply. • De-load the currently overloaded infrastructure in the area, thus reducing interruptions during supply. The community will benefit by having reliable electricity supply which will in turn stimulate economic development in the area. The community as well as Mnisi and Amashangana Tribal Authorities welcome and support the project. The Basic Assessment study conducted established that the positive impacts of the proposed development will outweigh the potential negative impacts. An Environmental Management Programme (EMPr) has been compiled that outlines mitigation measures required to be implemented during planning, design, construction, operation and decommissioning phases in order to manage and minimise the extent of negative environmental impacts and maximise positive impacts.
The issues raised were: a) What is the next step to be taken in order for Eskom to get a go-ahead? b) This project will be affecting the communities how will they be informed? c) Have other Departments been consulted about the proposed project? d) What positive impact will the project have on the community? e) When is construction of the power line and substation expected to commence? f) Will the landowners that are affected by the project be compensated?	Tribal Council Amashangana Tribal Authority Meeting: 17 May 2012	a) Once Environmental Authorization (EA) for the preferred route has been received, it would be appreciated if the TA could make the land available for the construction of the substation and power line. b) Once a date for the public meeting has been arranged the Chief will assist SSI Environmental as he will call the community members to the meeting. c) The draft Basic Assessment had been sent for review and commenting to the following provincial authorities: • Department of Health • Department of Water Affairs • Department of Public Works, Roads and Transport • Bushbuckridge Local Municipality. • Ehlanzeni District Municipality: Dept. of Planning, Municipal Health & Environmental Management.

ISSUES / COMMENT	RAISED BY	RESPONSE
g) The project is fully supported and it can proceed.		d) The reliable electricity supply will stimulate economic development in the area. In terms of job creation, there are few opportunities that might be created during the construction e.g. clearing the servitude, otherwise all other jobs are highly technical and needed experienced and skilled labour. e) The construction could begin in 2014 because such a project entails various inputs. For example, a geotechnical study will have to be conducted to ensure that the proposed site of the substation is suitable. f) After positive Environmental Authorization has been obtained from DEA for the preferred route, the negotiators from Eskom will identify the lawful landowners and negotiate compensation. g) Comment has been noted.
The issues raised were: a) Whereabouts is the Tsakani substation located since there is an area called Tsakani nearby? b) Has permission to use the land been negotiated with the landowners and have the Chiefs been consulted in this regard? c) How long would this process take before people can receive electricity? d) Will any job opportunities be created by the project? e) What is the estimated budget for the proposed project?	Ward Councillors Bushbuckridge Local Municipality Meeting: 17 May 2012	a) The proposed substation will be constructed a few metres from the turn-off road that goes into Share on the way to Hluvukani. The name Tsakani, is an internal name selected by Eskom to identify this proposed substation and is not related to the Tsakani area. b) The proposed project is still awaiting EA before negotiations with landowners can be initiated. Once EA for the preferred route has been obtained from the Department of Environmental Affairs (DEA), the lawful landowners are identified and then the process of negotiations in order to determine compensation begins. The AmaShangana Tribal Authority has been consulted and the Mnisi Tribal Authority will be consulted the 0n 18 May 2012. c) The process takes a long time due to factors such as negotiations with the landowners and the line that has been approved by DEA has to be designed. The construction period could be around between 2014 and 2015.

ISSUES / COMMENT	RAISED BY	RESPONSE
		d) Job opportunities are limited and there might be jobs such as clearing the servitude. The ward councillors should advise people to register on the Eskom's Database so that when the project commences they can be considered for unskilled tasks. e) About R. 24 million.
The comments put forward were: a) They welcomed the project wholeheartedly and they are happy about it. b) Currently, there are power shortages and as a result numerous interruptions to those villagers that are already connected. It is appreciated that the proposed substation will reduce the load on the existing substation. The electricity available is unreliable and in short supply and the situation is very serious because the local hospital also experiences blackouts. c) The new proposed substation will add value to the villages by improving the quality of life and it will also support other substations. d) The proposed project will create job opportunities by stimulating economic development in the surrounding villages. e) The proposed site of the substation and power line is available for the proposed project. f) The Municipality must be involved at all times in matters that involve the community. It was requested that the councillors and headmen inform the local community about the proposed project.	Tribal Council Mnisi Tribal Authority Meeting: 18 May 2012	The main goals of constructing the power line and substation are to: • Split the current overloaded power lines in the area. • Provide sufficient capacity for new clients and improve the reliability of energy supply. • De-load the currently overloaded infrastructure in the area, thus reducing interruptions during supply. The community will benefit by having reliable electricity supply which will in turn stimulate economic development in the area. The Basic Assessment study conducted established that the positive impacts of the proposed development will outweigh the potential negative impacts. An Environmental Management Programme (EMPr) has been compiled that outlines mitigation measures required to be implemented during planning, design, construction, operation and decommissioning phases in order to manage and minimise the extent of negative environmental impacts and maximise positive impacts.
a) What will be the benefits of this proposed project? b) Will there be any job opportunities awarded to the community? c) Will the property owners receive any compensation from Eskom for their land? d) When will construction commence after EA has been granted?	Community Members Amashangana Tribal Authority Public meeting: 2 June 2012	a) The electricity supply will become reliable and new developments in the community will be supplied with power. b) In terms of job creation, there are few opportunities that might be available for local contractors during construction e.g. clearing the servitude, digging of holes. Therefore, the local contractors are advised to keep in touch with the headman.

ISSUES / COMMENT	RAISED BY	RESPONSE
		c) There are evaluators appointed by Eskom who will enter negotiations with the affected landowners after EA has been received from the DEA for the preferred route alignment. d) The earliest possible date is between 2014 and 2015.

APPENDIX E6

I&AP REGISTRATION FORMS

EHLANZENI
DISTRICT MUNICIPALITY

BASIC ASSESSMENT AND ENVIRONMENTAL MANAGEMENT PROGRAMME FOR THE PROPOSED CONSTRUCTION OF A NEW 132 KV POWER LINE FROM THE EXISTING MBUMBU TRACTION SUBSTATION TO THE PROPOSED NEW TSAKANI SUBSTATION
PUBLIC PARTICIPATION PROCESS

TITLE (Prof/Mr/Mrs)	Miss	FIRST NAME	Funeka
SURNAME:	Bongweni		
CAPACITY (Landowner, member etc.)	Deputy Manager: Municipal Health Services		
ORGANISATION (if applicable)	Ehlanzeni District Municipality		
POSTAL ADDRESS	P. O. Box 3333 Nelspruit	POSTAL CODE	1200
TEL:	0137598552	CELL:	0825212628
FAX:		E-MAIL:	fbongweni@ledc.co.za

1. What is your main area of interest with regards to the proposed project?

1.1 Health and safety of the community in the area.

2. Are there any concerns you would like to raise, at this stage, regarding the proposed project?

2.1 Request to visit the development site - concerns will be raised after the site inspection.

3. Are there any additional role-players whom we should involve in the process?
If **"yes"**, please provide us with their contact details (Name, address & telephone no):

3.1 Mpumalanga Department of Health: Anna-Marie Van Brakel: 0137555100

NAME: Funeka Bongweni	SIGNATURE:

From:	Mbebe, Akhona Zandile
To:	annamariea@social.mpu.gov.za; fbongweni@ledc.co.za
Cc:	Kalele, Phyllis
Subject:	Eskom Mbumbu-Tsakani I&AP
Date:	07 October 2011 09:22:41 AM
Attachments:	Eskom Mbumbu Final BID-03 10 11.pdf

07 October 2011

Dear Interested and Affected Party,

BASIC ASSESSMENT FOR THE PROPOSED CONSTRUCTION OF A 17 KM 132kV POWER LINE FROM THE EXISTING MBUMBU TRACTION TO THE NEW TSAKANI SUBSTATION, BUSHBUCKRIDGE LOCAL MUNICIPALITY, MPUMALANGA PROVINCE (DEA REF: 12/12/20/2374)

Notice is hereby given in terms of the National Environmental Management Act, 1998 (Act No 107 of 1998) as amended and the Environmental Impact Assessment Regulations (2010) that Eskom Distribution-Northern Region has submitted an application for environmental authorisation to the Department of Environmental Affairs (DEA).

Eskom Distribution intends to carry out activities listed under GN R.544 (Listing Notice 1) and GN R.546 (Listing Notice 3). The proposed project will entail the following:

- The establishment of a new 132 kV power line between the existing Mbumbu traction to the proposed new Tsakani substation, a distance of approximately 17 km.
- The construction of a new 10,000m^2 substation in Tsakani

SSI Environmental Consultants have been appointed as the independent environmental assessment practitioner (EAP), to undertake the Basic Assessment study and Public Participation (PP) process for this proposed project. Therefore, SSI Environmental would like to invite you, as an interested and/or affected party (I&AP), to become actively involved in the PP process.

Please find attached herewith the project Background Information Document (BID) which provides you with more information regarding the proposed project and PP process to be undertaken. Also attached is a registration and comment form for you to complete, in order to be registered as an I&AP on the project database and to receive further information.

WHO SHOULD YOU CONTACT?

Phyllis Kalele
SSI Environmental Consultants
PO Box 25302
Monument Park 0105, Pretoria.
Tel: 012 367 5800
Fax: 012 367 5878
E-mail:phyllisk@ssi.co.za

SSI Environmental would like to thank you in advance, for taking part in the public participation process and is looking forward to receiving your valuable comments relating to the proposed project.

Regards,

Phyllis Kalele.

Akhona Mbebe
Junior Environmental Consultant

SSI
Building No. 5, Country Club Estate
21 Woodlands Drive
Woodmead, 2191
Tel: +27 (0) 11 7986000
Fax: +27 (0) 11 7986010
Tel (Direct): +27 (0) 11 7986450
Mobile: +27 (0) 79 4840607
Email: akhonam@ssi.co.za
www.ssi-dhv.com

PO Box 867
Gallo Manor, 2052
South Africa

 **Please, consider your environment.**
Before printing this e-mail ask yourself: "Do I need a hard copy?"

Kalele, Phyllis

Subject: Notification of Review of Basic AssessmentReport-Proposed Construction of 132kV Power Line from

-----Original Message-----
From: FUNEKA BONGWENI [mailto:fbongweni@ledc.co.za]
Sent: Tuesday, January 24, 2012 11:53 AM
To: Mbebe, Akhona Zandile
Subject: Re: FW: Notification of Review of Basic AssessmentReport-Proposed Construction of 132kV Power Line from

Thank you for the corresponce it is being attended to.

Regards

Funeka Portia Bongweni
Municipal Health Services
Tel 013 759 8552
cell 082 521 2628
Ehlanzeni District Municipality
8 Van Niekerk Street
Nelspruit
1200
"Be The Change You Want To See"

>>> "Mbebe, Akhona Zandile" <akhonam@ssi.co.za> 01/23/12 2:36 PM >>>

<http://www.ssi-dhv.com/>

NOTICE OF BASIC ASSESSMENT FOR THE PROPOSED CONSTRUCTION OF A 17 KM 132kV POWER LINE FROM THE EXISTING MBUMBU TRACTION TO THE NEW TSAKANI SUBSTATION, BUSHBUCKRIDGE LOCAL MUNICIPALITY, MPUMALANGA PROVINCE (DEA
REF: 12/12/20/2374)

Notice is hereby given in terms of the National Environmental Management Act, 1998 (Act No 107 of 1998) as amended and the Environmental Impact Assessment Regulations (2010) that Eskom Distribution - Northern Region has submitted an application for Environmental Authorisation to the Department of Environmental Affairs (DEA).

Eskom Distribution intends to carry out activities listed under GN
R.544 (Listing Notice 1) and GN R.546 (Listing Notice 3). The proposed Project will entail the establishment of a new 132 kV power line between the existing Mbumbu traction to the proposed new Tsakani substation, a distance of approximately 17 km. In addition, a new substation will be constructed covering an area of
1 ha.

Consequently, Eskom Distribution - Northern Region intends to Undertake a Basic Assessment (BA) Process and submit a BA report in support of The proposed project.

NOTICE OF AVAILABILITY OF DRAFT BASIC ASSESSMENT REPORT FOR PUBLIC REVIEW

All I&APs are hereby notified that the draft Basic Assessment Report
(BAR) will be available for public comment from 26 January 2012 to 09 March 2012. The draft BAR will summarise key environmental issues identified to date and will be available at the following places:

* Offices of Bushbuckridge Local Municipality, Thulamahashe
Region (Stand No. 541, Section C, Thulamahashe Shopping Complex).

* Offices of SSI Environmental (78 Kalkoen Street, Monument
Park, Pretoria).

* SSI Environmental website (

www.ssi-dhv.com/pages/enviromental/current-projects.php
<http://www.ssi-dhv.com/pages/enviromental/current-projects.php>).

Due to the large size of the whole BAR, only the main document Excluding the Appendices has been attached. Appendices can be sent separately on request.

NOTICE OF PUBLIC MEETING

All I&APs are hereby invited to attend a public meeting to be held on
25
February 2012. Attendance at the public meeting is encouraged, as the project team will be on-hand to provide you with further details regarding the project as well as to receive relevant information.
Details of the public meeting are as follows:

* Date: Saturday, 25 February 2012

* Location: Regional Chambers, Thulamahashe Regional Office
Next to Thulamahashe Shopping Complex

* Time: 09h00 for 09h30

Should you wish to attend the public meeting, please RSVP as soon as possible to the contact person provided below.

A visit to the proposed site will be conducted on Friday, 24 February 2012. Meeting point for departure will be the Thulamahashe Stadium at 14h00; should you wish to attend the site visit, kindly make your own transport arrangements.

WHO SHOULD YOU CONTACT?

SSI Environmental Consultants is the appointed independent Environmental Assessment Practitioner (EAP), undertaking the required Basic Assessment and Public Participation process for the project. To register as an Interested and Affected Party (I&AP) and to obtain more details about the project, please submit your name, contact information and interest in the project to:

Phyllis Kalele

SSI Environmental

Tel: 012 367 5800

Fax: 012 367 5878

Email: phyllisk@ssi.co.za

BASIC ASSESSMENT AND ENVIRONMENTAL MANAGEMENT PROGRAMME FOR THE PROPOSED CONSTRUCTION OF A NEW 132 KV POWER LINE FROM THE EXISTING MBUMBU TRACTION SUBSTATION TO THE PROPOSED NEW TSAKANI SUBSTATION
PUBLIC PARTICIPATION PROCESS

REGISTRATION AND COMMENT FORM

Please **complete** in full and return to:

Phyllis Kalele

PO Box 25302, Monument Park, 0105 ☎ Phone: (012) 367 5800

E-mail:phyllisk@ssi.co.za Fax: (012) 367 5878

TITLE (Prof/Mr/Mrs)	Mrs	FIRST NAME	Nare Evelyn
SURNAME	Khosa		
CAPACITY (Landowner, member etc.)	Environmental Health Practitioner		
ORGANISATION (if applicable)	Ehlanzeni District Municipality		
POSTAL ADDRESS		POSTAL CODE	
TEL:		CELL:	0828505189
FAX:		E-MAIL:	ekhosa@edc.co.za

1. What is your main area of interest with regards to the proposed project?

.....

.....

2. Are there any concerns you would like to raise, at this stage, regarding the proposed project? Detailed document that addresses the following:
(1) Dust control (2) Noise control (3) Waste management (4) Water Pollution control (5) Ablution facilities for your personnel (6) Approved building plans from local authority.

3. Are there any additional role-players whom we should involve in the process? **YES/NO**

If "**yes**", please provide us with their contact details (Name, address & telephone no):

.....

.....

NAME: Evelyn Khosa	**SIGNATURE:**

THANK YOU FOR YOUR TIME

Kalele, Phyllis

From: EVELYN KHOSA [EKHOSA@ledc.co.za]
Sent: 11 November 2011 10:35 AM
To: Kalele, Phyllis
Subject: RE: NEW TSAKANE SUBSTATION COMMENTS- MPUMALANGA

Hi,

I did manage to locate the area. Thank you so much. Looking forward for detailed document.

Thanks

Evelyn

>>> "Kalele, Phyllis" <Phyllisk@ssi.co.za> 11/02/11 9:01 AM >>>
Dear Evelyn,

Thanks for the registration form. Did you manage to locate the point where the substation will be located?

We shall inform you in time when the draft Basic Assessment Report will be available for review.

Regards,

Phyllis.

-----Original Message-----
From: EVELYN KHOSA [mailto:EKHOSA@ledc.co.za]
Sent: 01 November 2011 11:36 AM
To: Kalele, Phyllis
Subject: NEW TSAKANE SUBSTATION COMMENTS- MPUMALANGA

Hi Phyllis

kindly receive attached comments regarding New Tsakani area substation.
Foward detailed document once completed.

Regards

Evelyn Khosa
Environmental Health Practitioner
Ehlanzeni District Municipality
0828505189
ekhosa@ledc.co.za

EHLANZENI
DISTRICT MUNICIPALITY

Enquiries: D.P. Masondo
Tel No: 0137598500
Cell No: 0828495994
Fax: 0866572624

09 March 2012

SSI Engineers and Environmental Companies
P.O. Box 25302
Monument Park
0105

Attention: Phyllis Kalele

APPLICATION FOR THE PROPOSED CONSTRUCTION OF NEW 132KV POWER LINE FROM THE EXISTING MBUMBU TRACTION SUBSTATION TO THE PROPOSED NEW TSAKANI SUBSTATION

Inspection of the proposed development site was carried out on the 28th of February 2012, and our comments are detailed hereunder.

Ehlanzeni District Municipality has no objection to the proposed development on condition that the following requirements are complied with during the construction/installation of the power lines:

1. WATER SUPPLY

1.1 Potable water for drinking and cleansing purposes must be provided for the construction workers.

APPLICATION FOR THE PROPOSED CONSTRUCTION OF NEW 132KV POWER LINE FROM THE EXISTING MBUMBU TRACTION SUBSTATION TO THE PROPOSED NEW TSAKANI SUBSTATION

2. ENVIRONMENTAL POLLUTION CONTROL

2.1 Toilet Facilities

(a) Temporary toilets must be provided for the construction workers. If chemical toilets are used, the contents thereof must be disposed of in an approved sewage treatment works, permission of which must be obtained from the relevant local municipality.

2.2 Waste Management

(a) Waste water generated at the site must be disposed of into septic tanks and french drains to prevent surface and ground water pollution.

(b) Refuse generated at the site must be collected, stored in closeable refuse bins and disposed of in an approved landfill site.

(c) Hazardous waste (used oil, diesel, petrol, paraffin, cement, etc.) must be collected, stored in appropriate containers and disposed of in an approved facility.

2.3 Air Quality Management

(a) Dust generation on that the roads and the construction site must be appropriately and satisfactorily mitigated.

(b) Noise that will be generated by machines, vehicles and any other sources must be appropriately and satisfactorily mitigated.

2.4 Management of Chemicals

(a) A properly constructed storage facility must be provided where chemicals and other hazardous materials will be kept under lock and key.

3. HEALTH AND SAFETY

(a) Construction workers must be provided with appropriate personal protective equipment. Education and training on the use of such equipment must be given to the construction workers.

APPLICATION FOR THE PROPOSED CONSTRUCTION OF NEW 132KV POWER LINE FROM THE EXISTING MBUMBU TRACTION SUBSTATION TO THE PROPOSED NEW TSAKANI SUBSTATION

4. EDUCATION AND TRAINING

(a) Education and training on handling of chemicals and other hazardous materials, health and hygiene and environmental management must be given to all construction workers including management.

Further requirements may be added as and when necessary.

Yours Faithfully

D.P. MNISI
MANAGER: PLANNING, MUNICIPAL HEALTH AND ENVIRONMENTAL MANAGEMENT

09/03/2012
DATE:

SSI
A DHV COMPANY
Linking People
Promoting Growth

TRANSPORT
WATER
ENERGY AND RESOURCES
BUILDINGS AND STRUCTURES
ENVIRONMENTAL
PROJECT AND CONSTRUCTION MANAGEMENT

7 June 2012

Dudu Masondo
Planning, Municipal Health & Environmental Management
Ehlanzeni District Municipality
PO Box 3333
Nelspruit, 1200

Dear Madam,

RE: BASIC ASSESSMENT FOR THE PROPOSED CONSTRUCTION OF A 17 KM 132kV POWER LINE FROM THE EXISTING MBUMBU TRACTION TO THE NEW TSAKANI SUBSTATION, BUSHBUCKRIDGE LOCAL MUNICIPALITY, MPUMALANGA - (DEA REF: 12/12/20/2374)

Please receive herewith our confirmation of receipt of your email received on 9 March 2012. Your comments have been noted and have been addressed as follows.

1. *Water Supply*
   Potable water for drinking and cleaning must be provided for the construction workers.

   Prior to construction, an appropriate Contractor will be appointed and an area will be identified for the establishment of a construction camp. The construction camp will have potable drinking water for construction workers.

2. *Toilet Facilities*
   Temporary toilets must be provided for the construction workers. If chemical toilets are used, the contents thereof must be disposed of at an approved sewage treatment works, permission must be obtained from the relevant local municipality.

   The contractor shall install mobile chemical toilets on site that will be emptied regularly by the service provider and disposed of at an appropriate treatment facility.

3. *Waste Management*
   a) *Wastewater generated at the site must be disposed of into septic tanks and French drains to prevent surface and groundwater pollution.*
   b) *Refuse generated at the site must be collected, stored in closable refuse bins and disposed of at an approved landfill site.*
   c) *Hazardous waste (used oil, diesel, petrol, paraffin, cement etc.) must be collected, stored in appropriate containers and disposed off in an approved facility.*

   The appropriate waste management measures are included in Section 5.13 of the EMPr.

4. *Air Quality Management*
   Dust generation on the roads and the construction site must be appropriately and satisfactorily mitigated.
   The appropriate air quality management measures are included in Section 5.9 of the EMPr.

5. *Noise Management*
   Noise that will be generated by machines, vehicles and any other sources must be appropriately and satisfactorily mitigated.

   The appropriate noise management measures are included in Section 5.10 of the EMPr.

6. *Management of chemicals*
   A properly constructed storage facility must be provided where chemicals and other hazardous materials will be kept under lock and key.

   The appropriate management measures for the handling of hazardous chemicals are included in Section 5.14 of the EMPr.

7. *Education and Training*
   Education and training on handling of chemicals and other hazardous materials, health and hygiene and environmental management must be given to all construction workers including management.

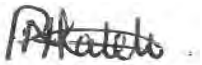
   The Contractor will also ensure that his/her staff are made aware of the health risks associated with any hazardous substances used and provide staff with the necessary training. MSDSs will also be kept on site. The Contractor will also provide construction staff with the appropriate protective clothing/equipment.

We would like to inform you that all comments raised by interested and/or affected parties (I&APs), have been captured in the Issues Trail, which forms part of the final Basic Assessment Report (BAR).

The dates of the review period for the final BAR will be communicated in due course.

Please accept herewith our appreciation for participating in the EIA process and being part of the public participation process. If you require any further information please do not hesitate to contact me.

