132kV Powerline between Klipkop and Umtu Substations in the Northern Cape

Environmental Impact Assessment Report (EIA) & Environmental Management Plan (EMP)

Version - FINAL REPORT

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EXECUTIVE SUMMARY

Introduction

It is the intention of ESKOM Holdings Limited (ESKOM), through Assmang Limited's (Assmang) Black Rock Manganese Mine, to construct an overhead powerline with a capacity of 132 kiloVolts (kV) between the Klipkop Substation and the Umtu Substation, located in the Kgalagadi District within the Northern Cape Province.

The proposed overhead powerline construction will entail a linear development with a 31m wide servitude (15.5m either side of the centreline) between the Klipkop and Umtu Substations. The Klipkop Substation is located on Portion 3 of the Farm Nchwaning 267 and the Umtu Substation is located on the Remaining Portion of the Farm Olive Pan 282.

In addition to the construction of the 132kV powerline between the Umtu and Klipkop Substations, the proposed project will furthermore include the following:

- The extension of Klipkop Substation;
    - The installation of a 132/66kV 40MVA transformer bay;
    - The installation of a 132kV busbar and feeder bay;
    - The installation of 3 x 132kV CT's (Current Transformers);
    - The installation of 3 x 132kV VT's (Voltage Transformers);
    - The installation of a complete 66kV feeder bay on the existing Wessels line;
    - The installation of a complete 66kV feeder bay on the existing Hotazel line;
    - The installation of 6 x 66kV VT's on 66kV busbars; and
    - The installation of 2 x 66kV busbar isolators.

Project Description & Need for the Project

ESKOM is mandated by the South African Government to ensure the provision of reliable and affordable power to South Africa. Electricity cannot be stored and must be used as it is generated. Therefore, electricity must be generated in accordance with supply-demand requirements. Eskom's core business is in the generation, transmission, trading and retail of electricity. The reliable provision of electricity by ESKOM is therefore critical for industrial/economic development and related employment and sustainable development in South Africa.

The purpose for the construction of the 132kV overhead powerline is to provide the Assmang Black Rock Manganese mine with sufficient electricity, which the mine will require for their proposed expansion projects in the near future. As part of the construction of the 132kV overhead powerline, the existing Klipkop Substation will be extended. The extension of the Klipkop Substation will be beneficial to the local Black Rock Village and farms in the surrounding areas, whose power supply is provided by the mine.

ESKOM, in response to the above, propose to construct a 132kV powerline between the Klipkop Substation and the Umtu Substation in the Kgalagadi District.

Public Participation Process

Ivuzi conducted the public participation process (PPP) for this EIA. The process was aimed at involving as many Interested and Affected Parties (I&APs) as possible.

The PPP included consultation with the National Department of Water and Environmental Affairs (DWEA), South African Heritage Resource Agency (SAHRA), Northern Cape Department of Tourism, Environment and Conservation (DTEC) and the District and Local Municipalities.

I&APs were informed about the proposed project and environmental authorisation process via the distribution of Background Information Documents (BIDs), placements of site notices, and placement of advertisements in the local newspapers. An I&AP database for this project has been created and maintained for the duration of the project.

Description of the Baseline Environment

The Northern Cape region is characterised by a low population density associated with the desert/semi desert environment. The majority of land situated north of Kuruman is extensively used for agricultural purposes.

The project area is located in the northern part within the Northern Cape in an area that marks the start of the Kalahari Desert. It is considered a very water scarce region with an average annual rainfall of 320.4mm, characterised by a summer rainfall climate. The average midday temperatures range from 16.8°C in June to 31.9°C in January.

The area is characterised by a relative flat landscape with elevations between 1020 metres above mean sea level (mamsl) and 1080mamsl. The topography slopes down gradually to the Ga-Mogara River to the east and to the north east towards the Kuruman River. The area has a rural character with the Black Rock village and mining area forming the residential/commercial hub within the landscape.

The Kalahari Manganese Field exists as structurally preserved erosional relicts of the Hotazel Formation below younger cover of late Early Proterozoic Olifantshoek red beds, late Carboniferous - early Permian Karoo Dwyka diamictite and Tertiary Kalahari beds. Virtually all of the deposits are covered by these younger sequences and natural outcrops are restricted to Black Rock, a small hill in the Kalahari deposit.

The major soil forms present in the area are of the orthic phase Hutton. These soils are freely drained, deep and sandy. The Hutton soils have low dryland agricultural potential despite their adequate depth for roots to grow into due to both that they are sandy and thus have poor water retention capacity as well as the harsh dry climatic conditions prevalent in the area. They will further require high levels of management to mitigate erosion hazards as they are of aeolian origin and are thus prone to wind transportation.

The project area falls within the Quaternary Catchments; D41K (Ga-Mogara River Catchment) and D41M (Kuruman River Catchment). The power lines start in the quaternary catchment D41M and run straight across the divide into quaternary catchment D41K, this is however not a steep divide as the terrain in this area is very flat.

The study area falls within the boundaries of two different vegetation types, namely the Kathu Bushveld vegetation type (which forms part of the Eastern Kalahari Bushveld Bioregion) and the Gordonia Duneveld (which forms part of the Kalahari Duneveld Bioregion). Both of the aforementioned bioregions form part of the Savanna Biome.

Three of the tree species found in the study area are protected in terms of Section 12 of the National Forests Act, namely Camel Thorn (*A. erioloba*), Shepherd's Tree (*B. albitrunca*) and Grey Camel Thorn (*A. haematoxylon*). Two of the plant species recorded within the study area are protected in the Northern Cape Province in terms of the Nature and Environmental Conservation Ordinance, namely *Nerine laticoma* and *Pergularia daemia* var*. daemia*. Due to the status of these flora species a permit will have to be obtained in order to approve the removal and/or trimming of these species that will occur during the construction and maintenance of the proposed 132kV powerline

No red data mammals have been confirmed for the proposed study area. However, the following of the mammal species that are commonly found within the broader area are protected in the Northern Cape Province under the Nature and Environmental Conservation Ordinance: Pangolin (*M. temminckii)*, Aardvark (*O. afer)*, Steenbok (*R. campestris)*, Gemsbok (*O. gazellea)*, Grey Rhebok (*P. capreolus),* Hedgehog (*A. frontalis)*, Kudu (*T. strepciseros),* Bat-eared Fox (*O. megalotis),* Silver Jackal (*V. chama),* Springbok (A. *marsupialis)*, Common Duiker (*S. grimmia)* and Warthog (*P. aethiopicus)*. The Pangolin is classified as "endangered", while the remainder of the aforementioned species are classified as "protected".

Approximately 445 bird species occur within the Northern Cape across a wide range of different biomes and habitat types. This includes pelagic species such as albatrosses, petrels and so forth. 56 of the species found within the Northern Cape are endemic to South Africa meaning that they do not occur outside of South Africa's borders with a further 42 being classified as near endemics i.e. their distribution reaches just outside of our borders into neighbouring countries. Of the 445 bird species occurring in the Northern Cape, 52 or 11.5% are listed in *The Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland* Status meaning that to a certain degree their existence as a species is threatened. A total of 54 species were recorded within the broader study area with White-browed Sparrow Weaver (*Plocepasser mahali*) and Southern Masked Weaver (*Ploceus velatus*) being the most abundant species recorded. Species richness was fairly low but this can be explained by the homogenous nature of the study area. If the study area had contained a variety of different habitats such as ephemeral pans, rivers and so forth the species richness or rather number of species detected would have been higher.

No archaeological or cultural heritage resources, as defined and protected by the NHRA 1999, were identified during the archaeological assessment for the proposed 132kV powerline project.

Project Alternatives

The following alternative powerline corridors have been considered for the proposed 132kV powerline:

- **Corridor 1 (Orange)** – This corridor is approximately 13.3km long. The corridor will begin at the existing Klipkop Substation, travels in a south-easterly direction towards the existing Assmang Gloria Mine, then meanders to the south towards the future opencast mining area of the Umtu Mine, ending at the Umtu Substation. Due to the sensitive crossing of the future opencast area of the Umtu Mine this corridor was eliminated for further environmental investigation and was marked as an unfeasible corridor option.
- **Corridor 2 (Green)** – This corridor is approximately 13.6km long. This corridor first begins at the existing Klipkop Substation before it crosses the R380 tar road. After crossing the road the line will run parallel with R380 tar road in a south-easterly direction before meandering to the south towards the future opencast mining area of the Umtu Mine, ending at the Umtu Substation. Due to the sensitive crossing of the future opencast area of the Umtu Mine this corridor was eliminated for further environmental investigation and was marked as an unfeasible corridor option.
- **Corridor 3 (Dark blue)** – This corridor is approximately 14km long. The corridor is an alternative alignment for a portion of Corridor 2. Due to the sensitive crossing of the future opencast area of the Umtu Mine this corridor was eliminated for further environmental investigation and was marked as an unfeasible corridor option.
- **Corridor 4 (Yellow)** – This corridor is approximately 16.6km long. This corridor will begin at the existing Klipkop Substation before it crosses the R380 tar road. After crossing the road the line will transverse a gravel road before crossing the R380 road again after a curve in the R380 road. From this point the corridor will run parallel with the R31 tar road in a southerly direction before meandering to the south-east (toward the old R31 road) ending at the Umtu Substation. This corridor was selected as a feasible alternative option and further environmental investigation was done on this corridor.
- **Corridor 5 (Light blue)** – This corridor is approximately 17.5km long. The corridor is an alternative alignment for a portion of Corridor 4. This corridor was selected as a feasible alternative option and further environmental investigation was done on this corridor.

- **Corridor 6 (Purple)** - This corridor is approximately 17.1km long. This corridor will begin at the existing Klipkop Substation, travel in a westerly direction for a short distance before turning to a south-easterly direction toward the old R31 road) ending at the Umtu Substation. This corridor was selected as a feasible alternative option and further environmental investigation was done on this corridor.

Alternative technology and the no-go option were considered unfeasible for this proposed 132kV powerline project.

Key Findings of the Environmental Impact Assessment (EIA) & Environmental Management Plan (EMP)

The aim of the EIA process is to identify and assess the potential impacts associated with the proposed 132kV overhead powerline project. The objective of the EMP is to develop management measures through which potential negative biophysical and socio-economic impacts, as identified during the EIA phase, can be mitigated and positive benefits associated with the project enhanced.

The impact analysis highlighted all impacts as being of a medium to low significance with the exception of the collisions of bird with the overhead powerlines. Although this preliminary impact has a high significance rating, the significance will be lowered to a low significance rating as and when the mitigation measures are implemented as stated in the EMP. The two mitigation measures that will be implemented will include the following:

- Correct alignment of the powerline away from topographical features to thus limit/prevent collisions; and
- The fitting of appropriate marking devices (such as bird flappers) to make the line more visible to avifauna species.

Recommendations

The recommended corridors to be considered for environmental approvment in terms of the proposed project are Corridor 4 or Corridor 5.

The two corridors were chosen for the following reasons:

- Alignment with existing servitudes (road); and
- Avoidance of crossing sensitive areas.

Therefore the construction of the proposed 132kV powerline between the Klipkop Substation and the Umtu Substation and associated infrastructure with suggested mitigation measures is recommended within Corridor 4 or Corridor 5.

Conclusion

Identified impacts and associated mitigation measures for the construction and operation of the proposed development must be implemented as stipulated in the Environmental Management Plan (EMP) during the construction and operation phases of the proposed development.

The findings of the EIA for the construction of the proposed 132kV powerline between the Klipkop and Umtu Substations show that there are no environmental fatal flaws that should prevent the proposed project from proceeding.

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Appendix D: Specialist Reports

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Dii: Avifauna Impact Assessment

Diii: Ecological Impact Assessment

Div: Soils, Land Use and Land Capability Impact Assessment

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Appendix E: Public Participation

Ei: List of Interested and Affected Parties

Eii: Background Information Document

Eiii: Proof of Site Notices

Eiv: Proof of Advertisements

Ev: Public Feedback Presentation

GLOSSARY OF TERMINOLOGY

ABBREVIATIONS

BID	Background Information Document
DTEC	Department of Tourism, Environment and Conservation
DEAT	Department of Environmental Affairs and Tourism
ESR	Environmental Scoping Report
DWAF	Department of Water Affairs and Forestry
EAP	Environmental Assessment Practitioner
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EMF	Electromagnetic Fields
EMP	Environmental Management Plan
GDP	Gross Domestic Product
GIS	Geographical Information System
GNR	Government Notice Regulation
Ha	Hectare
I&APs	Interested and Affected Parties
IUCN	International Union for the Conservation of Nature and Natural Resources
IRR	Issues and Response Report
Km	Kilometre
kV	Kilovolt
mm	Millimetres
NEMA	National Environmental Management Act, 1998 (Act No. 107 of 1998)
PPP	Public Participation Process
SAHRA	South African Heritage Resources Agency

TERMS

Aesthetic	The science or philosophy concerned with the quality of sensory experience.
Alignment	Refers to the actual physical placement of the proposed powerline within the approved powerline corridor.
Applicant	Any person who applies for an authorisation to undertake a listed activity or to cause such activity to be undertaken in terms of the relevant environmental legislation.
Biodiversity	Refers to the variability among living organisms from all sources including *inter alia* terrestrial, marine and other aquatic ecosystems and ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems.
Biome	A major biotic unit, consisting of plant and animal communities, having similarities in form and environmental conditions, but not including the abiotic portion of the environment.
Conservation	The management of the biosphere so that it may yield the greatest sustainable benefit to present generations while maintaining its potential to meet the needs and aspiration of future generations. This wise use of natural resources ensures to prevent loss of ecosystem function and integrity.
Clearance	Refers to the vertical and horizontal distance form any electrical power transmission conductor and other objects.
Corridor	Refers to the area within which the powerline will be constructed (aligned).
Cultural Resources	Refers to all non-physical and physical human-made occurrences, as well as natural occurrences that are associated with human activity. These include all sites, structures and artefacts of importance, either individually or in group, in the history, architecture and archaeology of human (culture) development.
Ecology	The study of the inter relationships between organisms and their

	environments.
Ecosystem Services	Activities that help to maintain an ecosystem but are not directly part of energy flow and nutrient cycle. Examples include pollination, dispersal, population regulation, provision of clean water and the maintenance of liveable climates (carbon sequestration).
Ecosystem	Organisms together with their abiotic environment, forming an interacting system, inhabiting and identifiable space.
Endangered	A taxon is Endangered when it is not Critically Endangered but is facing a very high risk of extinction in the wild in the near future.
Endemic	Occurring in a particular region, and nowhere else.
Environment	NEMA defines "environment" as "the surrounding within the humans exist and that are made up of the land, water and atmosphere of the earth; micro organisms, plants and animal life; any interrelationships among and between them and the physical, chemical aesthetic and cultural properties and conditions that influence human health and well-being".
Environmental Control Officer	Independent officer employed by the applicant to ensure the implementation of the Environmental Management Plan (EMP) and manage any further environmental issues that may arise.
Environmental Impact Assessment	An Environmental Impact Assessment (EIA) is an assessment of the positive and negative environmental consequences of the development of the proposed project. The primary objective of the EIA is to aid decision-making by providing factual information on the assessment of impacts and the significance of these impacts.
Environmental Management Plan	A detailed plan of action prepared to ensure that recommendation for enhancing or ensuring positive impacts and limiting or preventing negative environmental impacts are implemented during the life-cycle of a project. The Environmental Management Plan (EMP) focuses primarily on the construction phase and maintenance (operation) phase of the proposed project.
Footprint Area	The surface area to be used for the construction of the proposed poles (pylons) and the substation, which does not include the total study area.
Habitat	Type of environment in which a plant or animal lives.
Indigenous	Any species of plant, shrub or tree that occurs naturally in a region.
Invasive Species	Naturally alien plants that have the ability to reproduce, often in large numbers. Aggressive invaders can spread and invade large areas.
Powerline	Refers to an overhead line of varying voltage capacity, erected for the conduction/transmission of electricity.
Rare Species	Species, which have naturally small populations, and species, which have been reduced to small (often unstable) populations by human activities.
Red Data Species	A list of species, fauna and flora that require environmental protection based on the IUCN definition.
Sense of Place	That distinctive quality that makes a particular place memorable to the visitors, which can be interpreted in terms of visual character of the landscape. A more emotive sense of place is that of local identity and attachment for a place which begins as undifferentiated space and becomes place as we get to know it better and endow it with value.
Sensitive Area	Refers to an area or environment where a unique ecosystem, habitat for plant and animal life, wetlands or conservation activity exists or where there is a high potential for ecotourism.
Servitude	Refers to transmission rights grated to ESKOM over the immovable property of another and registered or to be registered against the title deed of the land in question and usually involves the payment of compensation.
Separation Distance	Refers to the horizontal distance between the centre line when measured perpendicularly between any two powerlines running parallel to each other.
Significance of Impacts	Significance of impact means the combination for the probability, scale, duration and magnitude of an impact occurring. An impact can be deemed significant if consultation with the relevant

	authorities and other I&APs, on the context and intensity of its effects, provide reasonable grounds for mitigating measures to be included into the EMP report.
Soil	A mixture of organic and inorganic substances, the composition and structure of the latter is derived from the parent rock material. Soil also contains bacteria, fungi, viruses and micro-arthropods, nematodes and worms.
Species diversity	A measure of the number and relative abundance of species (see biodiversity).
Species richness	The number of species in an area or habitat
Study Area	Refers to the entire study area encompassing all the alternative alignments and substation locations as indicated on the study area map.
Subsoil	Those layers of the soil and weathered rock immediately beneath the topsoil that covers the hard rock formation.
Substation	A distribution point within the local and national electricity network at which electrical current is increased/decreased and re-routed along different powerlines as well as distributed to local and municipal networks.
Threatened Species	Species, which have naturally small populations, and those, which have been reduced to small (often unstable) population by human activities.
Topsoil	Topsoil means the layer of soil covering the earth and which provides a suitable environment for the germination of seed; allow the penetration of water; is a source of micro-organism, plant nutrients and in some cases seed.
Tree and Building Restrictions	Refer to the horizontal distance measured perpendicularly from the centre powerline (on either side) within which no trees and/buildings may encroach.
Visual Character	This addresses the viewer response to the landscape elements and the relationship between these elements that can be interpreted in terms of aesthetic characteristics such as pattern, scale, diversity, continuity and dominance.
Visual Impact	Changed to the visual character of available views resulting for the development that include: obstruction of existing views; removal of screening elements thereby exposing viewers to unsightly views; the introduction of new elements into the view shed experienced by visual receptors and instruction of foreign elements into the view shed of landscape features thereby detracting from the visual amenity of the area.
Visual Impact Assessment	A specialist study to determine the visual effects of a proposed development on the surrounding environment. The primary goal of this specialist study is to indentify potential risk sources resulting from the project that may impact on the visual environment of the study area, and to assess their significance. These impacts include landscape impacts and visual impacts.
Visual Receptors	Includes viewer groups such as the local community, residents, workers, the broader public and visitors to the area, as well as public or community areas from which the development is visible.
Vulnerable	A taxon is “Vulnerable” when it is not “Critically Endangered” or “Endangered” but is facing a high risk of extinction in the wild in the medium-term future.
Water System	The term includes any dam, any other form of impoundment, canal, works, pipeline and any other structure or facility constructed for the retention or conveyance of water.

1. INTRODUCTION

1.1. PROJECT DESCRIPTION

It is the intention of ESKOM Holdings Limited (ESKOM), through Assmang Limited's (Assmang) Black Rock Manganese Mine, to construct an overhead powerline with a capacity of 132 kiloVolts (kV) between the Klipkop Substation and the Umtu Substation, located in the Kgalagadi District within the Northern Cape Province.

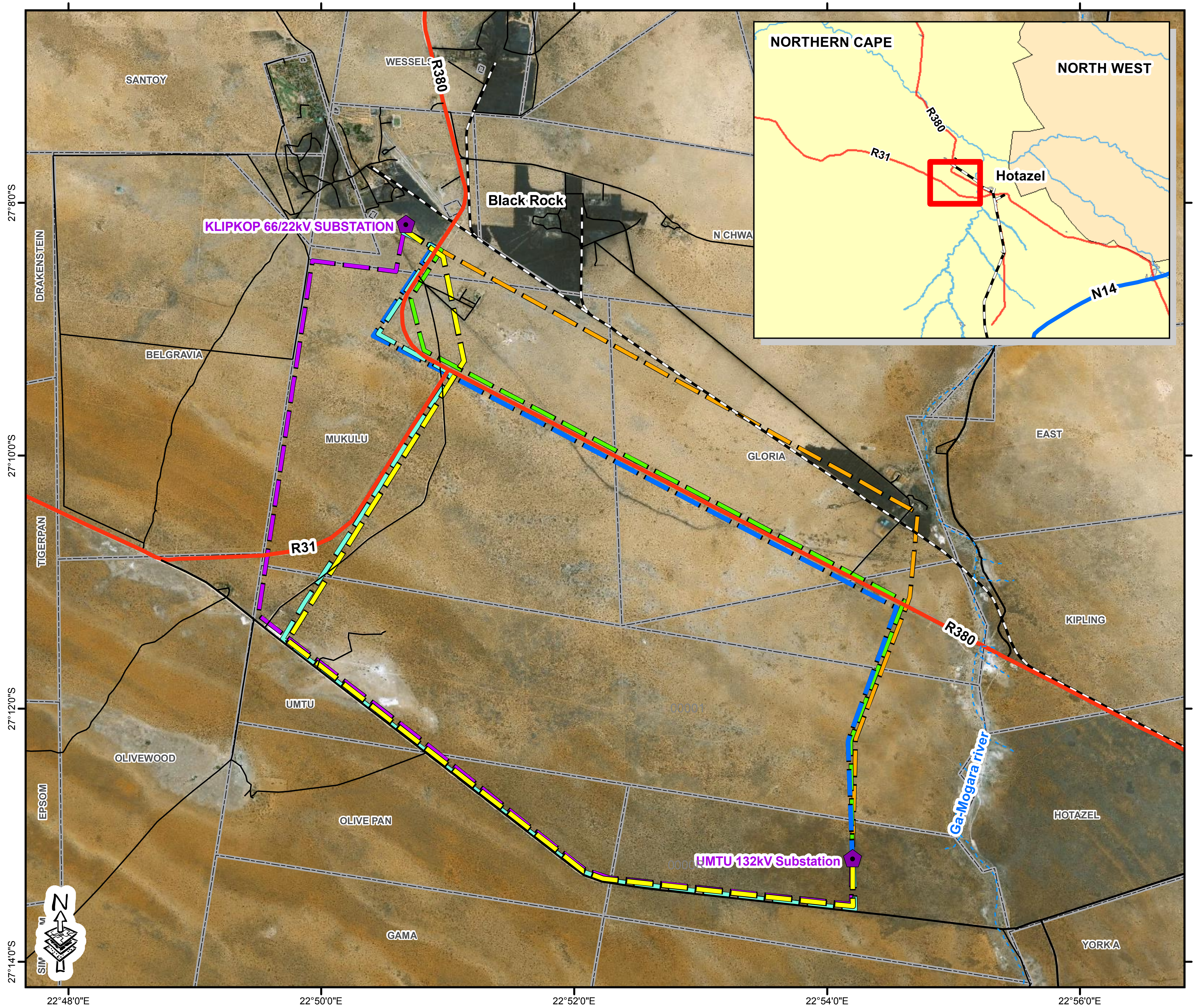
The purpose for the construction of the 132kV overhead powerline is to provide the Assmang Black Rock Manganese mine with sufficient electricity, which the mine will require for their proposed expansion projects in the near future. As part of the construction of the 132kV overhead powerline, the existing Klipkop Substation will be extended. The extension of the Klipkop Substation will be beneficial to the local Black Rock Village and farms in the surrounding areas, whose power supply is provided by the mine.

The proposed overhead powerline construction will entail a linear development with a 31m wide servitude (15.5m either side of the centreline) between the Klipkop and Umtu Substations. The Klipkop Substation is located on Portion 3 of the Farm Nchwaning 267 and the Umtu Substation is located on the Remaining Portion of the Farm Olive Pan 282.

At the beginning of the Scoping Phase ESKOM considered six possible corridor alignments to be investigated with the intention of determining the best possible route for the construction of the 132kV powerline. During the specialist investigation phase it was determined that only three out of the six alternative corridors were feasible options to investigate further. Based on the outcomes of the various specialist studies and the Environmental Impact Assessment (EIA) corridor Option 4 was selected as the best proposed corridor for the construction of the 132kV powerline between the Klipkop and Umtu Substations. The length of the Option 4 proposed corridor is approximately 16.6km.

Therefore the aim of this EIA to identify and assess the potential impacts associated with the proposed construction of the 132kV powerline between the Klipkop and Umtu Substations following the Option 4 corridor alignment. Refer to **Figure 1-1** for the location of the alternative powerline corridors that were originally considered for this project.

BLACK ROCK 132KV POWERLINE OPTIONS



LEGEND

- Sub-stations
- ROAD NETWORK
  - National Route
  - Main Road
  - Secondary Road
  - Other Access
- Railway line
- RIVERS & STREAMS
  - Perennial
  - Non-Perennial
- Option 1 (13.3 Km)
- Option 2 (13.58 Km)
- Option 3 (13.96km)
- Option 4 (16.59 Km)
- Option 5 (17.47 Km)
- Option 6 (17.09 Km)
- Parcel boundaries

DATA SOURCES:

Google Earth™ mapping service: 2009

Kilometers

0 1 2 4

DRAWN BY:	L. DU PLESSIS GIS TECHNOLOGIST
REVIEWED	R.F. VAN DER MERWE GIS MANAGER (PGPT 0023)
DATE	17 NOVEMBER 2009
SCALE:	1:58,000
PROJECTION:	WGS 84 GEOGRAPHIC
CLIENT:	ESKOM
PROJECT:	BLACK ROCK 132KV POWERLINE (09-011)

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In addition to the construction of the 132kV powerline between the Umtu and Klipkop Substations, the proposed project will furthermore include the following:

- The extension of Klipkop Substation;
    - The installation of a 132/66kV 40MVA transformer bay;
    - The installation of a 132kV busbar and feeder bay;
    - The installation of 3 x 132kV CT's (Current Transformers);
    - The installation of 3 x 132kV VT's (Voltage Transformers);
    - The installation of a complete 66kV feeder bay on the existing Wessels line;
    - The installation of a complete 66kV feeder bay on the existing Hotazel line;
    - The installation of 6 x 66kV VT's on 66kV busbars; and
    - The installation of 2 x 66kV busbar isolators.

1.2. *IMPORTANT TERMINOLOGY*

1.2.1. *Generation*

South Africa's indigenous energy resource base is dominated by coal. Internationally, coal is the most widely used primary fuel, accounting for about 36 percent of the total fuel consumption of the world's electricity production. About 77 percent of South Africa's primary energy needs are provided by coal. In addition to the extensive use of coal in the domestic economy, about 28 percent of South Africa's production is exported (http:www.eskom.co.za).

Electricity is produced from coal through the combustion and burning or pulverised fine coal powder in boilers. The heat in the boilers causes the coal particles to generate heat that turns water into steam. The steam form the boilers is used to turn the blades of a giant fan/propeller, called a turbine. The turbine turns a coil made of copper wire (the rotor) inside a magnet (the stator), which together make up the generator. Most of ESKOM's power stations generate electricity at about 22 000 volts (or 22kV). Transformers are installed at the power stations to increase the voltage for transmission.

1.2.2. *Transmission*

Electricity is transported along powerlines from the power station to substations located in areas where the power is required. The distances between the power stations and areas where the power is required, necessitates the transmission of electricity at high voltages to compensate for the losses that occur during electricity at high voltage to compensate for the losses that occur during the transmission over long distances. The transmission of high voltages also limits the number of powerlines. Transmission powerlines usually consists of overhead conductors suspended from transmission towers.

The overhead powerlines transmit electricity at voltages ranging from 22kV up to 765kV. ESKOM is the first utility in the world to successfully operate transmission lines as 765kV at high altitudes above sea level. Conductors are made of aluminium and steel in various combinations and in various shapes and sizes. Aluminium is used because it is a good conductor of electricity; steel is used to add strength. The electricity transmitted to substations must be reduced to a voltage that is suitable for the consumer. Transformers step-down the voltage and feed the electricity into the grid via distribution powerlines, which distribute the power to the end users.

1.2.3. Distribution

When the electricity arrives at the distribution station, bulk supplies of electricity at 22kV are taken for primary distribution to towns and industrial area, groups of villages, farms and similar concentrations of consumers.

The lines are fed into intermediate substations where transformers reduce the voltage to 11kV. Secondary distribution lines radiating from these substations carry the power into the areas to be supplied and terminate at distribution substations. Here the voltage is reduced to its final level of 380/220V for use in shops, office buildings, schools and homes.

Some consumers use electricity is such quantities that they are supplied at a higher voltage than is used in the home. Heavy industry may have their own link from the distribution station at 132kV.

The distribution of electricity must be arranged as far as practicable, to prevent the interruption of electricity supply in the event that there is a fault in one section of the system. Lines carry 132kV run from the distribution station to the substation and to the substation serving heavy industry. A further 132kV line connects point to point. If the direct connection to either substation breaks down, supplies can still be maintained by means of the connecting link. The reduce voltage such as 11kV in large factories and 380/220 volts in shops and homes is distributed via distribution lines to the end users. The Black Rock 132kV powerline proposed in terms of this EIA is regarded as a distribution powerline, which will be constructed between the Klipkop and Umtu Substations.

1.2.4. Substations

Substations are self-contained units, which are controlled from the main control centres and are located mostly in remote areas. They are specially designed to work 24 hours a day without attention and to operate outdoors in all weather conditions. The switchgear is able to interrupt and reconnect very high voltages and very high amounts of power.

For the substation to perform correctly it needs sophisticated protection equipment to detect any faults and abnormal conditions and to receive message from the control centre and also transmit back to the control centres if action is taken. Action consists of automatically switching the power off and on again to cater for abnormal conditions such as lighting strikes or trees falling on powerlines. This action is necessary to protect people when there is an accident or to keep the electricity supply constant.

1.3. *ENVIRONMENTAL AUTHORITY PROCESS*

The construction of a powerline and related infrastructure as listed above falls within the ambit of the Environmental Impact Assessment (EIA) Regulations promulgated in terms of Section 24 of the National Environmental Management Act (Act 107 of 1998) (NEMA) and requires that an EIA process in terms of Regulation 387 is undertaken for legislative and authorisation purposes.

In terms of Section 24C (2) of NEMA, if ESKOM (statutory body) is the proponent of the proposed project, the Department of Water and Environmental Affairs (DWEA) is regarded to be the competent authority for authorisations and all applications and reports need be sent to DWEA. The Northern Cape Department of Tourism, Environment and Conservation (DTEC) will be a commenting authority in term of this project.

Therefore an Application for Environmental Authorisation in terms of Section 13 of Regulations 385 was lodged with DWEA for the approval of the following listed activities that is triggered by the proposed 132kV powerline project (**Table 1-1**):

Table 1-1: Listed Activities Applicable to the 132kV Powerline

Number of the relevant notice:	Activity No(s):	Description of activity:
GN R. 386	12	The transformation or removal of indigenous vegetation of 3 hectares or more.
	16	The transformation of undeveloped, vacant or derelict land to – (b) Residential, mixed, retail, commercial, industrial or institutional use where such development does not constitute infill and where the total area to be transformed is bigger than 1 hectare.
GN R. 387	1(l)	The construction of facilities or infrastructure, including associated structures or infrastructure

Number of the relevant notice:	Activity No(s):	Description of activity:
		for the transmission and distribution of electricity above the ground with a capacity of 120 kilovolts or more.
	2	Any development activity, including associated structures and infrastructure, where the total area of the developed area is, or is intended to be, 20 hectares or more.

The aim of the EIA process is to identify and assess the potential impacts associated with the proposed project and to develop measures through which potential negative biophysical and socio-economic impacts can be mitigated and positive benefits can be enhanced.

The EIA has been conducted, to present the authorities with reliable and objective information for decision-making. The EIA process as prescribed by the new EIA Regulation consists of a Scoping Phase (preliminary investigations) and EIA Phase (detailed investigations), together with a concurrent public participation process (PPP). The stakeholder engagement and PPP is an interactive procedure, and continues throughout the EIA process.

The EIA Phase commended in March 2010. The Scoping Phase, which was concluded in February 2010, focused on a general environmental assessment of the study area, and included the identification of relevant, sensitive biophysical and socio-economic aspect and areas. The main purpose was to identify related environmental issues that will require further detailed investigation during the EIA phase. In order to allow input by stakeholders into the process, as required by legislation, the draft Environmental Scoping Report (ESR) was made available to the public and all registered I&APs for comment.

The main purpose of the EIA is to determine the final route for the 132kV powerline construction between the Klipkop and Umtu Substations, which will be feasible, as well as to provide recommendations and mitigation measures that would ensure the least impact on the environment in the event that the proposed powerline is constructed. The EIA report provides a systematic and consolidated record of the results, conclusions and recommendation of the specialist studies.

A number of detailed specialist assessments have been conducted based on the outcome of the Scoping phase. The main objectives of these studies were to determine the significance of the potential environmental impacts that the proposed development may have on the biophysical and socio-economic environment.

Based on the outcome of the Scoping phase, the following specialist investigations were conducted as part of the EIA phase:

- Archaeology;
- Avifauna;
- Ecology (fauna and flora);
- Soils, land use and land capability;
- Surface water; and
- Visual.

The specialist studies informed the final conclusion and recommendations of the EIA Report, in particular through proposing mitigation and/or management measures to reduce the significance of impacts, which cannot be avoided.

The outcome of the EIA Phase studies has been documented in this EIA Report, which has been submitted to the relevant authorities for review and I&APs for comment. All comments received will be documented and responded to, and will be included in an Issues and Response Report (IRR) and subsequently submitted to DEAT. The information contained in the EIA, together with the Environmental Management Plan (EMP), will inform DEAT in their Record of Decision (ROD) for the proposed powerline project.

1.4. *Overview of Scoping Phase*

During the Scoping Phase the potential environmental (biophysical and social) impacts associated with the proposed project were identified. A number of issues for consideration in terms of the alternatives were identified by the environmental team. The Environmental Scoping Report (ESR) was made available for public comment from 15 January 2010 until 15 February 2010. No comments or concerns were received up-to-date from the public in terms of the ESR or the proposed project. The final Scoping Report was submitted to DEAT on 25 February 2010.

1.4.1. Anticipated Impacts

Potential environmental impacts resulting from the construction of the proposed powerline were identified during the Scoping phase. A summary of the potential impacts identified for the construction and operational phases are provided in subsequent sections.

- **Construction Phase Impacts**

Table 1-2 identifies the impacts that may result from the construction phase of the project.

Table 1-2: Potential Construction Phase Environmental Impacts

Affected Environment	Anticipated Impacts
Ecological Processes	Irreversible habitat destruction associated with the construction camp are likely to be the largest sources of risk to faunal and flora communities in the broader region. The establishment of construction camps and access tracks (where necessary) must be undertaken in consultation with the landowner and must take into account sensitive areas identified in the EIA. Specific management measures are provided in the EMP.
Avifauna	The potential impact on birds is primarily related to the destruction of habitat during the establishment of the construction camp as well as the disturbance of normal bird behaviour patterns.
Surface Water	The placement of towers may result in erosion of the affected area. Contaminants such as hydrocarbons may be spilled by service vehicles which can drain into the surface water system, thereby polluting the water course system.
Soils	Removal of vegetation during site clearing may expose soils and render it susceptible to erosion. Soil contamination may occur due to the potential spillage of hydrocarbons by service vehicles.
Land Use	The proposed powerline will require the registration of a servitude in which, for safety reasons, no other land use will be allowed.
Heritage Resources	During the construction and excavation activities there is the potential to disturb areas of historical, cultural or archaeological importance.
Socio-Economic conditions	The potential issues are as follow: • Windblown dust may pose a nuisance factor to surrounding land uses; • Increased traffic due to construction activities; • Potential for the creation of fires through worker activities such as cooking/heating; • Compromised safety of landowners resulting from the presence of construction workers; • Littering leading to general domestic pollution; and • Employment of local labour.
Noise	The movement of machinery and vehicles will constitute a source of noise in the area. It should be noted that this will be limited to the construction phase only and where possible the necessary noise abatement measures/technology will be implemented to mitigate the impact of the noise.
Residents, tourists and motorists	Alteration of the landscape character and sense of place as a result of the constructed powerline.

- **Operational Phase Impacts**

Table 1-3 identifies the impacts that may result from the operational/maintenance phase of the project.

Table 1-3: Potential Construction Phase Environmental Impacts

Affected Environment	Anticipated Impacts
Avifauna	Collision of large terrestrial birds and the earth wires of the proposed powerline.
Ecology (Flora and Flora)	The largest effect on fauna and flora habitat during the operational phase is likely to be that of the creation of the service track roads and the actual servitude. The maintenance of the servitude may also result in the creation of vegetation structure and composition, which will differ from the surrounding landscape. These maintenance activities e.g. use of fire may influence the re-establishment of certain species over others. Faunal habitat that might be affected during the construction and operation of the proposed powerline include flat, open spaces, whereby migration patterns may be disturbed. Areas that area likely to be affected the most area areas that will suffer total or partial habitat destruction, such as the areas earmarked for the construction of the towers.
Soils	Soils may become more susceptible to erosion. Ongoing use of poorly constructed access tracks with inadequate provision for stormwater water management may increase erosion of areas.
Land Use	Once the servitude for the powerline has been determined, land use within the servitude will be restricted for most land uses except grazing. EKSOM personnel will be responsible for the maintenance of the servitude including the control of invasive plant species, control of erosion and the maintenance of firebreaks.
Visual Impact	The following general risks are associated with the visual instruction in the landscape and therefore apply to all corridor alternatives. These may result if the urge to keep the powerline as straight as possible persists: • The provision of views along the powerline from existing roads. This will magnify the visual intrusion of the line in the landscape; and • The degradation of areas of particular visual character.
Socio-Economic conditions	Most negative socio-economic impacts related to the project will be observed during the construction phase. Power failures caused by lightening and vegetation encroachment for example can result in fires. Preventative maintenance is therefore essential to ensure that these problems do not arise. Exposure of flora, fauna and human to electromagnetic fields (EMF).

1.5. STRUCTURE OF THE EIA

Figure 1-2 provides a schematic representation of the EIA process that was followed for the proposed project.

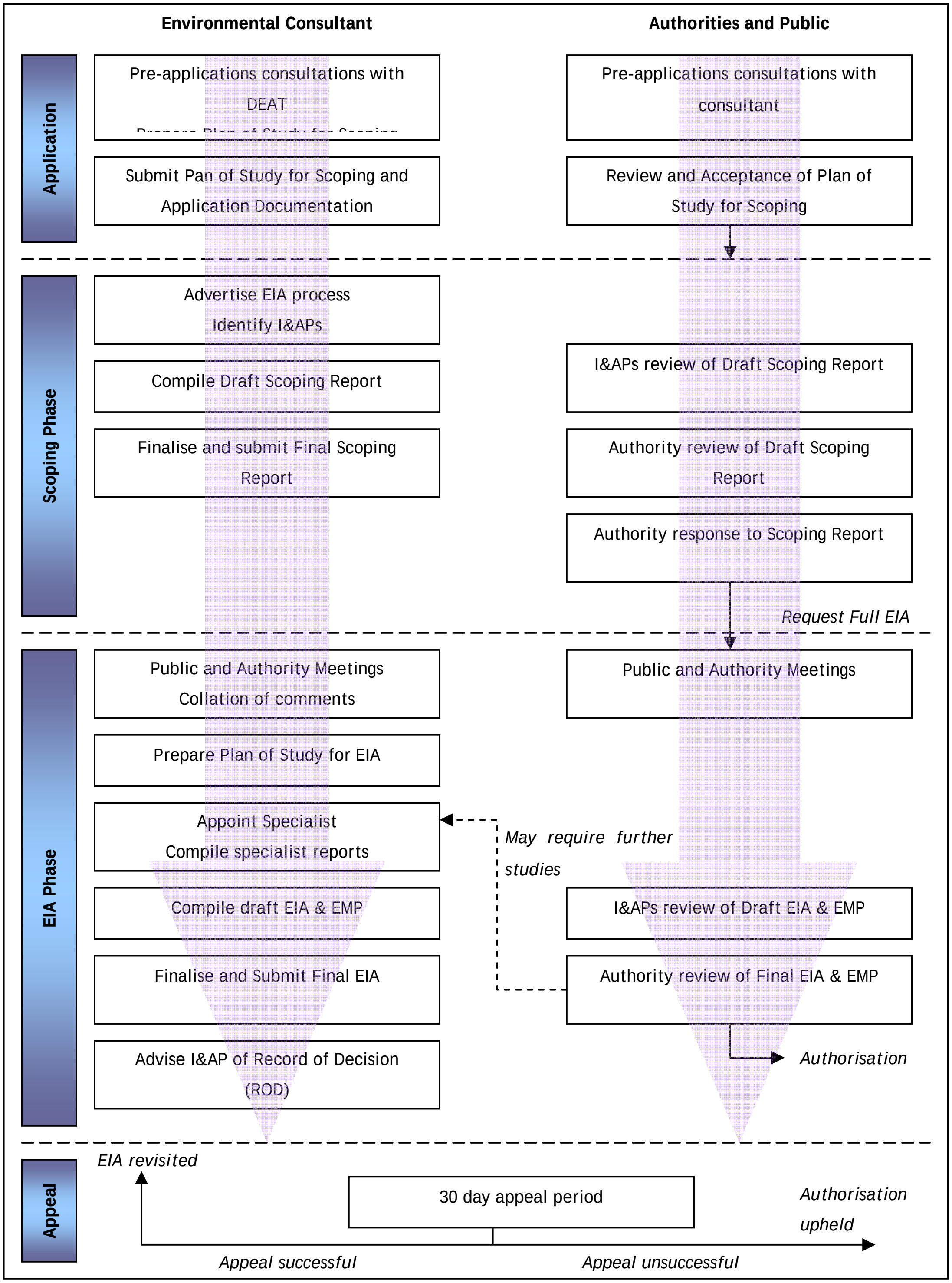


Figure 1-2: EIA Process as prescribed by the NEMA EIA Regulations

The EIA report has accordingly been structured to provide the following:

CHAPTER 1: Introduction

- This chapter provides a brief description of the proposed project, the purpose and structure of the EIA, the legal framework applicable to this project, as well as details the project team.

CHAPTER 2: Project Description

- This chapter provides a comprehensive description of the proposed project and how it is planned to be initiated and maintained/operated should the environmental investigations be sufficient.

CHAPTER 3: Public Participation Process

- This chapter details the process undertaken for stakeholder engagement.

CHAPTER 4: Description of the Baseline Environment

- A description of the current environment (which includes the biophysical and socio-economic components) prior to the commencing of the proposed project is provided in this chapter.

CHAPTER 5: Project Alternatives

- This chapter details the project alternatives considered for the proposed powerline project.

CHAPTER 6: Environmental Impact Assessment

- This chapter provides a description of the purpose, approach and methodology followed during the EIA phase. The potential impacts on the environment in terms of the proposed project are also assessed, rated and mitigation measures are provided for each to minimise the initial impact.

CHAPTER 7: Environmental Management Plan

- This chapter details the mitigation and management measures in terms of the proposed environmental impacts. The chapter also stipulates the person responsible to ensure that these commitments are adhered to along with the action /implementation timeframe for these mitigation measures.

CHAPTER 8: Recommendations

- This chapter details the required management measures to be implemented during the construction, maintenance/operation phase in order to prevent or mitigate the identified environmental impact listed in the previous chapter.

CHAPTER 9: Conclusion

- The conclusion provides a brief description of the findings in this report and provides an opinion as to whether the proposed project should be authorised or not based on the EIA outcomes.

CHAPTER 10: References

Together with the EIA, an EMP will be submitted to DWEA. The purpose of the EMP is to provide management measures in order to reduce, and or eliminate any negative impacts and enhance the positive impacts where possible.

1.6. *LEGAL FRAMEWORK*

Table 1-4 provides a summary of the environmental legislation Acts that are relevant to the proposed 132kV distribution powerline project and which must be considered by ESKOM during the implementation of the proposed powerline project.

Table 1-4: Summary of relevant environmental legislation

Legislation	Sections	Relates to:
The Constitution (Act 108 of 1996)	Chapter 2	Bill of Rights.
	Section 24	Environmental Rights.
	Section 25	Rights in property.
National Environmental Management Act (Act 107 of 1998)	Section 2	Defines the strategic environmental management goals and objectives of the government. Applies throughout the Republic to the actions of all organs of state that may significantly affect the environment.
	Section 24(a) & (d) & Section 24(5)	Listed Activities and Regulations
	Section 28	The developer has a general duty to care for the environment and to institute such measures as may be needed to demonstrate such care.
Environmental Conservation Act (Act 73 of 1989)	Section 2	General policy.
	Section 16	Provides for the setting aside of Protected Natural Environments (PNEs). Any construction activities within the PNE require the consent of the PNE management advisory committee and the Premier of the relevant province.
	Section 19 & 19A	Prevention of littering by employees and subcontractors during the construction and the maintenance phases of the proposed project.
The Conservation of Agricultural Resources Act (Act 43 of 1983)	Section 6	Implementation of control measures for alien and invasive plant species.
National Heritage Resources Act (Act 25 of 1999)		Provides general principles for governing heritage resources management throughout South Africa including national and provincial heritage sites, burial grounds and graves; archaeological and palaeontological sites, and public monuments and memorials.
National Environmental Management: Air Quality Act (Act 39 of 2004)	Section 26-27	Control of fuels.
	Section 32	Control of dust.
Occupational Health and Safety Act (Act 85 of 1993)	Section 8	General duties of employers to their employees.
	Section 9	General duties of employers and self employed persons to persons other than

Legislation	Sections	Relates to:
		their employees.
Fertilisers, Farm Feeds, Agricultural Remedies and Stock Remedies Act (Act 26 of 1983)	Section 3 – 10	Control of the use of registered pesticides, herbicides and fertilisers. Special precautions must be taken to prevent workers from being exposed to chemical substances in this regard.
Natural Conservation Ordinance Act (Act 12 of 1983)	Section 98	Identification of any specially protected or rare and endangered species. If these are to be affected by the proposed project, a permit from the Director General, Nature Conservation should be obtained prior to removal.
	Schedule 11	Prohibits the picking of all indigenous plants on public roads and nature reserves without a permit.

In addition to the abovementioned legislation all relevant Provincial Regulations, Municipal Bylaws and Ordinances and internal ESKOM laws will also be considered throughout the EIA process.

1.7. PROJECT TEAM DETAILS

1.7.1. Proponent Details

Name of Proponent: ESKOM Holding Limited (ESKOM) - Distribution NWR
Contact Person: Andrea van Gensen
Designation: Environmental Manager
Physical Address: 120 Henry Street
Bloemfontein
9300
Postal Address: P.O. Box 356
Bloemfontein
9300
Tel: (051) 404 2040
Fax: (051) 404 2972
E-mail: Andrea.vanGensen@eskom.co.za

1.7.2. Details of Environmental Assessment Practitioner

Ivuzi (Pty) Ltd (Ivuzi) have been appointed as the independent environmental consultants to undertake the environmental process required in obtaining approval for the proposed activities. Refer to **Appendix A** for the declaration of independence.

Name of Consultant: GCS (Pty) Ltd – Environmental Services
Contact Person: Ms Tanja Bekker / Ms Selma Nel
Physical Address: 63 Wessel Road
Woodmead
2191
Postal Address: P.O. Box 2597
Rivonia
2128
Tel: (011) 803 5726

Fax: (011) 803 5745
E-mail: selma@gcs-sa.biz

Ms Bekker is appointed as the Environmental Unit Manager for GCS/Ivuzi and has 8 years experience in the environmental consultancy industry. Project Management and Coordination of projects forms a critical component of her duties, which includes project planning, initiation of project, client, authority and stakeholder consultation, specialist coordination, budget control, process control, quality control and timeframe management. She is responsible for the mentoring and capacity building of the Environmental Unit. Her interest lies in the mining industry with the main focus on the compilation, implementation and assessing of EMPs in terms of the MPRDA. Tanja has a comprehensive experience and thorough understanding of the National Environmental Management Act and subsequent regulations. Tanja is involved in conducting environmental audits and site assessments, as well as assessing environmental compliance for specifically mining clients. Tanja is a registered Professional Natural Scientist. Ms Bekker has undertaken numerous EIA studies that are located in the Northern Cape Provinces.

Ms Nel holds a MA in Geography and Environmental Management. She is an Environmental Scientists with 3 years experience in the environmental field. Ms Nel specialises in the management of medium scale EIAs and EMPs, coordination and execution of public involvement processes and management of multi-disciplinary project teams. Ms Nel has undertaken numerous EIA studies, particularly for mining activities in the Mpumalanga Provinces.

Refer to **Appendix B** for the project team's Curriculum Vitae.

1.7.3. Details of Specialists

Specialist Field: Archaeology
Company: ArchaeMaps
Contact Person: Karen van Ryneveld

Specialist Field: Avifauna
Company: BirdLife South Africa
Contact Person: Martin Taylor

Specialist Field: Ecology
Contact Person: Karen van der Merwe

Specialist Field: Soils
Company: GCS
Contact Person: Brenton Mabuza

Specialist Field: Surface water
Company: GCS
Contact Person: Justine Porteous

Specialist Field: Visual
Company: GCS
Contact Person: Riaan van der Merwe

Refer to **Appendix C** for all specialist Curriculum Vitae.

1.8. LANDOWNERSHIP

A number of landowners were identified during the scoping phase, as property owners who could be affected by the proposed powerline alignment. A deed search was conducted to confirm these affected landowners. A summary of the landowners affected by the proposed corridors are provided in **Table 1-5**. These landowners were notified of the proposed distribution powerline in the study area through the distribution of the Background Information Documents (BIDs), site notices and placement of newspaper advertisement in the relevant local newspapers.

Table 1-5: Property Landowners Affected by Proposed Powerline

Farm Name	Portion Number	Surface Owner	Title Deed nr
Nchwaning 267	3	Assmang Ltd	T1214/1984
Mukulu 265	0 (REM)	Assmang Ltd	T288/1956
Umtu 281	0 (REM)	Kalagadi Manganese	T2388/1996
Olive Pan 282	1	Mr. L.P. van der Walt	T2123/1992
Olive Pan 282	0 (REM)	Kalagadi Manganese	T2399/1996

2. PROJECT DESCRIPTION

ESKOM proposes to construct a new 132kV distribution powerline between the existing Klipkop Substation to the new Umtu Substation.

The purpose for the construction of the 132kV overhead powerline is to provide the Assmang Black Rock Manganese mine with sufficient electricity, which the mine will require for their proposed expansion projects in the near future. As part of the construction of the 132kV overhead powerline, the existing Klipkop Substation will be extended. The extension of the Klipkop Substation will be beneficial to the local Black Rock Village and farms in the surrounding areas, whose power supply is provided by the mine.

The proposed project will involve the construction of one powerline within a servitude which will run between the Klipkop and the Umtu Substations. The powerline will be constructed on monopole structures which will be erected within the corridor alignment. The servitude width for a 132kV powerline is 31m (15.5m either side of the centreline) and it will continue for the length of the powerline.

At the beginning of the Scoping Phase ESKOM considered six possible corridor alignments to be investigated with the intention of determining the best possible route for the construction of the 132kV powerline. During the specialist investigation phase three out of the six alternative corridor options (Options 1, 2 and 3) were eliminated for further environmental investigation as their alignment crossed an area earmarked for future mining activities proposed by the Kalahari Resource Umtu Mine, thereby rendering these options as unfeasible alternatives.

Therefore based on the outcomes of the various specialist studies and the EIA process it became evident that the Option 4 corridor alignment will be the best suitable option for the construction of the 132kV powerline between the Klipkop and Umtu Substations. The length of the Option 4 proposed corridor is approximately 16.6km.

The assessment of the three possible corridor alignments, of which only one will be used, is discussed in further detail in **Section 5.**

The sections below provide detailed information regarding the proposed project to be undertaken if authorisation is given to construct the 132kV powerline within the Option 4 corridor alignment.

2.1. PROJECT LOCATION

The project area is located in the Northern Cape Province within the Kgalagadi Municipality District. Black Rock and Hotazel are major towns within the broader study area.

The proposed 132kV powerline will be aligned between the existing Klipkop Substation and the new proposed Umtu Substation. The Klipkop Substation is located on Portion 3 of the Farm Nchwaning 267 and the Umtu Substation is located on the Remaining Portion of the Farm Olive Pan 282.

The proposed powerline will generally run in a north-south direction. Refer to **Figure 1-1** for the location of the proposed powerline route considered for this project.

2.2. PROJECT NEED AND DESIRABILITY

ESKOM is mandated by the South African Government to ensure the provision of reliable and affordable power to South Africa. Electricity cannot be stored and must be used as it is generated. Therefore, electricity must be generated in accordance with supply-demand requirements. Eskom's core business is in the generation, transmission, trading and retail of electricity. The reliable provision of electricity by ESKOM is therefore critical for industrial/economic development and related employment and sustainable development in South Africa.

The purpose for the construction of the 132kV overhead powerline is to provide the Assmang Black Rock Manganese mine with sufficient electricity, which the mine will require for their proposed expansion projects in the near future. As part of the construction of the 132kV overhead powerline, the existing Klipkop Substation will be extended. The extension of the Klipkop Substation will be beneficial to the local Black Rock Village and farms in the surrounding areas, whose power supply is provided by the mine.

ESKOM, in response to the above, propose to construct a 132kV powerline between the Klipkop Substation and the Umtu Substation in the Kgalagadi District.

2.3. PROJECT ACTIVITIES

In terms of the proposed project, the following activities will be undertaken by ESKOM:

- Constructing the temporary construction camps;
- Establishing the servitude corridor;

- Constructing access tracks along the powerline corridor that will be used during the construction, operational and maintenance phases;
- Constructing the powerline; and
- Extension of the Klipkop Substation.

It is the intention of ESKOM to utilise, where possible, existing road servitudes for the construction of the proposed 132kV overhead powerline. This will ensure that the use and impact on vacant land is kept to a minimum and that the construction of the overhead powerline will mainly take place along already existing road servitudes where the natural environment has already been disturbed. Furthermore the planned route of construction will attempt to avoid any roads, railway lines and river crossings, where possible.

2.3.1. Construction of Powerline

The construction of the powerline involves teams working in phases. A summary of the different activities required for the construction of the powerline is outlined below.

- **Appointment of ECO**

ESKOM must ensure that an Environmental Control Officer (ECO) monitors the construction phase according to the approved EMP. Once the contract has been awarded to the contractor, the ECO will contact the relevant affected landowners to discuss access, the conditions of the area and roads, as well as the extent of the work that will transpire.

The ECO maintains contact with the landowners throughout the construction of the powerline, and monitors the status of the affected environment. Once construction has been completed, the ECO will ensure that rehabilitation of the site is undertaken as stipulated. Landowners will be requested to sign a release form stating their satisfaction with the way in which the land has been rehabilitated.

- **Bush-clearing**

A maximum of 8m (4m on either side of the centreline of the powerline) wide strips is to be cleared of all trees and shrubs down the centreline of the powerline servitude for stringing purposes only. If any trees or shrubs in other areas will interfere with the operation and/or reliability of the 132kV powerline it will be trimmed or completely cleared.

Earthmoving equipment will be used to during the construction phase. All areas that will be disturbed such as construction camps and the construction area around the towers will have the topsoil stripped and subsequently stockpiled for later use and rehabilitation.

- **Surveyors**

The surveyors will survey the proposed corridor alignment in order to determine the precise location of the servitude. Once the centre line has been cleared, the surveyor pegs every tower position. Once the tower positions have been marked, the vegetation clearing team will return to every tower position and clear vegetation (in accordance with the EMP) for assembling and erection purposes.

- **Gate and fencing around substations**

In order to establish easy access to the substations for service and maintenance purposes, gates need to be placed at strategic points along the substations boundaries. The gates and fencing around the substations will also serve as a security measure.

- **Foundation-laying**

The foundations are constructed first, followed by the assembly of the towers on the ground, then the erection of the towers and finally the stringing and regulation of the conductors.

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 – the actual sub-soil conditions. Strain structures require more extensive foundations for support than in-line structures, which contribute to the cost of the construction of a powerline. The minimum working area required around a structure position is 20m x 20m for free standing structures, with a 5m radius around anchors.

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 foundation. Prior to erecting the poles and filling the foundations, the excavated foundations will be clearly demarcated and covered with corrugated iron sheets in order to safeguard unsuspecting animals and people from injury. All foundations are backfilled, stabilised through compaction, and capped with concrete at ground lever (**Figure 2-1**).

Figure 2-1: Concrete Cap

- **Tower assemble and Tower erection**

A construction team will be appointed that will assemble and erect the specified towers as indicated and marked by the surveyor. This activity will only commence once the bush-clearing is done.

- **Stringing**

Once the towers have been erected a team will start to string the 132kV chickadee powerline between the towers and will ensure that the right amount and type of conductors are stringed together on the line.

- **Site clean-up**

After the complete construction of the 132kV powerline, a final site clean-up will be undertaken in order to ensure that any additional construction material not used during the construction is removed in a proper manner.

- **Rehabilitation of disturbed areas**

Once the whole site have been cleaned the disturbed areas will be rehabilitated to ensure that no further environmental degradation will take place. Areas that have been stripped from vegetation will be revegetated in order to prevent water and wind erosion.

- **Final Inspection**

The appointed ECO will undertake the final site inspection along with the construction teams to ensure that the construction phase and rehabilitation of the area was done according to the EMP. Once the towers have been erected a team will start to string the 132kV chickadee powerline between the towers and will ensure that the right amount and type of conductors are stringed together on the line.

- **Releasing Contractors from site**

Once the ECO approves of the manner in which the construction and clean-up have been done the ECO will release the contractors from site and their duties.

2.3.2. Servitude

- **Servitude Acquisition**

ESKOM will negotiate with the landowners individually that are affected by the proposed powerline corridor for the servitude to be granted over their land to accommodate the powerline. The exact location of the servitude that is proposed by the EIA after due consideration of the alternative alignments will need to be discussed with the affected landowners.

According to Section 16 (1) of GN R. 358, an applicant must, before applying for an environmental authorisation in respect of that activity, obtain the written consent of the landowner to undertake the proposed activity on that land.

Section 16 (3) of the abovementioned legislation states that sub-regulation (1) does not apply in respect of a linear activity (such as the proposed construction of a 132kV powerline between the Klipkop and Umtu Substations), provided that the applicant has given notice of the proposed activity to the owners of the land on which the activity is to be undertaken as soon as the proposed route or alternative routes have been identified.

In order to adhere to the abovementioned regulation, a letter stating the proposed project description, location and purpose was sent to all relevant and affected landowners along with the contact detail of Ivuzi so that these people can register as I&APs. The distributions of these letters were done by means of post and hand delivery.

- **Servitude Requirements**

The servitude width for a 132kV powerline is 31m (15.5m on either side of the centre line of the powerline). The minimum vertical clearance to buildings, poles and structures not forming part of the powerline must be 3.8m, while the minimum vertical clearance between the conductors and the ground is 6.7m.

The minimum distance between any part of a tree or shrub and any bare phase conductor of a 132kV powerline must be 3.8m to allow for the possible lateral movement of this vegetation that could be a potential hazard for distribution lines that area operational and energised.

Should the preferred distribution line pathway receive environmental authorisation from DEAT, and following successful negotiations with landowners, the final delineation of the centreline of the 132kV powerline and co-ordinates of each bend in the line will be determined.

A minimum of 8m (4m on either side of the centreline of the powerline) wide strips is to be cleared of all trees and shrubs down the centreline of the powerline servitude for stringing purposes only. If any trees or shrubs in other areas will interfere with the operation and/or reliability of the 132kV powerline it will be trimmed or completely cleared.

The clearing of vegetation will take place, with aid of a surveyor, along approved profiles and in accordance with the approved EMP, and the minimum standards to be used for vegetation clearing for the construction of the proposed new 132kV powerline as listed in **Table 2-1**.

Table 2-1: Minimum standards to be used for vegetation clearing for the construction of the proposed new 132kV powerline.

Item	Standard	Follow up
Centre line of the proposed 132kV transmission line.	Clear to a maximum (depending on tower type and voltage) of an 8m wide strip of all vegetation along the centre line. Vegetation to be cut within 100mm of the ground. Treat stumps with herbicide.	Re-growth shall be cut within 100mm of the ground and treated with herbicide, as necessary.
Access/maintenance roads.	Clear a maximum (depending on tower type) 5m wide strip for vehicle access within the maximum 8m width, including de-stumping/cutting stumps to ground level, treating with a herbicide and re-compaction of soils.	Re-growth to be cut at ground level and treated with herbicide as necessary.
Proposed tower position and proposed support/anchor wire position.	Clear all vegetation within proposed tower position and within a maximum (depending on tower type) radius of 5m around the position, including de-stumping/cutting stumps to ground level, treating with a herbicide and re-compaction of soils.	Re-growth to be cut at ground level and treated with herbicide as necessary.
Indigenous vegetation within servitude area (outside of maximum 8m strip).	Area outside of the maximum 8m strip and within the servitude area, selective trimming or cutting down of those identified plants posing a treat to the integrity of the proposed 132kV powerline.	Selective trimming.
Alien species within servitude area (outside of maximum 8m strip).	Area outside of the maximum 8m strip and within the servitude area, remove all vegetation within servitude area and treat with appropriate herbicide.	Cut and treat with appropriate herbicide.

Once the centre line has been cleared, the surveyor pegs every tower position. Once the tower positions have been marked, the vegetation clearing team will return to every tower position and clear vegetation (in accordance with the EMP) for assembling and erection purposes.

Table 2-2 summarises some of the key clearances relevant to the construction of the proposed 132kV powerline.

Table 2-2: Clearance Specification

Clearance	Minimum Clearance Distance (m)
Ground clearance	6.7
Building structures not part of the powerline	3.8
Above roads in townships, proclaimed roads	7.5
Telkom telephone lines	2.0
Spoornet tracks	10.9

2.3.3. Access & Construction Camps

As far as possible, existing access roads will be used. A vehicle access/maintenance track will be established within the entire length of the powerline servitude. This is done in order to minimise the impact on the environment thereby using an area that will be cleared of vegetation for construction purposes. This track will consist of a two track access path, which would require no formal scraping of the area. Access to this track will be obtained from either the Klipkop Substation or the Umtu Substation. Both these substations have existing access roads which can be used for by the construction and maintenance teams. Therefore no new access roads will be required. The access track will enable the transportation of construction material, as well as construction teams to the site and will also facilitate maintenance activities once the powerline has been constructed.

Construction camps will be established at strategic positions along the access/maintenance track to provide optimum access to the construction areas for construction workers.

Construction camps will be clearly demarcated and areas restricted for pylon installations will be buffered and subsequently fenced so as to keep animals out of the construction area.

Access to the distribution line will be required for the construction and occasional maintenance activities, thus access roads at agreed points within the servitudes will be established if the existing road network is insufficient for this purpose.

2.3.4. Extension of Klipkop Substation

In addition to the construction of the approximately 132kV powerline between the Umtu and Klipkop Substations, the proposed project will furthermore include the following:

- The extension of the Klipkop Substation:
  - The installation of a 132/66kV 40MVA transformer bay and will include:
    - 1 x 132kV isolator;
    - 1 x 132kV breaker;
    - 3 x 132kV CT's;
    - 1 x 132/66kV transformer;
    - 3 x 66kV CT's;
    - 1 x 66kV breaker; and
    - 2 x 66kV isolators;
  - The installation of a 132kV busbar and feeder bay;
  - The installation of 3 x 132kV CT's (Current Transformers);
  - The installation of 3 x 132kV VT's (Voltage Transformers);
  - The installation of a complete 66kV feeder bay on the existing Wessels line;
  - The installation of a complete 66kV feeder bay on the existing Hotazel line;
  - The installation of 6 x 66kV VT's on 66kV busbars; and
  - The installation of 2 x 66kV busbar isolators.

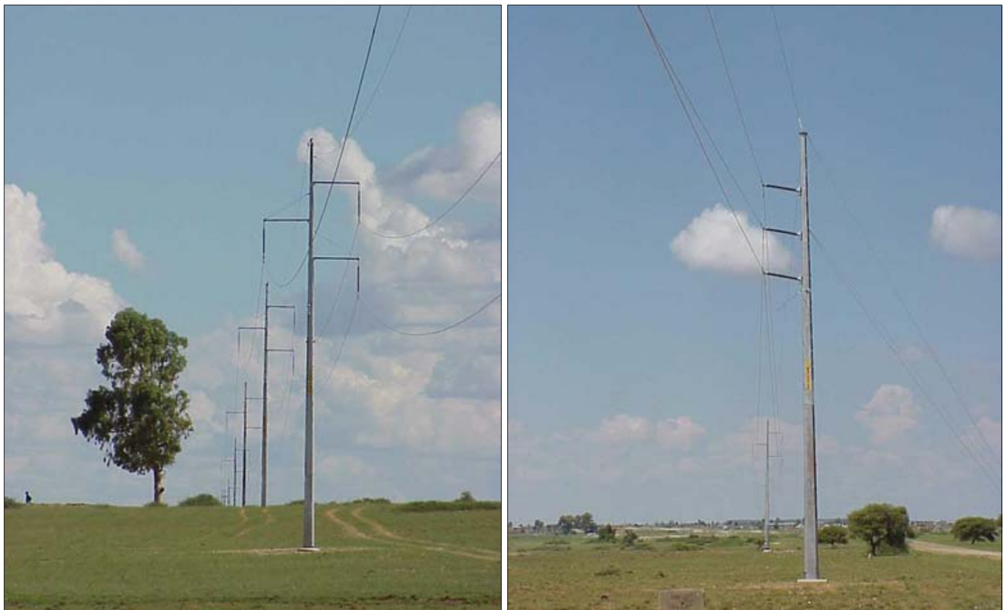
The proposed extension of the existing Klipkop Substation (**Figure 2-2**) will increase the current footprint of the existing substation area. The length of the substation will have to be extended by approximately 40m to accommodate the new 132kV feeder bays, 132kV busbar and 132/66kv transformer bay. The extension will be towards the tar road.

This area is currently used as a High Voltage Yard and is fenced off for security purposes.

Figure 2-2: General view of the existing Klipkop Substation

2.3.5. *Types of Towers*

The proposed powerlines will be constructed by using steel monopoles structures (**Figure 2-3**). These poles weigh approximately 1 200kg each and vary in height from approximately 17.4m to 28m.



a) Free Standing Structure

b) Supported Angle Structure

Figure 2-3: 132kV Steel Monopole Structures

The size of the foundation footprint depends on the type of pole, i.e. whether it is a self supporting, guyed suspension or an angle strain pole structure. The size of the footprint areas ranges from $0.36m^3$ to $2.35m^3$, with the larger footprint area associated with the guyed suspension and angle strain pole structures.

The average span between two towers is 200m, but can vary between 250m and 375m depending on the ground profile and the terrain to be traversed. The self-supporting structure is typically used along the straight sections of the powerline, while the guyed intermediate suspension structures and angle strain structures are used where there is a bend in the powerline alignment.

2.3.6. *Operation*

The only activity that will occur during the operational phase of this proposed project will be the regular maintenance of the powerline. During such activities the access tracks established within the servitude during the construction phase will be utilised.

The servitude will also require regular maintenance whereby vegetation clearing/trimming is undertaken to ensure that vegetation does not interfere with the operation of the powerline. Access tracks will be monitored for erosion and the necessary corrective measures undertaken if required. Servitude maintenance therefore goes hand in hand with the use of and maintenance of access tracks.

2.3.7. Maintenance

- *Control of Vegetation*

ESKOM has a programme in place to ensure that control of vegetation around the existing towers are monitored and maintained to minimise the risk of fires. Tall trees that are located within the servitude can get struck by lightning and can be set alight. The heat and flames from the natural veld fire can then damage the overhead powerline.

- *Anti-climb wires*

The installation of anti-climb wires serves as a deterrent to unauthorised climbing of the towers. It will not prevent a determined individual from climbing over and up the tower. ESKOM has programmes where the broken wires are replaced as part of the maintenance on the powerline.

- *Bird Fatalities*

Various bird species can collide with the conductors or earth wires of overhead powerlines. It is generally accepted that birds can usually avoid the highly visible bundled conductors but often fail to see the thin ground wire. Typical injuries that result from a powerline collision are impact injuries such as broken necks and legs.

- *Corrosion*

Corrosion on structures is frequently found where the protective system, either galvanizing or a protective organic coating, has weathered, exposing the steel substance. With routine maintenance, this form of corrosion can be avoided.

Corrosion problems can be avoided by the correct use of materials and their combination with each other. The overall atmospheric conditions expected in a location of an intended structure, and the local environmental effects produces by the erection of structures or installations of equipment should be considered in the selection of appropriate corrosion protection systems.

2.4. SERVICES

The following services will be used during the construction phase of the proposed 132kV powerline project:

- **Sewage**

A negligible sewage flow is anticipated for the duration of the construction phase. A system of chemical toilets will be used during the construction phase on site. The toilets systems will be serviced and cleaned periodically by the supplier.

- **Roads**

Existing roads will be utilised to gain access to the relevant substations. From thereon access to the powerline will be gained through the servitude and access tracks that links the two substations.

- **Solid waste disposal**

All solid waste will be collected at a central location at each construction camp and will be stored temporarily until removed to an appropriately permitted landfill site in the vicinity of the construction site.

- **Electricity**

Diesel generators will be used for the temporary provision of electricity during the construction phase in needed.

3. PUBLIC PARTICIPATION PROCESS

The Public Participation Process (PPP) plays a vital role in the compilation of the EIA. The PPP can facilitate the planning, design and implementation of the project as a whole. The PPP for this project was designed according to the Regulation 56 of GN R. 385 and was aimed at achieving the following objectives:

- Facilitating negotiated outcomes;
- Creating trust and partnership;
- Minimising negative effects;
- Maximising positive effects;
- Providing an indication of issues which may:
  - Prevent the project continuing;
  - Cause costly delays later; and
  - Result in enhanced and shared benefits.

The main PPP activities that have been undertaken and that will be undertaken can be summarised as follows:

- I&APs identification and registration;
- Compilation of an Electronic I&AP Database;
- Public Feedback Meeting;
- Compilation of an Issues and Response Report; and
- Incorporating issues into the Final EIA Report.

The consultation process was undertaken in phases; Scoping and EIA Phase. Therefore the following sections present the consultation activities undertaken respectively.

3.1. SCOPING PHASE CONSULTATION

The primary aims of the PPP during the Scoping phase are:

- To inform I&APs of the proposed project;
- To identify issues, comments and concerns raised by I&APs;
- To determine any fatal flaws, and/or other alternatives not yet considered;
- To promote transparency and an understanding of the project and its consequences;
- To serve as a structure for liaison and communication with I&APs; and
- To provide local knowledge and input in identifying potential environmental (biophysical and social) impacts and sensitive areas associated with the proposed development.

3.1.1. Authority Consultation

The authorities, that are required to provide input to the proposed project, were consulted from the outset of this study, and will be engaged throughout the project process. The required NEMA Application form was submitted to and acknowledged by DWEA.

As previously mentioned, in terms of Section 24C (2) of the NEMA, if Eskom (statutory body) is the proponent of a project, the DWEA is regarded to be the competent authority and an application needs be lodge with DWEA. The Northern Cape DTEC is seen as a commenting authority with regard to this project.

Authority consultation to date has included the following activities:

- Submission of an Application for Authorisation in terms of Regulations R. 385 to R. 387 of NEMA to DWEA, together with a declaration of independence from the environmental consultant;
- Informing all relevant Authorities of the proposed project; and
- On-going consultation with Authorities regarding the proposed project.

3.1.2. Identification of Interested and Affected Parties (I&APs)

The first step in the public participation process was to identify key stakeholders, including:

- Central and Provincial Government Representatives, such as DWEA & DTEC;
- Local Authorities (i.e. Kgalagadi District Municipality and Gamagara Local Municipality);
- Affected and surrounding landowners;
- Environmental NGOs; and
- Community based organisations.

To ensure that all key stakeholders were identified, the locations of the proposed powerline corridor options were taken into consideration as these lines transverse various farm portions. Please refer to **Table 1-5** or the list of key stakeholder identified in this manner.

All I&APs information is summarised in **Appendix Ei**. The database has been updated on an ongoing basis throughout the project, and will act as a record of communication/public involvement process.

3.1.3. Compilation and Distribution of a Background Information Document (BID)

A Background information document (BID) was compiled in English and distributed in the broader region in compliance with Regulation 56 (2)(b) of GN R. 385.

The purpose of the BID was to inform the general public and identified I&APs of the proposed project and associated activities. The BID provided detailed information regarding the EIA process and public participation process that would be followed during this project. Along with the project description and EIA process details, the BID also contained contact information of Ivuzi and a I&AP registration form.

The BID was distributed to all I&APs via email, fax and post on 10 November 2009. Please refer to **Appendix Eii** for a copy of the BID that was distributed to the I&APs. The BID encourage I&APs to register their interest in the project. It was also ensured that a copy of the BID was distributed to the relevant key stakeholders.

3.1.4. Placement of Notices

The EIA Regulations require that an A2 notice board be fixed at a place conspicuous to the public at the boundary or fence of the study area where the proposed activity is to be undertaken and on any other alternative sites. Four (4) site notices were placed at the following sites on 11 November 2009 (**Appendix Eiii**):

- Black Rock Library;
- Black Rock Supermarket;
- Assmang Black Rock Manganese Mine Security Gate; and
- The R31 road to Van Zylsrus (immediate route of the proposed powerline corridor options – *Option 4,5 and 6* - considered for this EIA).

3.1.5. Advertisements

In terms of the EIA Regulations the commencement of the Scoping Phase and EIA process for the project was advertised in the following newspapers:

- The Diamond Fields Advertiser on 20 October 2009; and
- The Kalahari Bulletin on 22 October 2009.

This advertisement requested I&APs to register, and to become involve in the project.

The primary aim of these adverts was to ensure that the widest possible group of I&APs were informed of the proposed powerline project, and to elicit comments from the public regarding the proposed project. Please refer to **Appendix Eiv** for proof of advertisements.

3.1.6. Public Commenting Period

The ESR was made available for public review, from 15 January 2010 to 15 February 2010, at the following public locations, which were identified as readily assessable to I&APs:

- Black Rock Library; and

- Assmang Black Rock Manganese Mine.

The availability of this report was advertised in the Diamond Fields Advertiser and Kalahari Bulletin on 21 January 2010 (**Appendix Eiv**).

PLEASE NOTE: No comments or concerns were received up-to-date from the public in terms of the ESR or the proposed project.

3.2. Environmental Impact Assessment Phase Consultation

3.2.1. Project Advertising

The comment period of the EIA phase for the project was advertised in the following newspapers:

- The Diamond Fields Advertiser on 16 April 2010; and
- The Kalahari Bulletin on 15 April 2010.

The purpose of these advertisements was to inform the I&APs of the availability of the Draft EIA Report for public review and the public meeting to be held for the project. In addition to these advertisements, registered I&APs were sent emails, faxes and posted letters informing them of the availability of the Draft EIA for review.

3.2.2. Updating of I&AP Database

I&APs will continuously be identified throughout the duration of the project and their details will be added to the existing I&AP Database. Every person on the database will be informed of the availability of any project documentation and the applicable commenting period.

3.2.3. Public Meeting

A public feedback meeting was held on 28 April 2010 at the Black Rock Recreational Centre in Black Rock, to update I&APs on the outcomes of the environmental investigations in terms of the proposed project. The aim of the meeting will be to:

- Provide I&APs and stakeholders with information regarding the EIA process;
- Provide I&APs with additional information regarding the proposed development;
- Inform I&APs of the finding of the Draft EIA report;
- Provide opportunity for I&APs to seek clarity on the project;
- Record issues and concerns raised; and
- Provide a forum fro interaction with the project team.

In accordance with the requirements of the EIA Regulations, this meeting was advertised 10 days prior to the event. Registered I&APs was also be notified of the meeting via email, posted letters and faxes and will be encouraged to attend the meeting. Key stakeholders and Focus Group Meetings shall be scheduled if deemed necessary.

In addition to the above the EIA report was made available to the public 15 days prior to the meeting to ensure an informed forum for discussion.

A copy of the public feedback meeting presentation is provided in **Appendix Ev.**

3.2.4. Issues and Response Report

All issues, comments and/or concerns raised during the public commenting period of the EIA phase will be incorporated into the Issue and Response Report. This report will be continuously updated with comments received until the submission of the Final EIA Report to DEAT.

3.2.5. Public Commenting Period of the Draft Environmental Impact Assessment Report

The Draft EIA Report was made available on 13 April 2010 for public review at the following public locations:

- Black Rock Library; and
- Assmang Black Rock Manganese Mine.

The public commenting period commences on 13 April 2010 and concluded on 13 May 2010. The availability of the Draft EIA Report was advertised as mentioned in Section 3.2.1 and all I&APs was notified via email, faxes and posted letters about the availability of the report as well as the date of the public feedback meeting.

3.2.6. Final Environmental Impact Assessment Report

The Final EIA Report will be submitted to DEAT for review and decision-making once the commenting period for the Draft EIA Report has lapsed. All I&APs comments received (if any) during the commenting period shall be included into the final report for consideration.

PLEASE NOTE: No comments or concerns were received or raised up-to-date from the public in terms of the EIA/EMP Report or the proposed project in general.

4. DESCRIPTION OF THE BASELINE ENVIRONMENT

This section of the report provides a detailed description of the biophysical and socio-economic environment of the broader affected study area. Information has been augmented by detailed site-specific information provided in the specialist reports and desktop research undertaken by Ivuzi.

4.1. CLIMATE

4.1.1. Temperature

The project area is located in the northern part within the Northern Cape in an area that marks the start of the Kalahari Desert. It is considered a very water scarce region with an average annual rainfall of 320.4mm, characterised by a summer rainfall climate.

The average midday temperatures range from 16.8°C in June to 31.9°C in January (**Table 4-1**). The temperature often can drop below 0°C during the cool nights of winter.

Table 4-1: Average monthly temperatures (°C)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Max	31,9	28,7	28,0	23,7	21,9	16,8	31,9	28,7	28,0	23,7	21,9	16,8
Min	17,2	15,3	13,5	9,7	5,7	1,4	0,2	4,2	6,5	9,6	13,1	15,1

4.1.2. Mean Annual Precipitation (MAP)/Mean Annual Evaporation (MAE)

The Mukulu Rainfall Station 0392640 was not used for its information on MAP and MAE instead the Department of Water Affairs and Forestry was consulted in order to obtain a more concessive record. The closest reliable rainfall station to the project area is the Olifantshoek Station at Olifants Dam. It has rainfall records from December 1959 to September 2000 and S-Pan evaporation data over the same time period. From this record the average monthly values and the average annual values were calculated. The MAP is 320.4mm while the MAE is 2165.6mm (**Table 4-2**).

Table 4-2: MAP/MAE (mm)

Month	Average Rainfall	Average Evaporation
January	59.6	276.1
February	52.1	221.6
March	63.3	191.9
April	33.4	139.8

Month	Average Rainfall	Average Evaporation
May	14.1	105.3
June	5.3	79.9
July	3.2	90.7
August	5.5	132.6
September	5.8	180.6
October	19	234.9
November	27.4	266.6
December	32.7	293.2
Total Average	**320.4**	**2165.6**

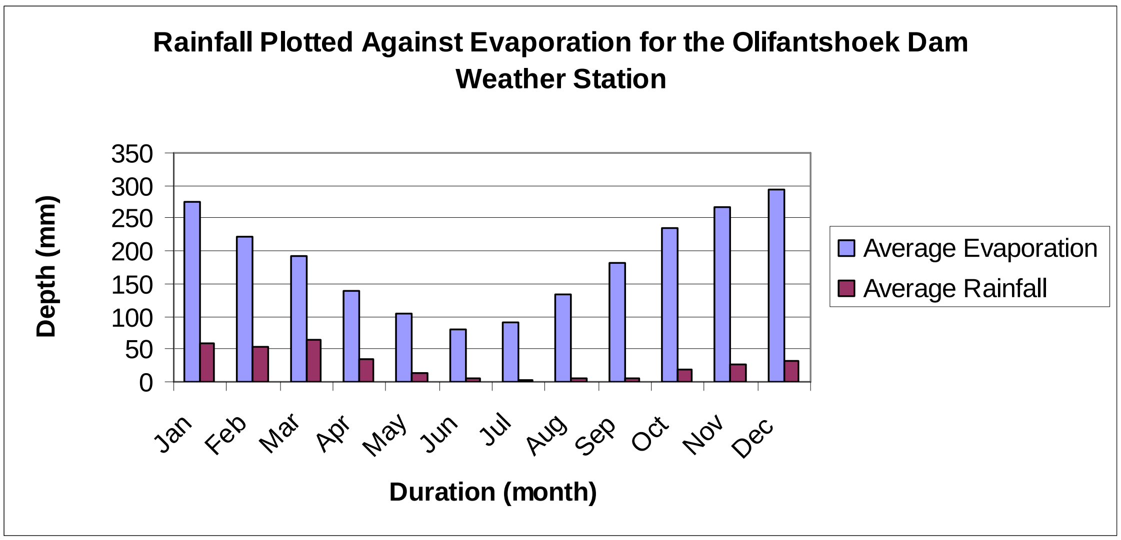


Figure 4-1: Mean Annual Precipitation vs. Mean Annual Evaporation

4.1.3. Wind

The winds are usually north-westerly, attaining maximum speed in the afternoon (**Table 4-3**).