Kind regards,



Phyllis Kalele
SSI Environmental
Tel: 012 367 5916

BASIC ASSESSMENT AND ENVIRONMENTAL MANAGEMENT PROGRAMME FOR THE PROPOSED CONSTRUCTION OF A NEW 132 KV POWER LINE FROM THE EXISTING MBUMBU TRACTION SUBSTATION TO THE PROPOSED NEW TSAKANI SUBSTATION
PUBLIC PARTICIPATION PROCESS

REGISTRATION AND COMMENT FORM

Please **complete** in full and return to:

Phyllis Kalele

PO Box 25302, Monument Park, 0105 ☎ Phone: (012) 367 5800

E-mail:phyllisk@ssi.co.za Fax: (012) 367 5878

TITLE (Prof/Mr/Mrs)	**Mr**	FIRST NAME	**Silence Jerry**
SURNAME	**Mathebula**		
CAPACITY (Landowner, member etc.)	**Interest group**		
ORGANISATION (if applicable)	**DARDLA (THULAMAHASHE DISTRICT OFFICE)**		
POSTAL ADDRESS	**P. OBOX 3933, Acornhoek**	POSTAL CODE	**1360**
TEL:	**087 350 4969**	CELL:	**072 796 1729**
FAX:	**N/A**	E-MAIL:	**silencemathebula@yahoo.com**

1. What is your main area of interest with regards to the proposed project?

.....

*My main area of interest is where the **New Tsakani Eskom Sub-station** which is going to be built.*

2. Are there any concerns you would like to raise, at this stage, regarding the proposed project?

Yes, the concern is that from the site visit that we had on the 24th February 2012, there were no members of the affected parties/ individual groups to give their views during the mini-discussions

that we had.

Another thing is that, the proposed site,(which is still subject to be negotiated for approval) is within the expanding Agricultural Land of the nearby community. So this means that the community around the proposed site need to be consulted and a certain portion need to be reserved/remain untouched for the purpose of the proposed development. This means that there should be an agreement between the farmers (particularly farmers association) and the developer with regard to the available left piece of land which is currently covered by the “Circle bos” species.

3. Are there any additional role-players whom we should involve in the process? **YES/NO**

If **“yes”**, please provide us with their contact details (Name, address & telephone no):

.....

Yes, The Hluvukani Regional Municipal, CDF, CPF, LandCare committee, Head-man (Induna) Ward clr and the farmers committee. (Contact details for the above mentioned structures, (except for the LandCare committee and farmers committee which can be obtain from Thulamahashe Agricultural office: Ms Zanele Mpangane: 082 805 1076/ Silence Mathebula 072796 1729), can be obtain from Hluvukani Municipal Regional office.

NAME: Silence Jerry mathebula	**SIGNATURE:**

THANK YOU FOR YOUR TIME

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TRANSPORT
WATER
ENERGY AND RESOURCES
BUILDINGS AND STRUCTURES
ENVIRONMENTAL
PROJECT AND CONSTRUCTION MANAGEMENT

7 June 2012

Silence Mathebula
Thulamahashe District Office
DARDLA
PO Box 3933
Acornhoek, 1360
Mpumalanga

Dear Sir,

RE: BASIC ASSESSMENT FOR THE PROPOSED CONSTRUCTION OF A 17 KM 132kV POWER LINE FROM THE EXISTING MBUMBU TRACTION TO THE NEW TSAKANI SUBSTATION, BUSHBUCKRIDGE LOCAL MUNICIPALITY, MPUMALANGA - (DEA REF: 12/12/20/2374)

Please receive herewith our confirmation of receipt of your email received on 9 March 2012. Your comments have been noted and have been addressed as follows.

1. *Your main area of interest is the site selected for the proposed Tsakani substation.*
   From the site visit conducted on 24 February 2012, there were no members of the affected parties / individuals groups to give their views during the discussions that were held.

   The proposed site of the substation (which is still subject to be negotiated for approval) is within the expanding agricultural land of the nearby community. This therefore means that the community around the proposed site need to be consulted and a certain portion need to be reserved/remain untouched for the purpose. There should be an agreement between the farmers (particularly Farmers Associations) and the developer with regards to the available piece of land which is currently covered by the "Circle bos" species

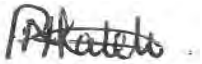
   The following additional role-players should be involved in the process: Hluvukani Region Municipal Office, Community Development Forum, Community Police Forum, Land Care Committee, Headman (Induna), Ward Councillor and the Farmers Committee.

   A meeting was conducted with the Mnisi Tribal Authority (TA) (the TA that governs the area of the proposed Tsakani substation) Headmen and Chief Mnisi on 18 May 2012. SSI Environmental and Eskom informed the TA about the proposed project and they assured us that the proposed site is available for the project and they welcome the entire proposed development wholeheartedly.

We would like to inform you that all comments raised by interested and/or affected parties (I&APs), have been captured in the Issues Trail, which forms part of the final Basic Assessment Report (BAR). The dates of the review period for the final BAR will be communicated in due course.

Please accept herewith our appreciation for participating in the EIA process and being part of the public participation process. f you require any further information please do not hesitate to contact me.

Kind regards,



Phyllis Kalele
SSI Environmental
Tel: 012 367 5916

MPUMALANGA PROVINCIAL GOVERNMENT

Building No. 4
No. 7 Government Boulevard
Riverside Park Extension 2
Nelspruit
1200
South Africa

Private Bag X 11215
Nelspruit, 1200
Tel: 013 766 4004
Fax: 013 766 4614
Int: +27 13 766 4004
Int: +27 13 766 4614

Department of Economic Development, Environment and Tourism

Litiko Letekutfutfukiswa
Kwetemmotfo, Simondzvo neteku Vakasha

Umngango WezokuThuthukiswa
KoMnotho, iBhoduluko nezamaVakatjho

Departement van Ekonomiese
Ontwikkeling, Omgewing en Toerisme

Enq: Robyn Luyt
Tel: (013) 766 4826
Ref: 17/2/5/E-168

Phyllis Kalele
SSI Environmental
P.O. Box 25302
Monument Park
0105

Fax no: (012) 367 5916
Email: phyllisk@ssi.co.za

BASIC ASSESSMENT REPORT: CONSTRUCTION OF A 132KV POWER LINE BETWEEN FROM THE EXISTING MBUMBU TRACTION SUBSTATION TO THE PROPOSED TSAKANI SUBSTATION, BUSHBUCKRIDGE LOCAL MUNICIPALITY, MPUMALANGA PROVINCE

The Department confirms having received the basic assessment report for the abovementioned project from SSI Environmental on 24 February 2012 for comment.

After reviewing the information provided, this Department has the following comments:

1. It is indicated in the basic assessment report that, for all three alternatives, the farms Oakley 285 KU and Ronaldsey 283 KU will be traversed by the proposed power line. However, according to our records, these farms do not fall within the proposed routes. Our records also show that these two farms are located within 10km of the Kruger National Park, in which case, activities listed in GNR 546 may be applicable. The affected farm names must be verified.
2. This Department would not support any construction activities within the identified wetland areas, or within 50m from the edge of the Sephiriri River. It is recommended that such restrictions must be applied when the proposed development is considered for approval.
   The following additional conditions are also recommended:
   - 2.1 The applicant must appoint an independent ECO that will have the responsibility of monitoring and reporting on compliance with the conditions of the environmental authorisation as well as monitoring and reporting on the implementation of the approved EMP.
   - 2.2 The ECO must be appointed before the start of construction and the Department must be notified of such an appointment for communication purposes.
   - 2.3 The ECO must accompany the surveyor on site to ensure that no pylons are located within any wetland / watercourse / stream bank, or on any sensitive rocky outcrops.
   - 2.4 The ECO must oversee all vegetation clearing operations and the identification and protection / relocation / removal of plant species of conservation importance.
   - 2.5 Prior to the commencement of construction, the ECO must identify any breeding bird species that may be affected by the construction of the powerline, and case specific recommendations must be made accordingly so that breeding is not negatively impacted in any way.

2.6 The ECO must remain employed until all rehabilitation measures as well as site clean-up are completed and the site is handed over to the applicant by the contractor for operation.

2.7 Before construction activities may commence, plant species of conservation importance (i.e. protected species, red data species and endemic species) must be identified and marked and left undisturbed, and where disturbance cannot be avoided, permits for their damage, relocation or removal must be obtained from the relevant authority. Commencement for the purposes of this condition includes bush clearing.

2.8 Scalping of vegetation on any part of the servitude is prohibited. The ECO must accompany the contractor responsible for vegetation clearing to ensure that conditions pertaining to protected plant species and the clearing of vegetation are complied with.

2.9 De-stumping, scalping or uprooting of riparian or wetland vegetation is prohibited, and no vegetation clearing is permitted across ravines and gullies.

2.10 The contractor responsible for vegetation clearing must have a valid herbicide applicators license, and the application of herbicide may only take place after consultation with the ECO.

2.11 All towers must be fitted with the standard Eskom Bird Perch or Perching Bracket to provide safe perching substrate at the top of the pylons well clear of dangerous hardware.

2.12 'High risk sections' (i.e. sections of the line that will cross any watercourse / wetland / dam, and sections of the line within 250m of a watercourse / wetland / dam) of the earth wire must be marked with a suitable anti-collision marking device in order to increase its visibility and reduce bird collisions.

2.13 Breeding sites of birds must be kept intact, and breeding pairs may not be disturbed in any way.

2.14 No temporary road crossings may be constructed through any watercourse or wetland.

Please contact this office for any further enquiries.

Sincerely,

Ms NV MDHLULI
DD: ENVIRONMENTAL IMPACT MANAGEMENT
DATE: 22/03/2012

24 April 2012

Robyn Luyt
Environmental Impact Management
MDEDET
Private Bag X11215
Nelspruit, 1200

Dear Madam,

RE: BASIC ASSESSMENT FOR THE PROPOSED CONSTRUCTION OF A 17 KM 132kV POWER LINE FROM THE EXISTING MBUMBU TRACTION TO THE NEW TSAKANI SUBSTATION, BUSHBUCKRIDGE LOCAL MUNICIPALITY, MPUMALANGA - (DEA REF: 12/12/20/2374)

Please receive herewith our confirmation of receipt of your email received on 22 March 2012. Your comments have been noted and have been addressed as follows.

1. *It is indicated in the Basic Assessment report that, for all three alternatives, the farms Oakley 285 KU and Ronaldsey 283 KU will be traversed by the proposed power line. However, according to our records, these farms do not fall within the proposed routes. Our records also show that these two farms are located within 10 km of the Kruger National Park, in which case activities listed in GNR 546 may be applicable. The affected farms must be verified.*

   None of the routes will traverse farms Oakley 285 KU and Ronaldsey 283 KU and the BAR has been amended accordingly. Thank you for pointing out the discrepancy.

   Additionally, the ecological assessment survey established that none of the servitudes for the proposed red and green alternatives traverses sensitive geographical areas that would trigger Listing Notice 3 activities even though activities 4,13,14 and 19 were applied for.

2. *This Department would not support any construction activities within the identified wetland areas, or within 50m from the edge of the Sephiriri River. It is recommended that such restrictions must be applied when the proposed development is considered for approval.*
   The BA report (under assessment of impacts) and EMPr (under construction phase) specifies that a buffer zone of 50 m should be adopted for the Sephiriri river and 32 m for other wetlands / Sand river seasonal tributaries. No construction activities will be allowed within these buffers.

   The recommended additional conditions are noted and the EMPr will be updated to address the conditions that are not included.

We would like to inform you that all comments raised by interested and/or affected parties (I&APs), will be captured in the Issues Trail, which will form part of the final draft Basic Assessment Report.

Due to new engineering information having come to light later, the draft BA report will be updated and made available for another round of public review. The dates of the review period will be communicated in due course.

If you require any further information please do not hesitate to contact me.

Kind regards,

Phyllis Kalele
SSI Environmental
Tel: 012 367 5916

BUSHBUCKRIDGE LOCAL MUNICIPALITY
ECONOMIC DEVELOPMENT, PLANNING AND ENVIRONMENT

Tel no: 013 795 5630
Fax no: 086 241 6765

Enquiries: J.T Ndlovu

Private Bag X 9308
BUSHBUCKRIDGE
1280
17 MAY 2012

Ref: 15/5/2/1/2

ATTENTION: Phyllis Kalele
SSI Engineers and Environmental Consultants
PO Box 1567
Nelspruit
1200

Fax: 012 367 5878

Dear Sir / Madam

SUBJECT: DRAFT BASIC ASSESSMENT REPORT FOR THE 132 KV POWERLINE FROM THE EXISTING MBUMBU TRACTION SUBSTATION TO THE PROPOSED TSAKANI SUBSTATION, BUSHBUCKRIDGE LOCAL MUNICIPALITY

The Environmental Management Unit acknowledges receipt of the Draft Basic Assessment Report for the above mentioned application.

The Draft Basic Assessment Report has been reviewed and herewith comments:

1. Bushbuckridge is having the challenge of providing electricity in some villages due to overloaded substations, hence the construction of new substation is recommended and it will benefit the community of Bushbuckridge.

2. The project is supported as the current substation at Thulamahashe is overloaded and the new substation will assist in reducing electrification backlogs within Bushbuckridge Municipality.

Yours sincerely

PP

H.M NONYANE
MANAGER: ENVIRONMENTAL MANAGEMENT

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ENERGY AND RESOURCES
BUILDINGS AND STRUCTURES
ENVIRONMENTAL
PROJECT AND CONSTRUCTION MANAGEMENT

7 June 2012

Helen Nonyane
Environmental Management
Bushbuckridge Local Municipality
Private Bag X9308
Bushbuckridge, 1280
Mpumalanga.

Dear Madam,

RE: BASIC ASSESSMENT FOR THE PROPOSED CONSTRUCTION OF A 17 KM 132kV POWER LINE FROM THE EXISTING MBUMBU TRACTION TO THE NEW TSAKANI SUBSTATION, BUSHBUCKRIDGE LOCAL MUNICIPALITY, MPUMALANGA - (DEA REF: 12/12/20/2374)

Please receive herewith our confirmation of receipt of your fax received on 18 May 2012. Your comments have been noted and have been addressed as follows.

Bushbuckridge Local Municipality is challenged with providing electricity in some villages due to overloaded substations. Hence the construction of the new substation is recommended as it will reduce electrification backlogs and it will benefit the community.

The main goals of constructing the power line and substation are to:

- Split the current overloaded power lines in the area.
- Provide sufficient capacity for new clients and improve the reliability of energy supply.
- De-load the currently overloaded infrastructure in the area, thus reducing interruptions during supply.

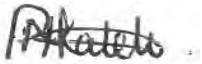
The community will benefit by having reliable electricity supply which will in turn stimulate economic development in the area. The community as well as Mnisi and Amashangana Tribal Authorities welcome and support the project.

The Basic Assessment study conducted established that the positive impacts of the proposed development will outweigh the potential negative impacts. An Environmental Management Programme (EMPr) has been compiled that outlines mitigation measures required to be implemented during planning, design, construction, operation and decommissioning phases in order to manage and minimise the extent of negative environmental impacts and maximise positive impacts.

We would like to inform you that all comments raised by interested and/or affected parties (I&APs), have been captured in the Issues Trail, which forms part of the final Basic Assessment Report (BAR). The dates of the review period for the final BAR will be communicated in due course.

Please accept herewith our appreciation for participating in the EIA process and being part of the public participation process. If you require any further information please do not hesitate to contact me.

Kind regards,



Phyllis Kalele
SSI Environmental
Tel: 012 367 5916

APPENDIX E7

NOTIFICATION OF LAND OWNERS

1. Mr. Mish Khoza
Department of Rural Development and Land Reform
Private Bag X11305
Nelspruit, 1200
Mpumalanga

REGISTERED LETTER
(with a domestic insurance option)
ShareCall 0860 111 502 www.sapo.co.za
RD 392 400 359 ZA
CUSTOMER COPY 301028R

2. Mr. Andries Mnisi
Municipal Manager
Bushbuckridge Local Municipality
Private Bag X9308
Bushbuckridge, 1280
Mpumalanga

REGISTERED LETTER
(with a domestic insurance option)
ShareCall 0860 111 502 www.sapo.co.za
RD 392 400 345 ZA
CUSTOMER COPY 301028R

Kalele, Phyllis

From: Mbebe, Akhona Zandile
Sent: Tuesday, October 04, 2011 10:07 AM
To: 'mnisiandries@bushbuckridge.gov.za'
Subject: FW: Eskom Mbumbu-Tsakani

04 October 2011

Dear Interested and Affected Party,

BASIC ASSESSMENT FOR THE PROPOSED CONSTRUCTION OF A 17 KM 132kV POWER LINE FROM THE EXISTING MBUMBU TRACTION TO THE NEW TSAKANI SUBSTATION, BUSHBUCKRIDGE LOCAL MUNICIPALITY, MPUMALANGA PROVINCE (DEA REF: 12/12/20/2374)

Notice is hereby given in terms of the National Environmental Management Act, 1998 (Act No 107 of 1998) as amended and the Environmental Impact Assessment Regulations (2010) that Eskom Distribution-Northern Region has submitted an application for environmental authorisation to the Department of Environmental Affairs (DEA).

Eskom Distribution intends to carry out activities listed under GN R.544 (Listing Notice 1) and GN R.546 (Listing Notice 3). The proposed project will entail the following:

- The establishment of a new 132 kV power line between the existing Mbumbu traction to the proposed new Tsakani substation, a distance of approximately 17 km.
- The construction of a new 10,000m^2 substation in Tsakani

SSI Environmental Consultants have been appointed as the independent environmental assessment practitioner (EAP), to undertake the Basic Assessment study and Public Participation (PP) process for this proposed project. Therefore, SSI Environmental would like to invite you, as an interested and/or affected party (I&AP), to become actively involved in the PP process.

Please find attached herewith the project Background Information Document (BID) which provides you with more information regarding the proposed project and PP process to be undertaken. Also attached is a registration and comment form for you to complete, in order to be registered as an I&AP on the project database and to receive further information.

WHO SHOULD YOU CONTACT?

Phyllis Kalele
SSI Environmental Consultants
PO Box 25302
Monument Park 0105, Pretoria.
Tel: 012 367 5800
Fax: 012 367 5878
E-mail:phyllisk@ssi.co.za

SSI Environmental would like to thank you in advance, for taking part in the public participation process and is looking forward to receiving your valuable comments relating to the proposed project.

Regards,
Phyllis Kalele.

Akhona Mbebe
Junior Environmental Consultant

SSI
Building No. 5, Country Club Estate
21 Woodlands Drive
Woodmead, 2191
Tel: +27 (0) 11 7986000
Fax: +27 (0) 11 7986010
Tel (Direct): +27 (0) 11 7986450
Mobile: +27 (0) 79 4840607
Email: akhonam@ssi.co.za
www.ssi-dhv.com

PO Box 867
Gallo Manor, 2052
South Africa

 **Please, consider your environment.**
Before printing this e-mail ask yourself: "Do I need a hard copy?"

Kalele, Phyllis

From: Mbebe, Akhona Zandile
Sent: 19 January 2012 12:22 PM
To: Kalele, Phyllis
Subject: FW: Return receipt
Attachments: ATT777650.txt; ATT777651.txt

Below is the delivery notification,

-----Original Message-----
From: Mail Delivery Subsystem [mailto:MAILER-DAEMON@ch1ssibme1.basel.usf.ihost.com]
Sent: Tuesday, October 04, 2011 10:10 AM
To: Mbebe, Akhona Zandile
Subject: Return receipt

The original message was received at Tue, 4 Oct 2011 10:08:34 +0200 from webmail.ssi.co.za [196.14.136.217]

----- The following addresses had successful delivery notifications ----- <mnisiandries@bushbuckridge.gov.za> (relayed to non-DSN-aware mailer)

----- Transcript of session follows ----- <mnisiandries@bushbuckridge.gov.za>... relayed; expect no further notifications

Kalele, Phyllis

From: Kalele, Phyllis
Sent: 03 November 2011 03:04 PM
To: 'mmkhoza@ruraldevelopment.gov.za'
Subject: BA FOR THE PROPOSED CONSTRUCTION OF A POWER LINE FROM THE EXISTING MBUMBU TRACTION TO THE NEW TSAKANI SUBSTATION, MPUMALANGA
Attachments: Eskom Mbumbu Final BID-03 10 11.pdf; Eskom Mbumbu Reg Comment Form.doc

Dear Interested and Affected Party,

BASIC ASSESSMENT FOR THE PROPOSED CONSTRUCTION OF A 17 KM 132kV POWER LINE FROM THE EXISTING MBUMBU TRACTION TO THE NEW TSAKANI SUBSTATION, BUSHBUCKRIDGE LOCAL MUNICIPALITY, MPUMALANGA PROVINCE (DEA REF: 12/12/20/2374)

Notice is hereby given in terms of the National Environmental Management Act, 1998 (Act No 107 of 1998) as amended and the Environmental Impact Assessment Regulations (2010) that Eskom Distribution-Northern Region has submitted an application for environmental authorisation to the Department of Environmental Affairs (DEA).

Eskom Distribution intends to carry out activities listed under GN R.544 (Listing Notice 1) and GN R.546 (Listing Notice 3). The proposed project will entail the following:

- The establishment of a new 132 kV power line between the existing Mbumbu traction to the proposed new Tsakani substation, a distance of approximately 17 km.
- The construction of a new 10,000m^2 substation in Tsakani

SSI Environmental Consultants have been appointed as the independent environmental assessment practitioner (EAP), to undertake the Basic Assessment study and Public Participation (PP) process for this proposed project. Therefore, SSI Environmental would like to invite you, as an interested and/or affected party (I&AP), to become actively involved in the PP process.

Please find attached herewith the project Background Information Document (BID) which provides you with more information regarding the proposed project and PP process to be undertaken. Also attached is a registration and comment form for you to complete, in order to be registered as an I&AP on the project database and to receive further information.

WHO SHOULD YOU CONTACT?

Phyllis Kalele
SSI Environmental Consultants
PO Box 25302
Monument Park 0105, Pretoria.
Tel: 012 367 5800
Fax: 012 367 5878
E-mail:phyllisk@ssi.co.za

SSI Environmental would like to thank you in advance, for taking part in the public participation process and is looking forward to receiving your valuable comments relating to the proposed project.

Regards,
Phyllis Kalele.

Kalele, Phyllis

From: Kalele, Phyllis
Sent: 07 December 2011 02:10 PM
To: 'Kobus.Human@transnet.net'; 'Hansie.Marais@transnet.net'
Cc: Prashika
Subject: RE: Proposed Eskom 132kV Power Line from Mbumbu Traction to proposed Tsakani Substation
Attachments: Eskom Mbumbu Final BID-03 10 11.pdf; Eskom Mbumbu Tsakani-Registration and Comment Form.doc

Dear Interested and Affected Party,

BASIC ASSESSMENT FOR THE PROPOSED CONSTRUCTION OF A 17 KM 132kV POWER LINE FROM THE EXISTING MBUMBU TRACTION TO THE NEW TSAKANI SUBSTATION, BUSHBUCKRIDGE LOCAL MUNICIPALITY, MPUMALANGA PROVINCE (DEA REF: 12/12/20/2374)

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Fax: 012 367 5878
E-mail:phyllisk@ssi.co.za

SSI Environmental would like to thank you in advance, for taking part in the public participation process and is looking forward to receiving your valuable comments relating to the proposed project.

Regards,
Phyllis Kalele.

From: Kobus.Human@transnet.net [mailto:Kobus.Human@transnet.net]
Sent: 07 December 2011 01:42 PM
To: Kalele, Phyllis; Hansie.Marais@transnet.net
Subject: RE: Proposed Eskom 132kV Power Line from Mbumbu Traction to proposed Tsakani Substation

Hi Phyllis,
You can send it to me or and Hansie Marais

Kobus Human|Portfolio Manager|Transnet Property|Johannesburg and Pretoria|40th Floor Carlton Centre 150 Commissioner Street Johannesburg|Tel:011 308 1637|Fax:086 679 5323|Mobile:083 453 8821|e-mail:Kobus.Human@transnet.net

---

From: Kalele, Phyllis [mailto:Phyllisk@ssi.co.za]
Sent: 07 December 2011 12:12 PM
To: Kobus Human *Transnet Property GP
Subject: Proposed Eskom 132kV Power Line from Mbumbu Traction to proposed Tsakani Substation
Importance: Low

Dear Kobus,

We are currently conducting the Basic Assessment process for the above-mentioned proposed Eskom project in Bushbuckridge municipality, Mpumalanga.