Table 4-3: Average Wind Direction and Wind Speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Direction	NW	NW	NW	NW	NW	NW	NW	NW	NW	NW	NW	NW
Speed	4,0	3,9	4,2	4,1	4,7	4,3	4,9	5,2	4,9	4,7	4,5	4,0

4.1.4. *Incidence of extreme weather conditions*

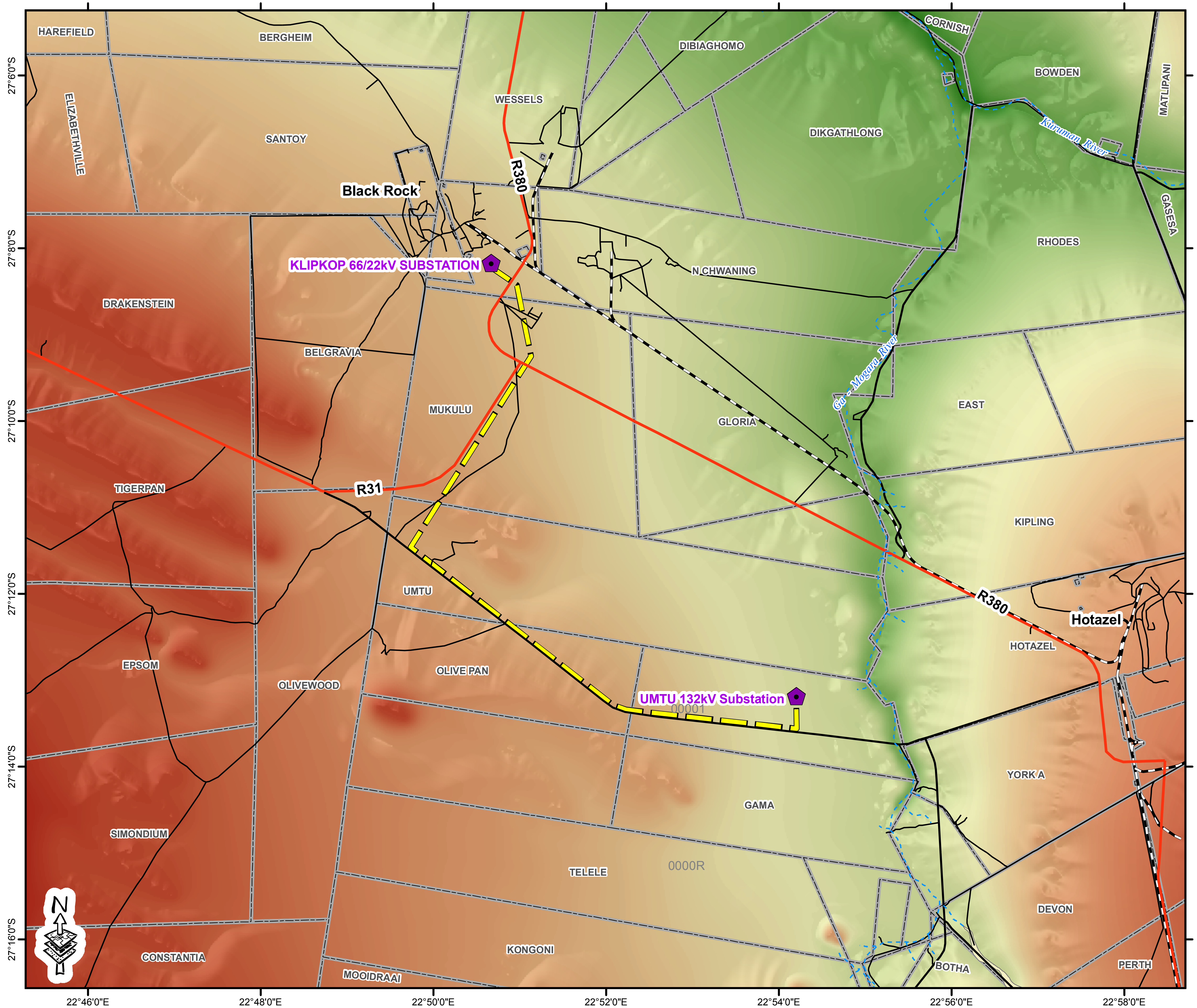
Thunderstorms occur during the rainy season and may be accompanied by lightning, heavy rain, strong winds and sometimes hail. The storms are highly localised and rainfall can vary markedly over short distances. Frost occurs occasionally during June to September.

4.2. TOPOGRAPHY AND TERRAIN

The regional topography is generally flat, with the Kalahari plains intersected by a few river beds such as the Gamagara River, which flows east of the proposed project area. The rivers are seasonal and do not always flow at surface each year.

The project area is characterised by a relative flat landscape with elevations between 1020 metres above mean sea level (mamsl) and 1080mamsl. The topography slopes down gradually to the Ga-Mogara River to the east and to the north east towards the Kuruman River. The area has a rural character with the Black Rock village and mining area forming the residential/commercial hub within the landscape. Refer to **Figure 4-2** for the topography of the study area.

FIGURE 11: BLACKROCK 132KV POWER LINE TOPOGRAPHY



LEGEND

Sub-stations

ROAD NETWORK

Main Road

Secondary Road

Other Access

Railway line

RIVERS & STREAMS

Perennial

Non-Perennial

Option 4 (16.59 Km)

Parcel boundaries

Elevation (m)

High : 1090

Low : 1000

DATA SOURCES:
The Chief Directorate of Survey & Mapping
1:50 000 Topographical Series: 2722BB & BD

Kilometers

0 1.25 2.5 5

DRAWN BY:	R.F. VAN DER MERWE GIS MANAGER (PGPT 0023)
REVIEWED	R.F. VAN DER MERWE GIS MANAGER (PGPT 0023)
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PROJECTION:	WGS 84 GEOGRAPHIC
CLIENT:	ESKOM
PROJECT:	BLACK ROCK 132KV POWERLINE (09-011)

GCS

WATER
ENVIRONMENTAL
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4.3. GEOLOGY

The Kalahari Manganese Field exists as structurally preserved erosional relicts of the Hotazel Formation below younger cover of late Early Proterozoic Olifantshoek red beds, late Carboniferous - early Permian Karoo Dwyka diamictite and Tertiary Kalahari beds. Virtually all of the deposits are covered by these younger sequences and natural outcrops are restricted to Black Rock, a small hill in the Kalahari deposit.

The manganese-bearing Hotazel Formation is conformably underlain by pillow lava, hyaloclastite and jaspellite of the Ongeluk Formation and overlain by Mapedi shales and quartzites. The strata dip gently to the West at about eight degrees. Near the western margin of the deposit, Ongeluk lava and Hotazel manganese deposits have been duplicated by thrusting from the west. The sequence has also been affected by a series of north-trending normal faults. These faults postdate the deposition of the overlying Early Proterozoic Olifantshoek red beds, but predate the thrust event. Thrusting is related to formation of the Kheiss Orogen some 1700 million years ago.

4.3.1. Presence of dykes, sills and faults

The banded ironstone and underlying lava, which outcrops at Black Rock, have been forced over the basal lower of the same sequence by a series of thrust faults. No dykes have been encountered during the past 22 years of mining at the site.

4.4. SOILS, LAND USE AND LAND CAPABILITY

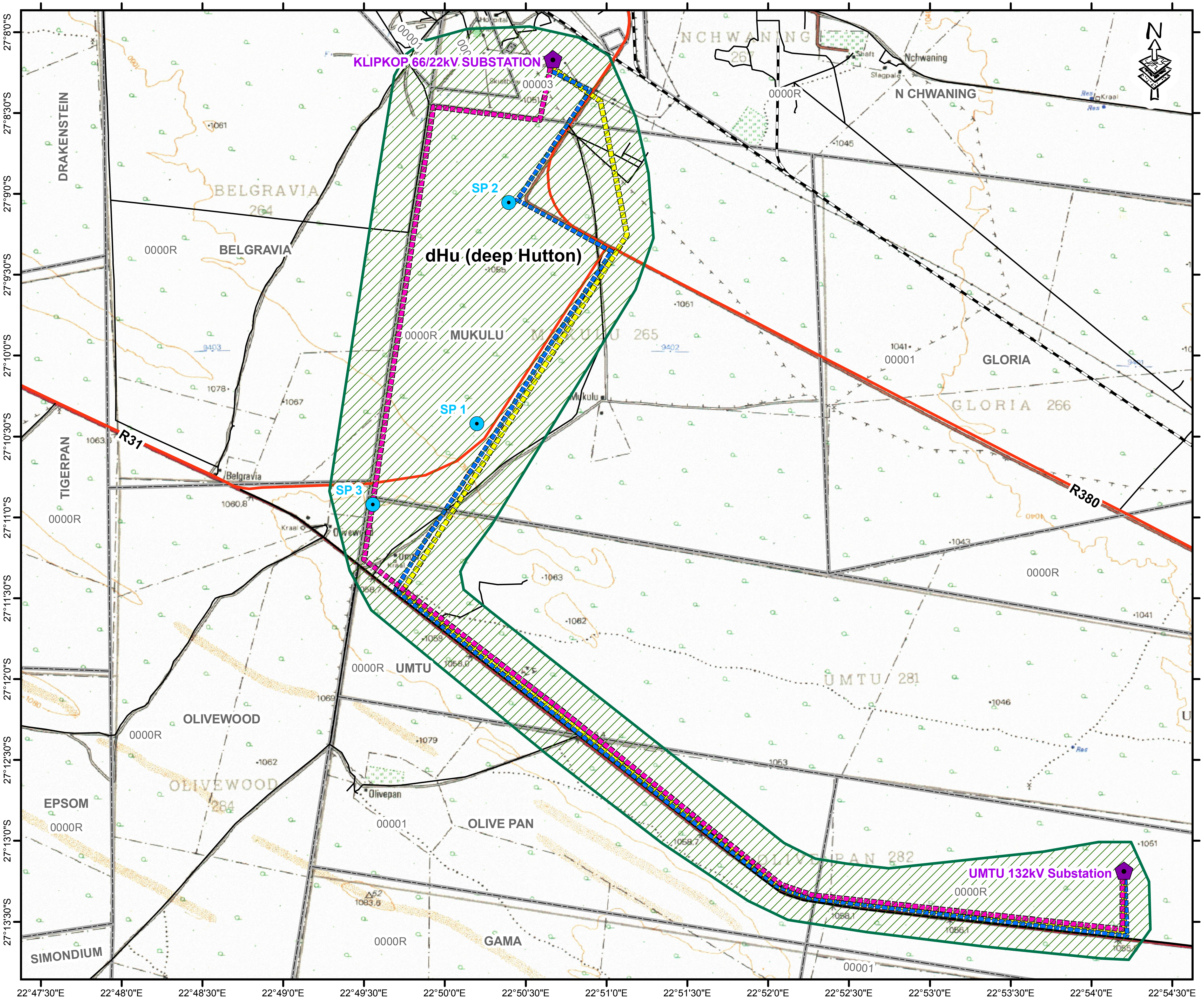
4.4.1. Soils

The soils in the region are typical of the Kalahari with fine-grained sands dominating the physical structure of the soils. In general the organic carbon status of the soils is low (± 0.1 %). The following sections provide more detailed information regarding the soils found within the study area.

The major soil forms present in the area are of the orthic phase Hutton. These soils are freely drained, deep and sandy. The Hutton soils have low dryland agricultural potential despite their adequate depth for roots to grow into due to both that they are sandy and thus have poor water retention capacity as well as the harsh dry climatic conditions prevalent in the area. They will further require high levels of management to mitigate erosion hazards as they are of aeolian origin and are thus prone to wind transportation.

Refer to **Figure 4-3** for the soil map based on the dominant soil form and family, effective depth and soil texture.

APPENDIX A: BLACK ROCK SITE: DETAILED SOIL MAP



LEGEND

- Sub-stations
- Soil Sample Points
- Option 4
- Option 5
- Option 6

ROAD NETWORK

- National Route
- Main Road
- Secondary Road
- Other Access
- Railway line
- Parcel boundaries
- Soil Type - dHu (deep Hutton)

DATA SOURCES:

The Chief Directorate of Survey & Mapping
1:50 000 Topographical Series: 2722BB

Kilometers
0 0.5 1 2

DRAWN BY:	L. DU PLESSIS GIS TECHNOLOGIST
REVIEWED	R.F. VAN DER MERWE GIS MANAGER (PGPT 0023)
DATE	09 OCTOBER 2009
SCALE:	1:45,000
PROJECTION:	WGS 84 GEOGRAPHIC
CLIENT:	ESKOM
PROJECT:	BLACK ROCK 132KV POWERLINE (09-011)

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- **Soil Analytical Data**

The analytical data of the topsoil and subsoil collected for analysis is provided in **Table 4-4** along with the location of the sample points

Table 4-4: Soil Analysis

Sample Site	SP 1 Option 4_A	SP 1 Option 4_B	SP 2 Option 5_A	SP 2 Option 5_B	SP 3 Option 6_A	SP 3 Option 6_B	Optimum Range
GPS Coordinate	27^{o}10’26.8”S 22^{o}48’41.5” E		27^{o}10’26.8”S 22^{o}48’41.5” E		27^{o}10’26.8”S 22^{o}48’41.5” E		
Laboratory Reference	2956	2957	2958	2959	2960	2961	
7 Fraction PSA (%)							**15 - 25 %**
Coarse Sand (2-0.5 mm):	5.1	8.8	2.7	2.0	8.3	11.5	
Medium Sand (0.5-0.25mm)	15.8	15.7	14.3	14.1	14.9	15.8	
Fine Sand (0.25-0.106mm)	55.0	54.4	64.2	64.7	55.5	51.7	
Vf sand (0.106-0.05mm)	15.5	13.2	13.1	13.2	14.6	13.9	
Coarse Silt (0.05-0.02mm)	2.6	2.6	1.6	1.4	2.3	3.1	
Fine Silt (0.05-0.002mm)	1.0	0.1	0.7	0.8	0.2	0.1	
Clay (<0.002 mm)	3.1	4.7	2.5	3.2	3.5	3.3	
Texture Chart	fisa	fisa	fisa	fisa	fisa	fisa	
Exchangeable Cations cmol(+)kg^{-1} soil							
Ca	1.686	1.791	1.063	1.065	0.729	1.107	
Mg	0.470	0.707	0.640	0.842	0.267	0.476	
K	0.142	0.173	0.090	0.175	0.113	0.130	
Na	0.016	0.016	0.013	0.022	0.015	0.023	
S value	**4.72**	**2.11**	**3.21**	**2.14**	**3.21**	**3.21**	**2.14**
CEC cmol(+)kg^{-1} clay	2.037	3.443	2.262	3.239	4.397	1.921	**>5**
pH_{KCl}	5.83	5.76	5.06	5.52	4.53	5.04	**6.2-7.3**
ESP (%)	0.79	0.38	0.57	0.68	0.34	1.19	
Organic Carbon (%)	0.16	-	0.09	-	0.11	-	**0.56-1.16**
P (Bray 1) (mg/kg)	13.27	7.23	11.07	5.56	7.89	4.03	**30+**
EC (mS.m^{-1})	171	7	5	4	4	5	**< crop threshold**
SAR	0.159	0.305	0.228	0.327	0.228	0.294	**<1**
Zinc (ppm)	1.66	0.52	0.45	0.68	0.56	0.60	**>2**
Soil Form	Hutton		Hutton		Hutton		
Soil Family	Stella		Stella		Stella		
Code	Hu 3100		Hu 3100		Hu 3100		
Degree of leaching	Eutrophic		Eutrophic		Eutrophic		
Present Land Use	Grassland		Grassland		Grassland		
Broad Soil Group	deep Hu		deep Hu		deep Hu		

- **Soil Texture**

Soil texture is defined as the relative proportions of the various soil separates in a soil which are comprised of sand, silt and clay (Brady and Weil, 1999). Soil texture influences soil properties such as porosity, water-holding capacity, permeability and erodibility. The samples showed texture contents dominated by fine sand for the A and B horizons.

- **Soil pH**

Soil pH refers to the relationship between H+ and OH- ions. These ions relate to each other in a definite ratio and it is therefore common to ignore one of them. By convention, the H+ ions are usually considered even in the case of a strong base. The common soil pH ranges are described as in **Table 4-5**.

Table 4-5: Common Soil pH

Soil pH									
Extremely Acid	Very strongly acid	Strongly acid	Medium acid	Slightly acid	Neutral	Mildly alkaline	Moderately alkaline	Strongly alkaline	Very strongly alkaline
< 4,5	4,5–5,0	5,1-5,5	5,6-6,0	6,1-6,5	6,6-7,3	7,4-7,8	7,9-8,4	8,5-9,0	>9,0

From the analysis results provided, the pH of the soils found in the study area range of the samples is very strongly acid to medium acid.

- **Electrical Conductivity**

Electrical Conductivity (EC) is a measure of the ability of the soil saturation extract to conduct electricity. The Chamber of Mines specifies that for a soil to be defined as arable, it must have an EC of less than 400 mS/m at 25oC and an Exchangeable Sodium Percentage (ESP) of less than 15 % throughout the upper 0.75 m of soil. The samples collected during the specialist investigation showed EC figures way below the 400mS/m mark although the EC figure for sample 4A is relatively high. The ESP % values for all the samples is low.

- **Organic Carbon**

Organic matter (determined by the amount of organic carbon) is broadly defined as the total complement of organic substances present in soil, including living organisms of various sizes, organic residues in various stages of decomposition and dark coloured humus consisting of non-humic and humic substances (Fertilizer Handbook, 2007). Humus is relatively stable and has a major effect on various soil characteristics and processes that play a role in soil fertility.

The organic matter content of the soil sampled is extremely low.

- **Soil Fertility**

The samples returned values indicated that the soils within the study area have lower than acceptable levels of zinc reserves as well as very low phosphorus levels. This indicates that the soil fertility is very low/poor.

- **Erosion Potential and Slope**

The critical slope for soil erosion to occur is determined for land regarded as arable. The "K" value is used to determine the erodibility of a particular soil form. Erodibility is defined as the vulnerability or susceptibility of a soil to erode. It is a function of both the physical characteristics of that soil and the treatment of the soil. Erodibility ratings are as follow:

Resistant	"K" factor = <0.15
Moderate	"K" factor = 0.15-0.35
Erodible	"K" factor = 0.35-0.45
Highly erodible	"K" factor = >0.45

The following five soil parameters, have been shown by research to have a major effect in determining erodibility:

i) The mass percentage of the fraction between limiting diameters of 0.1 mm and 0.002 mm (very fine sand plus silt);
ii) The mass percentage of the fraction between 0.1 mm and 2.0 mm diameter (residue of sand fraction);
iii) Organic matter content obtained by multiplying the organic carbon content (g per 100g soil, Walkley-Black method) by a factor of 1.72;
iv) A numerical index of soil structure; and
v) A numerical index of soil permeability.

The following calculations illustrate the erosion potential of the soils sampled at the study area:

Soil sample of the Corridor 4 Option : **Index of Erosion (IOE)**

= K x Slope (%)

= 0.10 x 2%

= 0.2, less than 2.0

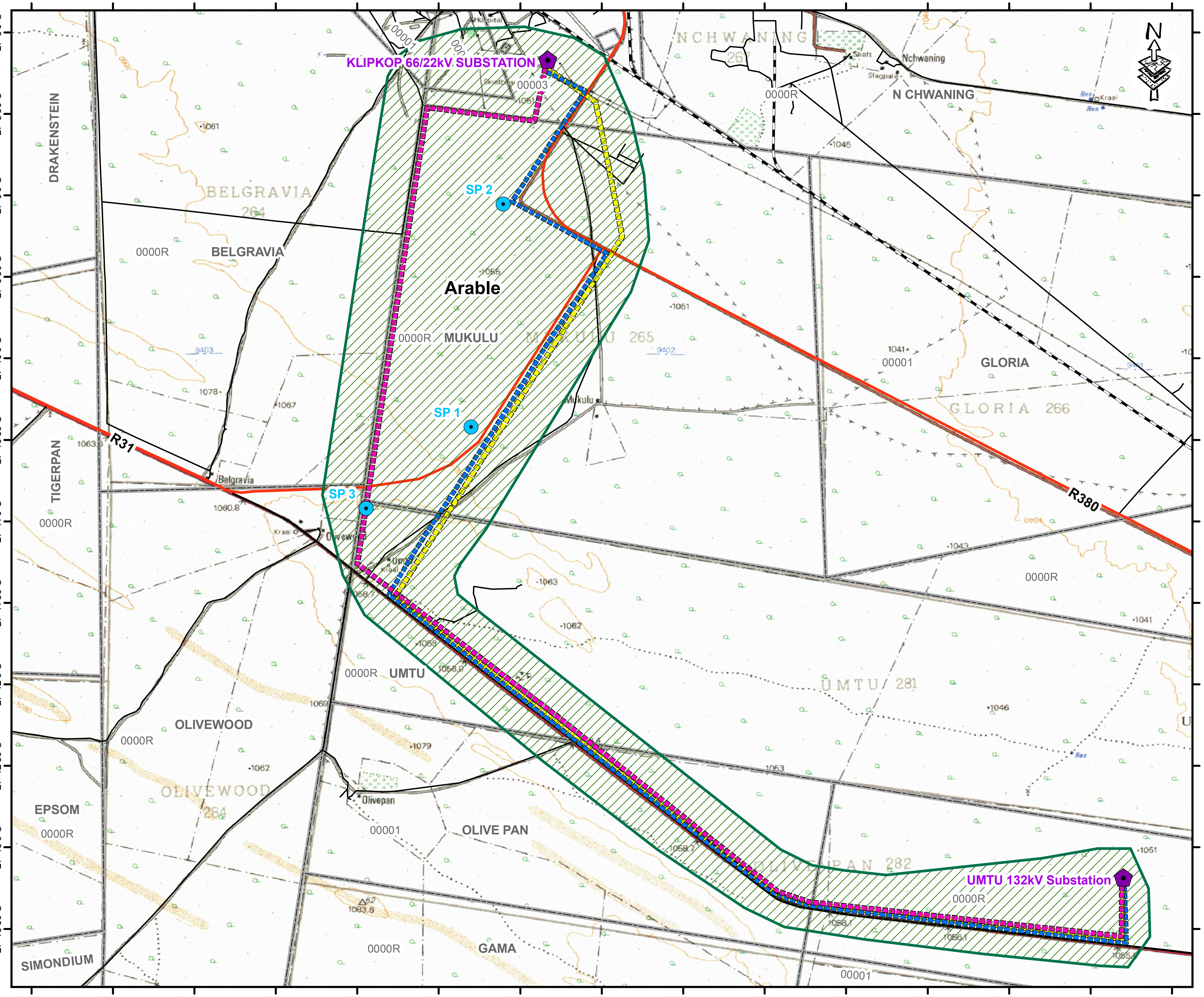
=> Resistant to erosion

4.4.2. Land use and land capability

Generally the land use is composed of a mixture of vacant/unspecified land, residential, and mining land use activities. Mining activities dominates the project area and are predominantly situated in the northern and to eastern section of the study area. Most of the mines are owned by either Assmang or BHP Billiton. A small number of farmsteads and dwellings are located throughout the study area, with the largest concentration of permanent residences located within the Black Rock Village.

According to the Chamber of Mines Guidelines for the Rehabilitation the main land capability for this area is classed as arable (**Figure 4-4**), while the main land use is classed as grassland (**Figure 4-5**).

APPENDIX B: BLACK ROCK SITE: LAND CAPABILITY MAP



LEGEND

- Sub-stations
- Soil Sample Points
- Option 4
- Option 5
- Option 6

ROAD NETWORK

- National Route
- Main Road
- Secondary Road
- Other Access
- Railway line
- Parcel boundaries
- Land Capability - Arable

DATA SOURCES:

The Chief Directorate of Survey & Mapping
1:50 000 Topographical Series: 2722BB

Kilometers
0 0.5 1 2

DRAWN BY:	L. DU PLESSIS GIS TECHNOLOGIST
REVIEWED	R.F. VAN DER MERWE GIS MANAGER (PGPT 0023)
DATE	09 OCTOBER 2009
SCALE:	1:45,000
PROJECTION:	WGS 84 GEOGRAPHIC
CLIENT:	ESKOM
PROJECT:	BLACK ROCK 132KV POWERLINE (09-011)

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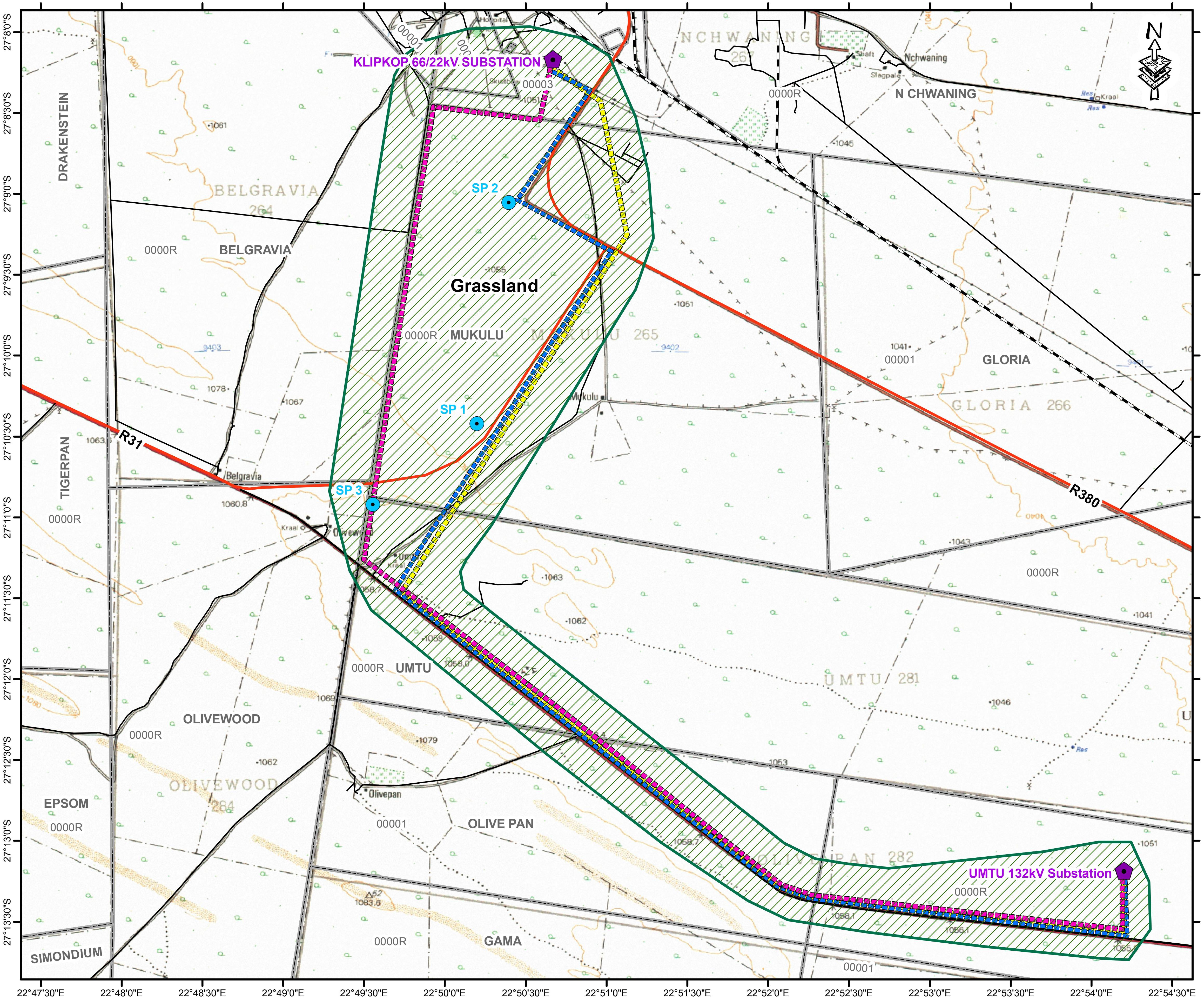
APPENDIX C: BLACK ROCK SITE: LAND USE MAP



LEGEND

- Sub-stations
- Soil Sample Points
- Option 4
- Option 5
- Option 6

ROAD NETWORK

- National Route
- Main Road
- Secondary Road
- Other Access
- Railway line
- Parcel boundaries
- Land Use - Grassland

DATA SOURCES:

The Chief Directorate of Survey & Mapping
1:50 000 Topographical Series: 2722BB

Kilometers
0 0.5 1 2

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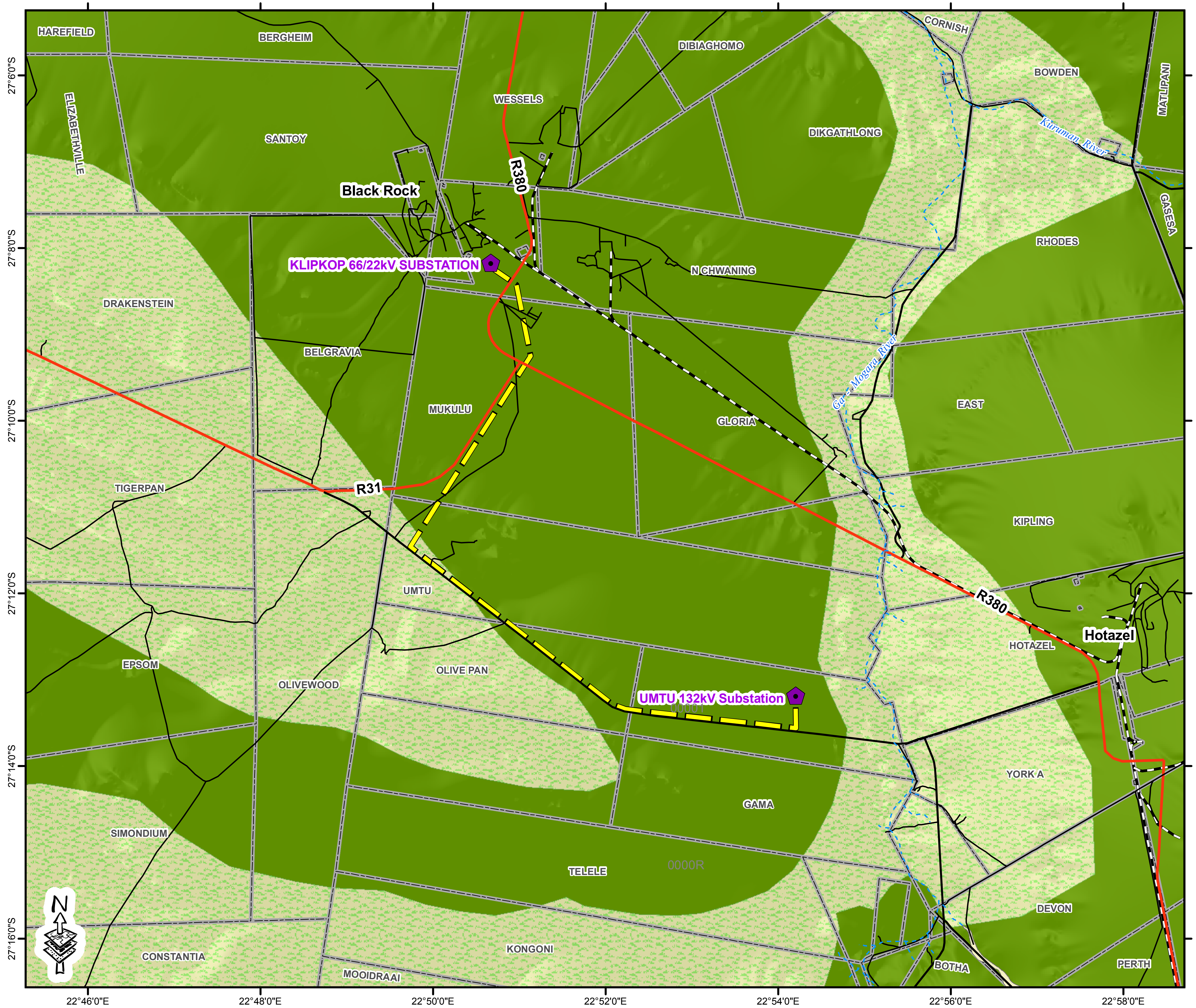
4.5. FLORA

Referring to **Figure 4-6**, the study area falls within the boundaries of two different vegetation types, namely the Kathu Bushveld vegetation type (SVk 12) (which forms part of the Eastern Kalahari Bushveld Bioregion) and the Gordonia Duneveld (SVkd 1) (which forms part of the Kalahari Duneveld Bioregion). Both of the aforementioned bioregions form part of the Savanna Biome (Mucina & Rutherford, 2006).

4.5.1. Kathu Bushveld (SVk 12)

According to Mucina and Rutherford (2006:522), the vegetation of the Kathu Bushveld vegetation type is characterised by a medium-tall tree layer with Camel Thorn Tree *Acacia erioloba* occurring in places. Mucina and Rutherford (2006:522) add, however, that this vegetation type is mostly regarded as open veld and that the Shepherd's Tree *Boscia albitrunca* is the prominent tree species found in the area. (It should be noted here that, in contradiction to the aforementioned statement of Mucina and Rutherford (2006:522), the results of this study indicate that although a number of very large *B. albitrunca* individuals do occur in the area, *A. erioloba* is, in fact, far more common and prominent in the study area than the aforementioned species). The shrub layer of this vegetation type is regarded as being very important, with species such as *Acacia mellifera, Diospyros lycioides* and *Lycium hirsutum* commonly found. The grass layer of this vegetation type varies in cover (Mucina & Rutherford, 2006:522).

FIGURE 12: BLACKROCK 132KV POWERLINE VEGETATION



LEGEND

Sub-stations

Gordonia Duneveld

Kathu Bushveld

ROAD NETWORK

- Main Road
- Secondary Road
- Other Access

RIVERS & STREAMS

- Perennial
- Non-Perennial

Railway line

Option 4 (16.59 Km)

Parcel boundaries

DATA SOURCE:

Ladislav Mucina & Michael C. Rutherford (eds). 2006: The Vegetation of South Africa, Lesotho and Swaziland. SANBI. "Vegmap"

Kilometers

0 1.25 2.5 5

DRAWN BY:	R.F. VAN DER MERWE GIS MANAGER (PGPT 0023)
REVIEWED	R.F. VAN DER MERWE GIS MANAGER (PGPT 0023)
DATE	01 OCTOBER 2009
SCALE:	1:85,000
PROJECTION:	WGS 84 GEOGRAPHIC
CLIENT:	ESKOM
PROJECT:	BLACK ROCK 132KV POWERLINE (09-011)

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Traversing the study area on foot confirmed that the largest part thereof is indeed situated within the Kathu Busveld vegetation type (as is illustrated in **Figure 4-6**), based on the general description of this vegetation type given above.

4.5.2. Gordonia Duneveld (SVkd 1)

According to Mucina and Rutherford (2006:525) the landscape of the Gordonia Duneveld is characterised by parallel dunes cresting approximately three to eight metres above the plains. The vegetation found in this vegetation type can be described as an open shrubland with ridges of grassland, the latter which is dominated by *Stipagrostis amabilis* on the dune crests and Grey Camel Thorn *Acacia haematoxylon* on the dune slopes. *A. mellifera* can be found on the lower slopes, with *Rhigozum trichotomum* occurring in the interdune straaten (Mucina & Rutherford, 2006:525).

A gradual transition from the Kathu Bushveld into the Gordonia Duneveld can be noted in the south-western and western parts of the study area (which forms part of Option 6). This transition is also visible in **Figure 4-10**, with the highest concentration of *Acacia haematoxylon* occurring in this area. The latter species is generally associated with "deep, red, sandy soils" (Coates Palgrave, 2002:283), "sand dunes" (Van Rooyen, 2001:28) and "deep Kalahari sand between dunes" (Van Wyk & Van Wyk, 1997:494), which is also characteristic of the Gordonia Duneveld.

4.5.3. Plant Species Recorded Within the Study Area

A list of all the plant species recorded in the study area during the site visit conducted on 24 and 25 October 2009 is provided in **Table 4-6**.

Table 4-6: Identified Plant Species within the Study Area

Scientific Name	Common Name
AMARYLLIDACEAE	
Nerine laticoma	Vlei Lily
ASCLEPIADACEAE	
*Pergularia daemia var. Daemia**	
ASPARAGACEAE	
*Asparagus bechuanicus**	
ASTERACEAE	
Felicia muricata	White Felicia
BIGNONIACEAE	
Rhigozum obovatum	Yellow Pomegranate
Rhigozum trichotomum	Three Thorn
BORAGINACEAE	
Ehretia rigida	Puzzle Bush
CACTACEAE	
Opuntia spp.	Prickly pear
CAPPARACEAE	
Boscia albitrunca	Shepherd's tree
Cadaba aphylla	Black Storm

Scientific Name	Common Name
CELASTRACEAE	
*Gymnosporia buxifolia**	
COMBRETACEAE	
Terminalia sericea	Silver Cluster leaf
COMPOSITAE	
Pentzia spp.	Karoo bossie
CUCURBITACEAE	
Acanthosicyos naudinianus	Gemsbok Cucumber
EBENACEAE	
Diospyros lycioides	Star Apple
FABACEAE	
Elephantorrhiza elephantina	Elephants root
Senna italica subsp. *arachoides*	Wild Senna
LILIACEAE	
Protasparagus spp.	Asparagus Fern
Sansevieria aethiopica	Mother in law's tongue
MIMOSACEAE	
Acacia erioloba	Camel Thorn
Acacia haematoxylon	Grey Camel thorn
Acacia hebeclada subsp. *hebeclada*	Candle Pod Thorn
Acacia karroo	Sweet Thorn
Acacia mellifera subsp. *detinens*	Black Thorn
Dichrostachys cinerea	Sickle Bush
PAPAVERACEAE	
Argemone ochroleuca subsp. *ochroleuca*	White Mexican Poppy
POACEAE	
Aristida congesta	Tassel Three-awn
Aristida meridionalis	Giant Three-awn
Digitaria eriantha	Common Vinger Grass
Eragrostis chloromelas	Curly Leaf
Eragrostis curvula	Weeping Love Grass
Eragrostis lehmanniana	Lehmann's Love Grass
Melinis repens	Natal Red Top
Schmidtia kalariensis	Kalahari Sour Grass
Schmidtia pappophoroides	Sand Quick
Stipagrostis uniplumis	Silky Bushmans Grass
RHAMNACEAE	
Ziziphus mucronata	Buffalo Thorn
SCROPHULARIACEAE	
*Aptosimum elongatum**	
Peliostomum leucorrhizum	Karoo Viooltjie
SELAGINACEAE	
Selago dinteri subsp. *Pseudodinteri**	
SOLANACEAE	
Lycium hirsutum	River Honey Thorn
TILIACEAE	
Grewia flava	Velvet raisin
Grewia retinervis	False sandpaper raisin
VISCACEAE	
*Viscum rotundifolium**	
ZYGOPHYLLACEAE	
Tribulus terrestris	Devils Thorn
Green - Species of conservation importance **Red - Alien weeds and invasive plants species** *** No Common Name**	

4.5.4. Protected Flora Species

- **Tree species protected in terms of the National Forests Act, 1998 (Act No. 84 of 1998)**

Three of the tree species found in the study area are protected in terms of Section 12 of the National Forests Act (Act No. 84 of 1998), namely Camel Thorn *A. erioloba* (**Figure 4-7**), Shepherd's Tree *B. albitrunca* (**Figure 4-8**) and Grey Camel Thorn *A. haematoxylon* (**Figure 4-9**).

The Camel Thorn Tree *A. erioloba* is one of the major tree species of the desert regions (Coates Palgrave, 2002:278) and is regarded as a keystone species in the Kalahari (Van Rooyen, 2001:26). [Van Rooyen (2001:26) defines the term "keystone species" as "a species upon which many other plant and animal species depend".] The pods and leaves (with a protein content of 17%) of this tree act as excellent food source to both livestock and game (Van Wyk & Van Wyk, 1997:492; Van Rooyen, 2001:26), while the shade that this tree provides in hot desert regions is, according to Coates Palgrave (2002:279) of "immense value" and "cannot be overestimated". According to Van Rooyen (2001:26) the life cycles of many mammals, birds and insects are intimately associated with these trees, which oftentimes provide the main source of both food and shelter. *A. erioloba* is, however, a slow-growing species and because it develops a very long tap-root, it is difficult or impossible to transplant (Coates Palgrave, 2002:279).

The Shepherd's Tree *B. albitrunca* is often referred to as "the tree of life" in the arid areas where it occurs, as it provides sustenance to both man and animals (Coates Palgrave, 2002:225). The leaves of this tree act as a nourishing fodder (Van Rooyen, 2001:24) and are heavily browsed by both livestock and game (Van Wyk & Van Wyk, 1997:164; Coates Palgrave, 2002:225). According to Van Wyk and Van Wyk (1997:164) *B. albitrunca* also acts as a larval food plant for butterflies of the family Pieridae. The Shepherd's Tree furthermore plays an important ecological role in the Kalahari by forming a cavern of cool shade in a region that is oftentimes hot and shadeless: The temperature on the shaded sandy surface beneath this tree can be as much as 20°C less than in the full sun (Van Rooyen, 2001:24). Some people hold these trees in such deep regard that its destruction is forbidden (Coates Palgrave, 2002:225). The seeds of *B. albitrunca* germinate with relative ease, but after this growth appears to be unpredictable (Coates Palgrave, 2002:225).

The Grey Camel Thorn *A. haematoxylon* is endemic to the southern and south-western Kalahari (Van der Walt & Le Riche, 1999:47; Van Rooyen, 2001:28). This species is, like *A. erioloba* and *B. albitrunca*, a valuable food source and source of shade in the arid areas in which it occurs (Van der Walt & Le Riche, 1999:47).

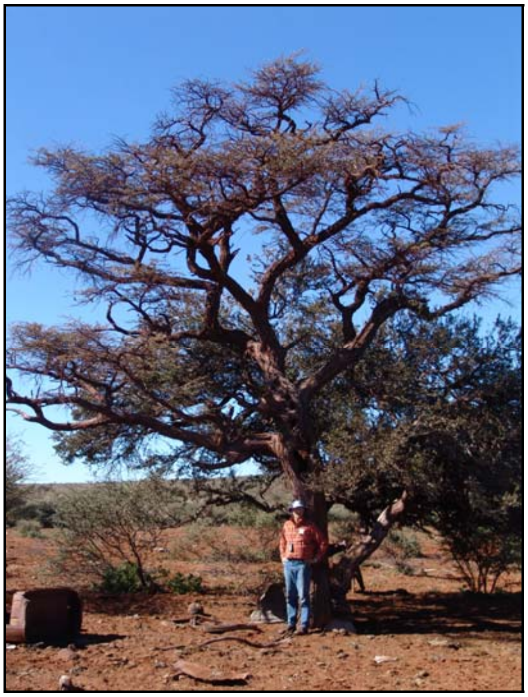


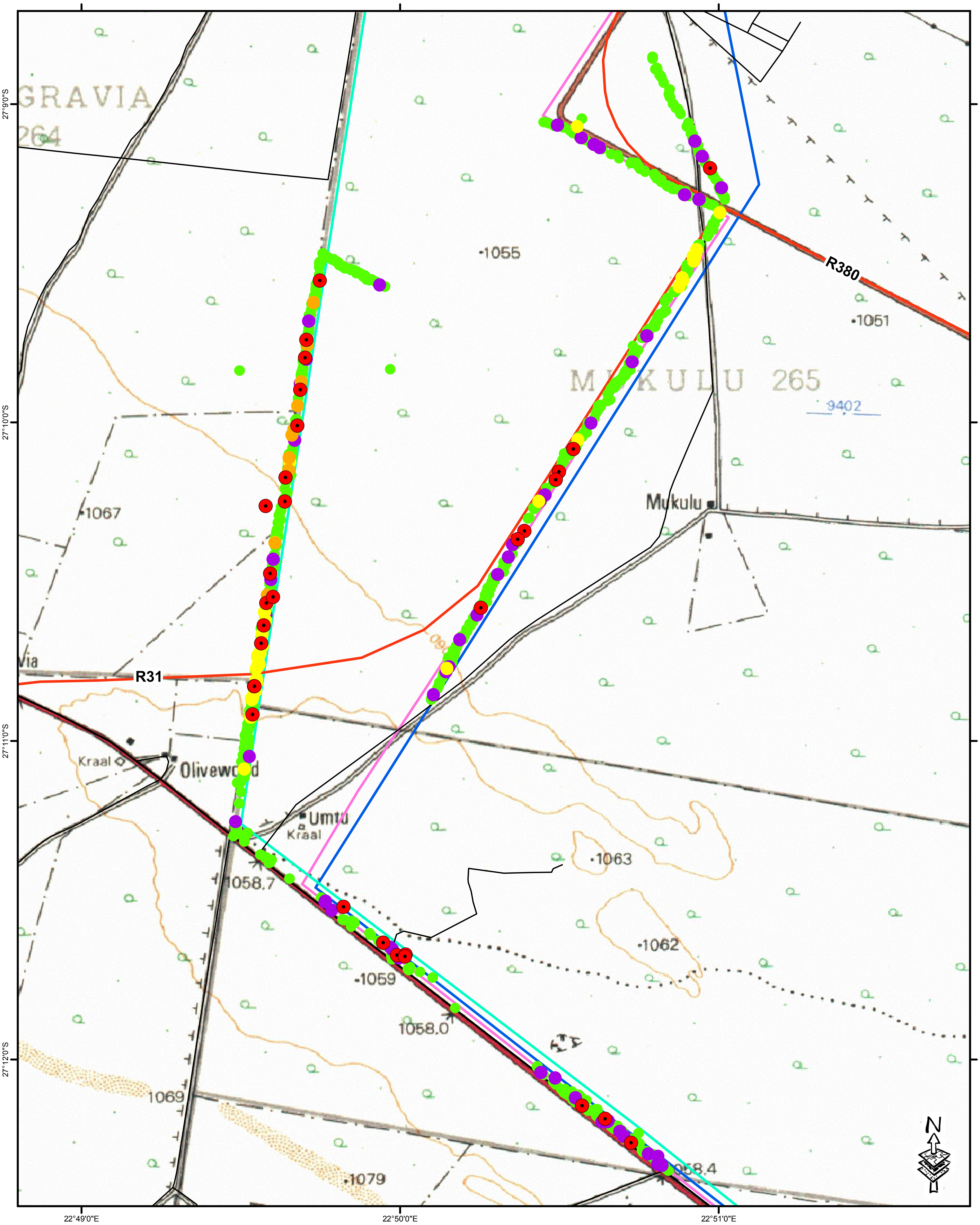
Figure 4-7: **Camel Thorn** *Acacia erioloba***.**

Figure 4-8: Shepherd's Tree *Boscia albitrunca***.**

Figure 4-9: Grey Camel Thorn *Acacia haematoxylon***.**

Figure 4-10 gives a visual representation of the distribution of individuals of the aforementioned three protected tree species, namely A. *erioloba*, *A. haematoxylon* and *B. albitrunca*, throughout large parts of the study area. From **Figure 4-10** it is clear that a relatively large number of protected trees occur within the borders of the study area: A total of 956 individuals and/or clusters of the aforementioned species were recorded during field surveys (please note that hybrids of *A. erioloba* and *A. haematoxylon* are also included in this figure, as is evident from **Figure 4-10**).

VEGETATION MAP: PROTECTED TREES



LEGEND

HIGHLY PROTECTED

- Rare should not be disturbed

TREE SPECIES

- A. erioloba x A. haematoxylon
- Acacia haematoxylon
- Boscia albitrunca
- Acacia erioloba

- Option 4
- Option 5
- Option 6

ROAD NETWORK

- Main Road
- Secondary Road
- Other Access

DRAWN BY	L. DU PLESSIS GIS TECHNOLOGIST
REVIEWED	R.F. VAN DER MERWE GIS MANAGER (PGPT 0023)
DATE	28 OCTOBER 2009
SCALE:	1:22,000
PROJECTION:	WGS 84 GEOGRAPHIC
CLIENT:	ESKOM
PROJECT:	BLACK ROCK 132KV POWERLINE (09-011)

Kilometers
0 0.25 0.5 1

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- **Plant species protected in terms of the Nature and Environmental Conservation Ordinance, 1974 (Ordinance No. 19 of 1974)**

Two of the plant species recorded within the study area are protected in the Northern Cape Province in terms of the Nature and Environmental Conservation Ordinance, 1974 (Ordinance No. 19 of 1974), namely *Nerine laticoma* and *Pergularia daemia* var*. daemia*.

4.5.5. Weeds and Alien Vegetation

Two alien weeds and invasive plants, declared as such in terms of the Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983), as amended, were recorded within the borders of the study area. These are: White-flowered Mexican Poppy *Argemone ochroleuca* subsp. *ochroleuca* and Prickly Pear *Opuntia* spp. Both of these species are classified as Category 1 Weeds in terms of the aforementioned Act and both were recorded on the farm Mukulu No. 265, where Options 4 and 5 overlap.

A. ochroleuca subsp. *ochroleuca* is known to invade roadsides, wasteland, abandoned lands, cultivated lands, recently cleared or disturbed areas, riverbanks and riverbeds (Bromilow, 1996:232; Henderson, 2001:29).

Opuntia spp. is a succulent, branched shrub or tree invading an array of different habitats, but mainly dry and rocky places in savanna and karoo areas (Henderson, 2001:89).

4.6. FAUNA

No red data mammals have been confirmed for the proposed study area.

Table 4-7 lists the mammal species that are commonly found within the area.

Table 4-7: Mammal species recorded within the boundaries of study area and that are common to the area

NO.	LATIN NAME	COMMON NAME
1	*Lepus capensis*	Cape Hare
2	*Suricata suricatta*	Suricate
3	*Xerus inauris*	Cape Ground Squirrel
4	*Antidorcas marsupialis*	Springbok
5	*Otocyon megalotis*	Bat-eared Fox
6	*Canis mesomelas*	Black-backed Jackal
7	*Caracal caracal*	Caracal
8	*Sylvicapra grimmia*	Common Duiker
9	*Oryx gazella*	Gemsbok
10	*Phacochoerus aethiopicus*	Warthog
11	*Pelea capreolus*	Grey Rhebok
12	*Tragelaphus strepsiceros*	Kudu
13	*Manis temminckii*	Pangolin
14	*Hystrix africaeaustralis*	Porcupine

NO.	LATIN NAME	COMMON NAME
15	*Pedetes capensis*	Spring Hare
16	*Raphicerus campestris*	Steenbok
17	*Orycteropus afer*	Aardvark
18	*Atelerix frontalis*	Hedgehog
19	*Vulpes chama*	Silver Jackal
20	*Ictonyx striatus*	Striped Polecat

4.6.1. Mammal species protected in terms of the Nature and Environmental Conservation Ordinance, 1974 (Ordinance No. 19 of 1974)

The following of the mammal species listed in **Table 4-7** are protected in the Northern Cape Province under the Nature and Environmental Conservation Ordinance, 1974 (Ordinance No. 19 of 1974): Pangolin *M. temminckii*, Aardvark *O. afer*, Steenbok *R. campestris*, Gemsbok *O. gazella*, Grey Rhebok *P. capreolus,* Hedgehog *A. frontalis*, Kudu *T. strepciseros,* Bat-eared Fox *O. megalotis,* Silver Jackal *V. chama,* Springbok A. *marsupialis*, Common Duiker *S. grimmia* and Warthog *P. aethiopicus*. The Pangolin *M. temminckii* is classified as “endangered”, while the remainder of the aforementioned species are classified as “protected”.

According to Section 27 of the aforementioned Ordinance, no person shall without a permit hunt or be in possession of any endangered wild animal or the carcase of any such animal. In addition hereto, no person shall, subject to the provisions of subsections (2) and (3) of Section 27, hunt any protected wild animal during any hunting season, unless he is the holder of a permit or of a licence in the prescribed form issued to him by the Director, a receiver of revenue or any person authorised to do so by the Director on payment of the prescribed fee, or at any other time unless he is the holder of a permit to do so.

4.7. AVIFAUNA

4.7.1. General overview

Approximately 445 bird species occur within the Northern Cape across a wide range of different biomes and habitat types. This includes pelagic species such as albatrosses, petrels and so forth. 56 of these species are endemic to South Africa meaning that they do not occur outside of South Africa’s borders with a further 42 being classified as near endemics i.e. their distribution reaches just outside of our borders into neighbouring countries. Of the 445 bird species occurring in the Northern Cape, 52 or 11.5% are listed in *The Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland* Status meaning that to a certain degree their existence as a species is threatened.

4.7.2. Community assemblage within the study area

Bird taxa are appropriate indicators for monitoring ecosystem health as individual bird species are associated with particular habitats and groups of bird species (or assemblages) can be used to develop associations with habitats that are predictive of the relative level of anthropogenic disturbance (Canterbury et al. 2000).

Given that the vegetation within the study area was homogenous the avifauna specialist utilised the MacKinnon List method, a rapid avifaunal assessment technique, to collect bird community data. All species seen or heard were grouped into consecutive lists of equal length and a species accumulation curve was generated from adding those species not recorded on any previous list to the total species number. The saturation point was defined as the point where the rate of species accumulation over five sample intervals fell below 0.10 (Colwell and Chang 2004). At this point the study area was deemed to have been adequately surveyed with the likelihood of further species being detected being negligible to the amount of survey effort required.

The results of the avifaunal assessment are depicted in **Figure 4-11**. A total of 54 species were detected within the study area. The graph shows an initial high rate of species accumulation during the early stages of the sampling program. As sampling progressed less new species were being recorded which explains the slowdown in the rate of accumulation up until an asymptote is reached after 43 sampling units. **Figure 4-11** indicates that the sampling effort for the study area was saturated.

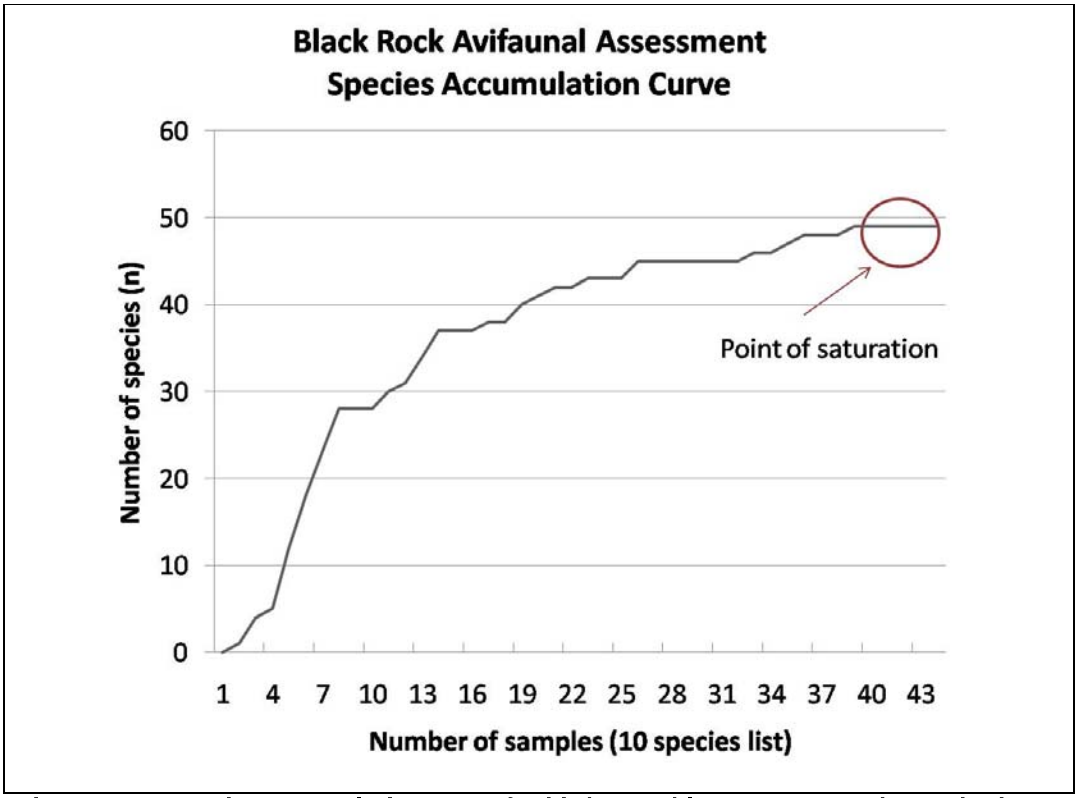


Figure 4-11: Species accumulation curve for bird assemblage present at the study site

4.7.3. Results of avifaunal survey

A total of 54 species were recorded within the broader study area with White-browed Sparrow Weaver (*Plocepasser mahali*) and Southern Masked Weaver (*Ploceus velatus*) being the most abundant species recorded. Species richness was fairly low but this can be explained by the homogenous nature of the study area. If the study area had contained a variety of different habitats such as ephemeral pans, rivers and so forth the species richness or rather number of species detected would have been higher.

It is interesting to note that none of the species that are considered threatened according to *The Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland* were detected on site during the avifaunal assessment. This does not mean that they would not occur within the area and subsequently would not be impacted upon by the powerlines and towers. Species such as Martial Eagle (*Polemaetus bellicosus)* have extremely large home ranges and could very well be found on occasion within the study area. Only a small number of raptors were encountered during the survey.

4.7.4. Endangered Avifaunal Species

Whilst many threatened or rare species may not fulfil vital roles in ecosystem functioning (Dean et al. 1997), they are essential indicators of overall ecosystem health and are initial rivets that signal ecosystem decay. Although none of the species that are considered endangered were detected within the study area during the avifaunal assessment, **Table 4-8** provides a summary of the Endangered Avifauna Species which may occur within the broader study area.

Table 4-8: Globally threatened species possibly occurring within the study area

Common name	Scientific name	Biome	Red Data Book status	Habitat
Marabou Stork	*Leptoptilos crumeniferus*	NK	Near-threatened	Grassland/Thornveld
Secretarybird	*Sagittarius serpentarius*	S, G	Near-threatened	Grassland
Egyptian Vulture	*Neophron percnopterus*	S, G	Regionally extinct	Grassland/Thornveld
Lappet-faced Vulture	*Torgos tracheliotus*	S	Vuln. / Threatened	Grassland/Thornveld
White-backed Vulture	*Gyps africanus*	S	Vulnerable	Grassland/Thornveld
Kori Bustard	*Ardeotis kori*	NK	Vulnerable	Grassland/Thornveld
Cape Vulture	*Gyps coprotheres*	S, G	Vulnerable / Threatened	Grassland/Thornveld
Red-billed Oxpecker	*Buphagus erythrorhynchus*	S	Near-threatened	Savanna
Bateleur	*Terathopius ecaudatus*	S	Vulnerable	Savanna
Short-clawed Lark	*Certhilauda chuana*	S	Near-threatened	Thornveld
Tawny Eagle	*Aquila rapax*	NK	Vulnerable	Thornveld
Lanner Falcon	*Falco biarmicus*	NK, S	Near-threatened	Varied
Martial Eagle	*Polemaetus bellicosus*	NK, S	Vulnerable	Varied

The above table represents species whose distribution range overlaps with the study area. Whilst the species accumulation curve (**Figure 4-11**) indicated that the saturation point was reached during the avifauna survey, it is not inconceivable for these species to occur within the study area at some stage – after all birds respond to the sporadic availability of resources such as food and move accordingly. Given this, the possibility that interactions between these Red Data species and the proposed powerline can occur has been included during the assessment of the potential environmental impacts associated with the construction of the 132kV powerline.

4.8. Sites of Archaeological, Cultural and Heritage Interest

No archaeological or cultural heritage resources, as defined and protected by the NHRA 1999, were identified during the archaeological assessment for the proposed *Black Rock Powerline Project*, Black Rock near Hotazel in the Northern Cape. This assessment was undertaken by Karen van Ryneveld from ArchaeMaps.

4.8.1. General Cultural and Heritage Interest of the Broader Area

Cultural heritage periods well represented in the Northern Cape include particularly the Stone Age and Historical / Colonial Period with the Iron Age represented primarily in a narrow band across the north of the province or culturally represented within Historic times. Later Stone Age (LSA) peoples, often referred to as the KhoiSan, were present on the landscape from the LSA to contemporary times. A wide range of archaeological sites could thus have been expected from the general area. However, anthropic use of the landscape is as a rule closely tied to the resources it offers. Within the generally flat topography Black Rock and the Gamogara River comprises the most prominent landscape features, both which yielded archaeological sites, although of varying Industrial Periods.

The absence of archaeological and cultural heritage sites across the proposed powerline development area and the general low presence of recoded sites within the general area may well be interpreted as a direct result of palaeo-environmental conditions combined with later socio-economic development.

4.9. SURFACE WATER

4.9.1. Quaternary Catchments and Sub Basins

The project area falls within the Quaternary Catchment D41K (Ga-Mogara River Catchment) and D41M (Kuruman River Catchment), from the DWEA data base. Therefore the power lines run across the divide of the Quaternary Catchments. The power lines start in the quaternary catchment D41M and run straight across the divide into quaternary catchment D41K, this is however not a steep divide as the terrain in this area is very flat.

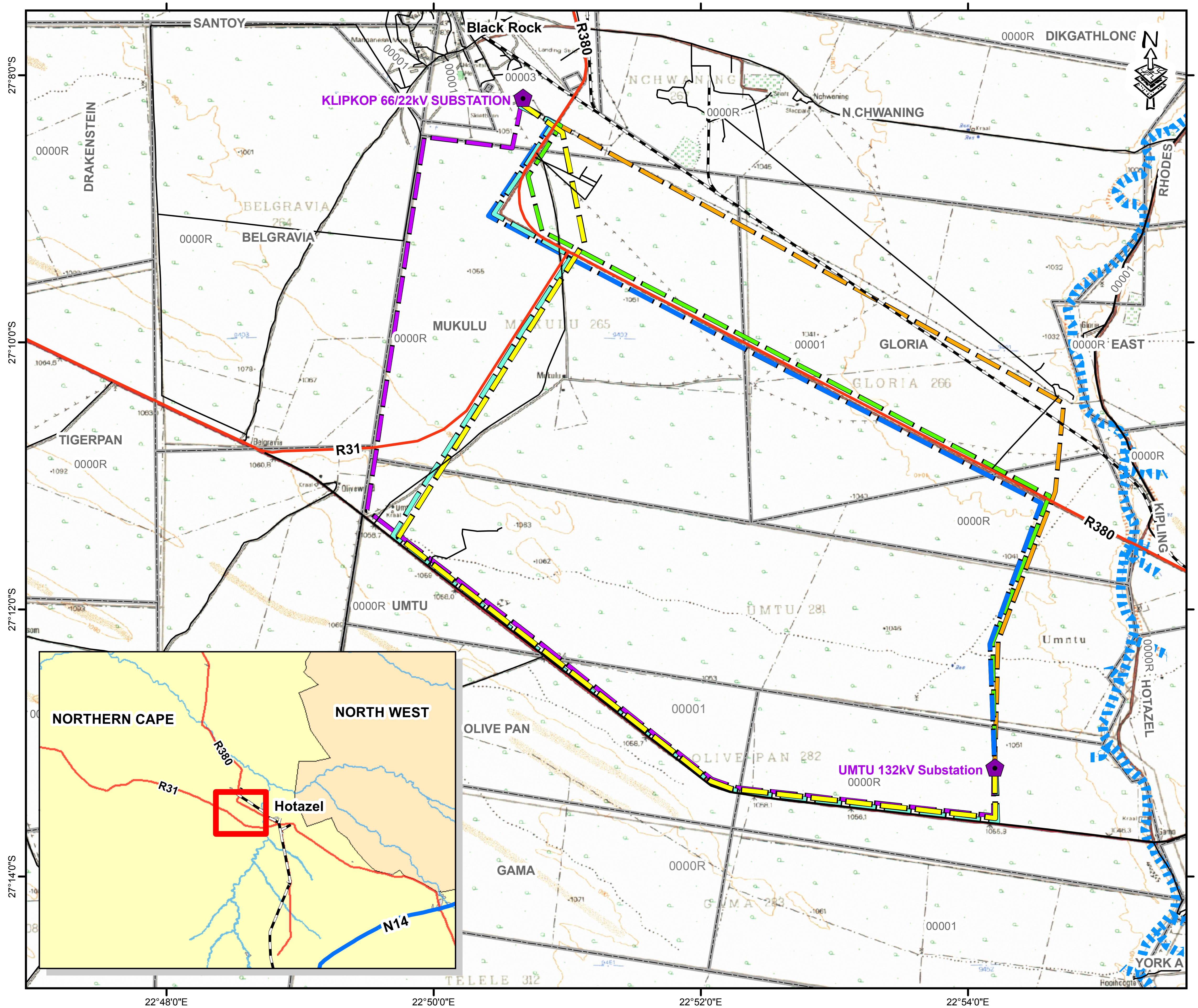
A catchment or water shed is derived from the topographical landscape. It is sectioned by a water divide, a high land separating two or more water systems. A catchment is the land and water surface area that contributes to the discharge at the system outlet. A catchment can be determined by the outlet and as the outlet (point of discharge) moves down stream so the catchment size increases, until it is at its largest where it enters the sea.

4.9.2. Existing River Systems and Surface Water

The Klipkop Substation is located approximately 9.8Km south-west of the transition between the Kuruman and Ga-Mogara Rivers. The Ga-Mogara River then flows in a southerly direction and eventually passes the Umtu Substation, which is located 1.8Km west of the Ga-Mogara River. In terms of the proposed powerline project there will be very little if any affect on the stream flow for the above-mentioned rivers as the proposed powerlines will take up very little surface area on the ground. Water will be able to flow around the tower structures without any hindrance.

The proposed alignment of the 132kV powerline will not cross any of the above-mentioned rivers. Please refer to **Figure 4-12** for the proposed powerline alignment relative to the location of the Kuruman and Ga-Mogara Rivers.

BLACKROCK POWERLINES IN RELATION TO RIVERS



LEGEND

Sub-stations

ROAD NETWORK
- National Route
- Main Road
- Secondary Road
- Other Access

FEAT_TYPE
- Ga-Mogara river
- Railway line
- Option 1 (13.3 Km)
- Option 2 (13.58 Km)
- Option 3 (13.96km)
- Option 4 (16.59 Km)
- Option 5 (17.47 Km)
- Option 6 (17.09 Km)
- Parcel boundaries

DATA SOURCES:
The Chief Directorate of Survey & Mapping
1:50 000 Topographical Series: 2722BB

Kilometers
0 0.5 1 2 3

DRAWN BY:	A.J. MAIN GIS TECHNOLOGIST
REVIEWED	R.F. VAN DER MERWE GIS MANAGER (PGPT 0023)
DATE	01 OCTOBER 2009
SCALE:	1:55,000
PROJECTION:	WGS 84 GEOGRAPHIC
CLIENT:	ESKOM
PROJECT:	BLACK ROCK 132KV POWERLINE (09-011)

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4.10. Sensitive Landscapes

The proposed corridor alignment will not intersect any rivers, wetlands, pans or any other sensitive landscapes.

4.11. Visual Quality and Character

The two largest factors that have formed the basis of the economy of the Kgalagadi District Management Area (DMA) are the commercial farms throughout the whole area and the mines in the south eastern section of the DMA. Not only do the mines provide jobs to hundreds of people, but it is also the reason why the towns of Hotazel and Black Rock were planned in the first place. Recently tourism has also joined the economic stables of the area and could become a very large factor in the future.

The Northern Cape is a unique part of South Africa with exceptional natural and cultural attributes. The Province has the potential to become the preferred adventure and ecotourism destination in South Africa that is recognized for its cultural heritage and special interest tourism offering through the responsible development of natural and cultural resources. The Northern Cape Province has however not capitalized on its full potential as a tourism destination and lies largely undiscovered to both the sizable domestic and high yield international markets. Tourism has the potential to significantly contribute to the economic growth, diversification, transformation, social development and upliftment along with the preservation of natural and cultural heritage in the Northern Cape (SDP, 2007). Please refer to **Figure 4-13** as illustration of tourism advertising within the study area.

Figure 4-13: Signage on the R380 main road (note the Kgalagdi District Municipality tourism promotional board in the background.

Tourist destinations in the area surrounding the Black Rock area are the Tswalu Kalahari Reserve, the Skerpion Park 4x4 Trail and the Kalahari Tsamma 4x4 Trail. Another ecological area within the broader study area include the Belgravia Game Farm, which is used by local residents of the Black Rock Village (refer to **Figure 4-14**).

It is clear that the visual character and quality of the area should remain intact to order to realise the benefits of tourism as mentioned above.

Figure 4-14: Entrance to the Belgravia Game Farm.

4.11.1. Sense of Place

Central to the concept of sense of place is that the landscape requires uniqueness and distinctiveness. The primary informant of these qualities is the spatial form and character of the natural landscape taken together with the cultural transformations and traditions associated with the historic use and habitation of the area.

The immediate landscape around the proposed 132kV powerline, especially to the north-east, is characterized by mining activities and associated infrastructure (refer to **Figure 4-15**). To the southern and western section of study area the sense of place is more strongly associated with farming activities and a sense of remoteness prevails.

Figure 4-15: **Exiting power line grid near the Black Rock mining area traversing the R380 main road.**

It has been established that the study area presents a medium sense of place primarily because of the combination mining activities at Black Rock and remote farming areas surrounding it.

4.11.2. Visual impact Simulation

Viewpoints representative of views experienced by residents, tourists, and motorists through the study area were used for the photographic simulations. The before and after simulations illustrated in **Figure 4-16** to **Figure 4-19**, show the proposed activity superimposed onto the existing landscape scene. The simulations illustrate the visual absorption potential of the affected landscape when viewed from various sensitive receptor positions within the study area.

It is apparent from the simulations that the landscape surrounding the proposed operations ability to 'visually absorb' the proposed 132kV power line is moderate due to the following:

- The proposed 132kV powerline is situated on a less diverse landform type;
- The degree of visual screening is minimal along the R31 and R380 roads (immediate vicinity, <20m from road surface), although some vegetation cover further away (>20m from the road surface) limits extended views; and

- The shape and dimensions of the proposed 132kV powerline is in disparity with the natural environment; and
- In areas where the proposed 132kV powerline traverses the R380 main road the visual absorption of the proposed 132kV powerline is anticipated to be high as a result of the existing powerlines in the area as this new power line is not anticipated to add significantly to the existing impact (refer to **Figure 4-15**).

The landscape therefore has a medium to low visual absorption (depending on location) capacity and will suffer a moderate to low visual impact from the proposed activity imposed on it.

Figure 4-16: View from the R31 road in a south-western direction (before).

Figure 4-17: View from the R31 road in a south-western direction (after).

Figure 4-18: A view from the R380 road in a north eastern direction (before).

Figure 4-19: A view from the R380 road in a north eastern direction (after).

Note almost no visual impact from this viewpoint due (**Figure 4-19**) to the relative long distance.

4.11.3. The Visual Absorption Capacity

Visual Absorption Capacity (VAC) signifies the ability of the landscape to accept additional human intervention without serious loss of character and visual quality or value. VAC is defined on the characteristics of the physical environment which are described below.

- **Degree of Visual Screening**

A degree of visual screening is provided by landforms, vegetation cover and/or structures such as buildings. For example, a high degree of visual screening is present in an area that is mountainous and is covered with a forest compared to an undulating and mundane landscape covered by vast grass areas.

The vegetation cover found in the study area provides a natural visual screening mechanism from the proposed powerline, due to the presents of relatively tall trees.

- **Terrain variability**

Terrain variability reflects the magnitude of topographic elevation and diversity in slope variation. A highly variable terrain will be recognised as one with great elevation differences and a diversity of slope variation creating talus slopes, cliffs and valleys. An undulating landscape with a monotonous and repetitive landform will be an example of a low terrain variability.

In terms of this project, a low terrain variability is dominant due to the topography of the study area.

- **Land Cover**

Land cover refers to the perceivable surface of the landscape and the diversity of patterns, colours and textures that are presented by the particular land cover (i.e. urbanised, cultivated, forested, etc).

Therefore areas which have a high visual absorption capacity are able to easily accept objects so that their visual impact is less noticeable. Conversely areas with low visual absorption capacity will suffer a higher visual impact from structures imposed on them.

Taking into account the above-mentioned physical characteristics of the study area the affected landscape has a medium to low visual absorption (depending on location) capacity and will suffer a moderate to low visual impact from the proposed activity imposed on it.

4.11.4. Critical Viewpoints

Traffic routes such as the R380 main road and the R31 secondary road, residential areas (Black Rock Village), farmsteads, eco-tourism attractions (Belgravia Game Farm) and undeveloped rural areas with high scenic value are regarded as critical view zones against which the visual impact of the powerline is evaluated. Critical views were determined during the field trip and from the 1:50 000 topographical maps.

Viewer groups are a collection of viewers that are involved with similar activities and experience similar views of the proposed development within the affected area. Within the receiving environment, specific visual receptors experience different views of the proposed development. The visual receptors included in this study are:

- **Residents**

In the case of static views, such as views from buildings, the visual relationship between an activity and the landscape will not change. The cone of vision is relatively wide as the viewer tends to scan back and forth across the landscape. Residents of the affected environment are therefore classified as visual receptors of *high* sensitivity owing to their sustained visual exposure to the proposed development as well as their attentive interest towards their living environment.

- **Tourists**

Tourists are regarded as visual receptors of exceptionally *high* sensitivity. Their attention is focused towards the landscape which they essentially utilise for enjoyment purposes and appreciation of the quality of the landscape. Although the R31 road isn't the main route to the Kgalagadi Transfrontier Park, tourist using it may have high expectations for unspoilt views along this route (refer to **Figure 4-20**).

Figure 4-20: Road signage pointing to the Kgalagadi Transfrontier Park via the R31 road.

- **Motorists**

Motorists are generally classified as visual receptors of *low* sensitivity due to their momentary views and experience of the proposed development. Under normal conditions, views from a moving vehicle are dynamic as the visual relationship between the activity is constantly changing as well as the visual relationship between the activity and the landscape in which they are seen. The view cone for motorists, particularly drivers, is generally narrower than for static views. Motorists will therefore show *low* levels of sensitivity as their attention is focused on the road and their exposure to roadside objects is brief.

4.11.5. The Viewshed

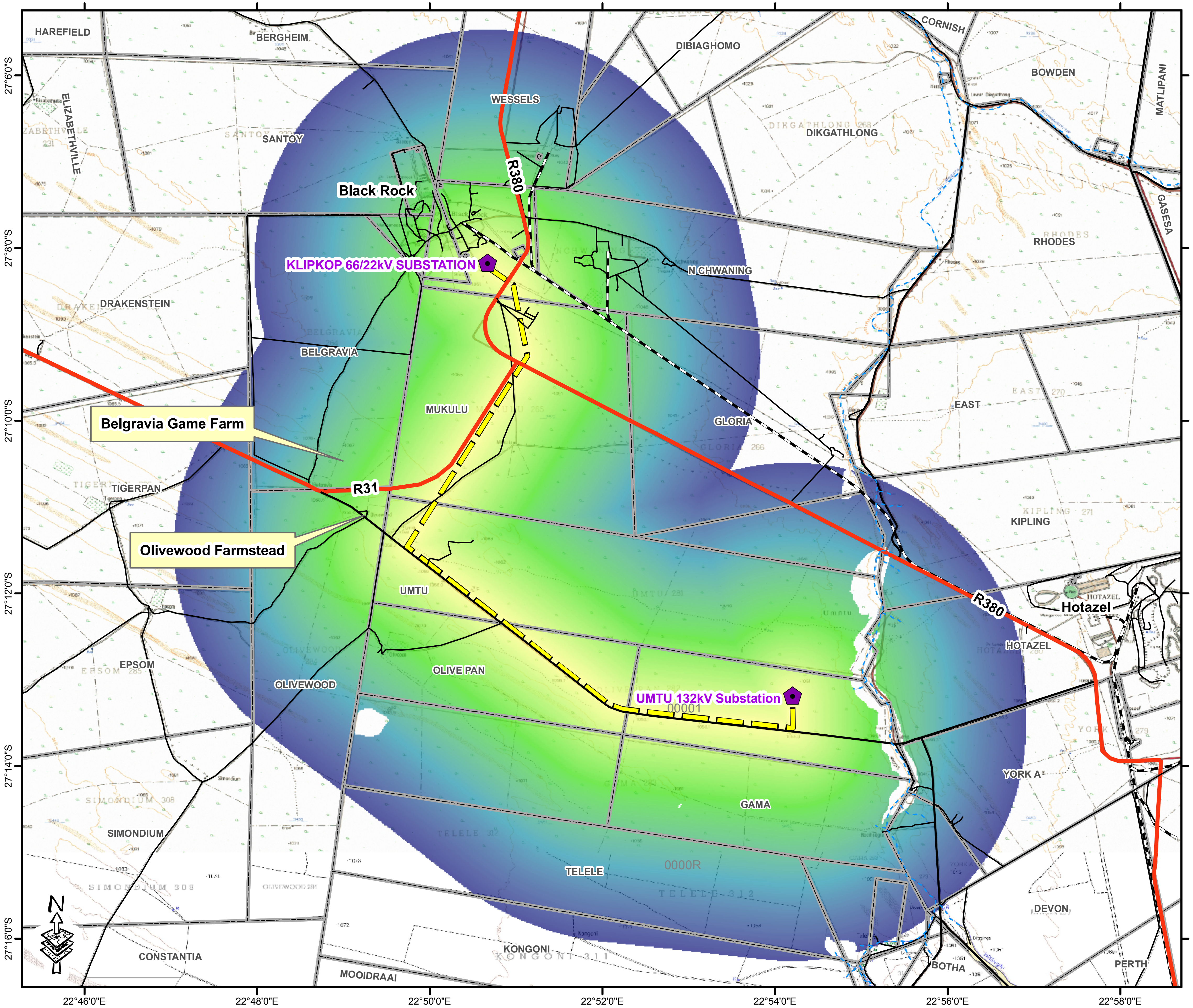
A viewshed analysis is carried out to define areas, which contain all possible observation sites from which the proposed infrastructure would be visible.

Topographic data was captured for the site at 20m contour intervals to create the Digital Elevation Model (DEM). The DEM was draped over the topographic data to complete the model used to generate the viewshed analysis.

The visibility analysis considers the worst-case scenario, using line-of-sight i.e. ignoring trees and other structures and is based on topography alone. This assists the process of identifying possible affected viewers and the extent of the effected environment.

Figure 4-21 spatially depicts the viewshed area and the areas which have direct visibility of the proposed infrastructure. A single analysis viewshed for the proposed 132kV power line was used, meaning that the figures show all the points from which the proposed 132kV power line can be seen (incorporating an offset height of 25m for the proposed infrastructure and an offset height of 2m for observation points). The total area which has a direct visual connection amounts to 21,295.9ha (98.5%).

FIGURE 14: BLACKROCK 132KV POWER LINE VIEWSHED



LEGEND

Sub-stations
Parcel boundaries

ROAD NETWORK
Main Road
Secondary Road
Other Access

Railway line

RIVERS & STREAMS
Perennial
Non-Perennial

Option 4 (16.59 Km)

High : 1.04505
Low : 1

DATA SOURCES:
The Chief Directorate of Survey & Mapping
1:50 000 Topographical Series: 2722BB & BD

Kilometers
0 1.25 2.5 5

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REVIEWED	R.F. VAN DER MERWE GIS MANAGER (PGPT 0023)
DATE	01 OCTOBER 2009
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The viewshed indicates that the 132kV power line will be extremely visible when viewed from the the R31 road. This is mainly due to the short distance between the R31 road and the proposed 132kV power line servitude. The viewhed also indicates that the proposed 132kV power line will be is visible for at least 3km along the R380 main road when it crosses the road at two points. Although only a small portion of the R380 main road may be affected, (specifically where the 132kV power line traverses the R380 main road) the presence of the exiting power line network in the area, just next to the newly proposed power line servitude, may “absorb” any additional negative visual affects due to the proposed infrastructure (Refer to **Figure 4-15**).

According the to viewshed it is also possible to see the proposed 132 kV power line from the Belgravia Game Farm, although it was determined that the local vegetation cover and relative long distance will limit extended views and any visual impact from the camping site within the Game Farm (refer to **Figure 4-22**).

Figure 4-22: The camping site within the Belgravia Game Farm

It is also apparent from the viewshed that the Olivewood farmstead will be able to see the proposed 132kV power line. During the site visit it was determined that the relative long distance and vegetation cover (garden and structures at Olivewood farmstead) will limit extensive views and will mitigate the visual impact extensively (Please refer to **Figure 4-23**).

Figure 4-23: The garden at Olivewood farmstead.

The remaining affected area can be classified as remote as no major sensitive viewing point is affected negatively.

4.12. REGIONAL SOCIO-ECONOMIC STRUCTURE

The Northern Cape region is characterised by a low population density associated with the desert/semi desert environment. The majority of land situated north of Kuruman is extensively used for agricultural purposes.

Data presented below have been obtained from the Northern Cape Department of Health and Welfare (March 1999).

4.12.1. Demographics

The population density in the Northern Cape region is generally low and is frequently congregated around towns. The land surrounding the manganese mines in the area is mainly used for agricultural purposes with residential population largely limited to land owners and farm labour. Assmang have a mine village at Black Rock that serves employees from Black Rock, Nchwaning and Gloria mines. In addition, Samancor have a mine village at Hotazel that predominantly serves the Samancor manganese mines.

The population in the local area comprises approximately 26,700 people (March 1999) constituted as follows:

- Black - 12 500
- Coloured - 7 694
- White - 6 505
- Asian - 22

4.12.2. Local economy

Within the Northern Cape various sectors contribute to the local economy (gross geographic product) and these are listed in **Table 4-9** below. From this table it is clear that the mining, services, agriculture and trade sectors are the main contributors to the local economy.

Table 4-9: Contributing Sectors to the Local Economy

Sector	Contribution (Millions or Rands)
Mining	319,6
Services	52,4
Agriculture	50,0
Trade and Commerce	43,4
Transport	32,6
Finance	31,2
Manufacturing	9,2
Construction	6,0
Energy	5,6

The two largest factors that have formed the basis of the economy of the Kgalagadi District Management Area (DMA) are the commercial farms throughout the whole area and the mines in the south eastern section of the DMA. Not only do the mines provide jobs to hundreds of people, but it is also the reason why the towns of Hotazel and Black Rock were planned in the first place. Recently tourism has also joined the economic stables of the area and could become a very large factor in the future.

4.12.3. Electricity

The Assmang Black Rock Manganese mine currently provides the mine, the Black Rock Village and surrounding farmers of electricity. It is the intention of the Black Rock mine to expand their current mining operation and will require additional electrical capacity that will be used for the expansion process while still providing sufficient electricity to the Black Rock Village and surrounding farmers. Therefore the proposed 132kV powerline and the extension of the Klipkop Substation can be seen as a necessity to ensure the mine’s economic development as well as the surrounding land users sustainable electricity supply.

5. PROJECT ALTERNATIVES

In terms of the EIA Regulations, feasible alternatives are required to be considered within the Scoping Study, as well as the no - go option. All identified, feasible alternatives are required to be evaluated in terms of social, biophysical, economic and technical factors.

5.1. SELECTION CRITERIA

Prior to selecting the best possible and practical corridor alignment out of the alternatives, several route selection criteria were considered. These are discussed below.

Physical Environment – Physical features, such as terrain and topography, of the study area was taken into account in terms of accessibility during construction and maintenance of the proposed powerline. Sensitive areas crossing, such as rivers, will also be avoided if possible. Preserving the natural environment is of significant importance hence the EIA Process.

Existing Services - Eskom identifies the existing corridors and infrastructure in the area before determining new corridors. This ensures proper planning of services. If possible, existing road servitudes will be considered for the construction of the proposed powerline. The planned route of construction will attempt to avoid any roads and railway lines crossings, where possible.