Eskom proposes to construct a 17 kilometre 132kV power line which will traverse a number of farms and

one of these farms belongs to Transnet. The farm is Portion 1 of Burlington 217KU. We would like to send a notification of Public Participation to Transnet and would greatly appreciate your assistance in providing us with a contact person for Transnet in that area.

Regards,

Phyllis Kalele
Environmental Consultant

SSI
Fountain Square
78 Kalkoen Street
Pretoria, 0181
Tel: +27 (0) 12 3675800
Fax: +27 (12) 367 5878
Tel (Direct): +27 (12) 367 5916
Email: Phyllisk@ssi.co.za
www.ssi-dhv.com

PO Box 25302
Pretoria, 0105
South Africa

Please, consider your environment.
Before printing this e-mail ask yourself: "Do I need a hard copy?"

Tracking:

Recipient	Delivery
'Kobus.Human@transnet.net'	
'Hansie.Marais@transnet.net'	
Prashika	
Reddy, Prashika	Delivered: 2011/12/07 02:10 PM

BASIC ASSESSMENT PROCESS

CONSTRUCTION OF A NEW 132 kV POWER LINE FROM THE EXISTING MBUMBU TRACTION SUBSTATION TO THE PROPOSED NEW TSAKANI SUBSTATION, MPUMALANGA PROVINCE

OCTOBER 2011

BRIEFING PAPER

WHAT DOES THIS DOCUMENT TELL YOU?

This document aims to provide you, as an Interested and Affected Party (I&AP), with background information regarding the proposed construction of a new 132 kV power line from the existing Mbumbu traction substation to the proposed new Tsakani substation in Mpumalanga. The document also provides information regarding the Basic Assessment (BA) process to be undertaken. Furthermore, the document advises how you can become involved in the project, receive information and/or raise issues, which may concern and/or be of interest to you. The sharing of information forms the basis of the public participation process and offers you the opportunity to become actively involved in the project from the outset. Public participation plays an important role in informing the basic assessment process as input from I&APs ensures that all potential issues are considered within the study.

WHAT IS THE PROPOSED PROJECT ALL ABOUT?

In order to be able to adequately provide for the growing electricity demand, Eskom Distribution proposes to construct the following:

- A new 132 kV line from the existing Mbumbu traction substation to the proposed Tsakani substation.
- The construction of the new Tsakani substation (1ha) to supply power to the surrounding communities.

The structures proposed to be used for the 132 kV distribution line are the 132 kV steel monopole structures (see **Figure 1**). These poles weigh approximately 1200 kg each and vary in height from approximately 17.4 m to 21 m. The size of the footprint depends on the suspension and angle strain pole used as bend / strain structures. The average span between two towers is 200 m, but can vary between 250 m and 375 m depending on the ground profile and the terrain to be spanned.

The self-supporting structure (suspension pole) is typically used along the straight sections of the power line, while the guyed intermediate or guyed suspension and angle strain structures are used where there is a bend in the power line alignment.

Figure 1: Monopole structures

ALTERNATIVES

In terms of the EIA Regulations (2010), feasible alternatives are required to be considered within the BA process. All identified, feasible alternatives are required to be evaluated in terms of social, biophysical, economic and technical factors. Two alternatives will be considered for the establishment of the 132 kV distribution line and proposed Tsakani substation in the (see the attached Locality Map).

WHAT ARE THE POTENTIAL ENVIRONMENTAL IMPACTS ASSOCIATED WITH THE PROPOSED PROJECT?

The potential environmental impacts associated with the project have been identified. As part of the Basic Assessment, these potential impacts will be assessed through the following specialist studies:

- **Ecological survey**
- **Wetland assessment**
- **Avifaunal assessment**
- **Heritage assessment**
- **Visual assessment**

WHY ARE ENVIRONMENTAL STUDIES NEEDED?

In terms of the Environmental Impact Assessment (EIA) Regulations Government Notice. R. 543, R. 544 and R. 546 of 2010 published in terms of Section 24(5) read with Section 44 of the National Environmental Management Act (NEMA) (Act No 107 of 1998), Eskom requires authorization from the Department of Environmental Affairs for the undertaking of the proposed project. Activities under Government Notice R. 544 and R. 546

(also referred to as Listing Notice 1 and 3 respectively) may have a detrimental effect on the environment, hence a BA process, as prescribed in the EIA Regulations (2010) will have to be undertaken.

A Basic Assessment is an effective planning and decision-making tool, which allows for the identification of potential environmental consequences associated with a proposed project, and its management through the planning process.

Eskom has appointed SSI Environmental, as the independent Environmental Assessment Practitioner (EAP), to undertake environmental studies to identify and assess all potential environmental impacts associated with the proposed project. As part of these environmental studies, all I&APs will be actively involved through a public participation process.

PUBLIC PARTICIPATION PROCESS

It is important that relevant I&APs are identified and involved in the public participation process (see **Figure 2**) from the outset of the project. To ensure effective public participation, the process includes the following steps:

STEP 1: Advertise the EIA Process (local press)
STEP 2: Register I&APs and key stakeholders on the database (on-going)
STEP 3: Consultation with, and transfer of information to I&APs through focus group meetings and public meetings
STEP 4: Invite I&AP comment and input on the BAR (40-day comment period)
STEP 5: Record all comments, issues and concerns raised by I&APs within a Comments and Responses Report, which will form an integral part of the final BAR

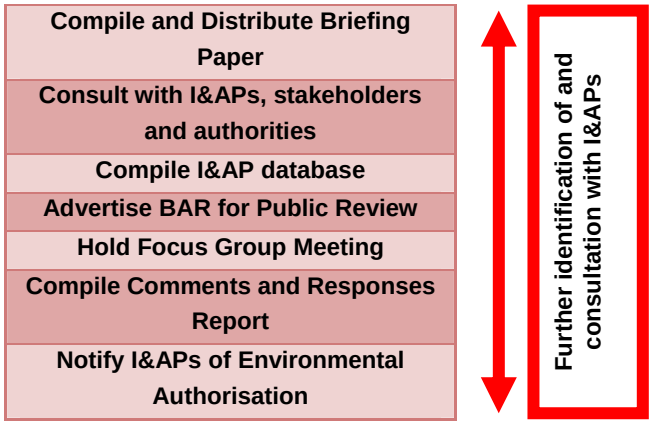

Figure 2: Public Participation Process

COMMENTS AND QUERIES

Direct all comments, queries or responses to:
SSI Environmental
Phyllis Kalele

PO Box 25302, Monument Park 0105

Phone: 012-367 5800

Fax: 012-367 5878

E-mail: phyllisk@ssi.co.za

BASIC ASSESSMENT AND ENVIRONMENTAL MANAGEMENT PROGRAMME FOR THE PROPOSED CONSTRUCTION OF A NEW 132 KV POWER LINE FROM THE EXISTING MBUMBU TRACTION SUBSTATION TO THE PROPOSED NEW TSAKANI SUBSTATION
PUBLIC PARTICIPATION PROCESS

REGISTRATION AND COMMENT FORM

Please **complete** in full and return to:

Phyllis Kalele

PO Box 25302, Monument Park, 0105 ☎ Phone: (012) 367 5800

E-mail:phyllisk@ssi.co.za Fax: (012) 367 5878

TITLE (Prof/Mr/Mrs)		FIRST NAME	
SURNAME			
CAPACITY (Landowner, member etc.)			
ORGANISATION (if applicable)			
POSTAL ADDRESS		POSTAL CODE	
TEL:		CELL:	
FAX:		E-MAIL:	

1. What is your main area of interest with regards to the proposed project?

..... …….

..... …….

2. Are there any concerns you would like to raise, at this stage, regarding the proposed project?

..... …….

..... …….

3. Are there any additional role-players whom we should involve in the process? **YES/NO**

If **"yes"**, please provide us with their contact details (Name, address & telephone no):

..... …….

..... …….

NAME:	**SIGNATURE:**

THANK YOU FOR YOUR TIME

ANDOVER 210 KU

BURLINGTON 217 KU

R/217

ISLINGTON 219 KU

CLARE 220 KU

U)TRAC 132kV

1/217

2/217

X=24185.00
Y=-2727750.00
LAT: -24° 39' 14.4", LONG: 31° 14' 20.1"

X=28728.40
Y=-2727686.36

6/225

7/225

X=32878.00
Y=-2727948.00
LAT: -24° 39' 20.3", LONG: 31° 19' 29.2"

8/225

5/225

EGLINTON 225

4/225

2/225

3/225

1/228

X=18131.0000
Y=-27308.6.0000
LAT: -24° 41' 44.9", LONG: 31° 10' 44.9"

X=23018.90
Y=-2732375.00
LAT: -24° 40' 42.1", LONG: 31° 13' 30.5"

2/228

LUDLOW 227 KU

EDINBURGH 228 KU

R/228

X=23104.14
Y=-2733129.92
LAT: -24° 42' 8.8", LONG: 31° 13' 37.2"

X=28163.00
Y=-2732308.00
LAT: -24° 41' 42.3", LONG: 31° 15' 41.9"

LEYDALE 292 KU

1/292

MBUMBU TRAC-THULAMAHASHE 132kV

R/237

ALLANDALE 237 KU

1/235

2/235

2/238

ROLLE 235 KU

R/235

ROLLE TRAC-THULAMAHASHE 132kV

NEWFOREST 234 KU

R/234

3/235

DUMFRIES 245 KU

1/264

EXETER 264 KU

MERRY PEBBLE STREAM 246 KU

1/245

REFERENCE:

- 11kV Power Line
- 11kV Cable
- 22kV Power Line
- 22kV Cable
- 22/11kV Surveyed line
- 33kV Power Line
- 44kV Power Line
- 66kV Power Line
- 88kV Power Line
- 132kV Power Line
- 275kV Power Line
- 400kV Power Line
- 765kV Power Line
- Substation
- 22kV Bend pole
- 11kV Bend pole
- Toff pole
- 22kV Transformer
- 11kV Transformer
- 22kV Metering unit
- 11kV Metering unit
- Breaker
- Mini substation
- Voltage regulator
- Link
- Cable marker

- National roads
- Main roads
- Secondary roads
- Rivers
- Streams
- Contours
- Farm boundary
- Subdivisional farm boundary

Proposed Route 1 — 1. 15.48km

Proposed Route 2 — 2. 10.26km

Proposed Route 3 — 3. 17.05km

REV	REVISION DESCRIPTION	BY	CHKD	AUTH	DATE	PROJECT NO.

Eskom Distribution

AUTH:
DATE:
CHKD:
DATE:
SCALE :
DRAWN: A. Mthethwa
DATE: 09/05/2019

Network Investigation

Mbumbu SVS - NE-STM-1002-1494-00001

WG84/31

EXTRACT OF:

SET	SHEET	REVISION

APPENDIX E8

NOTIFICATION OF WARD COUNCILLORS

TX RESULT REPORT

NAME :SSI
TEL :012 347 8378
DATE :NOV.24.2011 10:51

SESSION	FUNCTION	NO.	DESTINATION STATION	DATE	TIME	PAGE	DURATION	MODE	RESULT
0696	TX	001	0137991865	NOV.24	10:47	006	00h01min30s	ECM	OK

SSI
A DHV COMPANY

SSI Engineers and Environmental Consultants (Pty) Ltd
Reg No. 1966/001916/07

T: 012 367 5916 / F: 012 367 5878
Email: phyllisk@ssi.co.za

Linking **People**
Promoting **Growth**

Facsimile Transmission

This transmission consists of 1 page(s) including this cover sheet. If you do not receive all the pages, please call us immediately to resend.

Date: **24 November 2011**

Company:	Bushbuckridge Local Municipality		
Attention:	Ward Councillors	**Copied to:**	
Fax:	013 799 1865	**Your Ref:**	MDEDET Ref-17/2/3/GS-59
From:	Phyllis Kalele	**Our Ref:**	E02.PTA.000407

Dear Councillors,

RE: BASIC ASSESSMENT FOR THE PROPOSED CONSTRUCTION OF A 17 KM 132kV POWER LINE FROM THE EXISTING MBUMBU TRACTION TO THE NEW TSAKANI SUBSTATION, BUSHBUCKRIDGE LOCAL MUNICIPALITY, MPUMALANGA PROVINCE (DEA REF: 12/12/20/2374)

1. Councillor Renias Khumalo
2. Councillor Flomina Ntimba
3. Councillor Thandi Makhanka
4. Councillor Lydia Mabunda
5. Councillor Rodget Tshobete

Please find enclosed a notification of Public Participation process for the proposed construction of a 132kV power line.

Kind regards,

Phyllis Kalele
SSI Environmental
Tel: 012 367 5800
Fax: 012 367 5878
Email: phyllisk@ssi.co.za

SSI
A DHV COMPANY

Linking **People**
Promoting **Growth**

TRANSPORT
WATER
ENERGY AND RESOURCES
BUILDINGS AND STRUCTURES
ENVIRONMENTAL
PROJECT AND CONSTRUCTION MANAGEMENT

Botswana
Kenya
Mozambique
Zimbabwe
South Africa

November 2011

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BASIC ASSESSMENT PROCESS

CONSTRUCTION OF A NEW 132 kV POWER LINE FROM THE EXISTING MBUMBU TRACTION SUBSTATION TO THE PROPOSED NEW TSAKANI SUBSTATION, MPUMALANGA PROVINCE

OCTOBER 2011

BRIEFING PAPER

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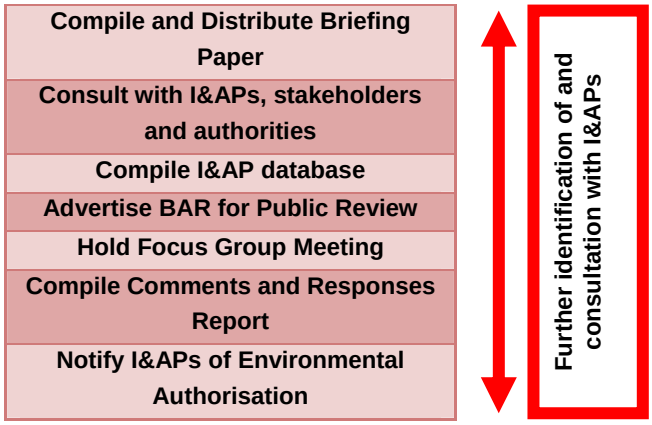

Figure 2: Public Participation Process

COMMENTS AND QUERIES

Direct all comments, queries or responses to:
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Phyllis Kalele

PO Box 25302, Monument Park 0105

Phone: 012-367 5800

Fax: 012-367 5878

E-mail: phyllisk@ssi.co.za

BASIC ASSESSMENT AND ENVIRONMENTAL MANAGEMENT PROGRAMME FOR THE PROPOSED CONSTRUCTION OF A NEW 132 KV POWER LINE FROM THE EXISTING MBUMBU TRACTION SUBSTATION TO THE PROPOSED NEW TSAKANI SUBSTATION
PUBLIC PARTICIPATION PROCESS

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Phyllis Kalele

PO Box 25302, Monument Park, 0105 ☎ Phone: (012) 367 5800

E-mail:phyllisk@ssi.co.za Fax: (012) 367 5878

TITLE (Prof/Mr/Mrs)		FIRST NAME	
SURNAME			
CAPACITY (Landowner, member etc.)			
ORGANISATION (if applicable)			
POSTAL ADDRESS		POSTAL CODE	
TEL:		CELL:	
FAX:		E-MAIL:	

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..... …….

..... …….

2. Are there any concerns you would like to raise, at this stage, regarding the proposed project?

..... …….

..... …….

3. Are there any additional role-players whom we should involve in the process? **YES/NO**

If **"yes"**, please provide us with their contact details (Name, address & telephone no):

..... …….

..... …….

NAME:	**SIGNATURE:**

THANK YOU FOR YOUR TIME

ANDOVER 210 KU

BURLINGTON 217 KU

R/217

ISLINGTON 219 KU

CLARE 220 KU

U)TRAC 132kV

1/217

2/217

X=24185.00
Y=-2727750.00
LAT: -24° 39' 14.4", LONG: 31° 14' 20.1"

X=28728.40
Y=-2727686.36

6/225

7/225

X=32878.00
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8/225

5/225

EGLINTON 225

4/225

2/225

3/225

1/228

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EDINBURGH 228 KU

R/228

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LAT: -24° 41' 42.3", LONG: 31° 15' 41.9"

LEYDALE 292 KU

1/292

MBUMBU TRAC-THULAMAHASHE 132kV

R/237

ALLANDALE 237 KU

1/235

2/235

2/238

ROLLE 235 KU

R/235

ROLLE TRAC-THULAMAHASHE 132kV

NEWFOREST 234 KU

R/234

3/235

DUMFRIES 245 KU

1/264

EXETER 264 KU

MERRY PEBBLE STREAM 246 KU

1/245

REFERENCE:

- 11kV Power Line
- 11kV Cable
- 22kV Power Line
- 22kV Cable
- 22/11kV Surveyed line
- 33kV Power Line
- 44kV Power Line
- 66kV Power Line
- 88kV Power Line
- 132kV Power Line
- 275kV Power Line
- 400kV Power Line
- 765kV Power Line
- Substation
- 22kV Bend pole
- 11kV Bend pole
- Toff pole
- 22kV Transformer
- 11kV Transformer
- 22kV Metering unit
- 11kV Metering unit
- Breaker
- Mini substation
- Voltage regulator
- Link
- Cable marker

- National roads
- Main roads
- Secondary roads
- Rivers
- Streams
- Contours
- Farm boundary
- Subdivisional farm boundary

Proposed Route 1 — 1. 15.48km

Proposed Route 2 — 2. 10.26km

Proposed Route 3 — 3. 17.05km

REV	REVISION DESCRIPTION	BY	CHKD	AUTH	DATE	PROJECT NO.

Eskom Distribution

AUTH:
DATE:
CHKD:
DATE:
SCALE :
DRAWN: A. Mthethwa
DATE: 09/05/2019

Network Investigation

Mbumbu SVS - NE-STM-1002-1494-00001

WG84/31

EXTRACT OF:

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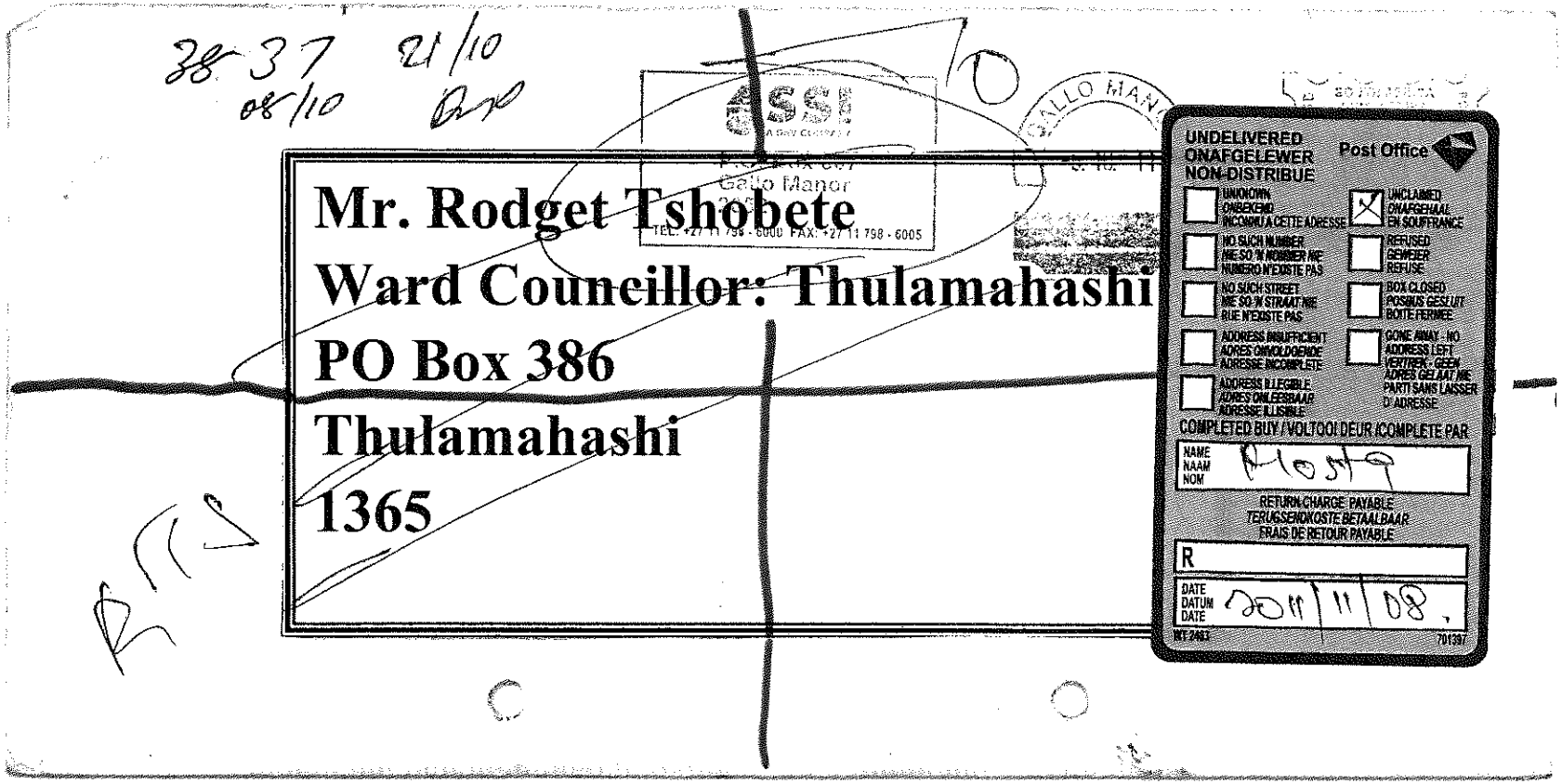

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Mr. Rodget Tshobete
Ward Councillor: Thulamahashi
PO Box 386
Thulamahashi
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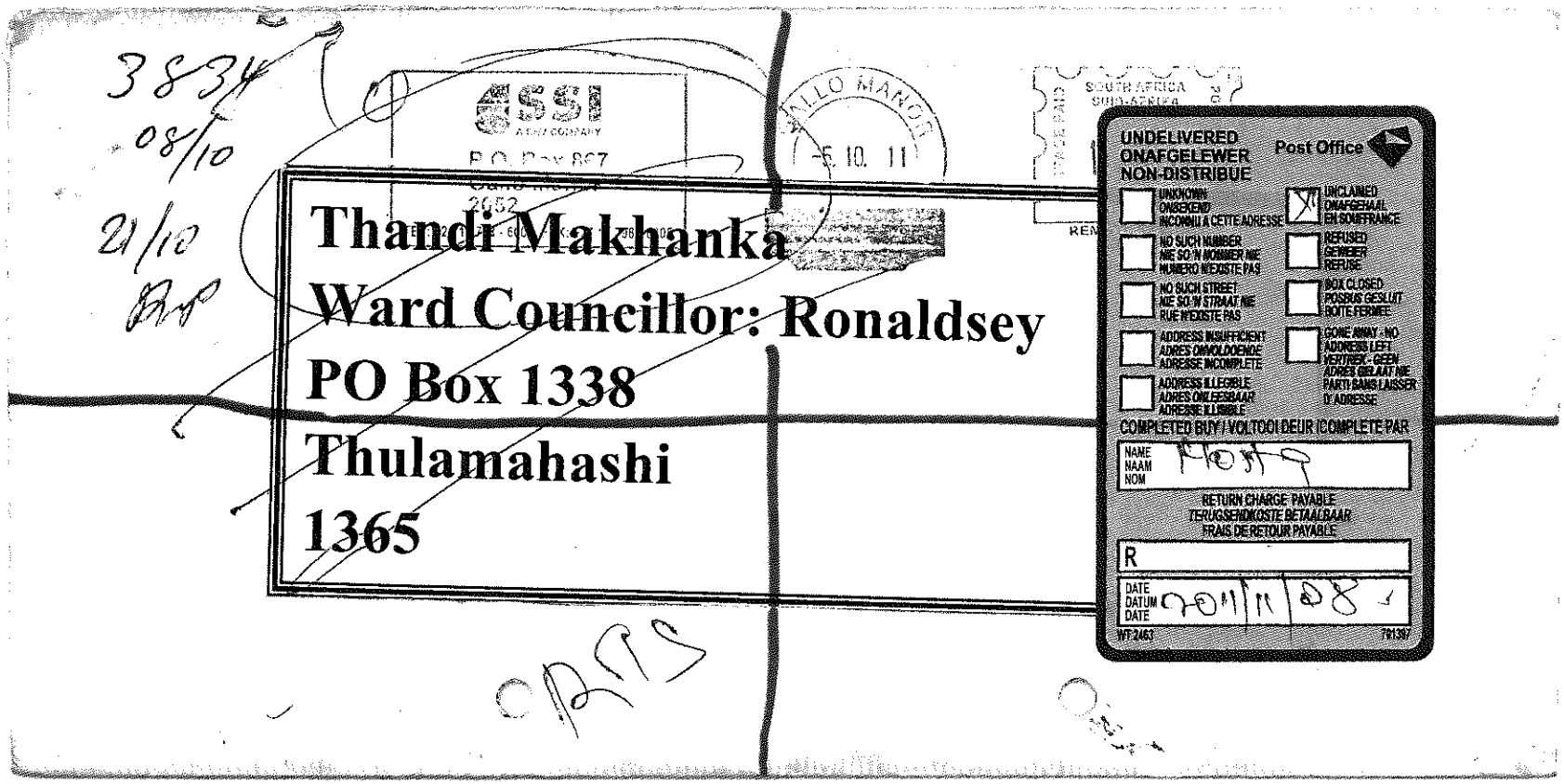
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Ms. Lydia Mabunda
Ward Councillor: Edinburgh
PO Box 1062
Thulamahashi
1365

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APPENDIX E9

LIST OF STATE ORGANS

APPENDIX E10

PUBLIC PARTICIPATION MEETINGS

APPENDIX F

ENVIRONMENTAL MANAGEMENT PROGRAMME

DEA REF: 12/12/20/2374
NEAS REF: DEA/EIA/0000443/2011

Draft Environmental Management Programme for the 132kV Power Line from the existing Mbumbu Traction Substation to the proposed Tsakani Substation

A Project for: Eskom Distribution

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A DHV COMPANY
ENGINEERS AND ENVIRONMENTAL CONSULTANTS
Linking People. Promoting Growth.