Future Planned Activities – Proposed land use activities, such as mining or any other developments, were considered. Therefore Eskom favours alignments that will utilise open vacant properties, were possible.

Specialist Input – The critical findings stated in the various specialists' reports were taken into account in terms of the potential environmental impacts associated with the construction and maintenance of the proposed powerline. If any fatal flaws were identified by the specialists the corridor relating to the fatal flaw will be disregarded as an alignment option for the proposed powerline.

5.2. PROPOSED POWERLINE CORRIDOR ALTERNATIVES

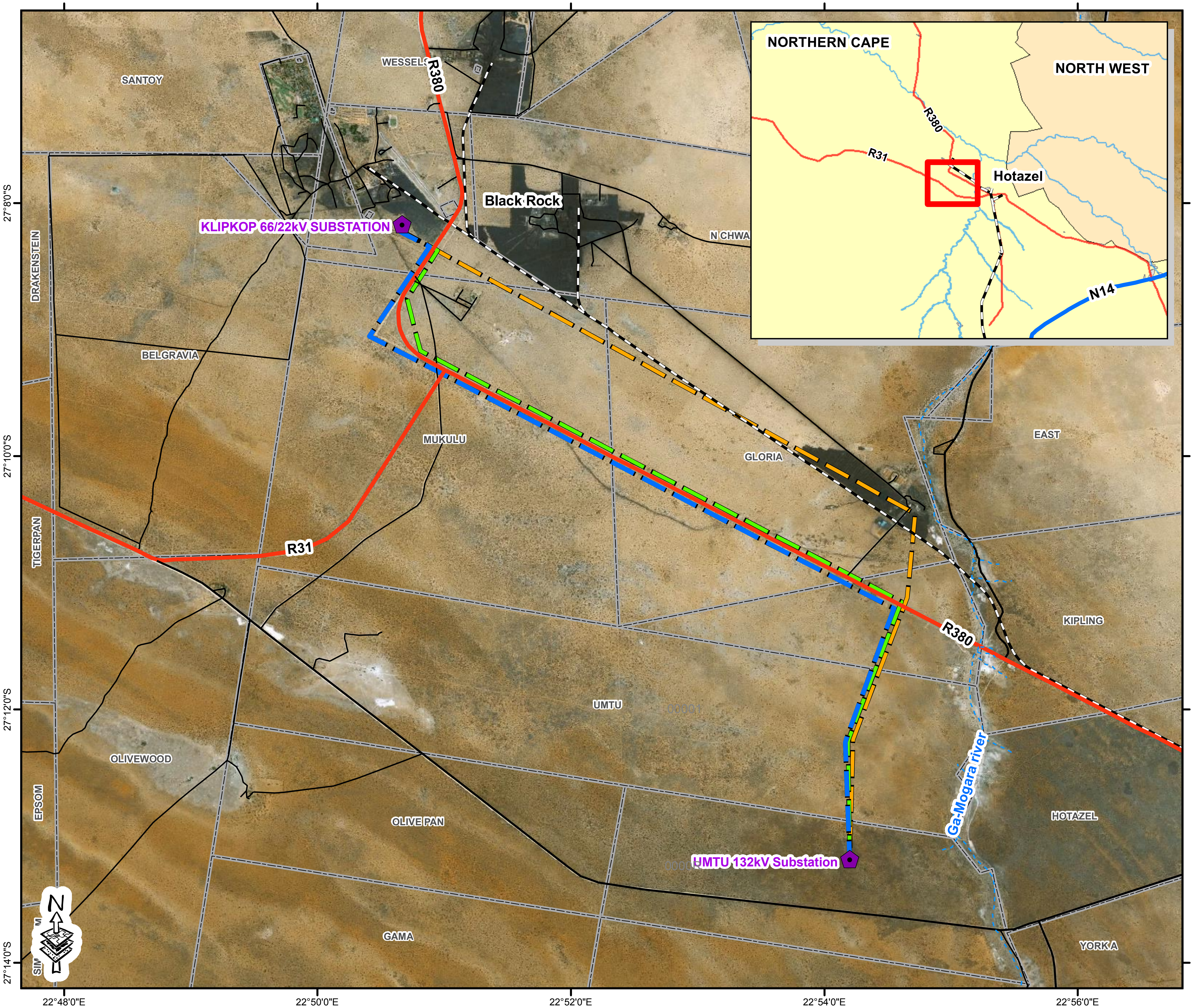
At the beginning of the Scoping Phase ESKOM considered six possible corridor alignments to be investigated with the intention of determining the best possible route for the construction of the 132kV powerline. During the specialist investigation phase, three out of the six alternative corridor options (Options 1, 2 and 3) were eliminated for further environmental investigation as their alignment crossed an area earmarked for future mining activities proposed by the Kalahari Resource Umtu Mine, thereby rendering these options as unfeasible alternatives.

The locations of the Corridor Options 1, 2 and 3 that have been eliminated for further investigation is depicted in **Figure 5-1**.

Therefore in terms of this alternative section of the EIA, Option 4, 5 and 6 will be discussed in more detail with the intention of explaining why the corridor Option 4 was selected as the most suitable option for the alignment of the 132kV powerline between the Klipkop and Umtu Substations.

The locations of the corridor Options 4, 5 and 6 are illustrated in **Figure 5-2**.

ELIMINATED CORRIDORS: BLACK ROCK 132KV POWERLINE OPTIONS



LEGEND

Sub-stations

Option 1 (13.3 Km)

ROAD NETWORK

Option 2 (13.58 Km)

National Route

Main Road

Secondary Road

Option 3 (13.96km)

Other Access

Parcel boundaries

Railway line

RIVERS & STREAMS

Perennial

Non-Perennial

DATA SOURCES:

Google Earth™ mapping service: 2009

Kilometers

0 1 2 4

DRAWN BY:	A.J. MAIN GIS TECHNOLOGIST
REVIEWED	R.F. VAN DER MERWE GIS MANAGER (PGPT 0023)
DATE	13 APRIL 2010
SCALE:	1:58,000
PROJECTION:	WGS 84 GEOGRAPHIC
CLIENT:	ESKOM
PROJECT:	BLACK ROCK 132KV POWERLINE (09-011)

GCS

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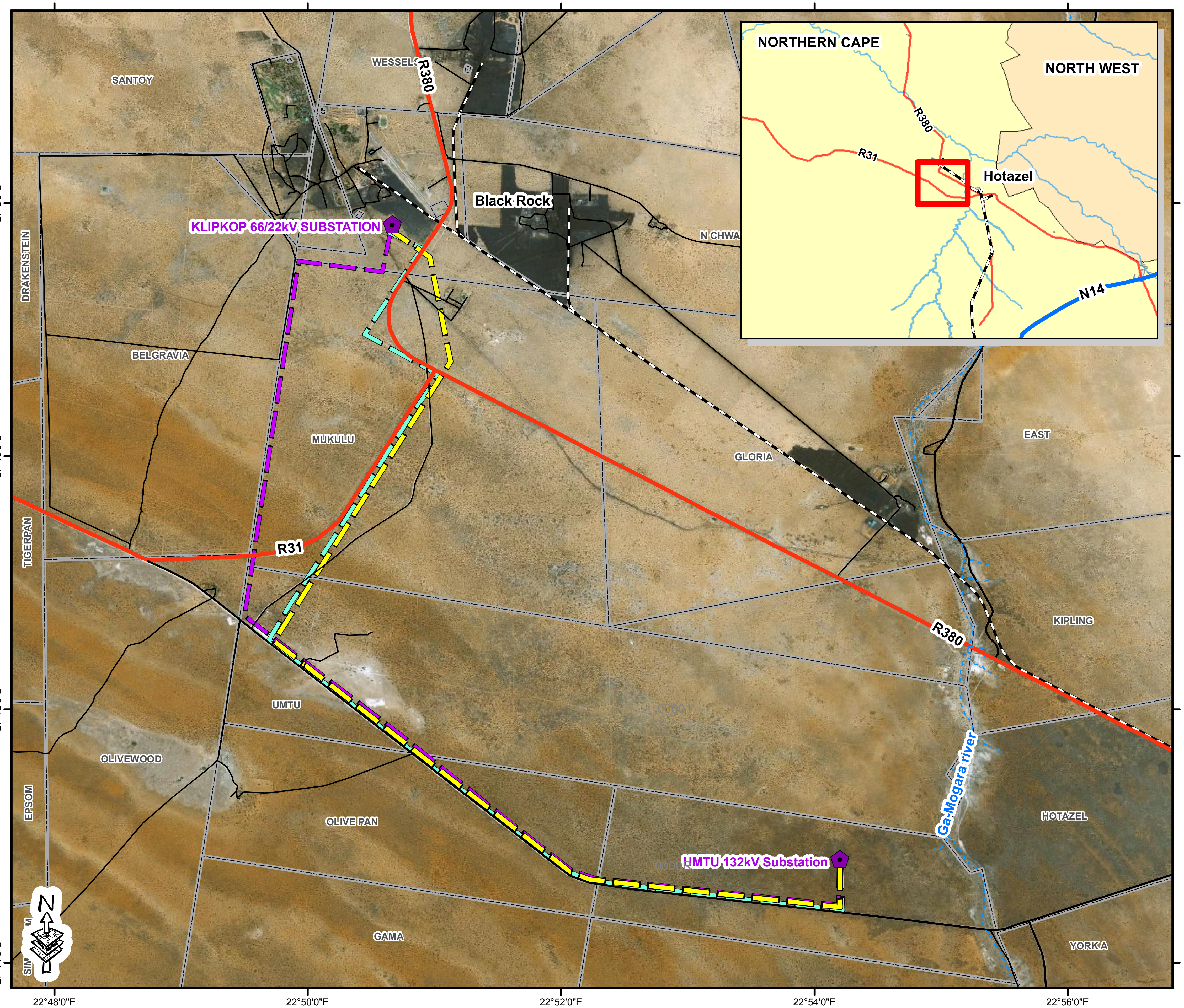
PROPOSED CORRIDORS: BLACK ROCK 132KV POWERLINE OPTIONS



LEGEND

- Sub-stations
- Option 4 (16.59 Km)
- Option 5 (17.47 Km)
- Option 6 (17.09 Km)
- Parcel boundaries

ROAD NETWORK
- National Route
- Main Road
- Secondary Road
- Other Access
- Railway line

RIVERS & STREAMS
- Perennial
- Non-Perennial

DATA SOURCES:

Google Earth™ mapping service: 2009

Kilometers

0 1 2 4

DRAWN BY:	A.J. MAIN GIS TECHNOLOGIST
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5.2.1. Assessment of alternative corridors

The assessment of the best suitable corridor alignment for the purpose of constructing the 132kV powerline is discussed in more details below. The assessment is based on the outcomes of the various specialists' investigations and input along with the EIA process.

Table 5-1: Summary of the Alternative Assessments – Option 4 (Yellow)

Length (km)	Socio-Economic Aspects	Sensitive Crossings	OUTCOME
16.6	Five (5) farms portions will be transverse by Option 4.	• Portion 3, Farm Nchwaning 267 • Remaining Extent, Farm Mukulu 265 • Remaining Extent, Farm Umtu 281 • Portion 1 of the Farm Olive Pan 282 • Remaining Extent, Farm Olive Pan 282	The **Option 4** powerline is seen as a **viable powerline option** and will be considered for further environmental investigation. No area of sensitivity will be transverse that may cause problems during the construction and operational phases. The Option 4 powerline will connect with the Umtu Substation at an angel and area that is not associated with any future development plans.
	The R380 tar road will be crossed twice by Option 4.	At 27°8'23.10"S & 22°50'54.01"E on Portion 3, Farm Nchwaning 267; and At 27°9'21.10"S & 22°51'3.72"E on the Remaining Extent, Farm Mukulu 265	
	A gravel road to a small village will be crossed twice by Option 4.	At 27°8'45.10"S & 22°51'1.58"E and at 27°8'52.41"S & 22°51'3.02"E on the Remaining Extent, Farm Mukulu 265.	
	Option 4 will continue to run parallel with the old R31 gravel road (no longer accessible to the public) on the northern side of the road and will turn in a northerly direction to connect with the Umtu Substation.		

Please refer to **Figure 5-3** for the proposed layout for Option 4 for the 132kV powerline between the Klipkop and Umtu Substations.

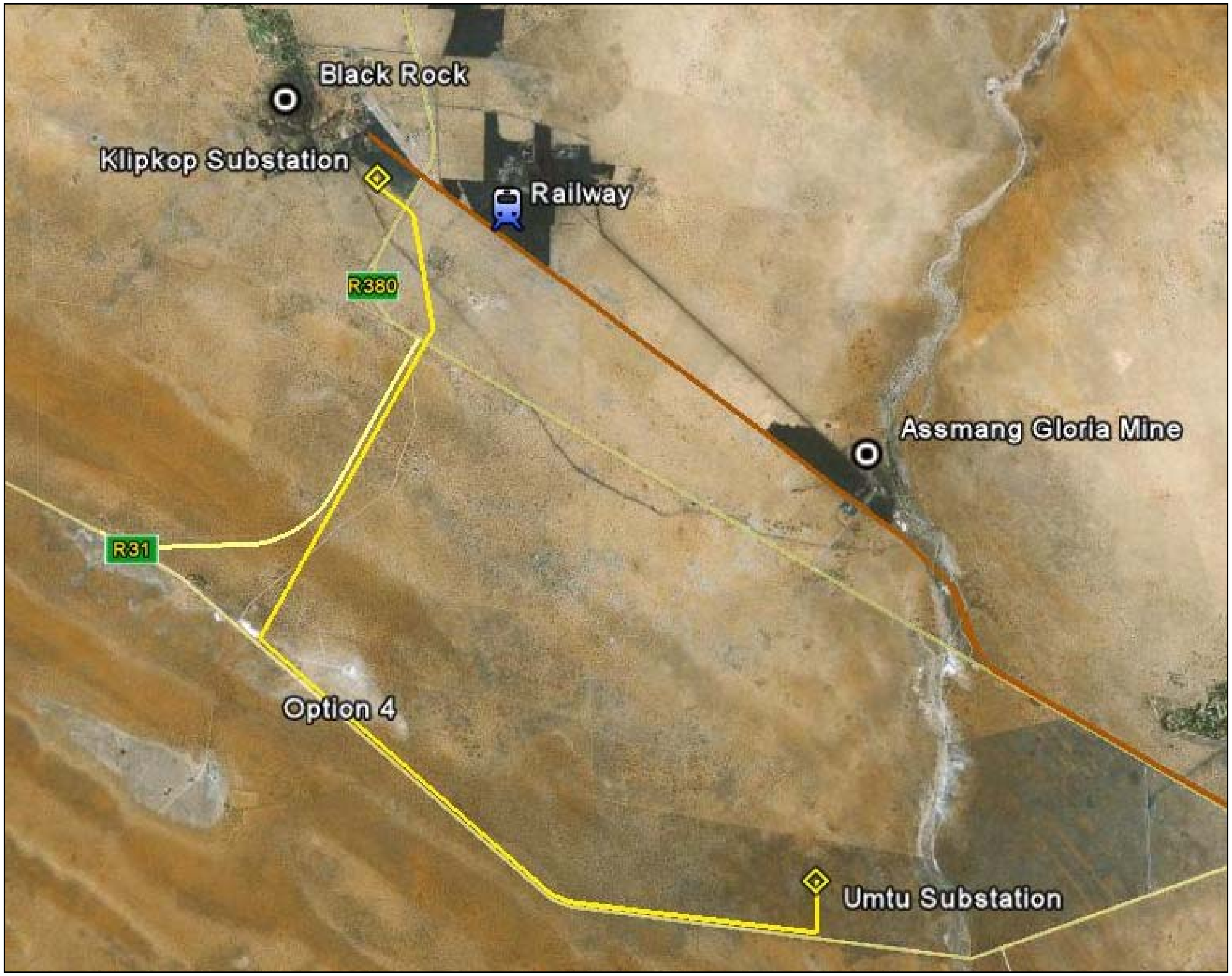

Figure 5-3: Option 4 Layout

Table 5-2: Summary of the Alternative Assessments – Option 5 (Light Blue)

<table>
<tr><th>Length (km)</th><th>Socio-Economic Aspects</th><th>Sensitive Crossings</th><th>OUTCOME</th></tr>
<tr><td rowspan="3">17.5</td><td>Five (5) farms portions will be transverse by Option 5.</td><td>• Portion 3, Farm Nchwaning 267
• Remaining Extent, Farm Mukulu 265
• Remaining Extent, Farm Umtu 281
• Portion 1 of the Farm Olive Pan 282
• Remaining Extent, Farm Olive Pan 282</td><td rowspan="3">The Option 5 powerline is seen as a viable powerline option and will be considered for further environmental investigation.
No area of sensitivity will be transverse that may cause problems during the construction and operational phases.
The Option 5 powerline will connect with the Umtu Substation at an angel and area that is not associated with any future development plans.</td></tr>
<tr><td>Option 5 will run parallel with the R380 on the southern side of the road and will gross the R31 tar road (Van Zylsrus Road)</td><td>At 27°9’20.92”S & 22°50’58.98”E on the Remaining Extent, Farm Mukulu 265.</td></tr>
<tr><td colspan="2">Option 5 will continue to run parallel with the old R31 gravel road (no longer accessible to the public) on the northern side of the road and will turn in a northerly direction to connect with the Umtu Substation.</td></tr>
</table>

Please refer to **Figure 5-4** for the proposed layout for Option 5 for the 132kV powerline between the Klipkop and Umtu Substations.

Figure 5-4: Option 5 Layout

Table 5-3: Summary of the Alternative Assessments – Option 6 (Purple)

<table>
<tr><th>Length (km)</th><th>Socio-Economic Aspects</th><th>Sensitive Crossings</th><th>OUTCOME</th></tr>
<tr><td rowspan="3">17.1</td><td>Five (5) farms portions will be transverse by Option 6.</td><td>• Portion 3, Farm Nchwaning 267
• Remaining Extent, Farm Mukulu 265
• Remaining Extent, Farm Umtu 281
• Portion 1 of the Farm Olive Pan 282
• Remaining Extent, Farm Olive Pan 282</td><td rowspan="3">The Option 6 powerline is seen as a viable powerline option and will be considered for further environmental investigation.
No area of sensitivity will be transverse that may cause problems during the construction and operational phases.
The Option 6 powerline will connect with the Umtu Substation at an angel and area that is not associated with any future development plans.</td></tr>
<tr><td>Option 6 will run parallel with the R380 and eventually the R31 tar road (Van Zylsrus Road) on the southern side of the road.
Option 6 will evidently cross the R31 tar road (Van Zylsrus Road) in order to connect with the Umtu Substation</td><td>At 27°10’47.51”S & 22°49’34.23”E on the Remaining Extent, Farm Mukulu 265.</td></tr>
<tr><td colspan="2">Option 6 will continue to run parallel with the old R31 gravel road (no longer accessible to the public) on the northern side of the road and will turn in a northerly direction to connect with the Umtu Substation.</td></tr>
</table>

Please refer to **Figure 5-5** for the proposed layout for Option 6 for the 132kV powerline between the Klipkop and Umtu Substations.

Figure 5-5: Option 6 Layout

The advantages and disadvantages of the alternatives corridors, as identified by the various specialists, are provided in **Table 5-4** below.

Table 5-4: Advantages and disadvantages of the identified corridor alternatives based on Specialist Input

Option	Advantages	Disadvantages	Outcome/Decision
1	• Minimal visual impacts in terms of road crossing and for road users.	• Railway crossing; • Crossing of Assmang Gloria Mine's Stockpile area and Access road; • A section of the line will be in close proximity of the Ga-Mogara River and could have an impact on the local and migratory movement of birds; and • Crossing future proposed mining area of Kalahari Resource Umtu Mine.	Least preferred corridor
2	• Large section of the line will be constructed within existing road servitude. This area is partially degraded and has no conservation value.	• 70% of the powerline will be running parallel with the R380 road; and • Crossing future proposed mining area of Kalahari Resource Umtu Mine.	Least preferred corridor
3	• Large section of the line will be constructed within existing road servitude. This area is partially degraded and has no conservation value.	• 75% of the powerline will be running parallel with the R380 road; and • Crossing future proposed mining area of Kalahari Resource Umtu Mine.	Least preferred corridor
4	• No future mining areas will be crossed by this line option; and • Section of the alignment will be constructed in close proximity of existing powerline servitude.	• 20% of the powerline will be running parallel with the R380 road.	**Preferred corridor**
5	• No future mining areas will be crossed by this line option; and • Section of the alignment will be constructed in close proximity of existing powerline servitude.	• 40% of the powerline will be running parallel with the R380 road.	**P referred corridor**
6	• Least impact on visual receptors.	• High concentration of protected tree species. • Will run parallel to the boarder fence of the Assmang conservation area, thereby crossing an area with conservation value.	Least preferred corridor

5.3. *TECHNOLOGY*

The only technological alternative that could be considered in terms of the proposed powerline project was the use of underground cables as opposed to aboveground cables. This alternative is however rejected from further consideration as underground cabling for the length and type of the powerline proposed will be prohibitively expensive.

Therefore the proposed overhead powerline remains the best feasible technological option for the proposed powerline.

5.4. NO DEVELOPMENT (NO-GO OPTION)

The purpose of the construction of the 132kV overhead powerline is to provide the Assmang Black Rock Manganese mine with sufficient electricity which the mine will require for their proposed expansion projects in the near future. As part of the construction of the 132kV overhead powerline, the existing Klipkop Substation (located on portion 3 of the farm Nchwaning 267) will be extended by approximately 40m. The extension of the Klipkop Substation will be beneficial to the local Black Rock Village and farms in the surrounding areas, whose power supply is provided by the mine.

If the proposed project were not to proceed, it is likely that the existing network would not meet the needs of the electricity demand for the current and future electricity use of the Assmang Black Rock Manganese Mine and surrounding farmers. The no-go option is, therefore, not considered to be a feasible option.

6. ENVIRONMENTAL IMPACT ASSESSMENT

The significant environmental impacts identified during the Scoping and EIA phase have been assessed through the various specialist studies. The findings of the environmental impact assessment have been consolidated into this section.

6.1. METHODOLOGY

To ensure uniformity, the assessment of potential impacts is addressed in a standard manner so that a wide range of impacts is comparable. For this reason a clearly defined rating scale was provided to all specialists to assess the significance of the impacts associated with the proposed construction of the 132kV powerline between the Klipkop and Umtu Substations.

The assessment of the potential impacts associated with the construction of the 132kV powerline was done using a descriptive, numerical method to eliminate subjectivity as far as possible taking consideration of the probability, duration, scale/extent, and magnitude of all the potential impacts. The numerical impact rating method is summarised in **Table 6-1**.

Table 6-1: Impact Rating Method

RATING	ASPECT	RATING	ASPECT
Magnitude (M)		*Duration (D)*	
10	Very high/Uncertain	5	Permanent
8	High	4	Long-term (ceases with the operational life)
6	Moderate	3	Medium-term (5-15 years)
4	Low	2	Short-term (0-5 years)
2	Minor	1	Immediate
Scale (S)		*Probability (P)*	
5	International	5	Definite/uncertain
4	National	4	Highly probable
3	Regional	3	Medium probability
2	Local	2	Low probability
1	Site only	1	Improbable
0	None	0	None

The significance is determined using the assessment outcomes of the scale, duration, magnitude and probability of occurrence of an impact. The significance is calculated as follow:

Significance/status = (magnitude + duration + scale) x probability

The significance of an impact can be either positive or negative. Both positive and negative impacts are ranked in the same way and result in **high**, **medium** or **low** positive or negative consequences.

The maximum value per aspect/impact is 100 significance points (SP). Possible environmental impacts are rated as having a high, medium or low significance, based on the class value. Values are divided into three classes:

- More than 60 significance points indicated high (H) environmental significance;

- Between 30 and 60 significance points indicted moderate (M) environmental significance; and
- Less than 30 significance points indicated low (L) environmental significance.

The significance of the proposed impacts is marked according to the following colour codes:

(red)	Impact of **high** significance
(yellow)	Impact of **medium** significance
(green)	Impact of **low** significance

The significance of an impact "without mitigation" is the prime determent of the nature and degree of mitigation required. In the assessment of the potential impacts, the significance of the impacts with and without prescribed mitigation actions is measured. The rationale behind this is to determine if possible impacts can be successfully avoided, mitigated and managed and to what extent.

6.1.1. Disclaimer

Ivuzi has incorporated the abovementioned impact rating methodology for the proposed powerline project. During the time the specialist investigations were undertaken this rating scales and methodology was not finalised and as a result of this, the specialists used an older impact rating scale that was also set up by Ivuzi.

Therefore although there was a difference in the rating scales used by the specialists and for the EIA process, the information contained within the specialists report could still be used and were adjusted accordingly in order to integrate their ratings with the new rating scale. For that reason the EIA report tables will look different to the tables within the specialists report, but the significance rating of the proposed impacts will remain the same.

6.2. CONSTRUCTION PHASE ACTIVITIES

In terms of the proposed powerline project the following activities will be undertaken during the construction phase which will be done over a period of approximately 12-18 months, provided construction progresses as scheduled:

- Construction of construction camps and an access tract along powerline corridor;
- Construction of a 132kv overhead powerline; and
- Extension the Klipkop Substation to accommodate additional electricity capacity (within the existing footprint area).

Due to the similarities in the nature of the construction activities that will be undertaken for the abovementioned aspects, **Table 6-2** describes the cumulative environmental impacts associated with the holistic construction phase.

Table 6-2: Cumulative environmental impacts and mitigation measures associated with all activities undertaken during the holistic construction phase

POTENTIAL ENVIRONMENTAL IMPACT	ACTIVITY	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION						RECOMMENDED MITIGATION MEASURES/ REMARKS	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION					
		M	D	S	P	Tot	SP		M	D	S	P	Tot	SP
ISSUES RELATED TO SURFACE WATER (Refer to Section 2.5 of the Hydrological Impact Assessment – Appendix Dv)														
When vegetation is removed for construction purposes soils are exposed to natural water erosion processes. Sediment can be picked up during precipitation evens and can lead to the transportation of soils.	Sediment / Transport Erosion	4	1	0	4	20	L	Holes must be filled after digging and vegetation must be replaced immediately after construction to minimize the time soils are exposed to natural water erosion processes.	2	1	0	1	4	L
Due to the alteration of the micro topography of the area, water can temporarily dam up in the construction holes where the towers need to be erected. This can lead to the reduction in the natural stream flow of surface water.	Stream Flow Reduction	4	1	0	2	10	L	All holes and depressions caused by the construction must be back filled and proper rehabilitation of the affected areas should take place after construction.	2	1	0	1	3	L

<table>
<tr><th rowspan="2">POTENTIAL ENVIRONMENTAL IMPACT</th><th rowspan="2">ACTIVITY</th><th colspan="6">ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION</th><th rowspan="2">RECOMMENDED MITIGATION MEASURES/ REMARKS</th><th colspan="6">ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION</th></tr>
<tr><th>M</th><th>D</th><th>S</th><th>P</th><th>Tot</th><th>SP</th><th>M</th><th>D</th><th>S</th><th>P</th><th>Tot</th><th>SP</th></tr>
<tr><td>During the construction phase some fuels form the construction vehicles may spill onto the soils which can lead to surface water pollution when surface runoff occurs over the affected area.</td><td>Deterioration of Water Quality</td><td>4</td><td>1</td><td>1</td><td>2</td><td>12</td><td>L</td><td>All fuels and waste used should be placed and stored in a controlled manner. When and if spillages occur immediate remediation actions needs to be undertaken to ensure the affected area is cleaned and rehabilitated.</td><td>2</td><td>1</td><td>0</td><td>1</td><td>3</td><td>L</td></tr>
<tr><td colspan="15">ISSUES RELATED TO ARCHAEOLOGY (Refer to Section 2.5 of the Archaeological Impact Assessment – Appendix Di)</td></tr>
<tr><td colspan="15">No known archaeological or cultural heritage resources will be impacted on the proposed 132kV powerline. The proposed development can thus be described as of Low Significance with the only potential treat being the uncovering of unknown/unidentified resources during sub-surface excavation as part of the development. All known resources from the general vicinity will be conserved.

Should any archaeological or cultural heritage resources as defined and protected by the NHRA 1999 and not reported on in this report be identified during the course of development the developer should immediately cease the construction operation in the vicinity of the find and report the site to SAHRA. A qualified archaeologist will be appointed to assess the findings and propose the correct mitigation measures if possible.</td></tr>
<tr><td colspan="15">ISSUES RELATED TO SOILS (Refer to Section 9.2 of the Soils Impact Assessment – Appendix Div)</td></tr>
<tr><td rowspan="2">Loss of soil due to exposed surface susceptible to wind and water erosion</td><td>Site Clearing</td><td>4</td><td>6</td><td>0</td><td>4</td><td>40</td><td>M</td><td>Rehabilitate immediately after pole installation</td><td>2</td><td>1</td><td>0</td><td>1</td><td>3</td><td>L</td></tr>
<tr><td>Topsoil stripping</td><td>4</td><td>6</td><td>0</td><td>4</td><td>40</td><td>M</td><td>Stockpile stripped soils in demarcated area. Spray stockpiles with mist and irrigate rehabilitated areas to minimise loss to wind. Rehabilitate immediately after pole installation.</td><td>2</td><td>1</td><td>0</td><td>1</td><td>3</td><td>L</td></tr>
<tr><td>During the construction phase some fuels form the construction vehicles may be spilt onto the soils which can lead to soil pollution</td><td>Deterioration of Soil Quality</td><td>4</td><td>1</td><td>1</td><td>2</td><td>12</td><td>L</td><td>All fuels and waste used should be placed and stored in a controlled manner. When and if spillages occur immediate remediation actions needs to be undertaken to ensure the affected area is cleaned and rehabilitated.</td><td>2</td><td>1</td><td>0</td><td>1</td><td>3</td><td>L</td></tr>
<tr><td colspan="15">ISSUES RELATED TO FLORA (Refer to Section 4 of the Ecological Impact Assessment – Appendix Diii)</td></tr>
<tr><td>Loss of protected flora species due to the removal of protected tree species at the construction areas</td><td>Site Clearing</td><td>6</td><td>5</td><td>1</td><td>4</td><td>48</td><td>M</td><td>Avoid destruction wherever possible and replace with trimming.

According to Section 15 of the National Forests Act (Act No. 84 of 1998), no person may cut, disturb,</td><td>4</td><td>2</td><td>0</td><td>1</td><td>6</td><td>L</td></tr>
</table>

POTENTIAL ENVIRONMENTAL IMPACT	ACTIVITY	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION						RECOMMENDED MITIGATION MEASURES/ REMARKS	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION					
		M	D	S	P	Tot	SP		M	D	S	P	Tot	SP
								damage or destroy any of the above-mentioned protected trees, or possess, collect, remove, transport, export, donate, purchase or sell or in any other manner acquire or dispose of any protected tree or any forest product derived from a protected tree without a license from the Department of Water Affairs and Forestry (except in terms of an exemption of this subsection published by the Minister in the Gazette on the advice of the council). Therefore a permit should be obtained beforehand if destruction or trimming is planned.						
								Avoid destruction wherever possible and where destruction cannot be altogether avoided, appoint suitably qualified specialists to sweep areas to be cleared prior to construction in order to relocate such plants to e.g. botanical gardens or nurseries.	4	2	0	1	6	L
Loss of protected flora species due to the destruction of protected tree and/or plant species by workers for medicinal use or use as fire wood.	Degradation of natural vegetation	6	5	1	4	48	M	Provide awareness training to workers re. the conservation status of protected plants prior to the commencement of construction and implement a fining system where individuals who are caught destructing protected trees or plants for whatever purpose are penalised financially.	4	2	0	2	12	L
An increase in the possibility of veld fires as a result of discarded cigarette or fires made by workers.	Degradation of natural vegetation	6	5	1	3	36	M	Fires should only be made in cleared areas in structures specifically constructed for this purpose. Workers should be given awareness training regarding the fire hazard of the area. Fire extinguishers should	6	2	1	1	9	L

POTENTIAL ENVIRONMENTAL IMPACT	ACTIVITY	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION						RECOMMENDED MITIGATION MEASURES/ REMARKS	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION					
		M	D	S	P	Tot	SP		M	D	S	P	Tot	SP
								be available on site.						
ISSUES RELATED TO FAUNA (Refer to Section 4 of the Ecological Impact Assessment – Appendix Diii)														
The setting of snares or traps for the killing of mammals by workers.	Potential killing of fauna	6	2	2	4	40	M	Draft and Implement a strict "no poaching" policy. Give awareness training to workers re. The total prohibition of poaching in the study area and surrounds and implement a fining system where individuals who are caught poaching are penalised financially.	2	1	2	4	20	L
The destruction of habitats for animals, dependant on protected trees at some stage during their life cycle.	Site Clearing	6	2	1	4	36	M	Avoid destruction wherever possible and replace with trimming where possible. (A permit should be obtained beforehand if destruction or trimming is planned.)	4	2	0	1	6	L
A decrease in the number of food sources available to animals.	Site Clearing	4	2	1	4	28	L	Avoid destruction wherever possible and replace with trimming where possible. (A permit should be obtained beforehand if destruction or trimming is planned.)	4	2	0	1	6	L
A decrease in the number of shade trees available to animals.	Site Clearing	4	2	1	4	28	L	Avoid destruction wherever possible and replace with trimming where possible. (A permit should be obtained beforehand if destruction or trimming is planned.)	4	2	0	1	6	L
An increase in instances of littering by workers working in the area, which may lead to animal suffocations and deaths.	General construction	4	2	1	4	28	L	Draft and Implement a strict "no littering" policy. Give awareness training to workers re. The total prohibition of littering in the study area and surrounds and implement a fining system where individuals who are caught littering are penalised financially. Also ensure that an adequate number of covered rubbish receptacles are available during	4	2	1	2	14	L

POTENTIAL ENVIRONMENTAL IMPACT	ACTIVITY	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION						RECOMMENDED MITIGATION MEASURES/ REMARKS	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION					
		M	D	S	P	Tot	SP		M	D	S	P	Tot	SP
								construction.						
ISSUES RELATED TO AVIFAUNA (Refer to Section 4.3 – Section 4.5 of the Avifauna Impact Assessment – Appendix Dii)														
Impact on local bird community due to disturbance caused by construction activities.	Site Clearing	3	3	0	5	30	M	The recommendations with regards to minimising the amount of impact that habitat disturbance are as follows: - Habitat clearance must remain at an absolute minimum. - Staff members responsible for the erection of the powerlines must remain within the designated work areas The Environmental Control Officer should be briefed on the need to notify the ornithologist with the Northern Cape Department of Environment, Tourism and Conservation should any breeding birds be found within the servitude and in particular large breeding species such as korhaans and bustards.	2	1	0	2	6	L
Impact on local bird community due to habitat loss	Site Clearing	3	3	0	5	30	M	If possible the servitude should follow existing roads where possible and should not cut across habitat. The purpose of this is to minimise the amount of fragmentation occurring within habitat and to rather lose habitat. All construction and maintenance activities must be undertaken in accordance with Eskom Transmissions	2	2	0	2	8	L

POTENTIAL ENVIRONMENTAL IMPACT	ACTIVITY	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION						RECOMMENDED MITIGATION MEASURES/ REMARKS	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION					
		M	D	S	P	Tot	SP		M	D	S	P	Tot	SP
								environmental best practice standards. All construction and access roads should be restricted as much as possible.						
ISSUES RELATED TO AESTHETIC ASPECTS (Refer to Section 6 of the Visual Impact Assessment – Appendix Dvi)														
Dust generated due to construction activities, earthworks, hauling and site clearance	Site Clearing	4	3	1	4	32	M	During construction of the proposed 132kV power line, construction roads will require an effective dust suppression management programme, such as regular wetting and/or the use of non-polluting chemicals that will retain moisture in the road surface	2	2	1	1	5	L
Large denude areas as a result of site clearance may cause unpleasant sites for visual receptors.	Site Clearing	4	2	1	2	14	L	Minimise the extent of cleared areas to only those necessary for completion of the works Temporarily revegetate open areas whilst construction is underway and fully rehabilitate and revegetate the site once construction has ceased. This should be done to restrict extended periods of exposed soil Utilise exiting power line servitudes where possible Avoid the unnecessary removal of vegetation for the power line servitudes and limit access to the servitude (during both construction and operational phases along exiting access roads	2	2	1	1	5	L

POTENTIAL ENVIRONMENTAL IMPACT	ACTIVITY	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION						RECOMMENDED MITIGATION MEASURES/ REMARKS	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION					
		M	D	S	P	Tot	SP		M	D	S	P	Tot	SP
Visual intrusion of site camp, vehicles and associated infrastructure	General construction	4	2	1	2	14	L	Appropriately site the construction camp as well as other storage areas and consider screening through the erection of shade cloth visual barrier Site ablution facilities out of view of road users Avoid the unnecessary removal of vegetation for the power line servitudes and limit access to the servitude (during both construction and operational phases along exiting access roads	2	2	1	1	5	L
Visual intrusion of stockpiles and material storage areas	General construction	4	2	1	2	14	L	Decrease the height of material stockpiles and locate these areas away from view of road users	2	2	1	1	5	L
Visual intrusion due to change in sense of place, increased activity and traffic in the area	General construction	4	3	1	2	16	L	Temporarily revegetate open areas whilst construction is underway and fully rehabilitate and revegetate the site once construction has ceased. This should be done to restrict extended periods of exposed soil. Utilise exiting power line servitudes where possible. Avoid the unnecessary removal of vegetation for the power line servitudes and limit access to the servitude (during both construction and operational phases along exiting access roads	2	2	1	1	5	L
ISSUES RELATED TO SOCIAL ASPECTS														
Dust generated due to construction activities, earthworks, hauling and site clearance	Site Clearing	4	3	1	2	16	L	During construction of the proposed 132kV power line, construction roads will require an effective dust suppression management programme, such as regular wetting and/or the use of non-polluting chemicals that will retain moisture in the road surface	2	2	1	1	5	L

POTENTIAL ENVIRONMENTAL IMPACT	ACTIVITY	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION						RECOMMENDED MITIGATION MEASURES/ REMARKS	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION					
		M	D	S	P	Tot	SP		M	D	S	P	Tot	SP
Visual intrusion of site camp, vehicles and associated infrastructure	General construction	4	2	1	2	14	L	Appropriately site the construction camp as well as other storage areas and consider screening through the erection of shade cloth visual barrier Site ablution facilities out of view of road users Avoid the unnecessary removal of vegetation for the power line servitudes and limit access to the servitude (during both construction and operational phases along exiting access roads	2	2	1	1	5	L

6.3. OPERATION PHASE ACTIVITIES

The only activity that will occur during the operational phase of this proposed project will be the regular maintenance and operation of the powerline. **Table 6-3** provides a summary of all cumulative environmental impacts and mitigation measures associated with the operation phase of the powerline.