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DOCUMENT DESCRIPTION

Client:
Eskom Distribution

Proposal Name:
Environmental Management Programme for the 132kV Power Line from the existing Mbumbu Traction Substation to the proposed Tsakani Substation

SSI Environmental Reference Number:
E02.PTA.000343

Authority Reference:
12/12/20/2374

Compiled by:
Phyllis Kalele

Date:
April 2012

Location:
Mpumalanga

Reviewer:
Prashika Reddy

Approval:
Malcolm Roods
Signature

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Appendices

GLOSSARY OF TERMS AND ABBREVIATIONS

Contractor:
A person or company appointed by Eskom to carry out stipulated activities.

Emergency:
An undesired event that does result in a significant environmental impact and requires the notification of the relevant statutory body, such as a local authority.

Environment:
In terms of the National Environmental Management Act (NEMA) (No 107 of 1998), "environment" means the surroundings within which humans exist and that are made up of:

i. the land, water and atmosphere of the earth;
ii. micro-organisms, plant and animal life;
iii. any part or combination of (i) of (ii) and the interrelationships among and between them; and the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and wellbeing.

Environmental Control Officer:
An individual nominated through the Project Manager to be present on site to act on behalf of the Project Manager in matters concerning the implementation and day to day monitoring of the EMP. The Environmental Control Officer is assumed to be the regional Environmental Practitioner appointed by Eskom.

Environmental Impact:
A change to the environment, whether adverse or beneficial, wholly or partially, resulting from an organisation's activities, products or services.

Environmental Management Programme:
A detailed plan of action prepared to ensure that recommendations for enhancing or ensuring positive impacts and limiting or preventing negative environmental impacts are implemented during the life cycle of a project. This EMPr focuses on the construction phase, operation (maintenance) phase and decommissioning phase of the proposed project.

General waste:
General waste means waste that does not pose an immediate hazard or threat to health or to the environment, and includes:

a) domestic waste;
b) building and demolition waste;
c) business waste; and
d) inert waste

Hazardous waste:
Hazardous waste means any waste that contains organic or inorganic elements or compounds that may, owing to the inherent physical, chemical or toxicological characteristics of that waste have a detrimental impact on health and the environment.

Impact:
A description of the potential effect or consequence of an aspect of the development on a specified component of the biophysical, social or economic environment within a defined time and space.

Incident:
An undesired event which may result in a significant environmental impact but can be managed through internal response.

Mitigation:
Measures designed to avoid, reduce or remedy adverse impacts.

Waste:
Waste means any substance, whether or not that substance can be reduced, re-used, recycled and recovered-

a) that is surplus, unwanted, rejected, discarded, abandoned or disposed of;
b) which the generator has no further use of for the purposes of production;
c) that must be treated or disposed of; or
d) that is identified as a waste by the Minister by notice in the Gazette, and includes waste generated by the mining, medical or other sector, but-
e) a by-product is not considered waste; and
f) any portion of waste, once re-used, recycled and recovered, ceases to be waste.

1 INTRODUCTION

Eskom Distribution proposes the establishment of a new 132 kV power line between the existing Mbumbu traction substation to the proposed new Tsakani substation. The new Tsakani Substation and distribution line are needed in order to split the current overloaded feeders in the area as well as to provide sufficient capacity for new clients and improve the reliability of energy supply. The new Tsakani substation further helps with de-loading the currently overloaded infrastructures in the area and reduces the customer base per line thus, improving the system average interruption duration.

The study area is located in the Mpumalanga Province and relatively small towns that are nearby include Thulamahashe. Nelspruit is approximately 120 km from the site of the existing Mbumbu substation. The power line alignments being considered for the project falls predominantly within rural areas largely characterised by villages and open spaces.

1.1 Project Description

Three alternative power line alternatives are being considered for the project (refer to Figure 1 below):

- Purple route:
- Red route:
- Green route:

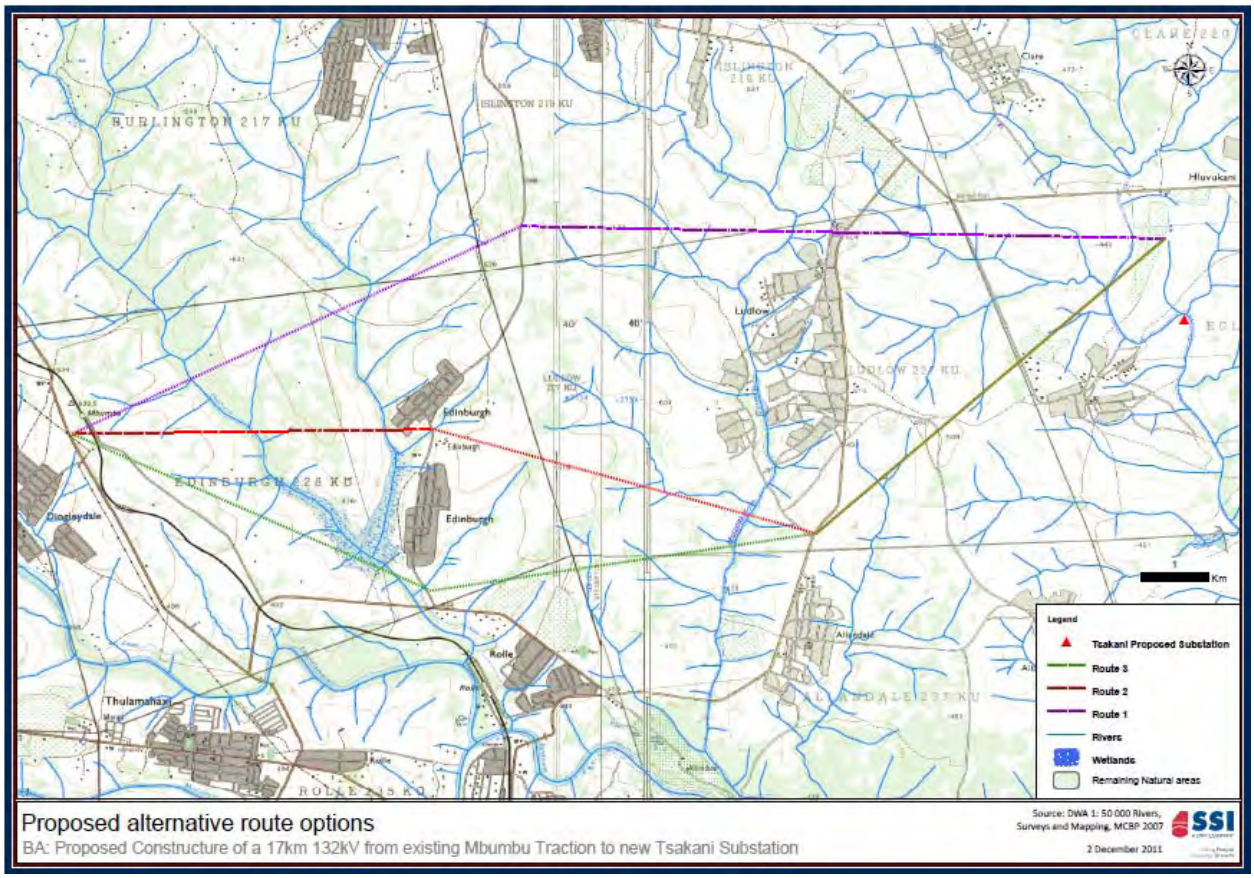


FIGURE 1: PROPOSED ALTERNATIVE ALIGNMENTS

1.2 Applicable Documentation

The following documentation is applicable for the project, and should be read in conjunction with this EMPr:

- Basic Assessment Report for the proposed construction of the new 132 kV power line from the existing Mbumbu traction substation to the proposed new Tsakani substation.
- The Environmental Authorisation (once) issued by the Department of Environmental Affairs (DEA).

1.3 Structure of the EMPr

The EMPr provides mitigation and management measures for the following key phases of the project:

FIGURE 2: KEY PHASES OF THE PROJECT LIFE-CYCLE

A section on Planning and Design phase impacts and mitigation measures is also included in this EMPr.

All relevant environmental legislation pertaining to the project from cradle to grave is listed within Appendix B. The Contractor is required to comply with this legislation for all phases of the project. This list is intended to serve as a guideline only for the Contractor and is not exhaustive.

It should be noted that this EMPr is a dynamic document which should be updated as required on a continuous basis. This may be of particular importance once the final route alignment within the preferred corridor has been selected, as at this stage it may be possible to add more 'site specific' management measures. Any amendments made must be submitted to the Environmental Control Officer (ECO), the Project Manager and the Competent Authority (DEA) for approval prior to implementation.

1.4 Objective of the EMPr

The EMPr has the following objectives:

- To outline functions and responsibilities of responsible persons;
- To state standards and guidelines, which are required to be achieved in terms of environmental legislation;
- To outline mitigation measures and environmental specifications, which are required to be implemented for all phases of the project in order to minimise the extent of environmental impacts, and to manage environmental impacts; and
- To prevent long-term or permanent environmental degradation.

An independent ECO must be appointed (by the proponent: Eskom) before construction commences to ensure compliance with the EMPr. The EMPr will be considered an extension of the Conditions of Approval as set forth by the Department of Environmental Affairs (DEA). Non-compliance with the EMPr will constitute non-compliance with said Conditions.

The EMPr is binding on all contractors operating on the site.

It should be noted that in terms of the National Environmental Management Act No 107 of 1998 (Section 28) those responsible for environmental damage must pay the costs both to the environment and human health and the preventative measures to reduce or prevent further pollution and / or environmental damage (The "polluter pays" principle).

1.5 Details of the Environmental Assessment Practitioner

Consultant:	SSI Environmental
Contact Person:	Prashika Reddy / Phyllis Kalele
Postal Address	P.O Box 867 Gallo Manor, 2052
Telephone:	(012) 367 5973
Facsimile:	(012) 367 5878
E-mail:	prashikar@ssi.co.za / phyllisk@ssi.co.za
Expertise:	Prashika Reddy is an Associate (*Pr Sci Nat 400133/10*) with a BSc Honours in Geography. Ms Reddy has the necessary experience in various environmental fields including: environmental impact assessments, environmental management plans/programmes, public participation and environmental monitoring and auditing. Phyllis Kalele is a Senior Environmental Consultant (*Pr Sci Nat 400456/11*) with experience in various facets of environmental management. These include conducting the Public Participation process; compiling Environmental Impact Reports; writing Environmental Management Programmes; conducting environmental awareness training; and conducting legal compliance audits.

2 MANAGEMENT PROCEDURES

The EMPr has a long-term objective to ensure that:

- Environmental management conditions and requirements are implemented from the project inception;
- Precautions against damage and claims arising from damage are dealt with timeously; and
- The completion date of the contract is not delayed due to problems with landowners arising during the course of construction.

Eskom requires a commitment from the Eskom Project Manager and the Contractor on the following issues:

- To underwrite the Eskom Distribution Environmental Policy at all times.
- Ensure environmental conditions stipulated in the Environmental Authorisation are implemented.
- Immediately resolve problems and claims arising from damage to ensure a smooth flow of operations.
- To implement this EMPr for the benefit of all involved.
- To preserve the natural environment by limiting destructive actions on site.

2.1 Functions and Responsibilities

Formal responsibilities are necessary to ensure that key procedures are executed. Specific responsibilities of the Project Manager, Environmental Control Officer (ECO) and Contractor for this project are as detailed below.

The Project Manager will:

- Be fully conversant with the Basic Assessment for the project, the conditions of the Environmental Authorisation (once issued), and all relevant environmental legislation.
- Be familiar with the recommendations and mitigation measures of this EMPr, and enforce these measures.
- Ensure that all stipulations within the EMPr are communicated and adhered to the appointed Contractor(s).
- Monitor site activities on a daily basis for compliance.
- Conduct internal audits of the construction site against the EMPr.
- Confine construction site to the demarcated area.
- Rectify transgressions through the implementation of corrective action.

The Environmental Control Officer will:

The Environmental Control Officer is responsible for the implementation of the EMPr during the construction phase as well as liaison and reporting to Eskom, Contractor, Landowners and Authorities. The following tasks will fall within his / her responsibilities:

- Be familiar with the recommendations and mitigation measures of this EMPr and the EA.
- Conduct monitoring of the construction site according to the EMPr.
- Educate the construction team about the management measures of the EMPr.
- Liaise regularly with the construction team and the project manager.
- Recommend corrective action for any environmental non-compliance incidents on the construction site.
- Compile a regular report highlighting any non-compliance issues as well as good compliance with the EMPr.
- All negotiations for any reason shall be between the ECO, Eskom Holdings Limited, affected parties (landowners) and the Contractor.
- All agreements shall be recorded in writing and all parties shall co-sign the documentation. No verbal agreements shall be made.
- The affected parties shall always be kept informed about any changes to the construction programme should they be involved. If the ECO is not on site the Contractor should keep the

affected parties informed. The contact numbers of the Contractor and the ECO shall be made available to the affected parties. This will ensure open channels of communication and prompt response to queries and claims.

Contractors and Service Providers:
All contractors (including subcontractors and staff) and service providers are ultimately responsible for:

- Complying with the environmental management specifications.
- Submitting Method Statements for approval by the ECO before any work is undertaken.
- Adhering to any instructions issued by the Project Manager on the advice of the ECO.
- Submitting a report at each site meeting which will document all incidents that have occurred during the period before the site meeting.
- Displaying the list of transgressions issued by the ECO in the site office.
- Maintaining a public complaints register.
- Arranging that all their employees and those of their subcontractors receive training before the commencement of construction in order that they are aware of the terms of reference of the EMPr.

2.2 Environmental Awareness Plan

It is important to ensure that all personnel have the appropriate level of environmental awareness and competence to ensure continued environmental due diligence and ongoing minimisation of environmental harm. To achieve effective environmental management, it is important that employees, contractors and sub-contractors are aware of their responsibilities in terms of the relevant environmental legislation and the contents of this EMPr.

The environmental awareness plan is aimed at:

- promoting environmental awareness amongst all personnel on site;
- informing personnel of all environmental procedures, policies and programmes applicable;
- providing generic training on the implementation of environmental management specifications; and
- providing job-specific environmental training in order to understand the key environmental features of the construction site and the surrounding environment.

The environmental awareness training programme will include:

- the induction of all construction and operation staff;
- signing by all persons an acknowledgement of receiving and understanding the induction;
- identification of environmental risks and job specific training on addressing these risks; and training on the implementation of emergency procedures (where necessary).

Topics covered by the Environmental Awareness Programme should include:

- What is meant by “Environment”?
- Why does the environment need to be protected and conserved?
- How can construction activities impact on the environment?
- What can be done to mitigate against such impacts?
- Waste management.
- Health and Safety.
- Awareness of emergency and spills response provisions.
- Social responsibility during construction of the substation and loop-in lines e.g. being considerate to local residents.

Training can be done either in a written or verbal format but will be in an appropriate format for the receiving audience. The training must ensure that the contents and requirements of the EMPr are transferred to the audience. Where training has been done verbally, persons having received training must sign an attendance register (which must be properly filed). Training should be conducted monthly by the ECO and can also be dealt with weekly during the ‘Toolbox Talks’.

2.3 Monitoring

A monitoring programme shall be in place not only to ensure compliance with the EMPr through the contract/work instruction specifications, but also to monitor any environmental issues and impacts which have not been accounted for in the EMP that are, or could result in significant environmental impacts for which corrective action is required. As part of the contract or work instruction, Eskom shall stipulate the period and frequency of monitoring required. The Project Manager shall ensure that the monitoring is carried out.

The ECO must be appointed to ensure compliance with the EMPr, and to carry out monitoring activities. The ECO will report to the Contractor should any non-compliance be evident or corrective action necessary. Only in severe cases of non-compliance, or repeated offences, will the ECO be required to report to the Project Manager.

2.4 Documentation and Reporting

The following documents must be kept on site in order to record compliance with the EMPr:

- Record of complaints.
- Monitoring results.
- Non-conformance reports.
- Written corrective action instructions.
- Notification of emergencies and incidents.
- Environmental Authorisation.

3 ENVIRONMENTAL GUIDELINES STANDARDS AND PERMITS

3.1 Environmental Guidelines and Standards

All applicable environmental standards contained within the environmental legislation shall be adhered to. At the time of compiling this draft EMPr, the following environmental guidelines and standards were identified as being applicable to the project.

3.1.1 Environmental Authorisation

No construction can commence without Environmental Authorisation being issued by the Department of Environmental Affairs.

3.1.2 Air Quality Guidelines

In terms of air quality, the Contractor will be required to describe how effective dust control measures will be achieved during the construction phase. This will only be required for activities that are to produce a significant amount of dust or other air pollutants (e.g. excavation activities, use of heavy vehicles during construction, etc.).

3.1.3 Blasting Regulations and Standards

Wherever blasting activity is required on the site, the Contractor shall rigorously adhere to the relevant statutes and regulations that control the use of explosives. It is, however, unlikely that blasting will be required for this project.

3.1.4 Control of Alien Vegetation

In terms of Government Notice R.1048 of the Conservation of Agricultural Resources Act (No 43 of 1983), the following regulations are applicable with regards to the control of invasive alien vegetation and declared weeds:

- It is illegal to have declared weed species or invasive alien vegetation on one's property.
- The landowner must immediately take steps to eradicate them by using the methods prescribed in the regulations, namely:
    - uprooting and burning, or
    - the application of a suitable chemical weed-killer (herbicide), or
    - any other method of permanent eradication.
- One may not uproot or remove such plants and dump or discard them elsewhere to re-grow or allow their seeds to be spread or blown onto other properties.
- If the landowner does not comply with requirements above, a person may be found guilty of a criminal offence.

3.1.5 Removal of Trees

The Minister has the power to declare a particular tree, a group of trees, a particular woodland, or trees belonging to a certain species, to be a protected tree, group of trees, woodland or species. In terms of section 15 of the National Forests Act (No 84 of 1998), no person may cut, disturb, damage, destroy or remove any protected tree; or collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, except under a licence granted by the Minister.

The following activities will require a license:

- *Cutting, disturbing, damaging or destroying protected tree(s).*
- *Pruning or de-limbing individual trees.*
- *Cutting, destroying, and/or transplanting protected trees to change the land use (e.g. convert forest to agriculture or infrastructure development).*
- *Disturbing trees (e.g. by excavations for buildings or earth moving operations).*
- *Selectively cutting or destroying individual trees/seedlings (e.g. if you want to remove free-standing individual trees, or trees from amongst other trees).*
- *Transplanting live trees/seedlings (e.g. if you want to remove free-standing trees, or trees from amongst others).*

3.1.6 River and Stream Crossings

Permission is required from the Mpumalanga Department of Economic Development, Environment and Tourism (MDEDET) for the removal of river bank vegetation and disturbance of the river bank itself for all river crossings under the Conservation of Agricultural Resources Act (No 43 of 1983). All disturbances will have to be appropriately rehabilitated. The positioning of the towers have not been determined as yet, and therefore the permit may or may not be required, depending on whether any of the towers are located adjacent to any non-perennial river. It is recommended that the banks of the watercourse be avoided wherever possible, rather than obtaining a permit in order to minimise the impact on the watercourse.
It should be noted that pollution of river water (silt-laden run-off, oil from machines etc.) is a contravention of the National Water Act (No 36 of 1998) and is not permitted. Therefore, this must be avoided at all times during construction and maintenance activities.

3.1.7 Abstraction of Water

If water is to be abstracted from a public stream during construction (for construction activities), a permit is required from the Minister of Water Affairs. If water is to be abstracted from water of which the rights of use belong to private landowners, it will be necessary to establish whether their water use rights are still valid in terms of the provisions of the National Water Act. If they are still valid then negotiations with the relevant landowners has to be undertaken and a water use permit obtained from Department of Water Affairs (DWA) in terms of Section 21, 40 and 41 of the National Water Act (No 36 of 1998).

3.1.8 Heritage Sites

In terms of the National Heritage Resources Act (No 25 of 1999), a permit is required to be obtained for the disturbance, removal or destruction of any national and provincial heritage sites, archaeological and paleontological sites, burial grounds and graves and public monuments and memorials. The demolition or dismantling of all man-made structures and buildings older than 60 years is subject to the approval of the relevant provincial heritage council under the National Heritage Council Act (No 11 of 1999).

3.1.9 Waste Disposal

All waste (general and hazardous) generated during the construction of the powerline and substation may only be disposed of at appropriately licensed waste disposal sites (in terms of Section 25 of the National Waste Act (No 59 of 2008) However every attempt must be made to reduce, recycle or re-use all waste before it is disposed off in terms of section 17 of the National Waste Act (59 of 2008). Cognisance must also be taken of the relevant provincial legislation in this regard.