Table 6-3: Cumulative environmental impacts and mitigation measures associated with the regular maintenance activities of the powerline

POTENTIAL ENVIRONMENTAL IMPACT	ACTIVITY	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION						RECOMMENDED MITIGATION MEASURES/ REMARKS	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION					
		M	D	S	P	Tot	SP		M	D	S	P	Tot	SP
ISSUES RELATED TO SURFACE WATER (Refer to Section 2.5 of the Hydrological Impact Assessment – Appendix Dv)														
During operation service and maintenance vehicles will be used, this will cause a track to form. This track will expose bare soil and during rain event this soil will be washed into the rivers	Use of Access tracks for maintenance purposes	4	3	1	2	16	L	The same track at all times, so as to limit the exposure of the impact, which also makes it much easier to rehabilitate afterwards, as only one track will have to ripped and revegetated.	2	3	0	1	5	L
Where erosion has taken place and dongas are formed, surface runoff will get trapped, therefore reducing the natural stream flow	Use of Access tracks for maintenance purposes	4	1	1	2	12	L	All vegetation will be replaced to ensure less erosion will form and therefore less runoff will be trapped	2	1	0	1	3	L
Soil could be washed or carried by wind from disturbed areas such as tracks made by service vehicles, this will increase sediment in the rivers	Use of Access tracks for maintenance purposes	4	2	0	2	12	L	Soil exposure must be limited as explained above	2	1	0	1	3	L
ISSUES RELATED TO SOILS (Refer to Section 9.2 of the Soils Impact Assessment – Appendix Div)														
Using access tracks during regular maintenance will cause loose soil particles to become airborne	Use of Access tracks for maintenance purposes	4	2	3	4	36	M	Ensure sufficient grass cover in worked areas as well as access tracks Reduce travelling speed when using the access tracks to limit dust creation	2	1	0	1	3	L
ISSUES RELATED TO FLORA (Refer to Section 4 of the Ecological Impact Assessment – Appendix Diii)														

POTENTIAL ENVIRONMENTAL IMPACT	ACTIVITY	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION						RECOMMENDED MITIGATION MEASURES/ REMARKS	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION					
		M	D	S	P	Tot	SP		M	D	S	P	Tot	SP
An increase in the number of alien weeds and invasive plants in disturbed areas.	Use of Access tracks for maintenance purposes	4	4	0	4	32	M	Limit vegetation clearing to the absolute minimum and control individuals of alien weeds and invasive plants in disturbed areas according to the requirements of Regulations 15(a) and (e) of the regulations made in terms of Section 29 of the Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983).	2	2	0	3	12	L
The disturbance or destruction of protected tree species during routine maintenance visits to the area.	Use of Access tracks	4	5	0	5	45	M	Avoid destruction wherever possible and replace with trimming where possible. According to Section 15 of the National Forests Act (Act No. 84 of 1998), no person may cut, disturb, damage or destroy any of the above-mentioned protected trees, or possess, collect, remove, transport, export, donate, purchase or sell or in any other manner acquire or dispose of any protected tree or any forest product derived from a protected tree without a license from the Department of Water Affairs and Forestry (except in terms of an exemption of this subsection published by the Minister in the Gazette on the advice of the council). Therefore a permit should be obtained beforehand if destruction or trimming is planned.	4	2	0	1	6	L
The disturbance or destruction of protected plant species during routine maintenance visits to the area.	Use of Access tracks	4	5	0	2	18	L	Avoid destruction wherever possible. A permit should be obtained beforehand if destruction is planned.	4	5	0	1	9	L

POTENTIAL ENVIRONMENTAL IMPACT	ACTIVITY	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION						RECOMMENDED MITIGATION MEASURES/ REMARKS	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION					
		M	D	S	P	Tot	SP		M	D	S	P	Tot	SP
Veld fires caused by smoking in the area during routine maintenance visits.	Use of Access tracks	6	5	1	1	12	L	Workers should be given awareness training regarding the fire hazard of the area. Inspection and maintenance vehicles should be equipped with fire extinguishers.	6	2	1	1	9	L
ISSUES RELATED TO FAUNA (Refer to Section 4 of the Ecological Impact Assessment – Appendix Diii)														
Potential for injuring animals due to vehicle use on the access roads	Use of Access tracks for maintenance purposes	6	5	0	5	55	M	Reduce travelling speed when access tracks are used for maintenance purposes. Ensure maintenance workers are aware of potential animal consecrating within the area.	6	5	0	2	22	L
Littering by employees visiting the site for routine inspections or maintenance purposes, this may lead to animal suffocations and deaths.	Use of Access tracks	4	5	1	2	20	L	Draft and Implement a strict "no littering" policy. Give awareness training to workers re. The total prohibition of littering in the study area and surrounds and implement a fining system where individuals who are caught littering are penalised financially. Also ensure that a covered rubbish receptacle is available during routine inspections.	4	2	1	2	14	L
ISSUES RELATED TO AVIFAUNA (Refer to Section 4.3 – Section 4.5 of the Avifauna Impact Assessment – Appendix Dii)														
Collisions of bird with the overhead power lines.	Operation of high voltage powerline	6	5	2	5	65	**H**	Two mitigation measures are proposed with regards to the collisions of birds with the overhead cables namely a) alignment of the powerline away from topographical features to thus limit/prevent collisions and b) the fitting of appropriate marking devices (such as bird flappers) to make the line more visible.	6	5	0	2	22	L
Electrocution of birds with the overhead power lines.	Operation of high voltage powerline	2	2	0	5	20	L	Discussions with the representative from Eskom indicated that it is planned to utilise the mono pole bird friendly structure which will significantly minimise the number of electrocutions on the powerlines.	2	2	0	1	4	L

POTENTIAL ENVIRONMENTAL IMPACT	ACTIVITY	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION						RECOMMENDED MITIGATION MEASURES/ REMARKS	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION					
		M	D	S	P	Tot	SP		M	D	S	P	Tot	SP
When a bird defecates and releases a stream of faeces it creates an air gap intrusion between the conductor and the earthed structure. A flashover occurs when an insulator string gets coated with pollutant which then causes the insulator to function incorrectly. When the pollutant is wet, the coating becomes conductive, insulation breaks down and a flashover occurs. This situation can also be created by a build up of bird faeces over a period of time on a line.	Streamers and faeces build up	6	5	0	2	22	L	Eskom has indicated that it intends to utilise the mono pole bird-friendly structure. The design of the tower needs to incorporate perch deterrents in the area directly above the insulator strings to ensure that bird species are not given the opportunity to defecate on the string	4	5	0	1	9	L
Certain structures have proven to be beneficial to certain raptors by providing roosting and nesting sites in areas where natural alternatives are scarce. The construction of bird nests on the smaller transmission lines has the potential to cause faults by creating an air gap intrusion. Various bird species use different materials they collect for nesting purposes which in turn can cause flashovers. The faults created by nests can also result in veld fires due to the nesting material catching fire as well as surrounding veld.	Bird nesting of tower structures	4	5	0	2	18	L	Eskom has indicated that it intends to utilise the mono pole bird-friendly structure. The design of the tower needs to incorporate perch deterrents in the area directly above the insulator strings to ensure that bird species are not given the opportunity to nest above these strings	2	5	0	1	7	L
ISSUES RELATED TO AESTHETIC ASPECTS (Refer to Section 4.3 – Section 4.5 of the Avifauna Impact Assessment – Appendix Dii)														
The erection of the 132kV powerline could remain aesthetically incompatible with surrounding landscape. The pylons may not blend in with the landscape and this may result in a permanent change to the existing visual quality of visually sensitive areas	Visual intrusion	2	6	2	4	40	M	Utilise exiting power line servitudes where possible.	2	3	2	2	14	L

POTENTIAL ENVIRONMENTAL IMPACT	ACTIVITY	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION						RECOMMENDED MITIGATION MEASURES/ REMARKS	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION					
		M	D	S	P	Tot	SP		M	D	S	P	Tot	SP
Vegetation clearing is required to trim, cut or clear the minimum number of trees and vegetation necessary for the safe mechanical construction and electrical operation of the 132 kV powerline and may result in visual scarring of the affected area.	Alteration to natural vegetation	2	6	2	4	40	M	Minimise the extent of cleared areas to only those necessary for completion of the works. Temporarily revegetate open areas whilst construction is underway and fully rehabilitate and revegetate the site once construction has ceased. This should be done to restrict extended periods of exposed soil. Avoid the unnecessary removal of vegetation for the power line servitudes and limit access to the servitude (during both construction and operational phases along exiting access roads)	2	3	2	2	14	L
The potential scarring of the landscape due to the creation of cleared cut-lines and new tracks	Visual intrusion	2	6	2	4	40	M	Temporarily revegetate open areas whilst construction is underway and fully rehabilitate and revegetate the site once construction has ceased. This should be done to restrict extended periods of exposed soil Avoid the unnecessary removal of vegetation for the power line servitudes and limit access to the servitude (during both construction and operational phases along exiting access roads)	2	3	2	2	14	L

7. ENVIRONMENTAL MANAGEMENT PLAN

During the Environmental Impact Assessment phase (including specialist investigations) a number of possible impacts of the proposed 132kV powerline project on the biophysical and socio-economic environment have been identified. Recommendations for the prevention and/or mitigation of these impacts during the construction and operational phases are captured in this Environmental Management Plan (EMP). This EMP serves to provide the actions for the management of identified environmental impacts emanating from the proposed development.

7.1. STRUCTURE OF THE EMP

The EMP provides mitigation and management measures for the following phases of the project:

- Construction phase

This section of the EMP provides management/mitigation measures for impacts that may be caused by the activities undertaken during the construction phase of the project. Under this section of the EMP the environmental actions, response time and responsibilities as required are specified. These specifications shall form part of the contract documentation and, therefore, the Contractor will be required to comply with the specifications to the satisfaction of the Project Co-ordinator and Environmental Control Officer, in terms of the construction contract.

- Operation phase

This section of the EMP provides management principles for the operation and maintenance phase of the proposed project. Environmental actions, procedures and responsibilities as required from Eskom within the operation and maintenance phase are stipulated in this section of the EMP.

It should be noted that this EMP is a dynamic document which should be updated as and when required on a continuous basis. This may be of particular importance once the final route alignment within the preferred corridor and the exact positioning of the poles has been selected, as at that stage it may be possible to add more 'site specific' management measures.

Any amendments made must be submitted to both the Environmental Control Officer and Project Co-ordinator for approval prior to implementation.

7.2. OBJECTIVES OF THE EMP

The EMP has been compiled in such a manner in order to achieve 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 effectively manage any environmental impacts; and
- To prevent long-term or permanent environmental degradation.

7.3. *GENERAL FUNCTIONS AND RESPONSIBILITIES*

The proposed organisational structure identifies and defines the authority structure, and the communication structure of the various parties involved in the implementation of this EMP in terms of the proposed project. All instructions and official communications regarding environmental matters and the EMP shall follow the organisational structure shown in **Figure 7-1**.

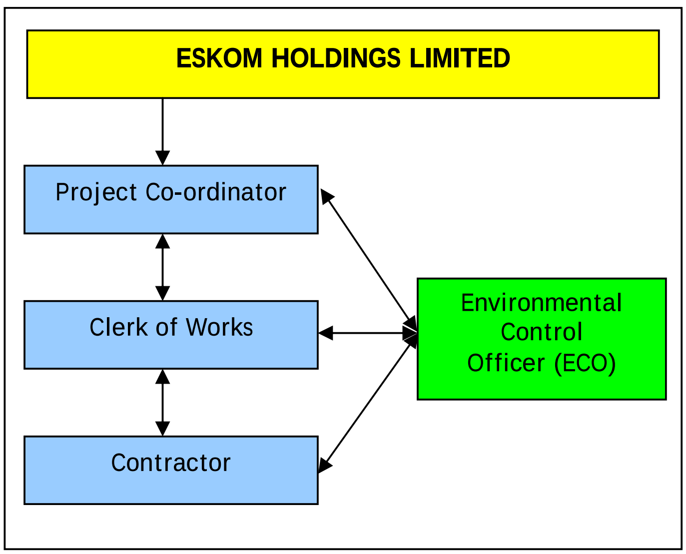

Figure 7-1: Organisational structure for construction of the proposed 132kv powerline project

Formal responsibilities are necessary to ensure that key procedures are executed. Specific responsibilities of the Project Co-ordinator, Clerk of Works and Environmental Control Officer (ECO) for this project are as detailed below.

The **Project Co-ordinator** will:

- Ensure that Eskom and the Contractor are aware of all specifications, legal constraints and Eskom standards and procedures pertaining to the project specifically with regard to the environment;
- Ensure that all stipulations within the EMP are communicated and adhered to by Eskom and its contractor(s);
- Monitor the implementation of the EMP throughout the project by means of site inspections and meetings. This should be documented as part of the site meeting minutes; and

- Be fully conversant with the Environmental Impact Report for the project, the conditions of the Environmental Authorisation (once issued), and all environmental legislation.

The **Clerk of Works** (Eskom's Representative) will:

- Be fully conversant with the Environmental Impact Report;
- Be fully conversant with the conditions of the Environmental Authorisation;
- Be fully conversant with the Environmental Management Plan;
- Be fully conversant with all environmental legislation and Eskom environmental policies and procedures, and ensure compliance with these;
- Have overall responsibility for the implementation of the EMP;
- Conduct audits to ensure compliance to the EMP;
- Liaise with the Project Co-ordinator or his delegate, the ECO and relevant discipline Engineers, on matters concerning the environment;
- Prevent actions that will harm or may cause harm to the environment, and take steps to prevent pollution on the site; and
- Confine activities to the demarcated construction site.

The **Environmental Control Officer (ECO)** will:

- Be fully conversant with the Environmental Impact Report;
- Be fully conversant with the conditions of the Environmental Authorisation;
- Be fully conversant with the Environmental Management Plan;
- Be fully conversant with all environmental legislation and Eskom environmental policies and procedures, and ensure compliance with them;
- Undertake regular and comprehensive inspection of the site and surrounding areas in order to monitor compliance with the EMP;
- Take appropriate action if the specifications are not followed;
- Monitor and verify that environmental impacts are kept to a minimum, as far as possible;
- Review and approve construction methods, with input from the Clerk of Works, where necessary;
- Ensure that activities on site comply with all relevant environmental legislation;
- Order the removal of person(s) and/or equipment in contravention of the specifications of the EMP;
- Compile progress reports on a regular basis, with input from the Clerk of Works, for
- Submission to the Project Co-ordinator, including a final post-construction audit; and
- Liaise with the Clerk of Works regarding the monitoring of the site, and to report any noncompliance or remedial measures that need to be applied.

The **Contraction Site Manager** shall:

- Ensure that the environmental specifications of this document (including any revisions, additions or amendments) are effectively implemented. This includes the on-site implementation of steps to mitigate environmental impacts;

- Ensure that all Employees and co-contractors employed comply with the requirements and provisions of the EMP;
- Prepare method statements;
- Monitor environmental performance and conformance with the specifications contained in this document during daily site inspections;
- Discuss implementation of and compliance with this document with staff at routine site meetings;
- Report progress towards implementation of and non-conformances with this document at site meetings with ECO;
- Notify ECO of the anticipated programme of works and fully disclose all details of activities involved;
- Ensure that suitable records are kept and that the appropriate documentation is available to the ECO;
- Notify the ECO of all incidents, accidents and transgressions on site with respect to environmental management as well as requirements of the EMP and corrective actions/remedial action taken;
- Report and record all accidents and incidents resulting in injury or death;
- Inform the ECO of problems arising when implementing the EMP and ways of improving the EMP; and
- Inform the ECO of any complaints received.

In terms of The Constitution of the Republic of South Africa (Act No. 108 of 1996) everyone has the right to an environment that is not harmful to their health or well-being and to have the environment protected, for benefit of present and future generations, though reasonable legislation and other measures that prevent pollution and ecological degradation, promote conservation and secure ecologically sustainable development and use of natural resources while prompting justifiable economic and social development. The needs of the environment, as well as I&APs should thus be integrated into overall project management. This Environmental Management Plan (EMP) provides a tool for meeting this objective by providing detailed mitigation and management measures in terms of the proposed environmental impacts associated by the proposed development of the 132kV powerline as well as mitigation measures as stated by the various specialists within their reports.

The following tables provide the management measures recommended to manage all the potential impacts rated in the EIA (Section 6). In addition to the management measures provided the table indicates the person responsible to ensure that these commitments are adhered to and implemented and the priority of these commitments are emphasized by the time frame within which the measure should be implemented (either prior a phase, during a phase and/or ongoing).

7.4. CONSTRUCTION PHASE

Table 7-1 provides all the management measures to be implemented during the construction activities that will be undertaken in terms of the proposed 132kV powerline project.

As the powerline will be a permanent structure within the environment and will be in use for a very long time period, no closure or decommissioning phase is associated with this project. Rehabilitation will however be undertaken during the construction phase in order to ensure that the disturbed areas are limited in size and that the affected areas are cleaned-up and rehabilitated as close as possible to the natural state it was found in.

Table 7-1: Management Measures for the Construction Phase

Environmental Aspects	Activity description and potential impacts on the environment	Management Measures and Action Plan	Time Period	Responsible Party/Person
Surface water:				
Sediment / Transport Erosion	When vegetation is removed for construction purposes soils are exposed to natural water erosion processes. Sediment can be picked up during precipitation evens and can lead to the transportation of soils.	Holes must be filled after digging and vegetation must be replaced immediately after construction to minimize the time soils are exposed to natural water erosion processes. Regular inspections should be undertaken to ensure that the excavation holes are properly backfilled and the affected area rehabilitated.	Once a week	Environmental Control Officer & Construction Site Manager
Stream Flow Reduction	Due to the alteration of the micro topography of the area, water can temporarily dam up in the construction holes where the towers need to be erected. This can lead to the reduction in the natural stream flow of surface water.	All holes and depressions caused by the construction must be back filled and proper rehabilitation of the affected areas should take place after construction. Regular inspections should be undertaken to ensure that the excavation holes are properly backfilled and the affected area rehabilitated.	Once a week	Environmental Control Officer & Construction Site Manager
Deterioration of Water Quality	During the construction phase some fuels form the construction vehicles may spill onto the soils which can lead to surface water pollution when surface runoff occurs over the affected area.	All fuels and waste used should be placed and stored in a controlled manner. When and if spillages occur, immediate remediation actions needs to be undertaken to ensure the affected area is cleaned and rehabilitated. Weekly inspections should be undertaken to ensure that waste is disposed of in a proper manner and placed correctly in demarcated area. A licence waste disposal company needs to collect and dispose the waste in a correct manner on a monthly basis. If more waste is produced than anticipated the disposal timeframe will need to be reassessed. Refer to Section 7.6.3 for the detailed waste management system.	Weekly inspections Monthly waste disposals	Environmental Control Officer
Heritage:				

Environmental Aspects	Activity description and potential impacts on the environment	Management Measures and Action Plan	Time Period	Responsible Party/Person
No known archaeological or cultural heritage resources will be impacted on the proposed 132kV powerline. The proposed development can thus be described as of Low Significance with the only potential treat being the uncovering of unknown/unidentified resources during sub-surface excavation as part of the development. All known resources from the general vicinity will be conserved. Should any archaeological or cultural heritage resources as defined and protected by the NHRA 1999 be identified during the course of development the developer should immediately cease the construction operation in the vicinity of the find and report the site to SAHRA. A qualified archaeologist will be appointed to assess the findings and propose the correct mitigation measures if possible. Regular inspections should be undertaken during the construction phase to investigate whether any potential archaeological or cultural heritage resources have been uncovered.			Weekly inspections	Environmental Control Officer
Soils:				
Site Clearing	Loss of soil due to exposed surface susceptible to wind and water erosion.	Rehabilitate the affected bare areas immediately after pole installation. Regular inspections should be undertaken to ensure that the excavation holes are properly backfilled and the affected area rehabilitated.	Once a week	Environmental Control Officer & Construction Site Manager
Topsoil Stripping	Loss of soil due to exposed surface susceptible to wind and water erosion.	Stockpile stripped soils in demarcated area. If soil is going to be stockpiled for longer than a day, spray stockpiles with mist and irrigate rehabilitated areas to minimise loss to wind. Rehabilitate the affected bare areas immediately after pole installation. Regular inspections should be undertaken to ensure that the excavation holes are properly backfilled. If dust monitoring through dust suppression measures is required the effectiveness of this should be monitored throughout the construction phase.	Once a week	Environmental Control Officer & Construction Site Manager
Deterioration of Soil Quality	During the construction phase some fuels form the construction vehicles may be spilt onto the soils which can lead to soil pollution.	All fuels and waste used should be placed and stored in a controlled manner. When and if spillages occur, immediate remediation actions needs to be undertaken to ensure the affected area is cleaned and rehabilitated. Fuel spills should be reported immediately to the Construction Site Manager as well as to the Environmental control Officer (ECO). Spillage cleaning kits should be readily available to clean any spills effectively and immediately. After a clean-up the ECO should inspect the affected site after clean-up to monitor the effectiveness of the clean-up as well as the correct manner in which the waste has been disposed of in a correct manner. Refer to Section 7.6.3 for the detailed waste management system.	When necessary	Environmental Control Officer & Construction Site Manager
Flora:				

Environmental Aspects	Activity description and potential impacts on the environment	Management Measures and Action Plan	Time Period	Responsible Party/Person
Site Clearing	Loss of protected flora species due to the removal of protected tree species at the construction areas.	Avoid destruction wherever possible and replace with trimming. According to Section 15 of the National Forests Act (Act No. 84 of 1998), no person may cut, disturb, damage or destroy any of the above-mentioned protected trees, or possess, collect, remove, transport, export, donate, purchase or sell or in any other manner acquire or dispose of any protected tree or any forest product derived from a protected tree without a license from the Department of Water Affairs and Forestry (except in terms of an exemption of this subsection published by the Minister in the Gazette on the advice of the council). Therefore a permit should be obtained beforehand if destruction or trimming is planned. Refer to Section 7.6.1. The precise location of the trees that will be removed will need to be surveyed in order to ensure that the correct trees are removed. This will furthermore ensure that the removal of protected tree species is limited to only those trees that are affected by the construction of the 132kV powerline.	Prior to construction	Environmental Control Officer & Surveyor
		Avoid destruction wherever possible and where destruction cannot be altogether avoided, appoint suitably qualified specialists to sweep areas to be cleared prior to construction in order to relocate such plants to e.g. botanical gardens or nurseries.	Prior to construction	Environmental Control Officer & Ecologist
Degradation of natural vegetation	Loss of protected flora species due to the destruction of protected tree and/or plant species by workers for medicinal use or use as fire wood.	Provide awareness training to workers re. the conservation status of protected plants prior to the commencement of construction and implement a fining system where individuals who are caught destructing protected trees or plants for whatever purpose are penalised financially.	Prior to construction	Environmental Control Officer
	An increase in the possibility of veld fires as a result of discarded cigarette or fires made by workers.	Fires should only be made in cleared areas in structures specifically constructed for this purpose. Workers should be given awareness training regarding the fire hazard of the area. Fire extinguishers should be available on site.	Prior to construction	Environmental Control Officer
Fauna:				
Potential killing of fauna	The setting of snares or traps for the killing of mammals by workers.	Draft and Implement a strict "no poaching" policy. Give awareness training to workers re. The total prohibition of poaching in the study area and surrounds and implement a fining system where individuals who are caught poaching are penalised financially. Regular site inspections should be undertaken to scan the construction and immediate area for any animal traps.	Prior to construction & Weekly inspections	Environmental Control Officer
Site Clearing	The destruction of habitats for animals, dependant on protected trees at some stage during their life cycle.	Avoid destruction wherever possible and replace with trimming where possible. A permit should be obtained beforehand if destruction or trimming is planned. Refer to Section 7.6.1	Prior to construction	Environmental Control Officer

Environmental Aspects	Activity description and potential impacts on the environment	Management Measures and Action Plan	Time Period	Responsible Party/Person
	A decrease in the number of food sources available to animals. A decrease in the number of shade trees available to animals.	Undertake regular site inspections in order to ensure that construction activities are restricted to the demarcated powerline construction phase.	Weekly inspections	Environmental Control Officer & Construction Site Manager
General construction	An increase in instances of littering by workers working in the area, which may lead to animal suffocations and deaths.	Draft and Implement a strict "no littering" policy. Give awareness training to workers re. The total prohibition of littering in the study area and surrounds and implement a fining system where individuals who are caught littering are penalised financially. Also ensure that an adequate number of covered rubbish receptacles are available during construction. Refer to Section 7.6.3 for the detailed waste management system.	Prior to construction	Environmental Control Officer
Avifauna:				
Site Clearing	Impact on local bird community due to disturbance caused by construction activities.	The recommendations with regards to minimising the amount of impact that habitat disturbance are as follows: - Habitat clearance must remain at an absolute minimum. - Staff members responsible for the erection of the powerlines must remain within the designated work areas	Prior to construction	Environmental Control Officer & Construction Site Manager
		The ECO should be briefed on the need to notify the ornithologist with the Northern Cape Department of Environment, Tourism and Conservation should any breeding birds be found within the servitude and in particular large breeding species such as korhaans and bustards.	When necessary	Environmental Control Officer
Site Clearing	Impact on local bird community due to habitat loss.	If possible the servitude should follow existing roads where possible and should not cut across habitat. The purpose of this is to minimise the amount of fragmentation occurring within habitat and to rather lose habitat. All construction and maintenance activities must be undertaken in accordance with Eskom Transmissions environmental best practice standards. All construction and access roads should be restricted as much as possible.	Prior to construction & during construction phase	Environmental Control Officer
Visual:				
Site Clearing	Dust generated due to construction activities, earthworks, hauling and site clearance.	During construction of the proposed 132kV power line, construction roads will require an effective dust suppression management programme, such as regular wetting and/or the use of non-polluting chemicals that will retain moisture in the road surface. Regular site inspections should be undertaken to ensure the effectiveness of the dust suppression management programme.	Weekly inspections	Environmental Control Officer
	Large denude areas as a result of site clearance may cause unpleasant sites for visual receptors.	Minimise the extent of cleared areas to only those necessary for completion of the works. Temporarily revegetate open areas whilst construction is underway and fully	Monthly inspections	Environmental Control Officer & Construction Site Manager

Environmental Aspects	Activity description and potential impacts on the environment	Management Measures and Action Plan	Time Period	Responsible Party/Person
		rehabilitate and revegetate the site once construction has ceased. This should be done to restrict extended periods of exposed soil. Utilise exiting power line servitudes where possible. Avoid the unnecessary removal of vegetation for the power line servitudes and limit access to the servitude (during both construction and operational phases along exiting access roads. Regular site inspections should be undertaken to ensure that construction activities remains within the demarcated area for the 132kV powerline.		
General Construction	Visual intrusion of site camp, vehicles and associated infrastructure.	Appropriately site the construction camp as well as other storage areas and consider screening through the erection of shade cloth visual barrier. Site ablution facilities out of view of road users. Avoid the unnecessary removal of vegetation for the power line servitudes and limit access to the servitude (during both construction and operational phases along exiting access roads. Regular site inspections should be undertaken to ensure that construction activities remains within the demarcated area for the 132kV powerline. Ensure sewage removal company regularly extract and dispose of waste in proper manner throughout the construction phase. Refer to Section 7.6.3 for the detailed waste management system.	Monthly inspections	Environmental Control Officer & Construction Site Manager
	Visual intrusion of stockpiles and material storage areas.	Decrease the height of material stockpiles and locate these areas away from view of road users.	Throughout construction phase	Environmental Control Officer & Construction Site Manager
	Visual intrusion due to change in sense of place, increased activity and traffic in the area	Temporarily revegetate open areas whilst construction is underway and fully rehabilitate and revegetate the site once construction has ceased. This should be done to restrict extended periods of exposed soil. Utilise exiting power line servitudes where possible. Avoid the unnecessary removal of vegetation for the power line servitudes and limit access to the servitude (during both construction and operational phases along exiting access roads.	Throughout construction phase	Environmental Control Officer & Construction Site Manager

Environmental Aspects	Activity description and potential impacts on the environment	Management Measures and Action Plan	Time Period	Responsible Party/Person
		Regular site inspections should be undertaken to ensure that construction activities remains within the demarcated area for the 132kV powerline and that the disturbed areas are properly backfilled and rehabilitated.		
Social:				
Site Clearing	Dust generated due to construction activities, earthworks, hauling and site clearance.	During construction of the proposed 132kV power line, construction roads will require an effective dust suppression management programme, such as regular wetting and/or the use of non-polluting chemicals that will retain moisture in the road surface. Regular site inspections should be undertaken to ensure the effectiveness of the dust suppression management programme.	Weekly inspections	Environmental Control Officer
General construction	Visual intrusion of site camp, vehicles and associated infrastructure.	Appropriately site the construction camp as well as other storage areas and consider screening through the erection of shade cloth visual barrier. Site ablution facilities out of view of road users. Avoid the unnecessary removal of vegetation for the power line servitudes and limit access to the servitude (during both construction and operational phases along exiting access roads. Regular site inspections should be undertaken to ensure that construction activities remains within the demarcated area for the 132kV powerline. Ensure sewage removal company regularly extract and dispose of waste in proper manner throughout the construction phase. Refer to Section 7.6.3 for the detailed waste management system.	Monthly inspections	Environmental Control Officer & Construction Site Manager

7.5. OPERATIONAL PHASE

Table 7-2 provides all the management measures to be implemented during the operational activities that will be undertaken in terms of the proposed 132kV powerline project.

Table 7-2: Management Measures for the Operational Phase

Environmental Aspects	Activity description and potential impacts on the environment	Management Measures and Action Plan	Time Period	Responsible Party/Person
Surface water:				
Use of Access tracks for maintenance purposes	During operation service and maintenance vehicles will be used, this will cause a track to form. This track will expose bare soil and during rain event this soil will be washed into the rivers.	The same track will be used at all times, so as to limit the exposure of the impact. This is an environmental impact that is inevitable to occur. The only preventative measure that can be taken at this stage is to ensure that the same track is used during the maintenance phase in order to ensure that the impact is restricted to the demarcated area.	During routine maintenance and emergency maintenance	Environmental Control Officer & EKSOM maintenance team
	Where erosion has taken place and dongas are formed, surface runoff will get trapped, therefore reducing the natural stream flow.	All vegetation will be replaced to ensure less erosion will form and therefore less runoff will be trapped. Ensure final site inspection before releasing the construction team of their duties is undertaken. During this site inspection ensure that all rehabilitated areas are revegetated and natural succession has occurred.	Start of operation phase	Environmental Control Officer & Construction Site Manager
	Soil could be washed or carried by wind from disturbed areas such as tracks made by service vehicles; this will increase sediment in the rivers.	The same track will be used at all times, so as to limit the exposure of the impact. This is an environmental impact that is inevitable to occur. The only preventative measure that can be taken at this stage is to ensure that the same track is used during the maintenance phase in order to ensure that the impact is restricted to the demarcated area. All vegetation will be replaced to ensure less erosion will form and therefore less runoff will be trapped.	During routine maintenance and emergency maintenance	Environmental Control Officer & EKSOM maintenance team
Soils:				
Use of Access tracks for maintenance purposes	Using access tracks during regular maintenance will cause loose soil particles to become airborne.	Ensure final site inspection before releasing the construction team of their duties is undertaken. During this site inspection ensure that all rehabilitated areas are revegetated and natural succession has occurred. Ensure sufficient grass cover in worked areas as well as access tracks	Start of operation phase	Environmental Control Officer & Construction Site Manager
		Reduce travelling speed when using the access tracks to limit dust creation. The same track will be used at all times, so as to limit the exposure of the impact. This is an environmental impact that is inevitable to occur. The only preventative measure that can be taken at this stage is to ensure that the same	During routine maintenance and emergency	Environmental Control Officer & EKSOM maintenance team

Environmental Aspects	Activity description and potential impacts on the environment	Management Measures and Action Plan	Time Period	Responsible Party/Person
		track is used during the maintenance phase in order to ensure that the impact is restricted to the demarcated area. All vegetation will be replaced to ensure less erosion will form and therefore less runoff will be trapped.	maintenance	
Flora:				
Use of Access tracks for maintenance purposes	An increase in the number of alien weeds and invasive plants in disturbed areas.	Limit vegetation clearing to the absolute minimum and control individuals of alien weeds and invasive plants in disturbed areas according to the requirements of Regulations 15(a) and (e) of the regulations made in terms of Section 29 of the Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983). Ensure appropriate weed eradication programme is set in place for the life of the project.	During whole operational phase	Environmental Control Officer & Ecologist
	The disturbance or destruction of protected tree species during routine maintenance visits to the area.	Avoid destruction wherever possible and replace with trimming where possible. A permit should be obtained beforehand if destruction or trimming is planned. Refer to Section 7.6.1	During whole operational phase	Environmental Control Officer & Ecologist
	The disturbance or destruction of protected plant species during routine maintenance visits to the area.	Avoid destruction wherever possible. A permit should be obtained beforehand if destruction is planned. Refer to Section 7.6.1	During whole operational phase	Environmental Control Officer & Ecologist
	Veld fires caused by smoking in the area during routine maintenance visits.	Workers should be given awareness training regarding the fire hazard of the area. Inspection and maintenance vehicles should be equipped with fire extinguishers.	During whole operational phase	Environmental Control Officer
Fauna:				
Use of Access tracks for maintenance purposes	Potential for injuring animals due to vehicle use on the access roads.	Reduce travelling speed when access tracks are used for maintenance purposes. Ensure maintenance workers are aware of potential animal consecrating within the area.	Induction	Environmental Control Officer & EKSOM maintenance team
	Littering by employees visiting the site for routine inspections or maintenance purposes, this may lead to animal suffocations and deaths.	Draft and Implement a strict "no littering" policy. Give awareness training to workers regarding the total prohibition of littering in the study area and surrounds and implement a fining system where individuals who are caught littering are penalised financially. Also ensure that a covered rubbish receptacle is available during routine inspections.	Induction & During operational phase	Environmental Control Officer & EKSOM maintenance team
Avifauna:				
Operation of high voltage powerline	Collisions of bird with the overhead power lines.	Two mitigation measures are proposed with regards to the collisions of birds with the overhead cables namely: a) alignment of the powerline away from topographical features to thus limit/prevent collisions; and	During whole operational phase	ESKOM Engineer; Environmental Control Officer & EKSOM

Environmental Aspects	Activity description and potential impacts on the environment	Management Measures and Action Plan	Time Period	Responsible Party/Person
		b) the fitting of appropriate marking devices (such as bird flappers) to make the line more visible.		maintenance team
	Electrocution of birds with the overhead power lines.	Discussions with the representative from Eskom indicated that it is planned to utilise the mono pole bird friendly structure which will significantly minimise the number of electrocutions on the powerlines.	Design phase and maintenance phase	ESKOM Engineer
Streamers and faeces build up	When a bird defecates and releases a stream of faeces it creates an air gap intrusion between the conductor and the earthed structure. This can cause the insulators to function incorrectly. This situation can also be created by a build up of bird faeces over a period of time on a line.	Eskom has indicated that it intends to utilise the mono pole bird-friendly structure. The design of the tower needs to incorporate perch deterrents in the area directly above the insulator strings to ensure that bird species are not given the opportunity to defecate on the string.	Design phase and maintenance phase	ESKOM Engineer
Bird nesting of tower structures	The construction of bird nests on the smaller transmission lines has the potential to cause faults by creating an air gap intrusion. The faults created by nests can also result in veld fires due to the nesting material catching fire as well as surrounding veld.	Eskom has indicated that it intends to utilise the mono pole bird-friendly structure. The design of the tower needs to incorporate perch deterrents in the area directly above the insulator strings to ensure that bird species are not given the opportunity to nest above these strings.	Design phase and maintenance phase	ESKOM Engineer
Visual:				
Visual intrusion	The erection of the 132kV powerline could remain aesthetically incompatible with surrounding landscape. The pylons may not blend in with the landscape and this may result in a permanent change to the existing visual quality of visually sensitive areas.	Utilise exiting power line servitudes where possible.	Design phase and maintenance phase	ESKOM Engineer
	The potential scarring of the landscape due to the creation of cleared cut-lines and new tracks.	Avoid the unnecessary removal of vegetation for the power line servitudes and limit access to the servitude. Regular site visits will be undertaken to ensure that no additional vegetation or natural environment is affected by the operational and maintenance phases of the proposed 132kV powerline.	Monthly inspections	Environmental Control Officer
Alteration to natural vegetation	Vegetation clearing is required to trim, cut or clear the minimum number of trees and vegetation necessary for the safe mechanical construction and electrical operation of the 132 kV powerline and may result in visual scarring of the affected area.	Avoid the unnecessary removal of vegetation for the power line servitudes and limit access to the servitude. Regular site visits will be undertaken to ensure that no additional vegetation or natural environment is affected by the operational and maintenance phases of the proposed 132kV powerline.	Monthly inspections	Environmental Control Officer

7.6. ENVIRONMENTAL PERMITTING REQUIREMENTS

The Environmental Permit which will be required to be obtained for construction of the proposed powerline is discussed briefly below. This permit will be required to be obtained before construction commences.

7.6.1. Protected Trees and Plant Species

- **Protected Tree Species**

Three of the tree species, found in the study area, are protected in terms of Section 12 of the National Forests Act, 1998 (Act No. 84 of 1998). For further detail about the protected trees identified on site refer to Section 4.5.4.

According to Section 15 of the National Forests Act, 1998 (Act No. 84 of 1998), no person may cut, disturb, damage or destroy any of the above-mentioned protected trees, or possess, collect, remove, transport, export, donate, purchase or sell or in any other manner acquire or dispose of any protected tree or any forest product derived from a protected tree without a license from the Department of Water and Environmental Affairs (except in terms of an exemption of this subsection published by the Minister in the Gazette on the advice of the council).

- **Protected Plant Species**

Two of the plant species, recorded within the study area, were identified as protected plant species. For further detail about the protected plants identified on site refer to Section 4.5.4.

According to the requirements of Section 63 of the aforementioned Ordinance, no person shall without a permit take any of the following actions:

- Pick any protected flora; and/or
- Pick any flora on a public road or on the land on either side of such road within a distance of ninety metres from the centre of such road; and/or
- Pick any protected or indigenous unprotected flora on land of which he is not the owner, without the permission of the owner of such land or of any person authorised by such owner to grant such permission.

7.6.2. Protected Fauna Species

According to Section 27 of the Northern Cape Province under the Nature and Environmental Conservation Ordinance, 1974 (Ordinance No. 19 of 1974), no person shall without a permit hunt or be in possession of any endangered wild animal or the carcase of any such animal. In addition hereto, no person shall, subject to the provisions of subsections (2) and (3) of Section 27, hunt any protected wild animal during any hunting season, unless he is the holder of a permit or of a licence in the prescribed form issued to him by the Director, a receiver of revenue or any person authorised to do so by the Director on payment of the prescribed fee, or at any other time unless he is the holder of a permit to do so.

7.6.3. Waste Management System

All waste (general and hazardous) generated during the construction of the powerline and associated infrastructure may only be disposed of at appropriately licensed sites (in terms of Section 20 of the Environment Conservation Act, 1989 (Act No. 73 of 1989).

Cognisance must also be taken of the relevant provincial legislation in this regard. It should be noted that all controlling authority regulations pertaining to litter in terms of the Environment Conservation Act (sections 19, 19A and 24A) have been delegated to the provinces.

- **General Waste**

Waste generated by the Contractor shall be the responsibility of the Contractor, and shall be disposed of at an appropriate licensed waste disposal facility. The ECO will monitor the effectiveness of the waste management procedures.

The Contractor shall ensure the implementation of the following waste management procedures:

- Maintain good housekeeping practices to ensure that there is proper collection and no accumulation of waste within the site area;
- Ensure that construction workers are educated as to the different types of waste generated during construction, and that the waste is correctly disposed of.
- Provide appropriate containers (with lids/nets where waste could become airborne) within designated areas for construction rubble, general waste and hazardous waste on site;
- Ensure that the containers designated for the disposal of waste are appropriately and clearly marked according to the intended waste stream. Use should be made of appropriate pictures and colours to ensure that the containers are easily identifiable by all members of the construction workforce;
- Arrange for the removal of full waste containers as soon as possible by an appropriate waste contractor to be disposed of at an appropriately licensed disposal site. The Contractor shall supply the ECO with a certificate of disposal;
- Ensure that all waste is removed off site to an approved waste disposal site;
- Ensure no waste is burned, buried or used for rehabilitation purposes;
- Prevent temporary dumping of waste anywhere on site;
- Hazardous waste shall not be stored or stockpiled in any area other than that designated on the construction site layout. The location of this area shall be agreed with the Clerk of Works;
- Ensure that Hazardous Waste Disposal Manifests are obtained from the administrators of hazardous waste disposal sites. Hazardous waste should be disposed of at the nearest appropriate licensed Hazardous Waste Disposal Site;
- Ensure that no hazardous waste is disposed of in containers intended for general waste;
- Documentation regarding waste collection and disposal/recycling shall be collated and made available to the Project Co-ordinator, his delegate, or the ECO, on request; and

- Littering, specifically of the natural areas, should be prevented. Adequate containers for litter removal should be supplied on site. These containers should be emptied on a regular basis and the contents removed to an appropriate and licensed waste disposal site. Illegal dumping shall not be tolerated.

- **Hazardous Waste**

The Contractor shall ensure the implementation of the following procedures for the management of hazardous substances:

- Identify and maintain a register of all activities that involve the handling of potentially hazardous substances, as well as devise and supervise the implementation of protocols for the handling of these substances. This will include all fuels, oils, lubricants and grease;
- Ensure that all hazardous substances are handled in accordance with the manufacturer's specifications, legal requirements and Eskom's procedures;
- Store all hazardous substances (including oils, fuels, chemicals, etc.) in a manner prescribed in the relevant Acts and Regulations, namely the Environment Conservation
- Act, 1989 (Act No. 73 of 1989), the Hazardous Substances Act, 1973 (Act 15 of 1973) and the National Water Act, 1956 (Act No. 54 of 1956);
- Implement appropriate actions and measures to reduce, stop or contain a spill of potentially hazardous substances (e.g. fuel or lubricating oil);
- Implement appropriate actions and measures to reduce or prevent contamination of the ground and surface water as a result of a spill of potentially hazardous substances.
- Arrange and supervise the implementation of clean-up operations and appropriate disposal of contaminated materials at a licensed hazardous waste disposal site;
- Keep written records detailing the type of spill, the corrective and remedial measures implemented in the stopping or reduction of the spill, and the clean up of the spill.
- Such progress reporting is important for monitoring and auditing purposes and the written reports may afterwards be used for training purposes in an effort to prevent similar future occurrences; and
- Report the nature and extent of the spill to the Environmental Control Officer, the Risk Manager and the Technical Service Officer at the nearest Eskom Depot as soon as reasonably possible, but within 24 hours.

The ECO shall prescribe measures to be implemented in order to prevent spills of potentially hazardous substances.

8. RECOMMENDATIONS

The impact analysis highlighted most impacts as being of low significance with the exception of the destruction of individual protected flora species which was rated a high significance rating. If possible the destruction of protected tree species should be replaced with trimming.

The destruction of individual protected flora species is a negative impact which is likely to occur if trimming cannot be applied, but this activity cannot be legally undertaken by ESKOM unless a permit is obtained in terms of Section 63 the Nature and Environmental Conservation Ordinance, 1974 (Ordinance No. 19 of 1974). Therefore although this impact is likely to occur, it is not considered a fatal flaw. However, it does not reduce the significance of the impact should it occur.

Section 5 assessed the alternatives in terms of the proposed distribution powerline. Based on this assessment the corridor options 4 and 5 are the preferred recommended option for the powerline alignment. These two options are preferred in terms of reducing negative impacts on protected tree species, sensitive (conservation) areas and avifauna. This is due to the fact that the mentioned corridor options run along an existing servitude (not currently used) which has been degraded to an extent. These options area also acceptable in terms of visual aspects as these alignments will run along a regional road that is less frequently used compared to the alternative road within the study area.

Therefore, the construction of the proposed 132kV overhead powerline between the Klipkop Substation and the Umtu Substation and associated infrastructure with suggested mitigation measures is recommended within corridors 4 and 5.

9. CONCLUSION

The Environmental Impact Assessment (EIA) process for the proposed 132kV powerline between the Klipkop and Umtu Substation has been undertaken in accordance with the EIA Regulations (GN. R385 to R387 of 2006).

A range of relevant legislation, policies and plans have been considered in the assessment of the proposed development. Further to this the relevant legislation has informed the identification and development of appropriate management and mitigation measures and is incorporated in the Environmental Management Plan (EMP) section of this document. These measures must be implemented in order to minimise potentially significant impacts associated with all phases of the development.

The conclusion and recommendations of this Draft EIA report are a result of comprehensive studies and specialists assessments. These studies were based largely on issues identified during the Scoping phase of this project. The public consultation process has been comprehensive, and every effort has been made to inform all stakeholders and I&APs of the proposed project.

The potential significant environmental impacts associated with the proposed project as discussed in this EIA report include:

- Potential impacts on avifauna (birds);
- Potential impacts on fauna and flora;
- Potential impacts on soils and land use;
- Potential impacts on surface water; and
- Potential impacts on scenic value.

During the EIA phase, relevant stakeholders and I&APs were encourage to provide input regarding alternative corridors. The alternatives identified and discussed in **Section 5** was thus the result of input from I&APs, specialists assessments and the EIA Project Team. The following alternatives were considered:

- Proposed corridor alignment options;
- Technology alternatives; and
- No-Go alternative.

All alternatives excluding the alternative corridors were considered as being unfeasible.

Identified impacts and associated management/mitigation measures for the construction and operation of the proposed 132kV powerline development must be implemented as stipulated in the EMP of this report (**Section 7**) during the construction and operational phases of the proposed development.

The findings of the EIA for the construction and operation of the proposed 132kV powerline and associated infrastructure show that there area no environmental fatal flaws that should prevent the proposed project to proceeding.

10. REFERENCES

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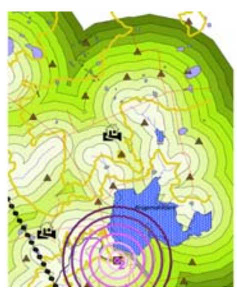
Black Rock Proposed 132kV Powerline

Appendix A: Declaration of Independence

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CONSULTANTS IN WATER, ENVIRONMENTAL AND APPLIED EARTH SCIENCES

March 2010

Declaration of Independence

I, Selma Nel as duly authorised representative of **Ivuzi (Pty) Ltd**, hereby confirm my independence (as well as that of **Ivuzi**) as an Environmental Scientist and declare that neither I nor **Ivuzi** have any interest, be it business, financial, personal or other, in any proposed activity, application or appeal in respect of which **Ivuzi** was appointed as environmental assessment practitioner in terms of the Natural Environmental Management Act, 1998 (Act No. 107 of 1998), other than fair remuneration for worked performed, specifically in connection with the Environmental Impact Assessment for the proposed Black Rock 132kV Distribution Powerline.

Full Name: Selma Nel

Title/Position: Environmental Scientist
Qualification: MA (Environmental Management)
Experience (years/months): 3 years

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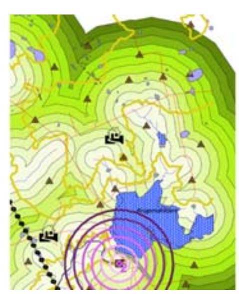
Appendix B: Project Team - Curriculum Vitae
Tanja Bekker




PERSONAL DETAILS

NAME: **Tanja Bekker**

DATE OF BIRTH: **23.06.1980**

NATIONALITY: **South African**

TITLE: Environmental Unit Manager

Tanja is appointed as the Environmental Unit Manager for GCS (Pty) Ltd and has 7 years experience in the environmental consultancy industry. Project Management and Coordination of projects forms a critical component of her duties, which includes project planning, initiation of project, client, authority and stakeholder consultation, specialist coordination, budget control, process control, quality control and timeframe management. She is responsible for the mentoring and capacity building of the Environmental Unit. Her interest lies in the mining industry with the main focus on the compilation, implementation and assessing of Environmental Management Programmes in terms of the Mineral and Petroleum Resources Development Act. Tanja has a comprehensive experience and thorough understanding of the National Environmental Management Act and subsequent regulations. Tanja is involved in conducting environmental audits and site assessments, as well as assessing environmental compliance for specifically mining clients.

ACADEMIC QUALIFICATIONS

2004 M.Sc (Environmental Management): Rand Afrikaans University, Johannesburg, South Africa

2002 B.Sc (Hons) (Geography / Environmental Management): Rand Afrikaans University, Johannesburg, South Africa

2001 BSc (Geography / Environmental Management/ Geology): Rand Afrikaans University, Johannesburg, South Africa

CERTIFICATES AND DIPLOMAS

2004	ISO 14000 Lead Auditors
2005	Certificate in Project Management Practices and Principles
2008	Management Advance Programme (MAP81)

PROFESSIONAL REGISTRATION AND AFFILIATIONS

Member: International Association for Impact Assessment South Africa

LANGUAGE PROFICIENCY

English (excellent)
Afrikaans (excellent)
German (poor)

EMPLOYMENT HISTORY

April 2000 to June 2002:	UWP Engineers (Part time)
October 2002 to September 2003:	Digby Wells and Associates (Part time)
September 2003 to May 2006:	GCS (Pty) Ltd.
May 2006 to December 2006:	WSP Consulting
December 2006 to current:	GCS (Pty) Ltd

FIELDS OF SPECIALIZATION

- Project Management;
- Prospecting- and Mining Rights / Permit Application;
- Public / Stakeholder Participation;
- Environmental Management Plans according to the Mineral and Petroleum Resources Development Act of 2002;
- Environmental Impact Assessment and Management Programmes according to the Mineral and Petroleum Resources Development Act of 2002;
- Basic Assessments, Scoping Studies and Environmental Impact Assessments according to the National Environmental Management Act of 1998;
- Due Diligence Assessments and Reports;
- Closure Cost Estimations;
- Environmental Legal Compliance and Performance Assessments;
- ISO 14000 Audits.

KEY PROJECTS

The following provide a concise list of projects where she has actively been involved in:

1. International Projects

- Environmental Management Programme – Form part of project team and was specifically responsible for initial authorities liaison and stakeholder notification documentation (2004)

2. National Water Act, 1998:

- Water Use License Application in terms of the National Water Act, 1998 – Compilation of the Water Use License Application for Eden Districts Municipality (2004)

3. Minerals Act, 1991

- Environmental Management Programme Report in terms of the Minerals Act of 1991 - Compilation of the Addendum Report for Two Rivers Platinum (2004)

4. Mineral and Petroleum Resources Development Act, 2002

- Prospecting Right Application and Environmental Management Plan – Project manager and co-ordination of the environmental authorisation process on the farm McCarthy for Assmang Ltd for the prospecting of iron ore in the Northern Cape Province. Responsibilities included the overall management of the project with the compilation of the application and subsequent Environmental Management Plan (2004)
- Prospecting Right Application and Environmental Management Plan – Project manager and co-ordination of the environmental authorisation process on the farm Doornfontein for Assmang Ltd for the prospecting of iron ore in the Northern Cape Province. Responsibilities included the overall management of the project with the compilation of the application and subsequent Environmental Management Plan (2004)
- Prospecting Right Application – Main responsibility involved the compilation and submission of a Prospecting Right Application and associated Environmental Management Plan for Rovic (Pty) Ltd on the farm Rietkuil (2005)
- Prospecting Right Application – Main responsibility involved the compilation and submission of a Prospecting Right Application and associated Environmental Management Plan for Rovic (Pty) Ltd on the farms Ou Damplaats, Mineside, Redhills, Woolcott and Prospect (2005)
- Prospecting Right Application – Project manager for the environmental authorisation process for a Prospecting Right Application for Khusela Womens Investments (Pty) Ltd on the farm

Loopspruit in the Mpumalanga Province. Main responsibility involved the coordination of the public participation process and associated Environmental Management Plan (2005)

- Prospecting Right Application – Project manager for the environmental authorisation process for a Prospecting Right Application for Khusela Womens Investments (Pty) Ltd on the farm Van Kolderskop in the Mpumalanga Province. Main responsibility involved the coordination of the public participation process and associated Environmental Management Plan (2005)
- Mining Right Application, Environmental Authorisation and Rehabilitation Fund - Project manager and co-ordination of the environmental authorisation process for the green fields Khumani Iron Ore Mine for Assmang Ltd. Main responsibilities involved the application for the Mining Right Application and subsequent liaison with the relevant authorities; coordination and management of sub consultants; liaison with the relevant stakeholders, which included the consultation in terms of purchasing of land and utilisation of bulk services; coordination and management of the public participation process; overview of the Water Use License Application; Environmental Feasibility Reporting; Site Selection process for the location of a paste disposal facility; Scoping Reporting and Environmental Impact Assessment and Management Reporting and the compilation of the rehabilitation fund (2006)
- Environmental Programme Addendum – Project manager and coordination of the addendum of the Harmony Randfontein Operation's approved Environmental Management Programme to alight the report with the requirements of the Mineral and Petroleum Resources Development Act, 2002, as well as the undertaking of the relevant public participation process
- Environmental Programme Addendum – Project manager and coordination of the addendum of the Harmony Randfontein Operation's approved Environmental Management Programme to allign the report with the requirements of the Mineral and Petroleum Resources Development Act, 2002, as well as the undertaking of the relevant public participation process (2006)
- Environmental Programme Amendment - Project manager and coordination of the Merensky Environmental Management Programme Amendment for Anglo Platinum in Amandelbult. Main responsibilities involved the coordination of sub consultants, quality control, coordination of the public participation process and client liaison (2006)
- Environmental Programme Amendment - Project manager and coordination of the UG2 Environmental Management Programme Amendment for Anglo Platinum in Amandelbult. Main responsibilities involved the coordination of sub consultants, quality control, coordination of the public participation process and client liaison (2006)
- Environmental Programme Amendment - Project manager and coordination of the Khumani Iron Ore Mine Amendment for the inclusion of the mining of the barrier pillar between the mine and Sishen Iron Ore Mine for Assmang Limited. Main responsibilities involved the coordination and management of the project, quality control, coordination of the public

participation process and client liaison, as well as the formulation of the financial closure cost (2007)

- Mining Right Application and Environmental Management Programme - Project manager and coordination for a mega tailings dam extension for Mine Waste Solutions, First Uranium South Africa in the Northwest Province. Main responsibilities involved the coordination and management of the project, quality control, coordination of the public participation process and client liaison, as well as the formulation of the financial closure cost (2007)
- Environmental Management Programme - Project manager and coordination of the green fields East Mine Expansion Project for Total Coal South Africa for the establishment of new opencast and underground operations with the associated plant and ancillary infrastructure, including a railway line link to the Richard Bay Coal Terminal. Main responsibilities involved the coordination and management of the project, compilation of the environmental feasibility report, site selection for a co-disposal facility and new railway line, quality control, coordination of the public participation process and client liaison, as well as the formulation of the financial closure cost (2008)
- Environmental Programme Amendment – Project manager and coordination of the amendment of the Harmony Kalgold Operation's approved Environmental Management Programme to align the report with the requirements of the Mineral and Petroleum Resources Development Act, 2002. Main responsibilities involved the coordination and management of the project, , quality control, coordination of the public participation process and client liaison, as well as the formulation of the financial closure cost, as well as the undertaking of the relevant public participation process (2008)
- Environmental Management Programme Amendment - Project manager and coordination of the East Mine Option 1 Project for Total Coal South Africa for the establishment of conveyor line link to the Richard Bay Coal Terminal. Main responsibilities involved the coordination and management of the project, quality control, and client liaison, as well as the formulation of the financial closure cost (2009 and ongoing)
- Environmental Management Programme Amendment - Project manager and coordination of the West Mine Project for Total Coal South Africa for the establishment of new opencast and underground operations with the associated plant and ancillary infrastructure. Main responsibilities involved the coordination and management of the project, quality control and client liaison (2009 and ongoing)
- Environmental Management Programme Amendment – P roject manager and coordination of the Black Rock Manganese Mines for Assmang Ltd to align the report with the requirements of the Mineral and Petroleum Resources Development Act, 2002 and to include activities such as a new plant, water treatment facility, footprint increases, etc. Main responsibilities involved the coordination and management of the project, quality control, coordination of the public participation process and client liaison, as well as the formulation of the financial closure cost (2009 and ongoing)

- Glossam Closure Assessment - Project manager of the historic Glossam Mine operations for Assmang Ltd to obtain closure in terms of the requirements of the Mineral and Petroleum Resources Development Act, 2002 Main responsibilities involve the coordination and management of the project, quality control, client liaison, as well as the formulation of the financial closure cost (2009 and ongoing)
- Financial Provision Assessment – Responsible for the assessment of and reporting on the financial closure cost for Assmang Ltd for the Beeshoek Iron Ore Mine, Northern Cape (2007)
- Financial Provision Assessment – Responsible for the assessment of and reporting on the financial closure cost for Simmer and Jack Ltd for the Buffelsfontein Gold Mine, Northwest Province (2007)
- Financial Provision Assessment – Responsible for the assessment of and reporting on the financial closure cost for Simmer and Jack Ltd for the Buffelsfontein Gold Mine, Northwest Province (2008)
- Financial Provision Assessment – Responsible for the assessment of and reporting on the financial closure cost for Assmang Ltd for the Beeshoek Iron Ore Mine, Northern Cape (2009)
- Financial Provision Assessment – Responsible for the assessment of and reporting on the financial closure cost for Assmang Ltd for the Khumani Iron Ore Mine, Northern Cape (2009)
- Financial Provision Assessment – Responsible for the assessment of and reporting on the financial closure cost for Assmang Ltd for the Black Rock Manganese Mine, Northern Cape (2009)
- Financial Provision Assessment – Responsible for the assessment of and reporting on the financial closure cost for Simmer and Jack Ltd for the Buffelsfontein Gold Mine, Northwest Province (2009)

5. Environmental Conservation Act, 1989

- Environmental Authorisation - Project manager and co-ordination of the environmental authorisation process for the green fields Khumani Iron Ore Mine for Assmang Ltd to obtain approval for listed activities (2005)
- Environmental Authorisation – Compilation of the Environmental Impact Assessment Report for the Gerus-Murani Power line in Namibia for NamPower (2006)
- Environmental Authorisation – Project manager and co-ordination of the environmental authorisation for Blue Horisons Investments for the Paarl eco-estate development in Lephalale, Limpopo Province. Main responsibilities involved the coordination of sub consultants, quality control, coordination of the public participation process and client liaison (2006)

- Environmental Authorisation – Project manager and co-ordination of the environmental authorisation for Blue Horisons Investments for the Madulakgogo eco-estate development in Burgersford, Mpumalanga Province. Main responsibilities involved the coordination of sub consultants, quality control, coordination of the public participation process and client liaison (2006)

6. National Environmental Management Act, 1998 and Subsequent Regulations 385, 586, and 387

- Environmental Authorisation for listed activities - Project manager and coordination for a mega tailings dam extension and associated listed activities (linear, plant, areas greater than 20ha, etc.) for Mine Waste Solutions, First Uranium South Africa in the Northwest Province. Main responsibilities involved the coordination and management of the project, quality control, coordination of the public participation process and client liaison, as well as the formulation of the financial closure cost (2007)
- Environmental Authorisation for listed activities - Project manager and coordination of the green fields East Mine Expansion Project for Total Coal South Africa for the authorisation of listed activities that included areas greater than 20ha, railway lines, conveyors, mining within wetland and watercourse areas, etc. Main responsibilities involved the coordination and management of the project, site selection for a co-disposal facility and new railway line, quality control, coordination of the public participation process and client liaison, as well as the formulation of the financial closure cost (2008)
- Basic Assessment for listed activities - Project manager and coordination for Assmang Ltd for the Khumani Iron Ore Mine for the temporary storage of diesel along the railway line. Main responsibilities involved the coordination and management of the project, site selection for a co-disposal facility and new railway line, quality control, coordination of the public participation process and client liaison, as well as the formulation of the financial closure cost (2008)
- Basic Assessment for listed activities - Project manager and coordination for Harmony Gold Mines Limited for the Evander Operations for the closure of a domestic waste disposal site. Main responsibilities involved the coordination and management of the project, co ordination of specialists, closure alternatives, quality control, coordination of the public participation process and client liaison (2008)
- Environmental Authorisation for listed activities - Project manager and coordination of the West Mine Expansion Project for Total Coal South Africa for the authorisation of listed activities that included areas greater than 20ha, conveyors, mining within wetland and watercourse areas, etc. Main responsibilities involved the coordination and management of the project, quality control, coordination of the public participation process and client liaison (2009 ongoing)

- Environmental Authorisation for listed activities - Project manager and coordination of the of the East Mine Option 1 Project for Total Coal South Africa for the authorisation of listed activities that involve conveyors, activities within wetland and watercourse areas, etc. Main responsibilities involved the coordination and management of the project, quality control, and client liaison, as well as the formulation of the financial closure cost (2009 ongoing)
- Environmental Authorisation for listed activities - Project manager and coordination of the Black Rock Manganese Mines for Assmang Ltd for the authorisation of listed activities that included diesel storage and generation etc. Main responsibilities involved the coordination and management of the project, quality control, coordination of the public participation process and client liaison (2009 and ongoing)
- Environmental Authorisation for listed activities - Project manager and coordination of the Black Rock Manganese Mines for Assmang Ltd for the authorisation of listed activities, which include a new Eskom power line. Main responsibilities involve the coordination and management of the project, quality control, coordination of the public participation process and client liaison (2009 and ongoing)

7. Crack Surveys

- Mining Related Crack Survey – Responsible for the establishment of the potential impact on surrounding farm houses for Assmang Ltd for the Khumani Iron Ore Mine with relation to blasting activities. Main responsibility was the establishment of methodology and associated consultation with relevant specialists in the field and the associated reporting (2005)
- Residential Crack Survey – Responsible for determining the current status of houses in an area earmarked for business expansion in Hyde Park For Impafa Technologies (2006)

8. Audits and Due Diligence

- Due Diligence - Formed part of the audit team to assess the environmental liabilities as part of two Phase 1 Environmental Site Assessments for both the manufacturing site, as well as the warehouse. Main responsibility was the assessment of the environmental legal compliance in terms of the national, provincial and municipal legislation (2004)
- Participated as part of the audit team. The audit involved an ISO 14000 assessment in terms of the environmental, health and safety. Main areas of responsibility were to provide guidance in terms of the environmental statues of the South African Legislation (2005)
- Expert Summary on Environmental Legal Issues - The Total vs. Tavistock Arbitration assessment involved the environmental legal assessment of the two companies in question's legal status in terms of environmental compliance with specific reference to legal administration and water management. Main responsibly was the provision of an expert

summary regarding the environmental legal compliance in terms of the South African Legislation (2006)

- Environmental Audits as part of the requirements of the Environmental Conservation Act, 1989 and the Mineral and Petroleum Resources Development Act, 2002 - Responsible for the formulation of the audit protocols and feedback procedures for the implementation of the environmental management programme for the Khumani Iron Ore Mine, Northern Cape. The assessment involved six month audit programme during the start of the operational phase of the mine. As part of the assessment the responsibilities involve the provision of action plans to address areas of definite and potential non-compliance. The performance assessments were later extended into the operational phase (2007 and ongoing)
- Environmental, Health and Safety Audit - Participated as the lead auditor for eight mining operations within South Africa for African Rainbow Minerals. The audit addressed all aspects of environmental, safety and financial closure cost within the South African Legislation. The assessment involved the formulation of the audit protocols and audit papers (2007)
- Performance Assessment as part of the requirements of the Mineral and Petroleum Resources Development Act, 2002 - Participated as part of the audit team for Assmang Ltd, the Black Rock Manganese Mine, Northern Cape. Responsible for assessing the compliance to environmental aspects in terms of the broader South African Legislation, as well as the assesment of the financial rehabilitation fund (2007)
- Performance Assessment as part of the requirements of the Mineral and Petroleum Resources Development Act, 2002 - Participated as part of the audit team for Total Coal South Africa for the Forzando North and South Mine Operations. Main responsibility was the assessment of the financial rehabilitation fund (2008).
- Performance Assessment as part of the requirements of the Mineral and Petroleum Resources Development Act, 2002 - Annual environmental audit for Assmang Ltd, the Khumani Iron Ore Mine, Northern Cape. Responsible for assessing the compliance to environmental aspects on site (2008)
- Performance Assessment as part of the requirements of the Environmental Conservation Act, 1989 – Annual environmental audit for Assmang Ltd, the Khumani Iron Ore Mine, Northern Cape. Responsible for assessing the compliance to environmental aspects on site (2008)

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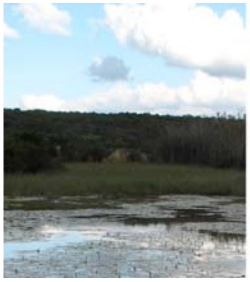
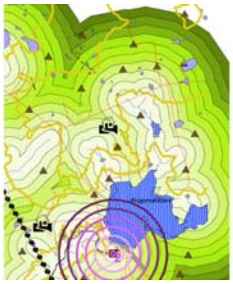
Appendix B: Project Team – Curriculum Vitae
Selma Nel




PERSONAL DETAILS

NAME: *Selma Nel*

DATE OF BIRTH: *11 October 1980*

NATIONALITY: *RSA*

MARRIED: *Married*

TITLE : ENVIRONMENTAL SCIENTIST

ACADEMIC QUALIFICATIONS

2007: M.A. (Geography & Environmental Management): University of Johannesburg, Johannesburg, South Africa

2004 B.A. (Hons) (Geography & Environmental Management): Rand Afrikaans University, Johannesburg, South Africa

2003 B.A. (Geography & Environmental Management/ Sociology): Rand Afrikaans University, Johannesburg, South Africa

- November 2003: Social Science Research Certificate, Rand Afrikaans University, Johannesburg, South Africa

EMPLOYMENT HISTORY

Period	Company	Position
2007 - Present	GCS (Pty) Ltd	Environmental Scientist
2003 - 2007	University of Johannesburg	Admin assistant
1999 - 2000	ABSA	Client Services Administrator

SPECIALIZATION

- Public / Stakeholder Consultation / Participation;
- Environmental Management Plans according to the Minerals and Petroleum Resources Development Act, Act 28 of 2002 (MPRDA);
- Environmental Impact Assessment and Management Programmes according to the MPRDA.
- Environmental Impact Assessment and Management Programmes according to the National Environmental Management Act of Minerals and Petroleum Resources Development Act, Act 107 of 1998 (NEMA).
- Analysing water quality data for monitoring programmes at various colliery.
- Conducting Bio-monitoring (including South African Scoring System Version 5 (SASS5) & Invertebrate Habitat Assessment System (IHAS) methods) to determine river health. *SASS accredited since July 2009*.

PROJECT MANAGEMENT

- November 2007 - Umthombo Resources: Schoongezicht Colliery (EIA and EMP under MPRDA).
- February 2008 – Lonmin Akanani Platinum Mine – Site Selection for Mine Facilities.
- March 2008 – Londani Coal: Nndanganeni Colliery (EIA and EMP under MPRDA).
- June 2008 – Bigen Africa: Maandagshoek Road Upgrade (EIA under NEMA).
- February 2009 – Shanduka Coal: Middelburg Townlands Colliery (EIA and EMP under MPRDA).
- February 2009 – Shanduka Coal: Lakeside and Leeuwfontein Colliery (EIA and EMP under MPRDA).
- March 2009 – Assmang Glosam: Mine Closure under MPRDA.
- April 2009 – Eskom-Assmang: Construction of a 132kV Powerline (EIA under NEMA).
- October 2009 – Shanduka Coal: Springlake Colliery (EIA and EMP under MPRDA).
- November 2009 – Shanduka Coal: Springlake Colliery Environmental Risk Assessment

OTHER PROJECTS

- January 2010 – RSK: Environmental Site Assessment and Vendor Due Diligence
- February 2010 – Cadbury Africa: Health, Safety and Environmental Audit

WATER MONITORING PROJECTS

- Sumo Coal – Pan Siding Water Monitoring – since 2008
- Sumo Coal – Rietkuil Siding Water Monitoring – since 2008
- Sumo Coal – Sunbury Siding Water Monitoring – since 2008
- Khodani Coal – Kopermyn Colliery Water Monitoring – since 2008
- Foskor – Foskor Phalaborwa Mine Water Monitoring – since 2008

BIOMONITORING PROJECTS

- June 2008 - Walter Sisulu Botanical Garden: Witklipspruit.
- June 2008 - Ekurhuleni Metropolitan Municipality Kempton Park: Swartspruit.
- November 2008- TGME Beta Mine: Blyde River.
- February 2009 - Assmang Dwars River Chrome Mine: Groot Dwars River.
- June 2009 – Total Coal Forzando Coal Mine: Winter Survey - Olifants River.
- July 2009 – Teldele Somkele Mine: Winter Survey - Umfolozi, Kwaluhlanga and Nkolokotho Rivers.
- December 2009 - Total Coal Forzando Coal Mine: Summer Survey - Olifants River.

COUNTRIES WORKED IN

Republic of South Africa
Tanzania
Egypt

LANGUAGE PROFICIENCY

Afrikaans	- speak and write: Excellent
English	- speak and write: Good

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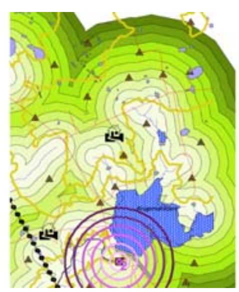
Appendix C: Specialists Curriculum Vitae

Karen van Ryneveld:
Archaeological Impact Assessment




KAREN VAN RYNEVELD

NAME: Karen van Ryneveld

CONTACT DETAILS:
1) Cell: 084 871 1064
2) Tel: 043 740 2370
3) Fax: 086 515 6948
4) E-mail: kvanryneveld@gmail.com
5) Postal address: Postnet Suite 239, Private Bag X3, Beacon Bay, 5205

COMPANY: ArchaeoMaps Archaeological Consultancy

OCCUPATION: Archaeologist

QUALIFICATION: MSc Archaeology (WITS University – 2003)

ACCREDITATION:
1) South African Heritage Resources Agency (SAHRA) listed
2) Association of Southern African Professional Archaeologists (ASAPA) accredited Cultural Resources Management (CRM) practitioner [member nr – 163]

TERTIARY EDUCATION

2010 (current)	**UNISA, Pretoria** *BSc (Hons.) Environmental Management*
2006-2007	**Nelson Mandela Metropolitan University, Port Elizabeth** *Undergraduate Certificate in Geographical Information Systems*
2001-2003	**WITS University, Johannesburg** *MSc Archaeology*
1999-2000	**University of Pretoria, Pretoria** *BA (Hons.) Archaeology*
1991-1993	**University of Pretoria, Pretoria** *BA Archaeology & History of Art*

OTHER COURSES

2010 (current)	**The Photography Institute, Johannesburg** *Photography*
2004 (1 year)	**Freda Erwee Design Studio, Pretoria** *Fashion design*

EMPLOYMENT HISTORY (Archaeology)

2007/04-Present	ArchaeoMaps Archaeological Consultancy (Archaeologist – CRM)
2006/06-2007/03	National Museum, Bloemfontein (Archaeologist – CRM, Department of Archaeology)
2005/04-2006/05	McGregor Museum, Kimberley (Archaeologist – Researcher / CRM, Department of Archaeology)
2004/04-2005/01	Amafa aKwaZulu-Natali, Pietermaritzburg (HoD – Archaeology, Paleontology and Meteorites Unit)
2002/09-2004/03	McGregor Museum, Kimberley (Archaeologist – Researcher / CRM, Department of Archaeology)

CRM REPORTS

2010/03 van Ryneveld, K.
- Archaeological Site Inspection – Graves discovered during upgrading of the R72 from Port Elizabeth to Port Alfred, Eastern Cape, South Africa (Aurecon SA Pty Ltd)

2010/03 van Ryneveld, K.
- Phase 1 Archaeological Impact Assessment – Thlolong Residential Development (Portion of) Mooifontein 669, Kestell, Free State, South Africa (Y.B. Mashalaba & Associates Consultants)

2010/03 van Ryneveld, K.
- Phase 1 Archaeological Impact Assessment – Upgrade and Realignment of the N2, Sitebe Komkhulu to Viedgesville, near Mthatha, Eastern Cape, South Africa (BESC)

2010/03 van Ryneveld, K.
- Phase 1 Archaeological Impact Assessment – Residential development, Dorps Gronden 131, Harrismith, Free State, South Africa (Y.B. Mashalaba & Associates Consultants)

2010/02	van Ryneveld, K. • Phase 1 Archaeological Impact Assessment – Tsolo Sewage Treatment Works, Tsolo, O.R. Tambo District, Eastern Cape, South Africa (BESC)
2010/02	van Ryneveld, K. & Rossouw, L. • Heritage Impact Assessment – Chrome Prospecting and Mining at Lemoenfontein 443, Molemole District, Limpopo Province, South Africa (Custom Alloys)
2010/01	van Ryneveld, K. • Phase 1 Archaeological Impact Assessment – The Black Rock Powerline Project, Black Rock near Hotazel in the Northern, South Africa (Ivuzi Environmental Consultants / GCS)
2009/10	van Ryneveld, K. • Phase 1 Archaeological Impact Assessment – Khayamnandi Extension housing development, Despatch, Eastern Cape, South Africa (SRK Consulting)
2009/10	van Ryneveld, K. • Letter of Recommendation – Exemption from a Phase 1 AIA for the proposed Simolotse Mine development (portions of Portion 26 of Spitskop 91, Portion 2 of Doornkloof 89 and Portion 3 of Sover 90), Barkley-West District, Northern Cape, based on findings of the Phase 1 AIA 'Archaeological specialist Report – Preliminary report on investigation of a cemetery at Sover Mine, Barkley-West District, Northern Cape' – David Morris – 2000 (Karien Potgieter Environmental)
2009/10	van Ryneveld, K. • Desktop Archaeological Study – National Long Haul Optic Fibre Infrastructure Network, Johannesburg to Cape Town, South Africa (Enviroworks)
2009/09	van Ryneveld, K. • Phase 1 Archaeological Impact Assessment – Fort Brown housing project, (Portion of) Fletchers Outspan 104, Albany District, Eastern Cape, South Africa (Merryweather Environmental)
2009/08	van Ryneveld, K. & Steyn, B. • Phase 2 Archaeological Mitigation – Middle Stone Age deposits with probable Acheulean / Fauresmith intrusions at Site M4.01, M4 mining area, Klipfontein 99, Francis Baard District, Northern Cape, South Africa (De Beers Consolidated Mines)
2009/07	van Ryneveld, K. • Phase 1 Archaeological Impact Assessment – Extension to the Rock Cliff Golf Estate, Cove Rock, East London, Eastern Cape, South Africa (BESC)
2009/07	van Ryneveld, K. • Phase 1 Archaeological Impact Assessment – Queenspark substation and powerline, East London, Eastern Cape, South Africa (Merryweather Environmental)
2009/06	van Ryneveld, K. • Phase 1 Archaeological Impact Assessment – Subdivision of Erf 4621, Hamilton, Bloemfontein, Free State, South Africa (Bopa Lesedi)
2009/06	van Ryneveld, K. • Phase 1 Archaeological Impact Assessment – Cemetery development, Olie Rivier 170, Douglas, Northern Cape, South Africa (Geokon)
2009/06	van Ryneveld, K. • Phase 1 Archaeological Impact Assessment – Thandanani residential development, portion 19 of Nooitgedacht 74, portion 1 of Kaalvalley 61 and portion 26 of Kijknou 81, Welkom, Free State, South Africa (Y.B. Mashalaba & Associates)
2009/05	van Ryneveld, K. • Phase 1 Archaeological Impact Assessment – Residential development, Portions 1 & 3 of Strathearn 2154, Bloemfontein, Free State, South Africa (Y.B. Mashalaba & Associates)
2009/05	van Ryneveld, K. • Phase 1 Archaeological Impact Assessment – Extension to an existing quarry for the Nyathyora internal roads project, King Williams Town, Eastern Cape (Merryweather Environmental)
2009/05	van Ryneveld, K. • Phase 1 Heritage Impact Assessment – Establishment of an interdenominational Christian cemetery at the 'Vegkop' provincial heritage Site, Heilbron District, Free State, South Africa (Phethogo Consulting)
2009/04	van Ryneveld, K. • Phase 1 Archaeological Impact Assessment – Subdivision and residential developments, Farm 723/7, Kwelera, East London, Eastern Cape, South Africa (BESC)
2009/04	van Ryneveld, K. • Phase 1 Archaeological Impact Assessment – Morojaneng Ext 8 residential development, Dewetsdorp, Free State, South Africa (Phethogo Consulting)
2009/03	van Ryneveld, K. • Phase 1 Archaeological Impact Assessment – Ratanang Ext residential development, Jacobsdal, Free State, South Africa (Phethogo Consulting)
2009/03	van Ryneveld, K • Phase 1 Archaeological Impact Assessment – Qibing Ext 7 residential development, Weperner, Free State, South Africa (Phethogo Consulting)

2009/03	van Ryneveld, K. • Phase 1 Archaeological Impact Assessment – Establishment of an Ammunition Disposal Plant, Sinclair's Dam 133, De Aar, Northern Cape, South Africa (BKS – Engineering and Management)
2009/02	van Ryneveld, K. & Steyn, B. • Phase 2 Archaeological Mitigation – Stone Age deposits at Sites L2/M1.04 and L2/M1.08, L2/M1 mining area, Klipfontein 99, Francis Baard District, Northern Cape, South Africa (De Beers Consolidated Mines)
2009/01	van Ryneveld, K. • Phase 2 Archaeological Mitigation – Middle Stone Age sequences at excavations DKE8 and DKE13, Diamond Koppie, Vogelstruispan 101, Francis Baard District, Northern Cape, South Africa (De Beers Consolidated Mines)
2008/12	van Ryneveld, K. • Letter of Recommendation – Exemption from a Phase 1 Archaeological Impact Assessment (AIA) for the beachfront adjoining the Cove Rock Golf Estate and the Hotel and Conference Centre Development, Cove Rock, East London, Eastern Cape, South Africa (BESC)
2008/12	van Ryneveld, K. • Letter of Recommendation – Exemption from a Phase 1 Heritage Impact Assessment (HIA) for the Salt River Resources Prospecting Program (Portions of the Farm Adjoining Geelvloer, Remainder & Portion 1 of the Farm Graafwater, Gannapoort, Lovedale, Quagga Maag, Hartbeestvlei and Vaal Kop) Kenhardt District, Northern Cape, South Africa (Salt River Resources)
2008/12	van Ryneveld, K. • Phase 1 Archaeological Impact Assessment – Kidd's Beach Golfing Estate, Portions of Farms 1075, 1076, 1077, 1078, 1079 & 1086, Kidd's Beach, East London, Eastern Cape, South Africa (BESC)
2008/11	van Ryneveld, K. • Phase 1 Archaeological Impact Assessment – Residential development, Matola private game reserve,Portion 2 of Farm 36Komga, Eastern Cape, South Africa (Merryweather Environmental)
2008/11	van Ryneveld, K. • Phase 1 Archaeological Impact Assessment – Rezoning and subdivision for purposes of mixed use development, Farm RE/961, Cove Rock, East London, Eastern Cape, South Africa (BESC)
2008/11	van Ryneveld, K. • Phase 1 Archaeological Impact Assessment –Warehousing and light industrial development, Farm 922, Cove Rock, East London, Eastern Cape, South Africa (BESC)
2008/11	van Ryneveld, K. • Archaeological & Cultural Heritage Site Management - Boomplaats 21, the Schmidtsdrift alluvial diamond mining area, Schmidtsdrift, Northern Cape, South Africa (TM Squared Project Managers)
2008/11	van Ryneveld, K. • Phase 1 Archaeological Impact Assessment – Extension to Refengkgotso Township, Portions 3 & 5 of Mooiplaats 581,Deneysville, Fezile Dabi District, Free State, South Africa (NSVT Consultants for Y.B. Mashalaba & Associates Consultants)
2008/10	van Ryneveld, K. • Archaeological Scoping Study – Establishment of an ammunition disposal plant, Sinclair's Dam 133, De Aar, Northern Cape, South Africa (BKS – Engineering and Management)
2008/10	van Ryneveld, K. • Phase 1 Archaeological Impact Assessment – Utilization of 17 existing quarries for upgrading of the DR2629, Road nr 654 and the DR2631, Middelburg area, Eastern Cape, South Africa (Kwezi V3 Engineers)
2008/10	van Ryneveld, K. • Phase 1 Archaeological Impact Assessment – Rezoning and mixed use development, Portion 4 of Farm 1050, East London, Eastern Cape, South Africa (BESC)
2008/09	van Ryneveld, K. • Phase 1 Archaeological Impact Assessment – Residential development, Portions 3, 4 & 18 of Farm 807, Quenera, East London, Eastern (BESC)
2008/09	van Ryneveld, K. • Phase 1 Archaeological Impact Assessment – Rezoning and subdivision for mixed use development, Farm 939, Cove Rock, East London, Eastern Cape, South Africa (BESC)
2008/08	van Ryneveld, K. • Phase 1 Archaeological Impact Assessment –Warehousing and related infrastructure, Portion 19 of Farm 925, Cove Rock, East London, Eastern Cape, South Africa (BESC)
2008/08	van Ryneveld, K. • Phase 1 Archaeological Impact Assessment – Proposed pipeline, Portion of Farm 1008, Winterstrand, EastLondon, Eastern Cape, South Africa (BESC)
2008/07	van Ryneveld, K. • Phase 1 Archaeological Impact Assessment – Riverleigh township development, Farm 817/53, East London, Eastern Cape, South Africa (BESC)
2008/07	van Ryneveld, K. • Phase 1 Archaeological Impact Assessment – Industrial development, Erven 17532 & 49336, Orange Grove, East London, Eastern Cape, South Africa (BESC)

2008/07 van Ryneveld, K.

- Phase 1 Archaeological Impact Assessment – Diamond mining, Portions of Erven 1 & 341, Douglas, Northern Cape, South Africa (Giet and Mieta Mining & EDM Family Trust)

2008/07 van Ryneveld, K.

- Phase 1 Archaeological Impact Assessment – Development of a shopping mall & commercial offices, Portions 21, 22 & 23 of Farm 925, Cove Rock, East London, Eastern Cape, South Africa (BESC)

2008/06 van Ryneveld, K.

- Phase 1 Archaeological Impact Assessment – Retail and residential development, Portions 3 & 5 of Farm 1234, Gonubie, East London, Eastern Cape, South Africa (BESC)

2008/06 van Ryneveld, K.

- Phase 1 Archaeological Impact Assessment – Hotel and conference centre development, Portion 2 of Farm 992, Cove Rock, East London, Eastern Cape, South Africa (BESC)

2008/05 van Ryneveld, K.

- Phase 1 Archaeological Impact Assessment – Cove Rock Golf Estate, Cove Rock, East London, Eastern Cape, South Africa (BESC)

2008/05 van Ryneveld, K.

- Phase 1 Archaeological Impact Assessment – Proposed construction of commercial offices and retail space, Erf 9582, Sweetwaters, King Williams Town, Eastern Cape, South Africa (BESC)

2008/05 van Ryneveld, K.

- Phase 1 Archaeological Impact Assessment – Residential development, Portions 1 & 4 of Farm 1245, Cove Rock, East London, Eastern Cape, South Africa (BESC)

2008/05 van Ryneveld, K.

- Phase 1 Archaeological Impact Assessment – Residential development, Farm 960, East London, Eastern Cape, South Africa (BESC)

2008/03 van Ryneveld, K.

- Phase 1 Archaeological Impact Assessment – The Albany RegionalWater Supply Scheme, Eastern Cape, South Africa (BESC)

2008/01 van Ryneveld, K.

- Addendum to the Phase 1 Archaeological Impact Assessment – Phase 1 Archaeological Impact Assessment – Extension to Mahlatswetsa Township, Excelsior, Free State, South Africa (Phethogo Consulting)

2008/01 van Ryneveld, K.

- Phase 1 Archaeological Impact Assessment – The DeWitteberg Mountain Resort Development, Portion 4 of the farm Jacobz-Berg 150, Rosendal, Ficksburg District, Free State, South Africa (EIMS)

2007/12 van Ryneveld, K.

- Phase 1 Archaeological Impact Assessment – Mnt. Coke Eco-Residential and Golf Estate, East-London, Eastern Cape, South Africa (BESC)

2007/12 van Ryneveld, K.

- Phase 1 Archaeological Impact Assessment for a 1.1ha Mining development to be located on a Portion of Erf 1, Douglas, Northern Cape, South Africa (Jan Minnie)

2007/12 van Ryneveld, K.

- Phase 1 Archaeological Impact Assessment – A 1.1ha Mining Development, Portion of Erf 1, Douglas, Northern Cape, South Africa (Valentine J. Julius)

2007/11 van Ryneveld, K.

- Phase 1 Archaeological Impact Assessment – Tumahole Ext 7 Residential Development, Parys, Free State, South Africa (Emendo Africa)

2007/11 van Ryneveld, K.

- Phase 1 Archaeological Impact Assessment – Extension 9 of the Manyatseng Township, Ladybrand, Free State, South Africa (Phethogo Consulting)

2007/11 van Ryneveld, K.