3.1.10 Occupational Health and Safety

All safety, health and environmental standards and emergency procedures in terms of the Occupational Health and Safety Act (No 85 of 1993), must be complied with during the construction and operation.

4 PLANNING AND DESIGN PHASE

ASPECT / IMPACT	MITIGATION	RESPONSIBILITY
FLORA Placement of footprints near areas of high sensitivity (natural vegetation, protected tree species, riparian areas, areas of high slopes, rocky outcrops, etc.) may impact these sensitive communities	1. The alignment of towers and the power line should be adjusted to prevent the destruction of remaining large (>4 m) indigenous tree species including the two protected tree species (*Pterocarpus angloensis* – Wild teak and *Sclerocarya birrea* – Marula). 2. Prior to construction and vegetation clearance, a suitably qualified zoologist/botanist or ecologist should closely examine the proposed construction areas (tower supports) for the presence of animal burrows, rocky outcrops, logs, stumps and other debris and relocate any affected animals to appropriate habitats away from the servitude or tower. 3. General mitigation measures would include the avoidance of any physical damage to natural vegetation on the periphery of the proposed servitude and is of particular importance in all riparian areas and areas of steep slopes.	**Project Manager, Engineering Team**
WETLANDS AND SURFACE WATER BODIES The proposed power line will traverse and impact on numerous seasonal drainage lines as well as the perennial Sephiriri River	1. The wetland buffer zone and development setback should be established, where no construction activities should take place within 32 m of wetlands edges for all identified water features (wetlands and Sand River seasonal tributaries). 2. For the Sephiriri River, a buffer of at least 50 m on each side of the river edge should be adopted as a no-go area.	**Project Manager, Engineering Team**
ACCESS ROADS New access roads and haulage routes could impact on areas of high sensitivity (natural vegetation, protected tree species, riparian areas, areas of high slopes, rocky outcrops, etc.)	1. Temporary access and haulage routes must be designed prior to construction commencing to ensure that the most preferable access and haulage routes for each tower site has been identified. Use should be made of existing roads as far as possible.	**Project Manager, Engineering Team**

5 CONSTRUCTION PHASE

5.1 Site Clearing

Site clearing must take place in a phased manner, as and when required. Areas which are not to be maintained within two months of time must not be cleared to reduce erosion risks. The area to be cleared must be visibly demarcated and this footprint strictly maintained. Spoil that is removed from the site must be moved to an approved spoil site or Department of Water and Environmental Affairs licensed landfill site. The necessary silt fences and erosion control measures must be implemented in areas where these risks are more prevalent - these include steep areas.

5.2 Site Establishment

Site establishment shall take place in an orderly manner and all required amenities shall be installed at the camp site before the main workforce move onto site. The construction camp shall have the necessary ablution facilities at the commencement of construction activities. The Contractor shall inform all site staff to make use of supplied ablution facilities and under no circumstances shall indiscriminate sanitary activities be allowed other than in supplied facilities.

The Contractor shall supply waste collection bins where such is not available and all solid waste collected shall be disposed of at a licensed landfill site. A certificate of disposal shall be obtained by the Contractor and kept on file. Where a registered waste site is not available close to the construction site, the Contractor shall provide a method statement with regard to waste management. The disposal of waste shall be in accordance with all relevant legislation. Under no circumstances may solid waste be burnt on site.

5.3 Construction Traffic and Access

ASPECT / IMPACT	MITIGATION	RESPONSIBILITY	FREQUENCY / MONITORING REQUIREMENTS
CONSTRUCTION TRAFFIC AND ACCESS Impact that construction traffic and access has on the site and surrounds	***Construction traffic*** 1. Construction routes must be clearly defined. 2. Access of all construction and material delivery vehicles should be strictly controlled, especially during wet weather to avoid compaction and damage to the topsoil structure. 3. Wheel washing and damping down of un-surfaced roads must be implemented to reduce dust. 4. Vehicles and equipment shall be serviced regularly to avoid the contamination of soil from oil and hydraulic fluid leaks etc. 5. Servicing must be done off-site. 6. Oil changes must take place on a concrete platform or on a drip tray. 7. Soils compacted by construction shall be deep ripped to loosen compacted layers and re-graded to even running levels. ***Access*** 1. Temporary access roads that might be required must be rehabilitated prior to the Contractor leaving the site. 2. Strategic positioning of entry and exit points to ensure as little impact/ effect as possible on the traffic flow. 3. The main routes to the site must be clearly signposted. ***Road maintenance*** 1. Contractors should ensure that access roads are maintained in good condition by attending to potholes, corrugations and stormwater damage as soon as these develop. 2. If necessary, staff must be employed to clean surfaced roads adjacent to construction sites where materials have spilt. ***General*** 1. The Contractor shall meet safety requirements under all circumstances. All equipment transported shall be clearly labelled as	**Main Contractor, ECO**	**Weekly**

ASPECT / IMPACT	MITIGATION	RESPONSIBILITY	FREQUENCY / MONITORING REQUIREMENTS
	to their potential hazards according to specifications. All the required safety labelling on the containers and trucks used shall be in place. 2. The Contractor shall meet these safety requirements under all circumstances. All equipment transported shall be clearly labelled as to their potential hazards according to specifications. All the required safety labelling on the containers and trucks used shall be in place. 3. The Contractor shall ensure that all the necessary precautions against damage to the environment and injury to persons are taken in the event of an accident.		

5.4 Construction Camp

ASPECT / IMPACT	MITIGATION	RESPONSIBILITY	FREQUENCY / MONITORING REQUIREMENTS
CONSTRUCTION CAMP Impacts relating to the construction camp	***Site of construction camp*** 1. Choice of site for the Contractor's camp requires the ECO's permission and must take into account location of local residents and / or ecologically sensitive areas, including flood zones and slip / unstable zones. A site plan must be submitted to the ECO and project manager for approval. 2. The construction camp may not be situated within the 1:100 year flood line or on slopes greater that 1:3. 3. If the Contractor chooses to locate the camp site on private land, he must get prior permission from both the project manager and the landowner. 4. The size of the construction camp should be minimized (especially where natural vegetation or grassland has had to be cleared for its construction). 5. The Contractor must attend to drainage of the camp site to avoid standing water and / or sheet erosion. 6. Suitable control measures over the Contractor's yard, plant and material storage to mitigate any visual impact of the construction activity must be implemented.	**Main Contractor, ECO**	**Weekly**

ASPECT / IMPACT	MITIGATION	RESPONSIBILITY	FREQUENCY / MONITORING REQUIREMENTS
	7. No development, or activity of any sort associated with camp, is allowed below the 1:100 year flood line of any water system. ***Storage of materials (including hazardous materials)*** 1. Choice of location for storage areas must take into account prevailing winds, distances to water bodies, general on site topography and water erosion potential of the soil. 2. Storage areas must be designated, demarcated and fenced. 3. Storage areas should be secure so as to minimize the risk of crime. They should also be safe from access by unauthorised persons. 4. Fire prevention facilities must be present at all storage facilities. 5. Proper storage facilities for the storage of oils, paints, grease, fuels, chemicals and any hazardous materials to be used must be provided to prevent the migration of spillage into the ground and groundwater regime around the temporary storage area(s). These pollution prevention measures for storage should include a bund wall high enough to contain at least 110% of any stored volume, and this should be sited away from drainage lines in a site with the approval of the ECO. 6. These storage facilities (including any tanks) must be on an impermeable surface that is protected from the ingress of storm water from surrounding areas in order to ensure that accidental spillage does not pollute local soil or water resources. 7. Clear signage must be placed at all storage areas containing hazardous substances / materials. 8. Staff dealing with these materials / substances must be aware of their potential impacts and follow the appropriate safety measures. 9. A Waste Disposal Contractor must be employed to remove waste oil. These wastes should only be disposed of at a licensed landfill sites designed to handle hazardous wastes. A disposal certificate must be obtained from the Waste Disposal Contractor. 10. The Contractor must ensure that its staff is made aware of the health risks associated with any hazardous substances used and has been provided with the appropriate protective clothing/equipment in case of spillages or accidents and have received the necessary training.		

ASPECT / IMPACT	MITIGATION	RESPONSIBILITY	FREQUENCY / MONITORING REQUIREMENTS
	11. All excess cement and concrete mixes are to be contained on the construction site prior to disposal off site. 12. Any spillage, which may occur, shall be investigated and immediate action must be taken. This must also be reported to the ECO and DEA, as well as local authorities if so required. ***Drainage of construction camp*** 1. Run-off from the camp site must not discharge into neighbours' properties or into adjacent wetlands, rivers or streams. ***End of construction*** 1. Once construction has been completed on site and all excess material has been removed, the storage area shall be rehabilitated. If the area was badly damaged, re-seeding shall be done. 2. Such areas shall be rehabilitated to their natural state. Any spilled concrete shall be removed and soil compacted during construction shall be ripped, levelled and re-vegetated. 3. Only designated areas must be used for storage of construction materials, soil stockpiles, machinery and other equipment. 4. Specific areas must be designated for cement batching plants. Sufficient drainage for these plants must be in place to ensure that soils do not become contaminated. 5. The construction camp must be kept clear of litter at all times. 6. Spillages within the construction camp need to be cleaned up immediately and disposed of in the hazardous skip bin for correct disposal. 7. No open fires are allowed within the construction camp and no wood from surrounding vegetation may be used to create a fire.		

5.5 Soils

ASPECT / IMPACT	MITIGATION	RESPONSIBILITY	FREQUENCY / MONITORING REQUIREMENTS
SOILS Impact that construction activities will have on soil	***Topsoil*** 1. The Contractor should, prior to the commencement of earthworks determine the average depth of topsoil, and agree on this with the ECO. The full depth of topsoil should be stripped from areas affected by construction and related activities prior to the commencement of major earthworks. This should include the building footprints, working areas and storage areas. Topsoil must be reused where possible to rehabilitate disturbed areas. 2. Care must be taken not to mix topsoil and subsoil during stripping. 3. Removed polluted topsoil should be transported to a licensed landfill site. 4. Remove and store topsoil separately in areas where excavation/degradation takes place. Topsoil should be used for rehabilitation purposes in order to facilitate re-growth of species that occur naturally in the area. ***Soil stripping*** 1. No soil stripping must take place on areas within the site that the Contractor does not require for construction works or areas of retained vegetation. 2. Subsoil and overburden should, in all construction and lay down areas, be stockpiled separately to be returned for backfilling in the correct soil horizon order. 3. Construction vehicles must only be allowed to utilise existing tracks or pre-planned access routes. ***Erosion*** 1. Limit construction, maintenance and inspection activities to dry periods in order to curb occurrence/ augmentation of erosion in areas of existing erosion. 2. No vehicles should be allowed to cross rivers or streams in any area other than an approved crossing, taking care to prevent any impact (particularly erosion) in a surrounding habitat.	**Main Contractor, ECO**	**Monthly**

ASPECT / IMPACT	MITIGATION	RESPONSIBILITY	FREQUENCY / MONITORING REQUIREMENTS
	3. Disturbed areas of natural vegetation as well as cut and fills must be rehabilitated immediately to prevent soil erosion. ***Stockpiles*** 1. Stockpiles should not be situated such that they obstruct natural water pathways and drainage channels. 2. Stockpiles should not exceed 2 m in height. 3. If stockpiles are exposed to windy conditions or heavy rain, they should be covered either by vegetation or cloth. Stockpiles may further be protected by the construction of berms or low brick walls around their bases. 4. Stockpiles should be kept clear of weeds and alien vegetation growth by regular weeding. *5.* Where contamination of soil is expected, analysis must be done prior to disposal of excess soil to determine the appropriate disposal route. ***Fuel storage*** 1. Topsoil and subsoil to be protected from contamination. 2. Fuel and material storage must be away from stockpiles. 3. Cement, concrete and chemicals must be mixed on an impermeable surface and provisions should be made to contain spillages or overflows into the soil. 4. Any storage tanks containing hazardous materials must be placed in bunded containment areas with sealed surfaces. The bund walls must be high enough to contain 110% of the total volume of the stored hazardous material. 5. Contaminated soil must be contained and disposed of off site at an approved landfill site. ***Concrete mixing (if required)*** 1. Concrete mixing must only take place within designated areas. 2. Ready mixed concrete must be utilised where possible. 3. No vehicles transporting concrete to the site may be washed on site. 4. If a batching plant is necessary, run-off should be managed		

ASPECT / IMPACT	MITIGATION	RESPONSIBILITY	FREQUENCY / MONITORING REQUIREMENTS
	effectively to avoid contamination of other areas of the site. Untreated run-off from the batch plant must not be allowed to get into the stormwater system or any rivers, streams, wetlands or existing erosion channels / dongas. ***Earthworks*** 1. Soils compacted during the construction of the loop-in lines should be deeply ripped to loosened compacted layers and re-graded to even running levels. Topsoil should be re-spread over landscaped areas.		

5.6 Groundwater Pollution

ASPECT / IMPACT	MITIGATION	RESPONSIBILITY	FREQUENCY / MONITORING REQUIREMENTS
GROUNDWATER POLLUTION Impact that construction activities could have on groundwater	***Sanitation*** 1. Adequate sanitary facilities and ablutions must be provided for construction workers 2. The facilities must be regularly serviced and emptied to reduce the risk of surface or groundwater pollution. 3. Sewage water should not be channelled through surface water bodies or be allowed to flow freely or stagnate on the soil surface. ***Hazardous materials*** 1. Use and or storage of materials, fuels and chemicals which could potentially leak into the groundwater must be controlled. 2. All storage tanks containing hazardous materials must be placed in bunded containment areas with sealed surfaces. The bund wall must be high enough to contain 110% of the total volume of the stored hazardous material with an additional allocation for potential stormwater events. 3. Any hazardous substances must be stored at least 20 m from any of	**Main Contractor, ECO**	**Weekly**

ASPECT / IMPACT	MITIGATION	RESPONSIBILITY	FREQUENCY / MONITORING REQUIREMENTS
	the water bodies on site. 4. The Environmental Control Officer should be responsible for ensuring that potentially harmful materials are properly stored in a dry, secure, ventilated environment, with concrete or sealed flooring and a means of preventing unauthorised entry. 5. Contaminated wastewater must be managed by the Contractor to ensure existing water resources on the site are not contaminated. All wastewater from general activities in the camp shall be collected and removed from the site for appropriate disposal at a licensed commercial facility. ***Cement mixing*** 1. Cement contaminated water must not enter the water system as this disturbs the natural acidity of the soil and affects plant growth. ***Public areas*** 1. Food preparation areas should be provided at the construction camp with adequate washing facilities and food refuse should be stored in sealed refuse bins which should be removed from site on a regular basis. 2. The Contractor should take steps to ensure that littering by construction workers does not occur and persons should be employed on site to collect litter from the site and immediate surroundings, including litter accumulating at fence lines. 3. No washing or servicing of vehicles on site. ***Water resources*** 1. Site staff shall not be permitted to use any other open water body or natural water source adjacent to or within the designated site for the purposes of bathing, washing of clothing or for any construction or related activities. 2. Municipal water (or another source approved by the ECO) should instead be used for all activities such as washing of equipment or disposal of any type of waste, dust suppression, concrete mixing,		

ASPECT / IMPACT	MITIGATION	RESPONSIBILITY	FREQUENCY / MONITORING REQUIREMENTS
	compacting, etc. 3. The Department of Water Affairs and the ECO as well as other Emergency contact numbers provided by the Municipality should be contacted in order to deal with spillages and contamination of aquatic environments. 4. Waste water should be directed into the proper systems.		

5.7 Hydrology and Stormwater

ASPECT / IMPACT	MITIGATION	RESPONSIBILITY	FREQUENCY / MONITORING REQUIREMENTS
HYDROLOGY AND STORMWATER Impact that construction activities could have on hydrology	1. Run-off from the construction area must be prevented from directly entering wetlands and associated water features (except where the gradient is not feasible). The intensity of stormwater run-off should be reduced where possible through encouraging paving and surfaces that allow for greater infiltration. 2. Bulldozing and the use of other mechanical machinery in the wetland buffer zone should also be prevented as far as possible. 3. A buffer zone of at least 32 m should be adopted for all identified Sand River Seasonal Tributaries and a buffer of at least 50 m should be adopted in the Sephiriri River System. 4. The site must be managed in order to prevent pollution of drains, downstream watercourses or groundwater, due to suspended solids, silt or chemical pollutants. 5. Silt fences should be used to prevent any soil entering the stormwater drains. 6. Temporary cut of drains and berms may be required to capture stormwater and promote infiltration. 7. Promote water saving mind set with construction workers in order to ensure less water wastage. 8. New stormwater infrastructure construction must be developed strictly according to specifications from ECO in order to ensure	**ECO, Main Contractor**	**Weekly**

ASPECT / IMPACT	MITIGATION	RESPONSIBILITY	FREQUENCY / MONITORING REQUIREMENTS
	efficiency. 9. Hazardous substances must be stored at least 20 m away from the buffer area surrounding any water bodies on site to avoid pollution. 10. The installation of the stormwater system must take place as soon as possible after commencement of the construction activities, to attenuate stormwater from the construction as well as the operational phase. 11. Earth, stone and rubble is to be properly disposed of so as not to obstruct natural water path ways over the site. (i.e. these materials must not be placed in stormwater channels, drainage lines or rivers). 12. There should be a periodic checking of the site's drainage system to ensure that the water flow is unobstructed. 13. If a batching plant is necessary, run-off should be managed effectively to avoid contamination of other areas of the site. Run-off from the batch plant must not be allowed to get into the stormwater system or nearby steams, rivers or erosion channels or dongas.		

5.8 Wetlands

ASPECT / IMPACT	MITIGATION	RESPONSIBILITY	FREQUENCY / MONITORING REQUIREMENTS
WETLANDS Impacts include the clearing and excavation of wetland vegetation at the tower location and the potential clearing and compaction of wetland vegetation and soil for the construction of temporary accesses / haulage roads for the	1. A buffer zone of at least 32 m should be adopted for all identified Sand River Seasonal Tributaries and a buffer of at least 50 m should be adopted in the Sephiriri River System. No construction vehicles should dredge and / or work within these buffers. 2. The substation and towers should be located outside the riparian areas of the Khokhovela River and the non-perennial drainage line. 3. Where possible all towers should be relocated to avoid wetlands. 4. The rehabilitation and re-vegetation of disturbed areas must take place concurrently. Only appropriate indigenous riparian vegetation may be used for rehabilitation and re-vegetation within the study area and wetland buffer areas (preferably indigenous plants represented in the reserve to the north and those existing in the	**Main Contractor, ECO**	**Weekly**

heavy construction vehicles transporting the constructing the tower structures	wetland areas). 5. If clearing of vegetation needs to be undertaken on site and in the wetland buffer, it should be carried-out without significantly altering the condition and health of the associated water feature. 6. Heavy construction vehicles (where possible) must not be used in proximity to the wetlands. 7. Runoff from the tower construction and assembly sites and the access/haulage routes must be controlled during the construction phase and any erosion associated with construction disturbances must remediated immediately. 8. The tower construction and assembly areas and access/haulage routes must be reduced to a minimum size and should be cordoned off using snow fencing and all areas outside these areas considered no-go areas. 9. All areas cleared during the construction phase must be re-grassed using deep rooted indigenous vegetation. If the re-grassing takes place in winter, the grassed area will need to be irrigated regularly. 10. Provision of adequate stormwater measures and controls during construction. 11. All alien vegetation should be cleared off the property and landscaping using the neighbouring parks and reserves plant species is encouraged. It is believed that this area will naturally recover from the direct (dust, pollution) and indirect (change in passive infiltration of the vicinity) disturbances. The trimming of bulrush and reeds should be allowed if densities are too high. 12. The establishment and re-growth of alien vegetation must be controlled after the removal of grass. All declared aliens must be identified and managed in accordance with the Conservation of Agricultural Resources Act, 1983 (Act No.43 of 1983).		

5.9 Air Quality

ASPECT / IMPACT	MITIGATION	RESPONSIBILITY	FREQUENCY / MONITORING REQUIREMENTS
AIR POLLUTION Vehicle activities associated with the	***Dust control*** 1. Frequent and effective dust-suppression is advised, particularly along dirt roads. Dust must be suppressed on the construction site	**Main Contractor, ECO**	**Daily**

ASPECT / IMPACT	MITIGATION	RESPONSIBILITY	FREQUENCY / MONITORING REQUIREMENTS
transport of equipment to the site; preparation of the surface areas which may be required prior to the set up of new infrastructure; and the removal of construction equipment from site after the set up of new equipment	during dry periods by the regular application of water. Water used for this purpose must be used in quantities that will not result in the generation of run-off. 2. Retention of vegetation where possible will reduce dust travel. 3. Excavations and other clearing activities must only be done during agreed working times and permitting weather conditions to avoid drifting of sand and dust into neighbouring areas. 4. The Contractor shall be responsible for dust control on site to ensure no nuisance is caused to the landowner or neighbouring communities. 5. A speed limit of 30 km/h must not be exceeded on dirty roads (if any). 6. Any complaints or claims emanating from the lack of dust control shall be attended to immediately by the Contractor. ***Odour control*** 1. Regular servicing of vehicles in order to limit gaseous emissions (to be done off-site). 2. Regular servicing of on site toilets to avoid potential odours. 3. Allocated cooking areas must be provided. 4. The Contractor must make alternative arrangements (other than fires) for cooking and / or heating requirements. LP gas cookers may be used provided that all safety regulations are followed. ***Rehabilitation*** 1. The Contractor should commence rehabilitation of exposed soil surfaces as soon as practical after completion of earthworks. ***Fire prevention*** 1. The Contractor must ensure that any grass left in a natural state during the construction of a sub-transmission should be cut in order to prevent veld fires, especially during the dry months. 2. No open fires shall be allowed on site under any circumstance. All cooking shall be done in demarcated areas that are safe and cannot		

ASPECT / IMPACT	MITIGATION	RESPONSIBILITY	FREQUENCY / MONITORING REQUIREMENTS
	cause runaway fires. 3. The Contractor shall have operational fire-fighting equipment available on site at all times. The level of fire fighting equipment must be assessed and evaluated thorough a typical risk assessment process. It may be required to increase the level of protection, especially during the winter months.		

5.10 Noise

ASPECT / IMPACT	MITIGATION	RESPONSIBILITY	FREQUENCY / MONITORING REQUIREMENTS
NOISE Construction activities (excavating and site clearing); construction vehicles; and construction staff	1. Surrounding communities and adjacent landowners are to be notified in advance of noisy construction activities. 2. The construction phase must aim to adhere to the relevant noise regulations and limit noise to within standard working hours in order to reduce disturbance of residential areas in close proximity to the development. 3. Construction site yards, workshops, and other noisy fixed facilities should be located well away from noise sensitive areas. Once the proposed final layouts are made available by the Contractor(s), the sites must be evaluated in detail and specific measures designed into the system. 4. Truck traffic should be routed away from noise sensitive areas, where possible. 5. Noise levels must be kept within acceptable limits. 6. Noisy operations should be combined so that they occur where possible at the same time. 7. Blasting operations (if required) are to be strictly controlled with regard to the size of explosive charge in order to minimise noise and air blast, and timings of explosions. The number of blasts per day should be limited, blasting should be undertaken at the same times each day and no blasting should be allowed at night. 8. Construction activities are to be contained to reasonable hours	**Main Contractor, ECO**	**Daily**

ASPECT / IMPACT	MITIGATION	RESPONSIBILITY	FREQUENCY / MONITORING REQUIREMENTS
	during the day and early evening. Night-time activities near noise sensitive areas should not be allowed. 9. With regard to unavoidable very noisy construction activities in the vicinity of noise sensitive areas, the Contractor and ECO should liaise with local residents on how best to minimise impact, and the local population should be kept informed of the nature and duration of intended activities. 10. As construction workers operate in a very noisy environment, it must be ensured that their working conditions comply with the requirements of the Occupational Health and Safety Act (Act No 85 of 1993). Where necessary ear protection gear should be worn. 11. Noisy activities to take place during allocated construction hours only as per section 25 of the Noise Control Regulations of the Environment Conservation Act, 1989 (Act No. 73 of 1989) 12. Noise from labourers must be controlled. 13. Noise suppression measures must be applied to all construction equipment. Construction equipment must be kept in good working order and where appropriate fitted with silencers which are kept in good working order. Should the vehicles or equipment not be in good working order, the Contractor may be instructed to remove the offending vehicle or machinery from site. 14. The Contractor must take measures to discourage labourers from loitering in the area and causing noise disturbance. Where possible labour shall be transported to and from the site by the Contractor or his sub-contractors by the Contractors own transport.		

5.11 Flora and Fauna

ASPECT / IMPACT	MITIGATION	RESPONSIBILITY	FREQUENCY / MONITORING REQUIREMENTS
FLORA Impacts on flora relating to the loss of protected tree species; loss of faunal habitats; destruction of threatened fauna; and interference with fauna.	***Protected tree species*** 1. Protected tree species or plants shall not be removed unless they are interfering with a structure. 2. Conduct a pre-construction walk-down of the approved corridor in order to mark, geo-reference and fence off all protected tree species within the servitudes and development areas. Submit relevant applications for impacts on these individuals. 3. Should impacts on protected tree individuals be unavoidable, obtain necessary and required approval per application for damage/ removal/ cutting/ pruning of protected tree species from Department of Agriculture, Forestry and Fisheries, as per National Forests Act (Act No. 84 of 1998) under Government Notice GN 1012 of 2004 and GN 767 of 2005. 4. The alignment of towers and the power line should be adjusted to prevent the destruction of any remaining large (>4 m) indigenous or protected tree species including the two protected tree species (*Pterocarpus angloensis* – Wild teak and *Sclerocarya birrea* – Marula). 5. Marking should be done by means of semi-permanent (removable) marker tape. 6. Cutting/ pruning/ damaging of any protected tree species should not be allowed under any circumstances without proper approval. ***Vegetation clearance*** 1. Removal of vegetation / plants shall be avoided until such time as soil stripping is required and similarly exposed surfaces must be re-vegetated or stabilised as soon as is practically possible. 2. Only an 8 m strip may be cleared flush with the ground to allow vehicular passage during construction. No scalping shall be allowed on any part of the servitude road unless absolutely necessary. 3. Vegetation clearing on tower sites must be kept to a minimum. 4. Big trees with large root systems shall be cut manually and removed, as the use of a bulldozer will cause major damage to the soil when the root systems are removed. Stumps shall be treated with	**ECO**	**Weekly**

ASPECT / IMPACT	MITIGATION	RESPONSIBILITY	FREQUENCY / MONITORING REQUIREMENTS
	herbicide. 5. Smaller vegetation can be flattened with a machine, but the blade should be kept above ground level to prevent scalping. 6. Any vegetation cleared on a tower site shall be removed or flattened and not be pushed to form an embankment around the tower. 7. No vegetation clearing in the form of de-stumping, scalping or uprooting shall be allowed on river- and stream banks (riparian zone). Vegetation shall only be cut to allow for the passage of the pilot-cables and headboard. 8. Trees and vegetation not interfering with the statutory clearance to the conductors can be left under the line. 9. With permission of the landowner, the total servitude under the line and up to 5m outside the outer phases should be cleared. 10. All remaining Aloes (*Aloe greatheadii*), bulbous plants (geophytes) should be replanted if unearthed during the construction phase of the project. 11. Disturbance of vegetation must be limited to areas of construction. 12. Where herbicides are used to clear vegetation, specimen-specific chemicals should be applied to individual plants only. General spraying should be prohibited. The use of herbicides shall only be allowed after a proper investigation into the necessity, the type to be used, the long-term effects and the effectiveness of the agent. The application of herbicides shall be under the direct supervision of a qualified technician. All surplus herbicide shall be disposed of in accordance with the supplier's specifications. 13. All declared aliens must be identified and managed in accordance with the Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983), namely: • Uprooting, felling or cutting; • Treatment with a weed killer that is registered for use in connection with such plants in accordance with the directions for the use of such a weed killer; • The application of control measures regarding the utilisation and protection of veld in terms of regulation 9 of the Act; • The application of control measures regarding livestock reduction or removal of animals in terms of regulations 10 and		

ASPECT / IMPACT	MITIGATION	RESPONSIBILITY	FREQUENCY / MONITORING REQUIREMENTS
	11of the Act; • Any other method or strategy that may be applicable and that is specified by the executive officer by means of a directive. 14. All alien vegetation in the total servitude and densifiers creating a fire hazard shall be cleared and treated with herbicides 15. All alien invasive plant should be removed from the site to prevent further invasion. 16. All alien vegetation should be eradicated over a five-year period. 17. According to the Conservation of Agricultural Resource Act (No. 43 of 1983) as amended, the person applying herbicide must be adequately qualified and certified as well as registered with the appropriate authority to apply herbicides. 18. Monitoring the potential spread of declared weeds and invasive alien vegetation to neighbouring land and protecting the agricultural resources and soil conservation works are regulated by the Conservation of Agricultural Resources Act, No. 43 of 1983 and should be addressed on a continual basis. 19. The establishment and re-growth of alien vegetation must be controlled after the removal of grass. 20. The contractor must have the necessary knowledge to be able to identify protected species as well as species not interfering with the operation of the line due to their height and growth rate. 21. The contractor must also be able to identify declared weeds and alien species that can be totally eradicated. 22. The contractor must be in possession of a valid herbicide applicators licence. 23. The Eskom Standard for Bush Clearing (Appendix C) should be adhered to. 24. The removal or picking of any protected or unprotected plants shall not be permitted and no horticultural specimens (even within the demarcated working area) shall be removed, damaged or tampered with unless agreed to by the ECO. 25. The removal of all economically valuable trees or vegetation shall be negotiated with the Landowner before such vegetation is removed. 26. Use of branches of trees and shrubs for fire making purposes is strictly prohibited.		

ASPECT / IMPACT	MITIGATION	RESPONSIBILITY	FREQUENCY / MONITORING REQUIREMENTS
	Faunal habitats 1. No dumping of any materials in undeveloped open areas and neighbouring properties should be allowed. 2. Disturbance of vegetation cover as well as rocky outcrops, logs, stumps, termite mounds within sensitive areas should be limited. 3. All temporary stockpile areas including litter and dumped material and rubble must be removed on completion of construction. ***Re-vegetation*** 1. Disturbed areas of natural vegetation as well as cut and fills must be rehabilitated immediately to prevent soil erosion. 2. Re-seeding shall be done on disturbed areas as directed by the Environmental Control Officer. ***Threatened fauna*** 1. As a precautionary mitigation measure it is recommended that the developer and construction contractor as well as an independent environmental control officer should be made aware of the possible presence of certain threatened animal species (Southern African Python) prior to the commencement of construction activities. In the event that any of the above-mentioned species are discovered relevant conservation authorities should be informed and activities surrounding the site suspended until further investigations have been conducted. 2. Access to the power line servitude must be restricted. Access to the power line servitude should ideally be fenced off and gated along the main access roads. 3. Prior to construction and vegetation clearance a suitably qualified Zoologist/Botanist or Ecologist should closely examine the proposed construction areas (tower supports) for the presence of any animal burrows (including spiders and scorpions), rocky outcrops, logs, stumps and other debris and relocate any affected animals to appropriate habitat away from the servitude or tower. 4. Contract employees must be educated about the value of wild animals and the importance of their conservation.		

ASPECT / IMPACT	MITIGATION	RESPONSIBILITY	FREQUENCY / MONITORING REQUIREMENTS
	5. Activities in the surrounding open undeveloped areas (especially open bushveld must be strictly regulated and managed. ***Human presence*** 1. Movement of workers must be limited to areas under construction and access to the undeveloped areas, especially the surrounding open areas must be strictly regulated ("no-go" areas during construction activities). ***Disturbance to livestock*** 1. Construction activities must be planned carefully so as not to interfere with the calving and lambing season for most animal species. 2. The Contractor shall under no circumstances interfere with livestock without the landowner being present. This includes the moving of livestock where they interfere with construction activities. 3. Should the Contractors workforce obtain any livestock for eating purposes, they must be in possession of a written note from the landowner. 4. Speed limits must be restricted especially on farm roads (30 km/hr) preventing unnecessary road fatalities of surrounding livestock. ***Fire*** 1. No open fires shall be allowed on site under any circumstance. The Contractor shall have fire-fighting equipment available on all vehicles working on site, especially during the winter months.		

5.12 Avifauna

ASPECT / IMPACT	MITIGATION	RESPONSIBILITY	FREQUENCY / MONITORING REQUIREMENTS
AVIFAUNA Disturbance of birds, impact on Red Data and other avifaunal species. Destruction or alteration of bird habitat, Impact on Red Data and other species.	1. Strict control should be maintained over all activities during construction, in particular heavy machinery and vehicle movements, and staff. It is difficult to mitigate properly for this as some habitat destruction is inevitable. During construction, if any of the "Focal Species" identified in the avifaunal report are observed to be roosting and/or breeding in the vicinity, the Endangered Wildlife Trust is to be contacted for further instruction.	**ECO**	**Weekly**

5.13 Waste Management

ASPECT / IMPACT	MITIGATION	RESPONSIBILITY	FREQUENCY / MONITORING REQUIREMENTS
WASTE MANAGEMENT Waste produced during construction includes: general construction rubble, hazardous waste (used oil, cement and concrete etc.)	***Construction rubble*** 1. Where possible, construction waste on site must be reused or recycled. 2. Disposal of waste must be in accordance with relevant legislative requirements. 3. Construction rubble shall be disposed of at the nearest registered landfill site that has been approved by the relevant Municipality. ***Litter management*** 1. Refuse bins must be placed at strategic positions to ensure that litter does not accumulate within the construction site. 2. A housekeeping team should be appointed to regularly maintain the litter and rubble situation on the construction site. 3. If possible and feasible, all waste generated on site must be separated into glass, plastic, paper, metal and wood and recycled. An independent Contractor can be appointed to conduct this	**Main Contractor, ECO**	**Weekly**

ASPECT / IMPACT	MITIGATION	RESPONSIBILITY	FREQUENCY / MONITORING REQUIREMENTS
	recycling. 4. Littering by the employees of the Contractor shall not be allowed under any circumstances. The ECO shall monitor the neatness of the work sites as well as the Contractor campsite. 5. Skip waste containers should be maintained on site. These should be kept covered and arrangements made for them to be collected regularly form the site by the local council. 6. All waste must be removed from the site and transported to a landfill site as approved by the relevant Municipality. 7. Waybills providing disposal at each site shall be provided to the ECO's inspection. 8. The Contractor must familiarise themselves with the definitions of waste and the handling, storage and transport of waste as prescribed in the applicable environmental legislation. 9. Burning of waste will not be permitted. ***Hazardous waste*** 1. All waste hazardous materials must either be stored in a bunded or lined area or as otherwise advised by the ECO, and then disposed of off at a licensed landfill site by a reputable third party waste Contractor. Hazardous waste may not be stored on site in excess of a 90 calendar day period. 2. Contaminants to be stored safely to avoid spillage. 3. Machinery must be properly maintained to keep oil leaks in check. 4. Labelled containers must be provided to store used oils, as well as hazardous waste containers for oily rags, oil filters etc. and must be disposed of at a suitable approved register dumpsite. ***Sanitation*** 1. The Contractor shall install mobile chemical toilets on the site. 2. No indiscriminate sanitary activities on site shall be allowed. 3. Ablution facilities shall be within 100 m from workplaces but not closer than 50 m from any natural water bodies or boreholes. There should be enough toilets available to accommodate the workforce. Male and females must be accommodated separately where		

ASPECT / IMPACT	MITIGATION	RESPONSIBILITY	FREQUENCY / MONITORING REQUIREMENTS
	possible. 4. Toilets should be no closer than 100 m or above the 1:100 year flood line from any natural or manmade water bodies or drainage lines or alternatively located in a place approved of by the ECO. 5. Potable water must be provided for all construction staff. ***Remedial actions*** 1. Depending on the nature and extent of the spill, contaminated soil must be either excavated or treated on-site. 2. Excavation of contaminated soil must involve careful removal of soil using appropriate tools/machinery to storage containers until treated or disposed of at a licensed hazardous landfill site. 3. The ECO must determine the precise method of treatment of polluted soil. This could involve the application of soil absorbent materials as well as oil-digestive powders to the contaminated soil. 4. If a spill occurs on an impermeable surface such as cement or concrete, the surface spill must be contained using oil absorbent materials. 5. If necessary, oil absorbent sheets or pads must be attached to leaky machinery or infrastructure. 6. Materials used for the remediation of petrochemical spills must be used according to product specifications and guidance for use. 7. Contaminated remediation materials must be carefully removed from the area of the spill so as to prevent further release of petrochemicals to the environment, and stored in adequate containers until appropriate disposal.		

5.14 Health and Safety

ASPECT / IMPACT	MITIGATION	RESPONSIBILITY	FREQUENCY / MONITORING REQUIREMENTS
HEALTH AND SAFETY Safety of workers and the public exposed to construction activity hazards	***Worker safety*** 1. Implementation of safety measures, work procedures and first aid must be implemented on site. 2. A health and safety plan in terms of the Occupational Health and Safety Act (Act No. 85 of 1993) must be drawn up to ensure worker safety. 3. Workers should be thoroughly trained in using potentially dangerous equipment. 4. Contractors must ensure that all equipment is maintained in a safe operating condition. 5. A safety officer must be appointed. 6. A record of health and safety incidents must be kept on site. 7. Any health and safety incidents must be reported to the project manager immediately. 8. First aid facilities must be available on site at all times. 9. Workers have the right to refuse work in unsafe conditions. 10. A record shall be kept of drugs administered or precautions taken and the time and dates when this was done. This can then be used as evidence in court should any claims be instituted against Eskom or Contractor. 11. The Contractor must ensure that all construction workers are well educated about HIV/ AIDS and the risks surrounding this disease. 12. Material stockpiles or stacks, such as, pipes must be stable and well secured to avoid collapse and possible injury to site workers. ***Worker facilities*** 1. Eating areas should be regularly serviced and cleaned to ensure the highest possible standards of hygiene and cleanliness. 2. Fires are not to be allowed. ***Protective gear*** 1. Personal Protective Equipment (PPE) must be made available to all construction staff and must be compulsory. Hard hats and safety	**Eskom, Main Contractor, ECO**	**Daily**

ASPECT / IMPACT	MITIGATION	RESPONSIBILITY	FREQUENCY / MONITORING REQUIREMENTS
	shoes must be worn at all times and other PPE worn where necessary i.e. dust masks, ear plugs etc. 2. No person is to enter the site without the necessary PPE. ***Site safety*** 1. The construction camp must remain fenced for the entire construction period. 2. Potentially hazardous areas such as trenches are to be demarcated and clearly marked 3. Adequate warning signs of hazardous working areas. 4. Uncovered manholes and excavations must be clearly demarcated 5. Emergency numbers for local police and fire department etc must be placed in a prominent area. 6. Fire fighting equipment must be placed in prominent positions across the site where it is easily accessible. This includes fire extinguishers, a fire blanket as well as a water tank. 7. Suitable conspicuous warning signs in English and all other applicable languages must be placed at all entrances to the site. 8. All speed limits must be adhered to. ***Hazardous material storage*** 1. Staff that will be handling hazardous materials must be trained to do so. 2. Any hazardous materials (apart from fuel) must be stored within a lockable store with a sealed floor. 3. Storage areas containing hazardous substances / materials must be clearly sign-posted. 4. All storage tanks containing hazardous materials must be placed in bunded containment areas with sealed surfaces. The bund walls must be high enough to contain 110% of the total volume of the stored hazardous material. 5. For transformer oil containers which may be required to be temporary stored on site for a period of not more than 21-calendar days, the following is proposed: • Oil dam and drainage system be built before the installations of		

ASPECT / IMPACT	MITIGATION	RESPONSIBILITY	FREQUENCY / MONITORING REQUIREMENTS
	transformers on site; • Drip-trays be placed underneath the nozzles to contain any leakage that may occur; • Impermeable plastics be placed underneath the tank / containers instead of building a bund-wall; • Drip-trays and containers be checked daily and should there be any leakage captured in drip-trays, that must be emptied into the already built oil drainage system linked to the oil dam; and • Adherence to Eskom's Oil Spill Clean-up and Rehabilitation Standard (Appendix D) and those prescribed by other statutory requirements will be maintained and adhered to at all times. The bund walls for the transformer oil containers must be in place before the installation of these containers. 6. The provisions of the Hazardous Chemical Substances Regulations promulgated in terms of the Occupational Health and Safety Act 85 of 1993 and the SABS Code of Practise must be adhered to. This applies to solvents and other chemicals possibly used in the construction time. ***Procedure in the event of a petrochemical spill*** 1. The individual responsible for or who discovers the petrochemical spill must report the incident to the Project Manager, ECO or Contractor. 2. The problem must be assessed and the necessary actions required will be undertaken. 3. The immediate response must be to contain the spill. 4. The source of the spill must be identified, controlled, treated or removed. ***Fire management*** 1. Fire fighting equipment should be present on site at all times as per Occupational Health and Safety Act 85 of 1993. 2. All construction staff must be trained in fire hazard control and fire fighting techniques. 3. All flammable substances must be stored in dry areas which do not		

ASPECT / IMPACT	MITIGATION	RESPONSIBILITY	FREQUENCY / MONITORING REQUIREMENTS
	pose an ignition risk to the said substances. 4. No open fires will be allowed on site.		

5.15 Security

ASPECT / IMPACT	MITIGATION	RESPONSIBILITY	FREQUENCY / MONITORING REQUIREMENTS
SECURITY Issues associated with security during construction for workers and surrounding land users	1. Access to the construction site should be strictly controlled by a security company. 2. 24 hour security on-site. 3. No person shall enter the site unless authorised to do so by the Contractor, project manager and ECO. 4. If any fencing interferes with the construction process, such fencing shall be deviated until construction is completed. The deviation of fences shall be negotiated and agreed with the landowner in writing. 5. Trespassing on private / commercial properties adjoining the site is forbidden. 6. Secure the site in order to reduce the opportunity for criminal activity in the locality of the construction site.	**Main Contractor, ECO**	**Weekly**

5.16 Social Environment

ASPECT / IMPACT	MITIGATION	RESPONSIBILITY	FREQUENCY / MONITORING REQUIREMENTS
SOCIAL ENVIRONMENT Social impacts of construction activities will have on the site and surrounds)	1. All contact with the affected parties shall be courteous at all times. The rights of the affected parties shall be respected at all times. 2. A complaints register should be kept on site. Details of complaints should be incorporated into the audits as part of the monitoring process. This register is to be tabled during monthly site meetings. 3. No interruptions other than those negotiated shall be allowed to any	**Project Manager, Main Contractor ECO**	**Bi-Monthly**

ASPECT / IMPACT	MITIGATION	RESPONSIBILITY	FREQUENCY / MONITORING REQUIREMENTS
	essential services. Damage to infrastructure shall not be tolerated and any damage shall be rectified immediately by the Contractor. A record of all damage and remedial actions shall be kept on site. ***Loss of land and relocation of households*** 1. Some households might need to be relocated to accommodate the new power line. 2. Avoid existing settlements whenever possible. 3. Compensate for relocation and hassle costs[1] appropriately. ***Influx of construction workers*** 1. Raise awareness amongst construction workers about local traditions and practices. 2. Inform local businesses that construction workers will move into the area to enable local businesses to plan for the extra demand. 3. Ensure that the local community communicates their expectations of construction workers' behaviour with them. ***Influx of job seekers*** 1. Ensure that employment procedures / policy are communicated to local stakeholders, especially community representative organisations and ward councillors. 2. In order to minimise the potential for influx of workers, however, it is recommended that local labour be utilised as far as possible. 3. Have clear rules and regulations for access to the camp / site office to control loitering. Consult with the local SAPS to establish standard operating procedures for the control and/or removal of loiterers at the construction site. 4. Construction workers should be clearly identifiable by wearing proper construction uniforms displaying the logo of the construction company. Construction workers could also be issued with identification tags. 5. Eskom (or its appointed Contractor) should monitor areas where		

[1] Hassle costs include: increase in transportation, educational costs etc. if households need to be relocated.

ASPECT / IMPACT	MITIGATION	RESPONSIBILITY	FREQUENCY / MONITORING REQUIREMENTS
	people gather in the field on a regular basis as this is normally the first indication that settlement might take place in the area. These people should be removed in co-operation with the local SAPS to prevent the formation and/or expansion of informal settlements in such an area. ***Electricity supply and economic growth*** 1. Consult with Bushbuckridge Local Municipality on their requirements in terms of capacity required and timeframes. ***Attitude formation against the project*** 1. If required, a communication forum should be established with neighbouring residents during the construction period. This forum can meet once a month to discuss any issues and progress on the construction of the substation. 2. Employment opportunities should first be offered to the local community if the skills are available within the community. 3. Eskom or its appointed Contractor(s) should deliver on their undertakings with the community in terms of employment creation, etc. (tangible benefits to the community). 4. The undertakings in the EMPr should also be implemented effectively and with due diligence. ***Additional demand on municipal services*** 1. Sufficient portable chemical toilets should be provided on site. ***Integration with local community*** 1. The community should be informed in advance of the influx of construction workers and the time they will spend in the community as well as the activities they will be involved in. This will enable the community to prepare for a possible (temporary) change in functioning. 2. A code of conduct should be established for construction workers in their dealings with the local community. Creating of awareness on		

ASPECT / IMPACT	MITIGATION	RESPONSIBILITY	FREQUENCY / MONITORING REQUIREMENTS
	both sides (community and outsiders) is crucial for the success of the project. 3. Potential conflict situations can be reduced beforehand using a transparent recruitment process, i.e. where labourers would be sourced from the local community. 4. A labour desk should be implemented where the local community members could register. A rotary system could be used for unskilled labour to ensure that all job seekers have an equal opportunity to employment. 5. Potential conflict situations within the construction village itself can be managed by means of weekly forum meetings. During these meetings residents should have the opportunity to raise any problems experienced and make suggestions in terms of their living space. Where feasible, these problems and suggestions should be addressed as soon as possible to ensure a conflict-free environment.		

5.17 Cultural and Heritage Artefacts

ASPECT / IMPACT	MITIGATION	RESPONSIBILITY	FREQUENCY / MONITORING REQUIREMENTS
CULTURAL AND HERITAGE ARTEFACTS Impact that the construction has on potential heritage and archaeological artefacts that could be found in the study area	1. If during construction any cultural heritage resources or graves are unearthed, all work has to be stopped until the site has been inspected and mitigated by a cultural heritage practitioner. 2. Any discovered artefacts shall not be removed under any circumstances. Any destruction of a site can only be allowed once a permit is obtained and the site has been mapped and noted. Permits shall be obtained from the South African Heritage Resources. 3. Any finds must be reported to the nearest National Monuments office to comply with the National Heritage Resources Act (Act No 25 of 1999) 4. Local museums as well as the South African Heritage Resource Agency (SAHRA) should be informed if any artefacts are uncovered	**Main Contractor, ECO**	**Monthly**

ASPECT / IMPACT	MITIGATION	RESPONSIBILITY	FREQUENCY / MONITORING REQUIREMENTS
	in the affected area. 5. The Contractor must ensure that his workforce is aware of the necessity of reporting any possible historical or archaeological finds to the ECO so that appropriate action can be taken. 6. Any mitigation measures applied by an archaeologist, in the sense of excavation and documentation, should be published in order to bring this information into the public domain.		

5.18 Visual

ASPECT / IMPACT	MITIGATION	RESPONSIBILITY	FREQUENCY / MONITORING REQUIREMENTS
VISUAL Impact that the construction has on potential sensitive viewing locations such as rural residences, roads, and protected areas	1. By taking advantage of natural topographic features, cut and fill slopes can be greatly minimized. 2. Partial clearing at the limits of construction rather than clearing the entire area – leaving islands of vegetation results in a more natural look. 3. Use irregular clearing shapes. 4. Feather/thin the edges of the cleared areas. Feathering edges reduces strong lines of contrast. To create a more natural look along an edge, a good mix of tree/shrub species and sizes should be retained. 5. Establish limits of disturbance that reflect the minimum area required for construction. 6. Locate construction staging and administrative areas in less visually sensitive areas. 7. Colours on smooth structures need to be two or three shades darker than the background colours to compensate for shadow patterns created by natural textures that make colours appear darker. The colour selection for all structures should be made to achieve the best blending with the surrounding landscape in the winter and summer. 8. Use earth-tone paints and stains. Colours that blend with or are in	**Main Contractor, ECO**	**Monthly**

ASPECT / IMPACT	MITIGATION	RESPONSIBILITY	FREQUENCY / MONITORING REQUIREMENTS
	harmony with the existing colours of the surrounding earth, rocks and vegetation, are usually more visually pleasing and attract less attention than colours that are chosen to match the colour of the sky. 9. Galvanized steel on structures should be darkened to prevent glare. Low lustre paints should be used wherever possible to reduce glare. 10. Select paint finishes with low levels of reflectivity. 11. Screen the structure from view through the use of natural landforms and vegetation. 12. Minimize the number of structures and combining different activities in one structure where possible. 13. Attempt to repeat the form, line, colour and texture of the surrounding landscape to reduce the contrast between the landscape and the proposed infrastructure. 14. Use natural stone in wall surfaces if possible. 15. Haul in or haul out excessive earth cut or fill in sensitive viewing areas. 16. Bend slopes to match existing landforms. 17. Retain existing rock formations, vegetation, drainage, etc., whenever possible. 18. Tone down freshly broken rock faces through the use of asphalt emulsions, rock stains, etc. 19. Protect roots from damage during excavations. 20. Avoid soil types that will generate strong contrasts with the surrounding landscape when they are disturbed. 21. Prohibit dumping of excess earth/rock on downhill slopes.		

6 OPERATIONAL PHASE

ASPECT / IMPACT	MITIGATION	RESPONSIBILITY	FREQUENCY / MONITORING REQUIREMENTS
ACCESS ROADS Access roads used for maintenance might impact on vegetation and water bodies	1. Use should be made of existing roads as far as possible, ensuring proper maintenance/upgrade. Alternative methods of construction / access to sensitive areas are recommended. 2. No vehicles should be allowed to cross rivers or streams in any area other than an approved crossing, taking care to prevent any impact (particularly erosion) in surrounding habitat. 3. All buffers around wetlands and rivers should be maintained. 4. Vehicular traffic shall not be allowed in permanently wet areas, no damage shall be caused to wet areas. Where necessary, alternative methods of construction shall be used to avoid damage to wet areas. 5. Any work or access near or in a permanent drainage system may have implications in terms of the National Water Act, 1998 (Act No. 36 of 1998), and therefore may well require the application of a Water Use License. Therefore, the Contractor must in consultation with the ECO, assess all areas along the alignment well in advance in order to ensure the relevant Water Use License is applied for where required.	**Project Manager**	**Weekly**
AVIFAUNA Collisions with overhead power lines - collisions with the proposed line of certain large flying bird species such Secretary Bird, Kori Bustard, various Stork species, and Southern Ground Hornbill, is a possibility. Possible bird electrocution, impact on Red Data and other species.	1. A “Bird Friendly” monopole structure, with a bird perch (as per standard Eskom guidelines) should be used for the tower structures. Any deviation should be reported to EWT. 2. For the purple route alternative - Mark the identified sections of line with anti-collision marking devices on the earth wire to increase the visibility of the line and reduce likelihood of collisions as indicated in the Avifaunal Report. Marking devices should be space 10 m apart. The sections of the line that pose a concern and require marking should be finalised in a site “walkthrough” by EWT once the final route is decided and the towers/pylons are pegged. 3. A “Bird Friendly” monopole structure, with a bird perch (as per standard Eskom guidelines) should be used for the tower structures. Any deviation should be reported to EWT as it will alter this impact rating.	**Project Manager**	**Monthly**
WASTE Waste generation during the operation	1. Where possible, construction waste on site must be reused or recycled. 2. Disposal of waste must be in accordance with relevant legislative requirements.	**Project Manager**	**Weekly**

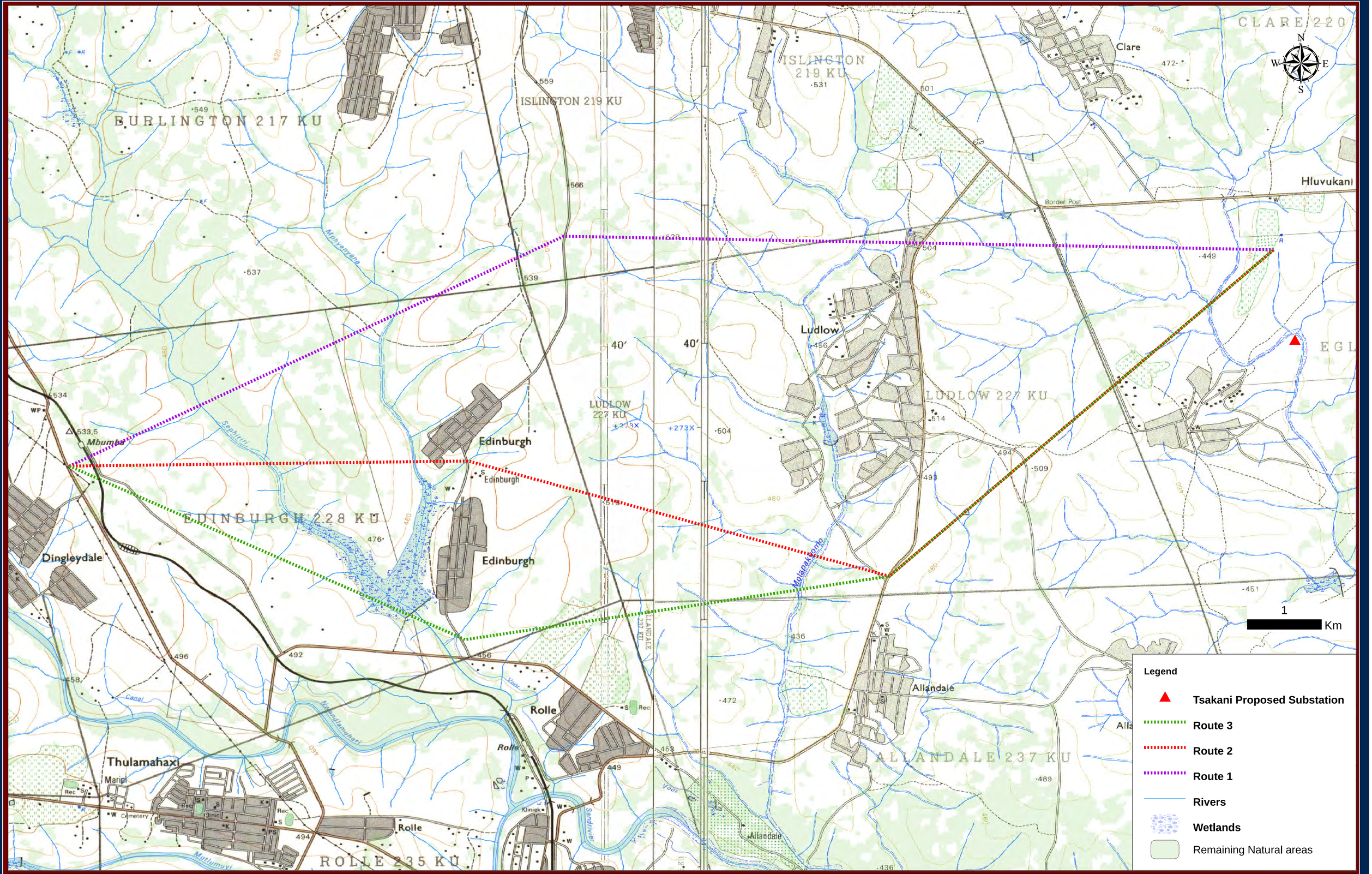
ASPECT / IMPACT	MITIGATION	RESPONSIBILITY	FREQUENCY / MONITORING REQUIREMENTS
phase will have a negative impact on the environment, if not controlled adequately. Waste includes: general waste or hazardous waste (used oil etc.)	3. The Contractor must familiarise themselves with the definitions of waste and the handling, storage and transport of it as prescribed in the applicable environmental legislation. 4. Burning of waste material will not be permitted.		
ELECTROMAGNETIC FIELDS	1. In general, it is not recommended for humans to live under power lines due to the effects of EMF. However, the radiation decreases with an increase in distance from the source. The EMFs are insignificant on the servitude border.	**Project Manager**	
SAFETY There is the potential risk of electrocution (people and livestock) if access to the site is not controlled.	1. Safety and security issues should be addressed as a priority by Eskom. It is recommended that the landowners and affected community members be contacted in advance to ensure that they are forewarned of the construction and maintenance activities planned in the area. 2. In addition, the local community must be educated about the dangers of high voltage electricity.	**Project Manager**	**Monthly**
VISUAL The power lines could have an impact on potential sensitive viewing locations such as rural residences, roads, and protected areas.	1. Indigenous vegetation should be planted to achieve landscape patterns that emulate in part existing mixes of tree and grass cover in the surrounding landscape. 2. An internal landscape plan for rehabilitation areas should be prepared. 3. Exposure of work areas should be as minimal as possible.	**Project Manager**	

7 DECOMMISSIONING AND CLOSURE PHASE

ASPECT / IMPACT	MITIGATION	RESPONSIBILITY	FREQUENCY / MONITORING REQUIREMENTS
DECOMMISSIONING	***Removal of equipment*** 1. All structures comprising the construction camp are to be removed from site. 2. The area that previously housed the construction camp is to be checked for spills of substances such as oil, paint, etc, and these shall be cleaned up. 3. All hardened surfaces within the construction camp area should be ripped, all imported materials removed, and the area shall be top soiled and regressed. ***Temporary services*** 1. The Contractor must arrange the cancellation of all temporary services. 2. A copy of all waste disposal certificates from waste disposal service providers are to be presented to the Project Manager. 3. Temporary roads must be closed and access across these, blocked. 4. All areas where temporary services were installed are to be rehabilitated to the satisfaction of the Project Manager. ***Associated infrastructure*** 1. Surfaces are to be checked for waste products from activities such as concreting and cleared in a manner approved by the ECO. 2. All surfaces hardened due to construction activities are to be ripped and imported material thereon removed. 3. All rubble is to be removed from the site to an approved disposal site as approved by the ECO. Burying of rubble on site is prohibited. 4. The site is to be cleared of all litter. 5. The Contractor is to check that all watercourses are free from building rubble, spoil materials and waste materials. 6. Fences, barriers and demarcations associated with the construction phase are to be removed from the site. 7. All residual stockpiles must be removed to spoil or spread on site as directed by the ECO. 8. All leftover building materials must be returned to the depot or removed	**Main Contractor, Project Manager, ECO**	**Weekly**

ASPECT / IMPACT	MITIGATION	RESPONSIBILITY	FREQUENCY / MONITORING REQUIREMENTS
	from the site. 9. The Contractor must repair any damage that the construction works has caused to neighbouring properties, specifically, but not limited to, damage caused by poor storm water management. ***Waste disposal*** 1. Disposal of waste must be in accordance with relevant legislative requirements. 2. Waste must be disposed off in the appropriate manner at a licensed disposal site. ***Erosion*** 1. Rehabilitation of areas affected by construction activities should ideally commence at the start of the raining season (November). 2. Recommended rehabilitation is in the form of active re-vegetation of affected areas, including areas where surface disturbances resulted from construction. 3. All partially constructed areas should be completed and prepared for final rehabilitation and re-vegetation; 4. All areas where topsoil was removed or placing of monopoles should be landscaped in order to reflect surrounding conditions. 5. Erosion monitoring and control should be conducted. This should be in the form of inspections subsequent to rains. Topsoil should be replaced in all areas that were eroded. It is critical that adequate topsoil remains in construction areas, implying that topsoil might need to be supplemented in some areas until such time that a layer of vegetation has stabilised the soil.		

APPENDIX A:
LOCALITY MAP



Proposed alternative route options

BA: Proposed Constructure of a 17km 132kV from existing Mbumbu Traction to new Tsakani Substation

Source: DWA 1: 50 000 Rivers, Surveys and Mapping, MCBP 2007

2 December 2011

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APPENDIX B:
ENVIRONMENTAL LEGISLATION

Summary table of relevant environmental legislation:

Name of Act or Regulation	Area of Application	Responsible Authority
Constitution of the Republic of South Africa Act (No 108 of 1996)	The constitution of South Africa.	National, Provincial and Local Government
National Environmental Management, Act (No 107 of 1998)	Control/prevention of pollution; combating of noise; activities which may have a detrimental effect on the environment, preparation and contents of environmental impact reports.	Department of Environmental Affairs; Department of Water Affairs; Provincial Department of Environmental Affairs
National Environmental Management: Air Quality Act (No. 39 of 2004)	Protect the environment by providing measures for the prevention of pollution and ecological degradation, while promoting justifiable economic and social development.	Department of Environmental Affairs
Conservation of Agricultural Resources Act (No 43 of 1983)	Control and prevention of veld fires, soil conservation, control, control of weeds and invader plants.	Department of Agriculture
National Environment Management: Waste Act No. 59 of 2008	Protect health and the environment by providing reasonable measures for the prevention of pollution and ecological degradation and provide for specific waste management strategies.	Department of Environmental Affairs
Hazardous Substances Act (No 15 of 1973)	Provides for the control of substances, which may cause injury or ill health to, or the death of human beings.	National Department of Health. Local Authorities may be authorised
National Water Act (No 36 of 1998)	Conservation and use of water. Treatment and disposal of waste, wastewater and effluent. Pollution and pollution emergencies.	Department of Water Affairs
National Heritage Resources Act (No 25 of 1999)	Conservation of national heritage and archaeological material.	South African Heritage Resources Agency; National Council for Heritage
National Biodiversity (Act No. 10 of 2004)	Provide for the protection of species and ecosystems that warrant national protection and the sustainable use of indigenous biological resources	Department of Environmental Affairs
National Forest Act No. 84 of 1998	Provides for related matters	Department of Agriculture, Forestry and Fisheries
Occupational Health and Safety Act (No 85 of 1993)	Controls the exposure of employees and the public to dangerous and toxic substances or activities.	Department of Labour
National Veld and Forest Fire Act (No 101	Control and prevention of veld fires.	Department of Forestry

Name of Act or Regulation	Area of Application	Responsible Authority
of 1998)		
Road Traffic Act (No 29 of 1989)	Provides for road traffic matters.	Department of Transport
Mpumalanga Biodiversity Conservation Plan	Provides information on biodiversity and its importance and indicates the biomes and other biodiversity highlights of Mpumalanga.	Department of Agriculture and Land Administration
White Paper on the Conservation and Sustainable Use of South Africa's Biological Diversity	Sets out the government's policy towards and strategy for achieving the objectives of the United Nation's Convention on Biological diversity (or biodiversity)	
All relevant Provincial regulations, Municipal by-laws and ordinances		

APPENDIX C:
ESKOM STANDARD FOR BUSHCLEARING

Table D1: Minimum standards to be used for vegetation clearing for the construction of a new 132 kV Sub-transmission line

Item	Standard	Follow up
Centre line of the proposed Sub-transmission line	Clear to a maximum (depending on tower type and voltage) of an 8 m wide strip of all vegetation along the centre line. Vegetation to be cut within 100 mm of the ground. Treat stumps with herbicide.	Re-growth shall be cut within 100 mm of the ground and treated with herbicide, as necessary.
Inaccessible valleys (trace line)	Clear a 1 m strip for access by foot only, for the pulling of a pilot wire by hand.	Vegetation not to be disturbed after initial clearing – vegetation to be allowed to re-grow.
Access / service roads	Clear a maximum (depending on tower type) 5 m wide strip for vehicle access within the maximum 8 m 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.
Proposed tower position and proposed support / stay wire position	Clear all vegetation within proposed tower position and within a maximum (depending on tower type) radius of 5 m around the position, including de-stumping / cutting stumps to ground level, treating with a herbicide and re-compaction of soil. Allow controlled agricultural practices, where feasible.	Re-growth to be cut at ground level and treated with herbicide as necessary.
Indigenous vegetation within servitude area (outside of maximum 8 m strip)	Area outside of the maximum 8 m strip and within the servitude area, selective trimming or cutting down of those identified plants posing a threat to the integrity of the proposed Sub-transmission line.	Selective trimming
Alien species within servitude area (outside of maximum 8 m strip)	Area outside of the maximum 8 m strip and within the servitude area, remove all vegetation within servitude area and treat with appropriate herbicide.	Cut and treat with appropriate herbicide.

APPENDIX D
OIL SPILL CLEAN-UP AND REHABILITATION STANDARD

ESKOM

STANDARD

		REFERENCE REV
		ESKASABT0 **0**
TITLE:	**OIL SPILL CLEAN-UP AND REHABILITATION**	DATE: **NOVEMBER 2000**
		PAGE **1** OF **11**
		REVISION DATE: **NOVEMBER 2003**

COMPILED BY	FUNCTIONAL RESP.	AUTHORIZED BY
.....	.....	.....
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This document has been seen and accepted by:

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E N Matya	**Executive Director (Generation)**
D D Mokgatle	**Executive Director (Transmission)**

Contents

Foreword

This standard has been compiled to set a uniform standard addressing oil spill emergencies and long term action following the need identification by Eskom's Corporate Environmental Affairs Department. The standard addresses the containment and the remediation issues surrounding an oil spill. It also gives a risk rating and response reaction guideline. The standard was compiled following various discussions with staff involved in oil spills as well as response teams from various organizations

NOTE All comments for revising and updating this document must be directed to the Environmental Liaison Committee (ELC), who will in turn liaise with the Technology Standardization Manager.

Queries concerning this standard may be directed to the compilers, Ms A Lombard at Technology Services International (TSI), Rosherville or Mr M Hunter at Distribution, Megawatt Park.

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- Ms W Poulton – Corporate Environmental Affairs
- Various Eskom staff members who participated in the oil spill questionnaire survey

Introduction

Insulating oil and other related hydrocarbon and synthetic compounds pose a serious pollution problem when released into the environment. Not only do these compounds pose a fire hazard, but with one litre of oil having the potential to contaminate in excess of a million litres of water, it needs to be handled with care. Oil can rapidly penetrate certain soil types, which may lead to extensive soil contamination as well as ground water and surface water contamination. The Water Act 36 of 1998, states that "hydrocarbons should not touch the soil or water and if they do, they shall be removed immediately".

1 Scope

1.1 Purpose

The purpose of this standard is to communicate a standard policy and response action following an oil spill on a site. It includes a rating system to enable a risk assessment that will assist with the reporting and especially the level of reporting of an oil spill.

This standard is applicable to any oil handling site and oil containing equipment, which includes distribution, transmission, generation sites as well as all contractors working on Eskom sites. It is of particular importance for employees in oil storage areas, maintenance teams and contractors to be familiar with the contents of this standard.

1.2 Applicability

This standard is applicable to all Eskom employees and contractors who in the event of their daily activities come across an oil spill.

2 Normative references

The following documents contain provisions that, through reference in the text, constitute requirements of this standard. At the time of publication, the editions indicated were valid. All standards and specifications are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the documents listed below. Information on currently valid national and international standards and specifications can be obtained from the Information Centre and Corporate Technology Standardization Division at Megawatt Park.

Erickson, MD:1993, *Remediation of PCB Spills*. Lewis publishers, Tokyo.

Waste-tech:1999, *National spill response service.*

MRO Product Management:1999, *Inland oil spill contingency plans*.

Eskom:1999, *NIOSC Insulating Oil Manual.*

ESKADABG8:Rev.0, Directive on oil spill clean-up and rehabilitation.

3 Definitions and abbreviations

3.1 Definitions

3.1.1 clean-up: The action of remediation, this may include soil excavation, bio-remediation, solvent soil wash, landfarming or electrochemical treatment.

3.1.2 containment: The prevention of the spreading of the oil spill.

3.1.3 drip: Where continuous dripping is taking place and can result in pooling of the oil.

3.1.4 explosion: A situation, which occurred due to the rupture of electrical equipment as a result of an electrical fault.

3.1.5 leak: A continuous dripping that will result in pooling of oil that will require corrective action as the electrical equipment will have to be topped-up.

3.1.6 off-site: A site, road or property not belonging to Eskom.

3.1.7 on-site: Any Eskom site (including any Eskom leased site).

3.1.8 remediation: A method of clean-up that will ensure a minimum hydrocarbon or synthetic oil presence of 1000 ppm or (0,1 %) above the background level.

3.1.9 Responsible Person: The person appointed by the relevant line manager, who will take responsibility during remedial action following a spill. This might be the environmental co-ordinator or the relevant site manager.

3.1.10 spill: Any amount of oil present out off its "normal" container – where normal refers to a transformer or a drum etc.

3.1.11 weep: Where no free running oil is visible, but the area is damp with oil. It will be an area where dust is accumulating but no effective loss of oil is evident.

3.2 Abbreviations

3.2.1 NIOSC: National Insulating Oil Steering Committee

3.2.2 PCB: polychlorinated biphenyls

3.2.3 ppm: parts per million

3.2.4 TSI: Technology Services International

3.2.5 UTO: used transformer oil

4 Requirements

4.1 General

An oil spill may be defined as being any amount of oil no longer present in its normal container or equipment. The Water Act, 1998 (Act 36 of 1998) states that “hydrocarbons should not touch the soil or water and if they do, shall be removed immediately". Oil spills can be categorized as being small or large, historic, weep, seep, drip, leaks on Eskom or neighbouring sites or major catastrophic events. However, the immediate prevention and clean-up is considered to be essential in all of the above.

4.2 Assessment of the spillage

Assessment of the oil spill will need considerable judgement to perform. Evaluating the cause, extent and ultimate corrective action can be done using the table given in annex A. The assessment shall include the following factors:

a) identifying the source of the spill;

b) the age of the spill;

c) life-threatening conditions;

d) weather conditions;

e) properties affected (Eskom, neighbours, National roads);

f) traffic implications;

g) threat to any water bodies;

h) PCB presence;

j) soil types; and

k) public relations threat.

4.3 Securing of sites

Where necessary, secure the site and contain the spill to avoid further pollution, determine the spill boundaries, prevent unauthorized access to the spill site and, where required, notify all parties involved. The securing can include barricades, ropes, plastic taping or covers, or any other appropriate measures in order to prevent access or spread of the contamination.

4.4 Spill on an Eskom site

4.4.1 Limit the spillage

The need for immediate corrective action to limit the spillage cannot be overemphasised as this will minimize the environmental damage and reduce remediation costs. This can involve actions such as:

a) closing a valve;

b) repairing the leak with rags, plugs or other appropriate material;

c) repositioning the container so that the leaking area is at the highest level or lifting a fallen drum/container;

d) placing a leaking container or equipment into a collecting tray or bund area; and

e) collecting the spilt oil in a container located underneath the leak or channelling the leak into a container.

4.4.2 Containing the spillage

The containment of a spillage will involve an action that will either prevent or stop a spill from spreading. It is vital to prevent any oil spill from entering waterbodies such as drains, stormwater systems, dams or rivers. Containment of the oil near the source will minimize pollution and will enable easy clean-up and/or remediation. This shall be done using one or more of the following:

a) soil barriers;

b) sand bags;

c) bund walls; and

d) absorbent materials.

4.4.3 Removal of oil

The free oil (puddles) shall be captured and put into a suitable container such as a drum or tanker for proper disposal as soon as possible.

This oil shall not re-enter the Eskom insulating oil pool for regeneration and re-use in electrical equipment.

4.4.4 Final clean-up/remediation

After removal of excess oil, saw dust, suitable absorbents or solvents shall be used to complete the clean-up of the spill. This might include the removal of leaking equipment, cleaning of pavements, removing contaminated soil and vegetation, as well as disposing of clean-up equipment. The absorbing material shall be bagged and disposed of at a class HH registered site.

PCB material shall be incinerated, encapsulated or de-chlorinated following consultation with NIOSC who will advise on the most viable option.

4.4.5 Bio-remediation/Landfarming

Bio-remediation/landfarming are based on the principle of stimulating the relevant microbes in order to break down the hydrocarbon molecules present in an oil spill. Landfarming will entail treatment of the soil away from the affected area, whereas bio-remediation will be done in-situ. Generally these processes may need stimulation or human intervention and are normally performed after the initial remediation phase to ensure total remediation of the site. These processes will need to be completed by bio-remediation /landfarming specialists in accordance with Eskom's approved supplier/contractor list.

4.5 Spill on a non-Eskom site

This shall be considered as a major spill greater than 25 points on the assessment scale in annex A and shall be treated as such.

4.6 Recommended spill kit

To allow for a rapid response and clean-up to an oil spill, it is mandatory for all Eskom sites and vehicles handling oil to have access to a recommended basic spill kit. The vehicle kit shall be a smaller version of the site spill clean-up kit, that meets the basic requirements for the volume of oil transported. This shall be used in the event of a spill that is less than 12 points as assessed using the table in annex A.

Adequate and relevant training shall be given to all staff, maintenance teams and contractors working with oil on an Eskom site. This shall involve the actions to be taken following an oil spill as well as the use of the recommended oil spill kit.

The recommended oil spill kit shall contain the following:

a) 2 pairs of latex or neoprene gloves;

b) 20 heavy duty disposable bags (rubbish bags);

c) 1 shovel;

d) 1 hard bristle broom;

e) 5 absorbent pads;

f) 3 bags of absorbent material (cellulosic or other efficient material); and

g) 1 pair of plastic goggles.

If a station or site is close to surface water, oil absorbing material for removal and containment of oil on water shall form part of the standard kit.

4.7 Remediation contractors

Because of the emergency situation surrounding an oil spill clean-up, and to avoid bureaucratic delays in

established on an “as and when required” basis with approved and relevant hazardous or emergency response teams. This will involve the availability of such a team, and agreement on relevant costs if an unforeseen event occurs.

4.8 Testing

Samples for both hydrocarbon and PCB content or other synthetic oil level evaluation shall be taken and submitted to TSI or approved laboratories for analysis. This shall form part of the evaluation of the oil spill assessment as well as the remediation procedure and prior to final payment, to ensure compliance with the relevant legislation.

4.9 Oil storage

To limit any potential oil spill, it is recommended that all sites where insulating oil is stored are accredited in terms of Eskom’s NIOSC manual. For all other oils, the relevant Eskom standards shall be adhered to.

UTO removed from equipment shall be promptly salvaged and returned to the closest, authorized regeneration facility after its removal from the equipment.

4.10 Reporting

All oil spills shall be assessed using the standard formats in annexes A and B. The completed forms shall be copied to the environmental co-ordinator who shall ensure that all appropriate reporting is carried out in accordance with the latest legislation.

4.11 Training

The Environmental co-ordinators responsible for the site shall ensure that appropriate training is given in the use of the spill equipment, reporting and emergency response procedures.

4.12 Preventive measures

Prevention remains better than cure and for this reason each spill shall be evaluated and analysed and appropriate preventive measures adopted. Any oil site design or facility shall be evaluated using relevant tools such as the Electrical Power Research Institute (EPRI) Mineral Oil Spill Evaluation System (MOSES) MP software that is available to the Eskom line groups.

Annex A
(normative)

Model oil spill assessment table

Using your judgement and the facts available, allocate the relevant points (1, 3 or 5) to each of the following and add them together. The cumulative score will dictate the appropriate corrective action.

Condition	1		2		5	
Source of the spill	**Weep**		**Drip/Leak**		**Explosion/Incident**	
Age of spill	Historic		Happened recently - spill still moist		Happened within last 24 h	
Threat to any waterbody	No threat		Threat with rain		Access to waterway	
Containment	Leak is minor – can be controlled, contained and plugged with oil spill kit		Leak is moderate – cannot be successfully managed with spill kit.		Leak is serious, containment is impossible	
Life threatening Conditions	Not at all		Moderate (Environmental or health risk only)		Serious (Explosion, fire, health and major environmental)	
Weather conditions	Good weather and will last until spill is cleared		Moderate, but may change suddenly to weather conditions which will hamper containment		Raining	
Properties affected	None		On-site (Only Eskom's property is affected)		Off-site (Eskom's neighbouring properties and public roads) **³ 25 points**	
Public relations threat	Small		Medium		Large	
Soil types	Clay or compacted ground		Loose or loam soil		Sandy soil and Gravel	
Traffic implications	Not on any road		Public road		Road closed	
PCB presence*	None		Less than 50 ppm in the oil		Over 50 ppm in the oil will automatically get **³ 25 points**	
Total score	**Sub total**		**Sub total**		**Sub total**	

Signature _____**Name** _____ __**Date** _____**Site**_____

Annex A
(concluded)

Minor spill **£ 12 points**	**Moderate spill** **13 – 24 points**	**Major spill** **³ 25 points**
Clean-up must be performed and a report issued to the relevant Environmental co-ordinator	Contain and call in the assistance of the Environmental co-ordinator	Contain, call on Environmental co-ordinator who will assess the situation and if needed call upon an emergency response team

*If the PCB levels of the oil are not known through prior testing, the spill shall be treated as a PCB spill, until such time that analysis proves otherwise.

Annex B
(normative)

Model oil spill feedback form

Please attach additional notes if necessary or if the space supplied is not sufficient

1	Give a short description of the oil spill incident.	
2	Give a short description on the following: -What was done immediately after the spill was discovered? -Could it be contained and how? -Was an emergency team involved and was it a contracted team? -Was free oil evident, how was this removed and what happened to this oil? -Has final remediation begun and what is being done? -Were PCB test results available and during which phase was this established?	
3	Which role did you fulfill within the process?	
4	How many litres of oil were involved?	
5	How big was the area that was polluted?	
6	Did any water pollution occur in the following areas? -trap dam -river -dam (water supply) -streams -underground	
7	How would you describe the incident – major or minor?	
8	Were there any other hazards or issues that needed attention?	
9	What were the weather conditions? -wind -temperature -precipitation, for example, rain or fog	
10	What were the causes - please explain? -human -technical -physical -organizational	
11	What was affected? -installation - describe -establishment -off-site local -off site regional	
12	How many people were affected? -staff -locals Describe the possible risks.	

Annex B
(concluded)

13	What were the ecological effects? -pollution/contamination/damage -residential area -common wild fauna/flora -water catchment areas -land -marine or other fresh water	
14	What were the material losses (in Rands)? -material (costs to Eskom) -response -clean-up -restoration	
15	Was any community life disrupted?	
16	Was any utility such as electricity, sewage or water interrupted?	
17	Was there significant public concern?	
18	Who was notified within Eskom?	
19	Who was notified outside of Eskom?	
20	What lessons were learnt from this? -measures to prevent recurrence -measures to mitigate consequences -useful references	
21	Did you experience a lack of: -guidance -expertise -standards -directives -reference material -Eskom assistance -Outside assistance	
22	Any recommendations	
23	Any other comments	

Name_____**Signature**_____

Date_____**Site**_____

APPENDIX G

OTHER INFORMATION

APPENDIX G1

CO-ORDINATES OF ALTERNATIVE ALIGNMENTS

Green Alignment-Coordinates Every 250 Meters			
FID	X	Y	Distance along route (Meters)
0	31° 10' 44.900" E	24° 40' 54.400" S	0
1	31° 10' 52.897" E	24° 40' 57.906" S	250
2	31° 11' 0.894" E	24° 41' 1.412" S	500
3	31° 11' 8.892" E	24° 41' 4.917" S	750
4	31° 11' 16.889" E	24° 41' 8.423" S	1000
5	31° 11' 24.887" E	24° 41' 11.929" S	1250
6	31° 11' 32.885" E	24° 41' 15.434" S	1500
7	31° 11' 40.883" E	24° 41' 18.939" S	1750
8	31° 11' 48.881" E	24° 41' 22.445" S	2000
9	31° 11' 56.879" E	24° 41' 25.950" S	2250
10	31° 12' 4.878" E	24° 41' 29.455" S	2500
11	31° 12' 12.876" E	24° 41' 32.960" S	2750
12	31° 12' 20.875" E	24° 41' 36.464" S	3000
13	31° 12' 28.874" E	24° 41' 39.969" S	3250
14	31° 12' 36.873" E	24° 41' 43.474" S	3500
15	31° 12' 44.872" E	24° 41' 46.978" S	3750
16	31° 12' 52.871" E	24° 41' 50.483" S	4000
17	31° 13' 0.870" E	24° 41' 53.987" S	4250
18	31° 13' 8.870" E	24° 41' 57.491" S	4500
19	31° 13' 16.870" E	24° 42' 0.995" S	4750
20	31° 13' 24.869" E	24° 42' 4.499" S	5000
21	31° 13' 32.869" E	24° 42' 8.003" S	5250
22	31° 13' 41.216" E	24° 42' 9.301" S	5500
23	31° 13' 49.972" E	24° 42' 7.994" S	5750
24	31° 13' 58.728" E	24° 42' 6.687" S	6000
25	31° 14' 7.484" E	24° 42' 5.379" S	6250
26	31° 14' 16.239" E	24° 42' 4.072" S	6500
27	31° 14' 24.995" E	24° 42' 2.764" S	6750
28	31° 14' 33.751" E	24° 42' 1.457" S	7000
29	31° 14' 42.507" E	24° 42' 0.149" S	7250
30	31° 14' 51.262" E	24° 41' 58.841" S	7500
31	31° 15' 0.018" E	24° 41' 57.533" S	7750
32	31° 15' 8.774" E	24° 41' 56.225" S	8000
33	31° 15' 17.529" E	24° 41' 54.916" S	8250
34	31° 15' 26.285" E	24° 41' 53.608" S	8500
35	31° 15' 35.040" E	24° 41' 52.299" S	8750
36	31° 15' 43.796" E	24° 41' 50.990" S	9000
37	31° 15' 52.551" E	24° 41' 49.681" S	9250
38	31° 16' 1.307" E	24° 41' 48.372" S	9500
39	31° 16' 10.062" E	24° 41' 47.062" S	9750
40	31° 16' 18.818" E	24° 41' 45.753" S	10000
41	31° 16' 27.573" E	24° 41' 44.443" S	10250
42	31° 16' 36.329" E	24° 41' 43.134" S	10500
43	31° 16' 44.264" E	24° 41' 40.294" S	10750
44	31° 16' 50.766" E	24° 41' 34.779" S	11000
45	31° 16' 57.267" E	24° 41' 29.264" S	11250
46	31° 17' 3.768" E	24° 41' 23.748" S	11500

47	31° 17' 10.269" E	24° 41' 18.233" S	11750
48	31° 17' 16.769" E	24° 41' 12.717" S	12000
49	31° 17' 23.270" E	24° 41' 7.201" S	12250
50	31° 17' 29.770" E	24° 41' 1.685" S	12500
51	31° 17' 36.270" E	24° 40' 56.169" S	12750
52	31° 17' 42.770" E	24° 40' 50.653" S	13000
53	31° 17' 49.270" E	24° 40' 45.137" S	13250
54	31° 17' 55.770" E	24° 40' 39.620" S	13500
55	31° 18' 2.270" E	24° 40' 34.104" S	13750
56	31° 18' 8.769" E	24° 40' 28.587" S	14000
57	31° 18' 15.268" E	24° 40' 23.071" S	14250
58	31° 18' 21.767" E	24° 40' 17.554" S	14500
59	31° 18' 28.266" E	24° 40' 12.037" S	14750
60	31° 18' 34.765" E	24° 40' 6.520" S	15000
61	31° 18' 41.264" E	24° 40' 1.003" S	15250
62	31° 18' 47.762" E	24° 39' 55.486" S	15500
63	31° 18' 54.261" E	24° 39' 49.969" S	15750
64	31° 19' 0.759" E	24° 39' 44.451" S	16000
65	31° 19' 7.257" E	24° 39' 38.934" S	16250
66	31° 19' 13.755" E	24° 39' 33.416" S	16500
67	31° 19' 20.252" E	24° 39' 27.899" S	16750
68	31° 19' 26.750" E	24° 39' 22.381" S	17000

Red Alignment-Coordinates Every 250 Meters			
FID	X	Y	Distance along route (Meters)
0	31° 10' 44.900" E	24° 40' 54.400" S	0
1	31° 10' 53.769" E	24° 40' 54.289" S	250
2	31° 11' 2.638" E	24° 40' 54.178" S	500
3	31° 11' 11.508" E	24° 40' 54.067" S	750
4	31° 11' 20.377" E	24° 40' 53.956" S	1000
5	31° 11' 29.246" E	24° 40' 53.844" S	1250
6	31° 11' 38.115" E	24° 40' 53.732" S	1500
7	31° 11' 46.985" E	24° 40' 53.621" S	1750
8	31° 11' 55.854" E	24° 40' 53.509" S	2000
9	31° 12' 4.723" E	24° 40' 53.397" S	2250
10	31° 12' 13.592" E	24° 40' 53.284" S	2500
11	31° 12' 22.462" E	24° 40' 53.172" S	2750
12	31° 12' 31.331" E	24° 40' 53.059" S	3000
13	31° 12' 40.201" E	24° 40' 52.947" S	3250
14	31° 12' 49.070" E	24° 40' 52.834" S	3500
15	31° 12' 57.940" E	24° 40' 52.721" S	3750
16	31° 13' 6.809" E	24° 40' 52.608" S	4000
17	31° 13' 15.679" E	24° 40' 52.495" S	4250
18	31° 13' 24.548" E	24° 40' 52.381" S	4500
19	31° 13' 33.418" E	24° 40' 52.268" S	4750
20	31° 13' 42.137" E	24° 40' 53.140" S	5000
21	31° 13' 50.634" E	24° 40' 55.466" S	5250
22	31° 13' 59.132" E	24° 40' 57.791" S	5500
23	31° 14' 7.630" E	24° 41' 0.116" S	5750
24	31° 14' 16.128" E	24° 41' 2.441" S	6000
25	31° 14' 24.626" E	24° 41' 4.766" S	6250
26	31° 14' 33.124" E	24° 41' 7.091" S	6500
27	31° 14' 41.622" E	24° 41' 9.415" S	6750
28	31° 14' 50.121" E	24° 41' 11.740" S	7000
29	31° 14' 58.619" E	24° 41' 14.064" S	7250
30	31° 15' 7.118" E	24° 41' 16.388" S	7500
31	31° 15' 15.616" E	24° 41' 18.713" S	7750
32	31° 15' 24.115" E	24° 41' 21.037" S	8000
33	31° 15' 32.614" E	24° 41' 23.361" S	8250
34	31° 15' 41.113" E	24° 41' 25.684" S	8500
35	31° 15' 49.612" E	24° 41' 28.008" S	8750
36	31° 15' 58.111" E	24° 41' 30.331" S	9000
37	31° 16' 6.611" E	24° 41' 32.655" S	9250
38	31° 16' 15.110" E	24° 41' 34.978" S	9500
39	31° 16' 23.610" E	24° 41' 37.301" S	9750
40	31° 16' 32.109" E	24° 41' 39.624" S	10000
41	31° 16' 40.609" E	24° 41' 41.947" S	10250
42	31° 16' 47.414" E	24° 41' 37.622" S	10500
43	31° 16' 53.915" E	24° 41' 32.107" S	10750
44	31° 17' 0.416" E	24° 41' 26.591" S	11000
45	31° 17' 6.917" E	24° 41' 21.076" S	11250
46	31° 17' 13.418" E	24° 41' 15.560" S	11500

47	31° 17' 19.919" E	24° 41' 10.044" S	11750
48	31° 17' 26.419" E	24° 41' 4.529" S	12000
49	31° 17' 32.919" E	24° 40' 59.013" S	12250
50	31° 17' 39.420" E	24° 40' 53.497" S	12500
51	31° 17' 45.920" E	24° 40' 47.980" S	12750
52	31° 17' 52.419" E	24° 40' 42.464" S	13000
53	31° 17' 58.919" E	24° 40' 36.948" S	13250
54	31° 18' 5.419" E	24° 40' 31.431" S	13500
55	31° 18' 11.918" E	24° 40' 25.915" S	13750
56	31° 18' 18.417" E	24° 40' 20.398" S	14000
57	31° 18' 24.916" E	24° 40' 14.881" S	14250
58	31° 18' 31.415" E	24° 40' 9.364" S	14500
59	31° 18' 37.914" E	24° 40' 3.847" S	14750
60	31° 18' 44.412" E	24° 39' 58.330" S	15000
61	31° 18' 50.911" E	24° 39' 52.813" S	15250
62	31° 18' 57.409" E	24° 39' 47.296" S	15500
63	31° 19' 3.907" E	24° 39' 41.778" S	15750
64	31° 19' 10.405" E	24° 39' 36.261" S	16000
65	31° 19' 16.903" E	24° 39' 30.743" S	16250
66	31° 19' 23.400" E	24° 39' 25.225" S	16500

Purple Alignment-Coordinates Every 250 Meters			
FID	X	Y	Distance along route (Meters)
0	31° 10' 44.900" E	24° 40' 54.400" S	0
1	31° 10' 52.807" E	24° 40' 50.728" S	250
2	31° 11' 0.715" E	24° 40' 47.056" S	500
3	31° 11' 8.622" E	24° 40' 43.384" S	750
4	31° 11' 16.529" E	24° 40' 39.711" S	1000
5	31° 11' 24.435" E	24° 40' 36.039" S	1250
6	31° 11' 32.342" E	24° 40' 32.366" S	1500
7	31° 11' 40.249" E	24° 40' 28.694" S	1750
8	31° 11' 48.155" E	24° 40' 25.021" S	2000
9	31° 11' 56.062" E	24° 40' 21.348" S	2250
10	31° 12' 3.968" E	24° 40' 17.675" S	2500
11	31° 12' 11.874" E	24° 40' 14.001" S	2750
12	31° 12' 19.780" E	24° 40' 10.328" S	3000
13	31° 12' 27.686" E	24° 40' 6.654" S	3250
14	31° 12' 35.592" E	24° 40' 2.981" S	3500
15	31° 12' 43.498" E	24° 39' 59.307" S	3750
16	31° 12' 51.403" E	24° 39' 55.633" S	4000
17	31° 12' 59.309" E	24° 39' 51.959" S	4250
18	31° 13' 7.214" E	24° 39' 48.285" S	4500
19	31° 13' 15.120" E	24° 39' 44.610" S	4750
20	31° 13' 23.025" E	24° 39' 40.936" S	5000
21	31° 13' 30.930" E	24° 39' 37.261" S	5250
22	31° 13' 38.835" E	24° 39' 33.586" S	5500
23	31° 13' 46.739" E	24° 39' 29.911" S	5750
24	31° 13' 54.644" E	24° 39' 26.236" S	6000
25	31° 14' 2.549" E	24° 39' 22.561" S	6250
26	31° 14' 10.453" E	24° 39' 18.886" S	6500
27	31° 14' 18.358" E	24° 39' 15.210" S	6750
28	31° 14' 27.012" E	24° 39' 14.534" S	7000
29	31° 14' 35.879" E	24° 39' 14.705" S	7250
30	31° 14' 44.746" E	24° 39' 14.877" S	7500
31	31° 14' 53.612" E	24° 39' 15.048" S	7750
32	31° 15' 2.479" E	24° 39' 15.219" S	8000
33	31° 15' 11.346" E	24° 39' 15.390" S	8250
34	31° 15' 20.213" E	24° 39' 15.561" S	8500
35	31° 15' 29.080" E	24° 39' 15.732" S	8750
36	31° 15' 37.947" E	24° 39' 15.903" S	9000
37	31° 15' 46.813" E	24° 39' 16.073" S	9250
38	31° 15' 55.680" E	24° 39' 16.243" S	9500
39	31° 16' 4.547" E	24° 39' 16.413" S	9750
40	31° 16' 13.415" E	24° 39' 16.583" S	10000
41	31° 16' 22.282" E	24° 39' 16.753" S	10250
42	31° 16' 31.149" E	24° 39' 16.923" S	10500
43	31° 16' 40.016" E	24° 39' 17.093" S	10750
44	31° 16' 48.883" E	24° 39' 17.262" S	11000
45	31° 16' 57.750" E	24° 39' 17.431" S	11250
46	31° 17' 6.618" E	24° 39' 17.600" S	11500

47	31° 17' 15.485" E	24° 39' 17.769" S	11750
48	31° 17' 24.352" E	24° 39' 17.938" S	12000
49	31° 17' 33.219" E	24° 39' 18.107" S	12250
50	31° 17' 42.087" E	24° 39' 18.276" S	12500
51	31° 17' 50.954" E	24° 39' 18.444" S	12750
52	31° 17' 59.822" E	24° 39' 18.612" S	13000
53	31° 18' 8.689" E	24° 39' 18.780" S	13250
54	31° 18' 17.557" E	24° 39' 18.948" S	13500
55	31° 18' 26.424" E	24° 39' 19.116" S	13750
56	31° 18' 35.292" E	24° 39' 19.284" S	14000
57	31° 18' 44.159" E	24° 39' 19.451" S	14250
58	31° 18' 53.027" E	24° 39' 19.619" S	14500
59	31° 19' 1.895" E	24° 39' 19.786" S	14750
60	31° 19' 10.762" E	24° 39' 19.953" S	15000
61	31° 19' 19.630" E	24° 39' 20.120" S	15250
62	31° 19' 28.498" E	24° 39' 20.287" S	15500

APPENDIX G2

PROPERTY DESCRIPTION

FARM NAME	NUMBER	PORTION	LPI CODE
PURPLE COLOURED ALIGNMENT			
Burlington	217KU	0	T0KU00000000021700000
Burlington	217KU	1	T0KU00000000021700001
Burlington	217KU	2	T0KU00000000021700002
Islington	219KU	0	T0KU00000000021900000
Edinburgh	228KU	0	T0KU00000000022800000
Edinburgh	228KU	2	T0KU00000000022800002
Ludlow	227KU	0	T0KU00000000022700000
Ludlow	227KU	3	T0KU00000000022700003
Eglington	225KU	0	T0KU00000000022500000
GREEN AND RED COLOURED ALIGNMENT			
Edinburgh	228KU	0	T0KU00000000022800000
Edinburgh	228KU	2	T0KU00000000022800002
Ludlow	227KU	0	T0KU00000000022700000
Ludlow	227KU	3	T0KU00000000022700003
Eglington	225KU	0	T0KU00000000022500000
SUBSTATION			
Eglington	225KU	0	T0KU00000000022500000