- Phase 1 Archaeological Impact Assessment – Extension to Mahlatswetsa Township, Excelsior, Free State, South Africa (Phethogo Consulting)

2007/11 van Ryneveld, K.

- Phase 1 Archaeological Impact Assessment – Thornhill Phase 2 Ministerial Housing Project, Port Alfred, Eastern Cape, South Africa (BESC)

2007/11 van Ryneveld, K.

- Phase 1 Archaeological Impact Assessment – Thornhill Phase 1 Ministerial Housing Project, Port Alfred, Eastern Cape, South Africa (BESC)

2007/11 van Ryneveld, K.

- Phase 1 Archaeological Impact Assessment – Upgrade of theWasteWater TreatmentWorks, Port Alfred, Eastern Cape, South Africa (BESC)

2007/10 van Ryneveld, K.

- Phase 1 Archaeological Impact Assessment – Upgrade of the Sewer Purification Plant, Springfontein, Free State, South Africa (NSVT Consultants)

2007/10 van Ryneveld, K.

- Phase 1 Archaeological Impact Assessment – Upgrade of the Sewer Purification Plant, Reddersburg, Free State, South Africa (NSVT Consultants)

2007/10 van Ryneveld, K.

- Phase 1 Archaeological Impact Assessment – Mooidraai Township Establishment (Zamdela Ext 17), Portions of Portion 1 and the Remainder of the Farm Mooidraai 44, Sasolburg, Free State South Africa (YB Mashalaba & Associates)

2007/10 van Ryneveld, K.

- Phase 1 Archaeological Impact Assessment – The Hopewell Conservation Project, Greenbushes, Port Elizabeth, Eastern Cape, South Africa (SRK Consulting)

2007/10 van Ryneveld, K.

- Phase 1 Archaeological Impact Assessment – The New Provincial Offices, Portion of Erf 15735, Bloemfontein, Free State, South Africa (Wellcorp Pty Ltd)

2007/09 van Ryneveld, K.

- Phase 1 Archaeological Impact Assessment – Realignment of the 6th Fairway, East London Golf Club, East London, Eastern Cape, South Africa (BESC)

2007/08 van Ryneveld, K.

- Proposed Phase 2 Archaeological Mitigation and Management for the Residential Development Remainder of Portion 1 of the Farm Van Zoelen's Laagte 158,Windsorton, Barkly-West District, Northern Cape (MLM van der Molen Environmental Consultancy)

2007/07 Biemond, W.M. & van Ryneveld, K.

- Archaeological Impact Assessment – The Kudumatse Groundwater Exploration Project, development Bock 1 and Alternative Development Block 4, Central District, Botswana (DigbyWells & Associates for CIC Energy Corporation)

2007/06 van Ryneveld, K.

- Archaeological Site Inspection – Mining Impact on two graveyard sites, Smitsdrift Mining Area, Boomplaats 21, Schmidtsdrift District, Northern Cape, South Africa (Nare Diamonds Ltd)

2007/05 Biemond, W.M. & van Ryneveld, K.

- Phase 1 Archaeological Impact Assessment – The Mmamabula Energy Project: Proposed Strip Mining Development, Central District, Botswana (DigbyWells & Associates for CIC Energy Corporation)

2007/04 van Ryneveld, K.

- Phase 1 Archaeological Impact Assessment – Phase 1 Intabazwe Residential Development, Harrismith, Free State, South Africa (Seaton, Thomson & Associates for Emendo Africa)

2007/04 van Ryneveld, K.

- Phase 1 Archaeological Impact Assessment – Sewer Purification Plant, Ikutseng Township,Warrenton, Northern Cape, South Africa (Tswelopele Environmental Ltd)

2007/03 van Ryneveld, K.

- Phase 1 Archaeological Impact Assessment – Portion of the Farm Boksputs 118, Groblershop District, Northern Cape, South Africa (Amber Mountain Investments)

2007/03 van Ryneveld, K.

- Phase 1 Archaeological Impact Assessment – Portion of the Farm Cnydas East 439, Upington District, Northern Cape, South Africa (Amber Mountain Investments)

2007/02 van Ryneveld, K.

- Phase 1 Archaeological Impact Assessment – Upgrading of the Waste Water Treatment Works, Wepener, Free State, South Africa (NSVT Consultants for Phethogo Consulting)

2007/02 van Ryneveld, K.

- Phase 1 Archaeological Impact Assessment – Baken Park Ext 5, 6 & 7 Residential Development, Portion of the Farm Vogelfontein 69, Bethlehem, Free State, South Africa (Seaton, Thomson & Associates for Emendo Africa)

2007/02 van Ryneveld, K.

- Phase 1 Archaeological Impact Assessment – CradockWeir Residential Development, Portion of Erf 1, Cradock, Eastern Cape, South Africa (JSP2 Developments)

2007/01 van Ryneveld, K.

- Phase 1 Archaeological Impact Assessment – Portion of the Farm Platfontein 68, Kimberley District, Northern Cape, South Africa (De Beers Consolidated Mines)

2006/12 van Ryneveld, K., van derWalt, J. & Walker, N. J.

- The Mmamabula Energy Project. Phase 1 Archaeological Impact Assessment – Portion of the Mine and Power Station Development Area, Botswana (Interim Report ii) (DigbyWells & Associates for CIC Energy Corporation)

2006/12 van Ryneveld, K., van der Walt, J. & Walker, N. J.

- The Mmamabula Energy Project. Phase 1 Archaeological Impact Assessment – The 25km 'South' Transmission Line, Botswana (Digby Wells & Associates for CIC Energy Corporation)

2006/12 van Ryneveld, K., van derWalt, J & Walker, N.J.

- The Mmamabula Energy Project. The Ethno-archaeology of Mmapashalala (DigbyWells & Associates for CIC Energy Corporation)

2006/11 Cowling, S., Cowling R, Binneman, J.B., Logie, B., Moodley, S, Henderson, Z.L. & van Ryneveld, K.

- The Baviaanskloof Mega Reserve: Cultural Heritage Impact Assessment and Cultural Heritage Management Plan (SAN Parks & The Department of Nature Conservation)

2006/10 van Ryneveld, K.

- The Mmamabula Energy Project. Archaeological Significance Assessment – Mine and Power Station Project Area, and Archaeological Impact Assessment – Power Station andWash Plant Site, Portion of the Mine and Power Station Project Area, Botswana (DigbyWells & Associates for CIC Energy Corporation)

2006/10 van Ryneveld, K.

- The Mmamabula Energy Project. Archaeological Impact Assessment – Portion of Phase 1 of the Proposed Transmission Line from Mmamabula to Phokoje and Mmamabula to Jwaneng, Botswana (DigbyWells & Associates for CIC Energy Corporation)

2006/10 van Ryneveld, K., Koortzen, C. & Kriek, J.

- Phase 1 Archaeological Impact Assessment – Portion of Mooipan 625, Memel, Phumelela District, Free State, South Africa (Bokamoso Consultants)

2006/08 van Ryneveld, K. & Koortzen, C

- Archaeological Site Inspection – Borrow Pit 76.0 quarry impact on archaeological 'Michausdal' deposits, Cradock District, Eastern Cape, South Africa (SNA/HHO/ICE Joint Venture for SANRAL)

2006/08 van Ryneveld, K.

- Phase 1 Archaeological Impact Assessment – (Portions of Kleinkloof) Portion 1 of Kloof 143, Hay District, Northern Cape, South Africa (P.J. Smit)

2006/08 van Ryneveld, K.

- Phase 1 Archaeological Impact Assessment – (Portions of) Portion 2 of Kloof 143, Hay District, Northern Cape, South Africa (P.J. Smit & M.H.P. Smit)

2006/08 van Ryneveld, K.

- Phase 1 Archaeological Impact Assessment – (Skurwepunt Portion of) Kafir Krans 379, Hay District, Northern Cape, South Africa' (Dawie Beukes)

2006/08 van Ryneveld, K.

- Phase 1 Archaeological Impact Assessment – (Nooitverwagt Portion of) Kafir Krans 379, Hay District, Northern Cape, South Africa (P.J. Smit, Jr & P.J. Smit)

2006/08 van Ryneveld, K.

- Phase 1 Archaeological Impact Assessment – (Portion of) Farm No 367, Hay District, Northern Cape, South Africa (Salmon J. Beukes)

2006/08 van Ryneveld, K.

- Phase 1 Archaeological Impact Assessment – (Portion of) Portion 1, Kalkfontein No 374, Hay District, Northern Cape, South Africa (Salmon J. Beukes)

2006/07 van Ryneveld, K.

- Phase 1 Archaeological Impact Assessment – Portion of Erf 1, Cradock, Cradock District, Eastern Cape, South Africa (Crabou Eiendomme)

2006/06 van Ryneveld, K.

- Phase 1 Archaeological Impact Assessment – John's Uitval No 479, Clocolan District, Free State, South Africa (Mpetsane Conservation Estate)

2006/06 van Ryneveld, K.

- Phase 1 Archaeological Impact Assessment – Vogelstruis Bult 104, Prieska District, Northern Cape, South Africa (Amber Mountain Investments)

2006/06 van Ryneveld, K.

- Cultural Heritage Site Inspection Report for the purpose of a Prospecting Right EMP – Doonies Pan 106, Kenhardt District, Northern Cape, South Africa (Amber Mountain Investments)

2006/06 van Ryneveld, K.

- Cultural Heritage Site Inspection Report for the purpose of a Prospecting Right EMP – Merries Pan 107, Kenhardt District, Northern Cape, South Africa (Amber Mountain Investments)

2006/06 van Ryneveld, K.

- Archaeological Impact Assessment: Stamper Claim on a portion of the farm Longlands, Barkley-West District, Northern Cape, South Africa (Willie Stamper)

2006/04 van Ryneveld, K.

- Cultural Resources Management Impact Assessment: A 400 ha Portion of Van Zoelen's Laagte 158, Windsorton District, Northern Cape, South Africa (Free State Diamond Mines)

2006/03 van Ryneveld, K.

- Archaeological Impact Assessment: Erf 49, Erf 687 and commonage Erf 687, Barkly-West District, Northern Cape, South Africa (Ekolone Small Mining)

2005/12 van Ryneveld, K.

- Cultural Resources Management Impact Assessment: Portion 1 of Roode Pan 146, Kimberley District, Northern Cape, South Africa (KimberleyWest Diamond Mining Company)

2005/12 van Ryneveld, K.

- Cultural Resources Management Impact Assessment: Rooipoort: (Portions of) Klipfontein 99, Berg Plaats 100, Vogelstruis Pan 98, Vogelstruis Pan 101 and Zand Plaats 102, Kimberley District, Northern Cape, South Africa (De Beers Consolidated Mines)

2005/12 van Ryneveld, K.

- Cultural Resources Management Impact Assessment: Erf 1, Vaalharts Nedersetting B, Barkly-West District, Northern Cape, South Africa (Jestvet 1290)

2005/10 van Ryneveld, K.

- Cultural Resources Management Impact Assessment: (Portion of) Areachap 462; Upington District, Northern Cape, South Africa (Amber Mountain Investments)

2005/10 van Ryneveld, K.

- Cultural Resources Management Impact Assessment: (Portions of) Ettrick 182; Hopetown District, Northern Cape, South Africa (Basadi Ba Tlou & Diamroq)

2005/09 van Ryneveld, K.

- Cultural Resources Management Impact Assessment: (Portion of) Van Zoelen's Laagte 158, Windsorton District, Northern Cape, South Africa (Evening Star Trading & Free State Diamond Mines)

2005/09 van Ryneveld, K.

- Cultural Resources Management Impact Assessment: (Portions of) Leeuw Poort 161, Kimberley District, Northern Cape, South Africa (Bonami Mining)

2005/08 van Ryneveld, K.

- Cultural Resources Management Impact Assessment: (Portions of) Paardeberg 154, Kimberley District, Northern Cape, South Africa (Bonami Mining)

2005/06 van Ryneveld, K.

- Cultural Resources Management Impact Assessment: (Portion of) Paardeberg 12; Paardeberg-East 153, Kimberley District, Northern Cape, South Africa (DigbyWells & Associates for Diamond Core Resources)

2005/06 van Ryneveld, K.

- Cultural Resources Management Impact Assessment: (Portion of) Uitdraai 33, Prieska District, Northern Cape, South Africa (DigbyWells & Associates for Diamond Core Resources)

2005/06 van Ryneveld, K.

- Cultural Heritage Site Inspection Report for the purpose of a Prospecting Right EMP – (Portion of) De Kalk 37, Herbert District, Northern Cape, South Africa (DigbyWells & Associates for Diamond Core Resources)

2005/06 van Ryneveld, K.

- Cultural Heritage Site Inspection Report for the purpose of a Prospecting Right EMP – (Portion of) Skeyfontein 536, Postmasburg District, Northern Cape, South Africa (Digby Wells & Associates for Diamond Core Resources)

2005/05 van Ryneveld, K.

- Cultural Heritage Impact Assessment: (Southern portion of) Camp 3, Erf 1,Windsorton, Barkley-West District, Northern Cape (Vernon Diamonds)

2005/05 van Ryneveld, K.

- Cultural Heritage Impact Assessment: Vergenoecht (portion of)Witpan 13, Warrenton District, Northern Cape, South Africa (Vernon Diamonds)

2005/04 van Ryneveld, K.

- Cultural Heritage Impact Assessment: (Portion of) Bellsbank Farm 85, Barkley-West District, Northern Cape, South Africa (Free State Diamond Mines)

2005/04 van Ryneveld, K.

- Cultural Heritage Impact Assessment: Erf 1, Douglas, Herbert District, Northern Cape, South Africa (Denzil H. Jants)

2004/09 van Ryneveld, K.

- KwaNibela Community Development Project, Hluhluwe, Northern KwaZulu-Natal (AMAFA Council)

2004/09 van Ryneveld, K.

- Site Inspection: Palaeontological Deposits at the Hellsgate Military Training Centre, St. Lucia, Northern KwaZulu-Natal (South African National Defence Force)

2004/08 van Ryneveld, K

- Report: Archaeological Site Inspection –Waayplaats & Strydpoort, Winterton, KwaZulu-Natal (Irwin Driemeyer)

2004/08 van Ryneveld, K

- Report: Archaeological Site Inspection – Cato Crescent, Amanzimtoti, KwaZulu-Natal (Anthony Whatmore & Company: Attorneys & Conveyances)

2004/05 van Ryneveld, K

- Cultural Heritage Assessment of Proposed Dam on the Farm Beacon Banks, Lowlands, Estcourt, Kwa-Zulu- Natal (Alan Dowie)

2004/05 van Ryneveld, K

- Report: Damage to Border Cave deposits, KwaZulu-Natal (AMAFA Council)

2004/03 van Ryneveld, K

- Two Historical Graves, Content Station, Warrenton District, Northern Cape (Transtel)

2004/01 van Ryneveld, K & Timothy, A

- Rehabilitation of Grave Sites, Mining Zones 1 & 3, Boomplaats, Schmidtsdrift District, Northern Cape (New Diamond Corporation Ltd)

2003/10 van Ryneveld, K & Timothy, A

- Assessment of Grave Site, Mining Zone 1, Boomplaats, Schmidtsdrift district, Northern Cape (New Diamond Corporation Ltd)

2003/09	van Ryneveld, K & Morris, D	

- Phase 1 Archaeological Impact Assessment at Du Toitspan 119 & Speculatie 217, Northern Cape (De Beers Consolidated Mines)

2003/08 van Ryneveld, K & Morris, D

- Diamond Kopje: Surface and Sub-surface Reconnaissance (De Beers Consolidated Mines)

2003/07 van Ryneveld, K & Morris, D

- Archaeological Salvage Work at Diamond Kopje, Vogelstruis Pan, Rooipoort – Second Interim Report (De Beers Consolidated Mines)

2003/06 van Ryneveld, K & Morris, D

- Archaeological SalvageWork at Diamond Kopje, Vogelstruis Pan, Rooipoort – First Interim Report (De Beers Consolidated Mines)

2003/01 Morris, D & van Ryneveld, K

- Report on an Archaeological Assessment of Possible Impacts of Agricultural Development at Riemvasmaak (Riemvasmaak community)

PUBLICATIONS

1. 2006. Curnoe, D., Herries, A., Brink, J., Hopley, P., van Ryneveld, K., Henderson, Z & Morris, D. *Beyond Taung: Palaeoanthropological research at Groot Kloof, Ghaap escarpment, Northern Cape province, South Africa*. Nyame Akuna 64:58-65
2. 2005. Van Ryneveld, K. *Palaeoarchaeology and Palaeoanthropology: The contribution of IKS (Indigenous Knowledge Systems) in an interdisciplinary scientific approach.* In Northern Cape Oral History Resource Book. McGregor Museum: Kimberley. Pp1-12
3. 2004 Morris, D., Van Ryneveld, K. & Voigt, E. *Outside Gladstone Cemetery: First Thoughts on Unmarked Late Nineteenth Century Graves, Kimberley.* In Morris, D. & Beaumont, P.B.(eds) Archaeology in the Northern Cape: Some Key Sites. McGregor Museum: Kimberley. Pp 64-66

COMPANY PROFILE

Company Name	: ArchaeoMaps Archaeological Consultancy (Closed Corporation – CC)
Registration number	: 2005/180719/23
VAT number	: 4320234455
Accountant	: Azima Financial Services (Willie Bender - Tel: 051 446 3622; E-mail: williebender@internext.co.za)
Members / Shareholders	: Karen van Ryneveld (100%)
BBBEE status	: Exempted Micro Enterprise

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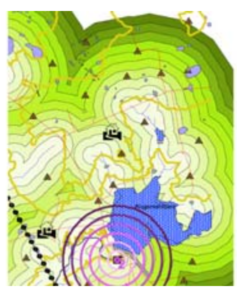
Appendix C: Specialists Curriculum Vitae

Martin Taylor:
Avifauna Impact Assessment




CURRICULUM VITAE– MARTIN TAYLOR

Name	**Martin Russell Taylor**
Year of Birth	1979
Nationality	South African (British passport holder)
Languages	English and Afrikaans
Professional experience in	South Africa, Central African Republic, Lesotho, Egypt, Kenya, Malawi and Mozambique
Qualifications	BSc Biology with University Honours (4yr degree), Francis Marion University, USA. MSc Zoology (Conservation Ecology), University of Pretoria, South Africa
Additional courses	WSP Environmental Internal Environmental Management Systems Auditor Course
Technical experience	Microsoft 98,2000 Professional, XP (Word, Excel, Powerpoint) Distance 4.1, Prism 4, Primer 4 GPS (Garmin II2+ and Etrex)
Professional Associations	Member of the South African Wildlife Management Association Pri Sci Nat (in progress)
Awards and honours	2005 – Recipient – Second place in the Graduate Research Award, South African Wildlife Management Association Conference, Magoebeskloof. 2004-2005 – Awarded a National Research Foundation Bursary to conduct research on coastal dune forest bird communities 2001 and 2003 – Recipient – Presidents Undergraduate Research Award, Francis Marion University. (Work done on a project initiated in 2001) 2001– Recipient – Second place in the Frank C. Brooks Undergraduate Research Award at Association of South-Eastern Biologists meeting – New Orleans.

2001 – Recipient – Biology Research Award, Francis Marion University.

1998-2000 – Deans List for Academic Achievement, Francis Marion University.

1998-1999 – Academic Honours Roll for the Peach Belt Athletics Conference

Career History

2008 until present – Birdlife South Africa

Route development manager responsible for avitourism development within South Africa, project and financial management, proposal writing, route development, marketing, human resource management and managing various community and conservation projects.

2007 to 2008 – Birdlife South Africa

Project manager of the Kruger to Canyons Birding Route project, a community and conservation orientated avitourism development project. Responsible for all aspects of project and financial management of the project.

2005 to 2007 – Coastal and Environmental Services

Held the position of Senior Environmental Consultant dealing with various projects involving scoping reports, environmental impact assessments, risk assessments, ecological assessments, environmental impact assessment guideline documents and environmental monitoring projects.

2003 to 2005 – Martin Taylor and Associates

Formed Martin Taylor and Associates providing freelancing consulting services ranging from strategic environmental overviews, scoping reports, ecological assessments, vegetation assessments, and environmental management plans. Company was formed in order to supplement income whilst studying for my Masters degree.

2001 to 2003 – WSP Walmsley (Pty) Ltd

Held the position of Environmental Scientist and was involved in various projects involving scoping reports and environmental impact assessments, risk assessments, ecological assessments, environmental impact assessment, guideline documents and environmental monitoring projects.

1998-2004 – Conservation Ecology Unit, University of Pretoria

Held position of Research Assistant at Richards Bay Minerals Field Station. Involved in restoration ecology, various graduate research projects and the processing of collected data (vocational work)

EIA Project Experience

SAPP EIA Thermal Guidelines for Nexant (plc), Sub Saharan Africa. Data Collection on EIA Practice in Sub-Saharan Africa and report writing.

Environmental Assessment for Additional Water Supply Options for the Kwale Mineral Sands Project, Kenya: Project management, data collection and report writing.

Environmental Risk Report for the Dimbi Diamond Concession, Central African Republic: Project management and report writing.

Environmental Assessment for El Burrullus Heavy Minerals Mine, Egypt: Project management, data collection and report writing.

Strategic Environmental Overview of a Heavy Mineral Deposit, Malawi. (Client and location confidential) Project management, data collection and report writing.

Construction Environmental Action Plans for various components of the Kwale Mineral Sands Project, Kenya: Compilation of environmental action plans and document management

EIA Guidelines for the Sectors of Roads, Transmission Lines, Telecom Masts, Filling Stations and Housing for the Department of Environmental Affairs and Tourism , South Africa. Data collection and report writing.

Limpopo State of the Environment Report, South Africa: Biodiversity and Terrestrial Resource Use Sections: Data collection and report writing

Environmental Assessment for the Knysna N2 Upgrade, South Africa: Project management and report writing

Rehabilitation and Closure Plan for the Coega Kop Quarry, South Africa: Project management and report writing

Zandrivierspoort Pre-Feasibility Study for Kumba Resources (plc), South Africa. Data collection, risk assessment, identification of alternatives and report writing.

Environmental Assessment for RBC Distributors (Pty) Ltd Bulk Material Handling and Storage Facility, South Africa. Data collection, impact assessment and report writing.

Environmental Assessment for Kingsburgh 132/11/32kV substation for Durban Metro Electricity. Project management and report writing.

Baseline Study for Platreef Resources. Synthesis of specialist reports and final report compilation.

Environmental Assessment of Ferro Furnaces (Pty) Ltd. Project management and report writing.

Professional review of the Van Ryn Mine EMPR. Data review and report writing.

Numerous Environmental Management Plans for road upgrade applications in the Limpopo Province
Numerous smaller EMPR's for borrow pits in the Limpopo province.
Numerous Environmental Due Diligence Assessments on various properties throughout South Africa.
Numerous Ecological Assessments for a variety of different projects and clients.

Ecological research experience

1998 - Small mammal trapping - Richards Bay Minerals Ecological Monitoring Program. Field work, grid maintenance, trap maintenance and data entry
1998 – Vegetation surveys - Richards Bay Minerals Ecological Monitoring Program. Field work and data entry
1999 – Herpetological surveys at Francis Marion University and surrounding areas, Florence, USA. Field work and data entry.
2000 – Small mammal museum specimen preparation at Francis Marion University, Florence, USA. Specimen collection and preparation.
2003-2005 – Bird surveys - Richards Bay Minerals Ecological Monitoring Program. Field work, data entry, data analysis and reporting
2004 – Acacia kosiensis seed bank trials – Richards Bay Minerals Ecological Monitoring Program. Field work, data entry and reporting
2005 – *Mastomys* competition trials – University of Pretoria. Field work.
2005 – Assistance in African Buffalo TB Research Program at Kruger National Park: Field assistant

Publications, Technical Reports and Presentations

Wassenaar, T.D and Taylor, M.R. (2004). Seed germination rates of *Acacia kosiensis*- CERU 22. Internal technical report. Conservation Ecology Research Unit. University of Pretoria.

Taylor, M.R. (2001): “The role of visual and auditory senses in prey detection by *Bufo terrestris*.” Bios. 72: 83-86.

Pike, L., Shannon, T., Larimore, K, McGee, A. and Taylor, M.R. (2003). Science education and sustainability initiatives: a campus recycling case study shows the importance of opportunity. International Journal of Sustainability in Higher Education.4: 218-228.

“Using DISTANCE methods to define bird communities.” South African Wildlife Management Association. Magoebeskloof. October 3, 2005.

“Recycling Education and Opportunity: How it can change waste stream audits for the better.” Southern Regional Honours Council, Nashville, Tennessee. March 29, 2001.

“Waste Stream Audit of Francis Marion University.” Association of Southeastern Biologists. New Orleans, Louisiana. April 6, 2001.

“The Role of Visual and Auditory Senses in Prey Detection by *Bufo terrestris*.” Association of Southeastern Biologists. New Orleans, Louisiana. April 6, 2001

References

Dr Adrian Shrader
Lecturer – Wildlife Conservation Management Unit
University of KwaZulu Natal
Cell: +27 845686640
Email: shrader@ukzn.ac.za

Dr. Angus Paterson
Director – Elwandle Node
South African Environmental Observation Network
Cell: +27 83 275 4407
Email: angus@saeon.ac.za

Contact details

Martin Taylor
Cell: +27 722777254
Email: k2c@birdlife.org.za

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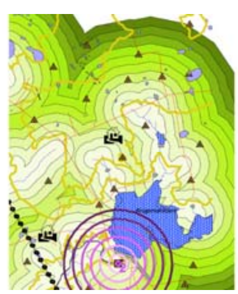
Appendix C: Specialists Curriculum Vitae

Karien van der Merwe:
Ecological Impact Assessment




PERSONAL DETAILS

NAME:	***Karien van der Merwe***
DATE OF BIRTH:	***10 May 1977***
NATIONALITY:	***South African***
MARITAL STATUS:	***Single***

TITLE : ENVIRONMENTAL SCIENTIST

ACADEMIC QUALIFICATIONS

Present MSc (Environmental Management): University of the Free State, Bloemfontein, South Africa.

2001 MSc (Ecology): University of the Free State, Bloemfontein, South Africa

1999 BSc (Hons) (Wildlife Management): University of Pretoria, Pretoria, South Africa

1998 BSc (Biology): University of the Free State, Bloemfontein, South Africa

PROFESSIONAL REGISTRATION AND AFFILIATIONS

Registered Candidate Natural Scientist S.A (Reg. No. 100042/05)

Member of:

- International Association of Impact Assessment (IAIAsa)

EMPLOYMENT HISTORY

2006 – Present GCS (Pty) Ltd – Kimberley, South Africa
Environmental Scientist

2004 - 2006 KARIEN VAN DER MERWE ENVIRONMENTAL CONSTULTANTS - Kimberley, South Africa
Environmental Consultant

SPECIALIZATION

- Project Management
- Mining Permit and Prospecting Right applications
- Mining related Environmental Management Plans and Environmental Impact Assessments
- Regional botanical investigations

PROJECT MANAGEMENT

- Management of projects related to mining authorizations.
- Management of projects related to development authorizations.

MINING PERMIT AND PROSPECTING RIGHT APPLICATIONS

- Preparation of Mining Permit and Prospecting Right applications for diamond, copper, gold, sand, manganese and iron ore mines.

MINING RELATED ENVIRONMENTAL MANAGEMENT PLANS AND EIAs

- Environmental Management Plans for diamond, copper, gold, platinum, salt, base metal, tiger's eye, sand, uranium, manganese and iron ore mines.
- Environmental Impact Assessments for diamond, salt and tiger's eye mines.

REGIONAL BOTANICAL INVESTIGATIONS

- Specialist botanical studies in the Northern Cape Province.

COUNTRIES WORKED IN

South Africa.

LANGUAGE PROFICIENCY

English and Afrikaans - Read, speak and write.

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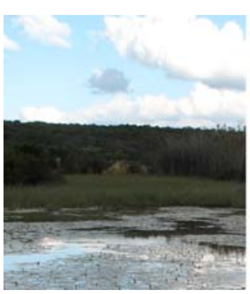
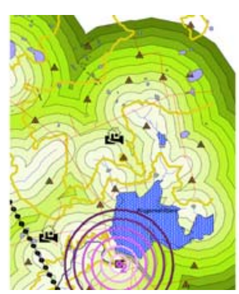
Appendix C: Specialists Curriculum Vitae

Brenton Mabuza:
Soils Impact Assessment




PERSONAL DETAILS

NAME: *Brenton Bongani Mabuza*

DATE OF BIRTH: *19/12/1966*

NATIONALITY: *South African*

MARRIED: *Yes*

TITLE : SOIL SCIENTIST

ACADEMIC QUALIFICATIONS

2005 BSc Honours (Soil Science): Pretoria University, South Africa
2004 BSc (Hydrology): Kwa-Zulu Natal University, South Africa

PROFESSIONAL REGISTRATION AND AFFILIATIONS

Member of:

- South African Soil Surveyors Organisation
- Soil Science Society of South African

EMPLOYMENT HISTORY

2009 – Present	GCS (Pty) Ltd Soil Scientist
2005 – 2008	ARC – ISCW Junior Researcher
1996 – 1999	TSB Cane Supply Officer
1992 – 1995	Agriwane Project Advisor
1989 – 1992	Agriwane Junior Project Advisor

SPECIALIZATION

Soil Survey & Mapping
Extension
Crop Production – sugar cane, cotton, rice

COUNTRIES WORKED IN

South Africa, Swaziland

LANGUAGE PROFICIENCY

English	- speak and write
Zulu, N. Sotho, S. Sotho	- speak and write
Xhosa, Shangan	- speak

POSTER

Salt Management at Fig Tree C Project

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Appendix C: Specialists Curriculum Vitae

Justin Porteous:
Hydrological (Surface water) Impact Assessment

PERSONAL DETAILS

NAME:	*Justin Stuart Porteous*
DATE OF BIRTH:	*7 September 1984*
NATIONALITY:	*South African*
MARRIED:	*Single*

TITLE : HYDROLOGICAL ENGINEER

ACADEMIC QUALIFICATIONS

2006 BSc (Hons) (Hydrology): University of Kwa-Zulu Natal, Pietermaritzburg, South Africa

2005 BSc (Hydrology/Geography): University of Kwa-Zulu Natal, Pietermaritzburg, South Africa

EMPLOYMENT HISTORY

2007 - 2008	CAMRO ESTATES cc Farm Manager
Present	GCS (Pty) Ltd - Johannesburg, South Africa Hydrological Engineer

SPECIALIZATION

- Mining related hydrological studies in support of EIA and EMP
- Hydrological investigation for developments
- Floodline delineation
- Mine water balance
- Conceptual designs of Hydrological structures
- Stormwater management
- Surface water modelling

MINING RELATED HYDROLOGY

- Hydrological investigations for coal, gold, platinum, base metal, chrome and diamond mines.
- Design flood calculations
- Sizing of pollution control dams
- Conceptual designs of pollution control dams
- Floodline delineation
- Stormwater management plans for mines.
- Water balance.

COUNTRIES WORKED IN

South Africa.

LANGUAGE PROFICIENCY

English	- speak, read and write
Afikaans and Zulu	- speak basic only

GCS
WATER
ENVIRONMENTAL
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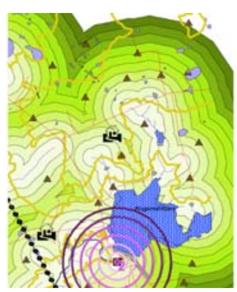
Eskom LTD
Black Rock Proposed 132kV Powerline

Appendix C: Specialists Curriculum Vitae

Riaan van der Merwe:
Visual Impact Assessment




PERSONAL DETAILS

NAME:	*Riaan Fourie van der Merwe*
DATE OF BIRTH:	*17 August 1978*
NATIONALITY:	*South African*
MARRIED:	*Yes*

TITLE :MANAGER - GIS UNIT

ACADEMIC QUALIFICATIONS

2010	MSc (Geography) (Wits)
2004	BMil Hons (Military Geography) (Stell)
2001	BMil (Human Sciences) (Stell)

PROFESSIONAL REGISTRATION AND AFFILIATIONS

Registered as a Professional Geo-Information Science Practitioner in Training (PGPT 0023) with the South African Council for Professional and Technical Surveyors (PLATO).

Member of the Geo-Information Society of South Africa (GISSA) (Membership Number: 5005).

EMPLOYMENT HISTORY

2008 – Present	**GCS (PTY) LTD** GIS Unit Manager
2006 – 2007	**Cymbian Enviro-Social Consulting Services** GIS/Environmental Consultant
1998-2006	**South African National Defense Force (SANDF)** Senior Military Officer (Major)

SPECIALIZATION

- Geographic Information Systems (GIS),
- Visual Impact Assessment,
- Site Selections,
- Risk Assessments'
- Remote Sensing, and
- Project Management

COUNTRIES WORKED IN

South Africa

LANGUAGE PROFICIENCY

English and Afrikaans -

WATER
ENVIRONMENTAL
ENGINEERING
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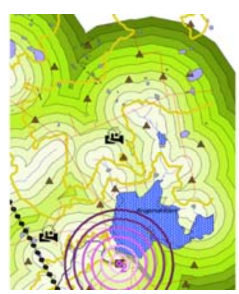
Eskom LTD
Black Rock Proposed 132kV Powerline

Vitae Appendix D: Specialists Reports

Appendix Di:
Archaeological Impact Assessment




PHASE 1 ARCHAEOLOGICAL IMPACT ASSESSMENT

[illegible]

[illegible] 2010-01-11

[illegible]

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PHASE 1 ARCHAEOLOGICAL IMPACT ASSESSMENT

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2.1) Archaeological Legislative Compliance ... *7*
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Ivuzi Environmental Consultants (Pty) Ltd / GCS has been appointed as independent environmental consultant by the proponents, Eskom Holdings Limited (Eskom) and Assmang mine (Assmang), to prepare the Environmental Impact Assessment (EIA) for the proposed *Black Rock Powerline Project*, a 132kV powerline from the Klipkop to the Umtu Substations, including the upgrading of the Klipkop and the construction of the Umtu stations, in the Black Rock area near Hotazel in the Northern Cape, South Africa. ArchaeoMaps Archaeological Consultancy has been appointed by Ivuzi Environmental Consultants / GCS to conduct the Phase 1 Archaeological Impact Assessment (AIA) as specialist sub-section to the EIA.

1.1) Development Location, Details & Impact

General: Eskom is mandated by the South African government to ensure the provision of reliable and affordable power to South Africa. Electricity cannot be stored and must be used as it is generated; it therefore needs to be generated in accordance with supply-demand requirements. Eskom's core business is the generation, transmission, trading and retail of electricity. The reliable generation of electricity by Eskom is thus critical for industrial / economic development, related employment and sustainable development in South Africa (Ivuzi 2009).

The purpose of the *Black Rock Powerline Project* is firstly to provide the Assmang Black Rock Manganese Mine with sufficient electricity for proposed expansion in the near future and secondly to meet increasing power demands at the Black Rock village (Ivuzi 2009).

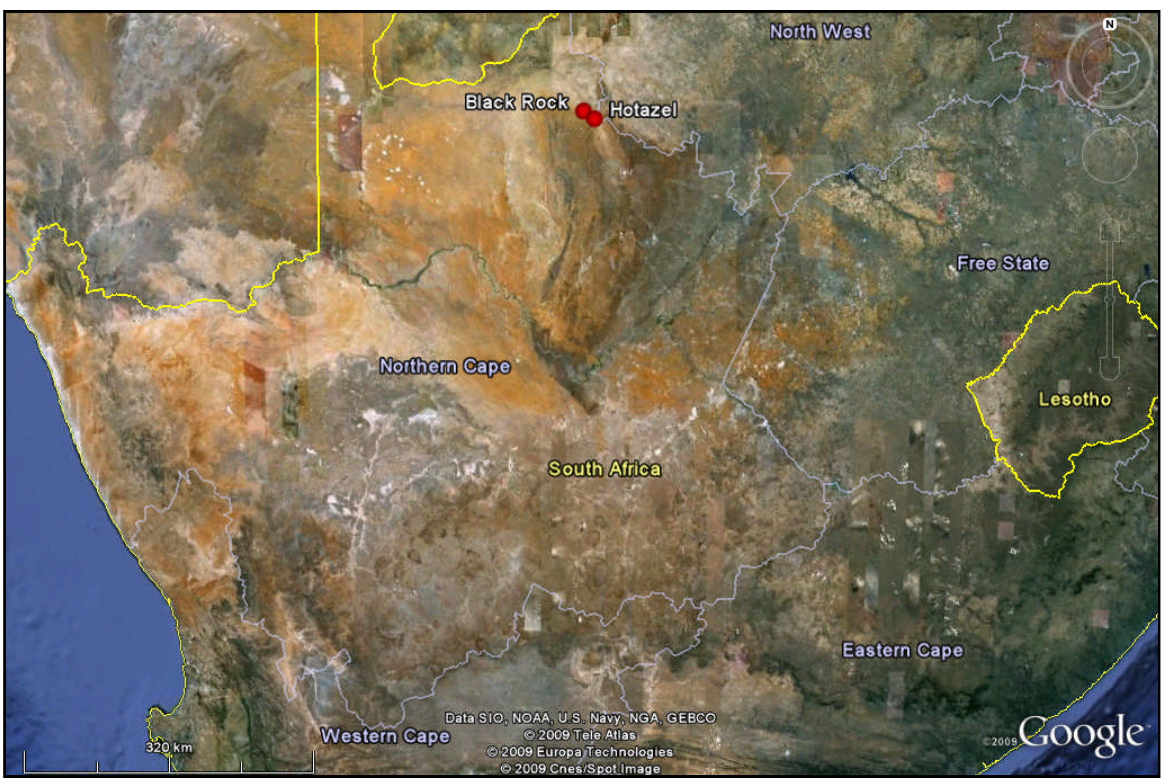


Figure 1: General locality of the *Black Rock Powerline Project* at Black Rock near Hotazel in the Northern Cape

Location: Eskom intends to, through Assmang's Black Rock Managenese Mine, construct a 132kV overhead powerline, between the Klipkop and the Umtu Substations at Black Rock near Hotazel, located in the Kgalagadi District of the Northern Cape Province.

Development Particulars: The proposed *Black Rock Powerline Project* will comprise of a maximum 17.5m linear development with a 38m wide servitude (19m on either side of the centre line) between the Klipkop and Umtu Substations. Monopole steel structures (pylons) are intended for use along the line route. Poles weigh approximately 1,200kg each and vary in height from 17.4-28m. The size of the foundation footprint depends on the type of pole, i.e. whether it is a self supporting, guyed suspension or an angle strain pole structure. The size of the footprint areas ranges from 0.36m² to 2.36m², with the larger footprint area associated with the guyed suspension and angle strain pole structures. The average span between 2 towers is 200m, but can be extended to 250 and 375m, depending on the ground profile and terrain that is traversed. The self supporting structure is typically used along the straight sections of the powerline, while the guyed intermediate suspension structures and angle strain structures are used where there is a bend in the powerline alignment (Ivuzi 2009).

Six alternative corridors (Line Routes 1, 2, 3, 4, 5 and 6) were considered for the line route during the Scoping Phase of the project, with a line route length varying from 13-17.5km. Three proposed line routes are further investigated for purposes of the Environmental Impact Assessment (EIA), namely Line Routes 4, 5 and 6 (Ivuzi 2009).

The Klipkop Substation is located on Portion 3 of the farm Nchwaning 267 and the Umtu Substation will be constructed on the Remaining Extent of the Farm Olive Pan 282 (Ivuzi 2009).

The proposed *Black Rock Powerline Project* can be summarized as (Ivuzi 2009):

- The construction of a maximum 17.5km 132kV chickadee line between the Klipkop and Umtu Substations (a chickadee powerline is a very thin type of powerline but will suffice to be the most reliable and cost effective way to transmit an electricity capacity of 132kV between the substations);
- The extension of the Klipkop Substation; and
- The construction of the Umtu Substation; comprising of
- The installation of 132/66kV 40MVA transformer bays;
- The installation of 132kVbusbar and feeder bays;
- The installation of 3 x 132kV CT's (Current Transformers);
- The installation of 3 x 132kV VT's (Voltage Transformers);
- The installation of a complete 66kV feeder bay on the existing Wessels lline;
- The installation of a complete 66kV feeder bay on the existing Hotazel line;
- The installation of 6 x 66kV VT's on 66kV busbars;
- The installation of 2 x 66kV busbar isolators; and
- The installation of lightning masts of 2 x 14m, at both the Klipkop and Umtu Substations.

The Proposed 6 Line Routes: Six alternative corridors were originally considered for the construction of the 132kV powerline, varying in length from 13-17.5km. The final corridor of the proposed powerline still needs to be finalized, and will in large be dependent on the outcome of the EIA (Ivuzi 2009).

It is the intension of Eskom to utilize, where possible, existing road servitudes for the construction of the powerline, thereby ensuring that the use and impact on vacant land is kept to a minimum and that the construction of the overhead powerline will mainly take place along already existing road servitudes where the natural environment has already been disturbed (Ivuzi 2009).

A vehicle access / maintenance track of approximately 6m in width will also be established along the entire length of the powerline servitude. The track will consist of a 2 track access path, which would require no formal scraping of the area. Access to the track will be negotiated with the relevant landowners, if existing access roads cannot be used. (Ivuzi 2009).

The proposed 6 Line Routes can be summarized as:

[illegible]	[illegible]	[illegible]	[illegible]
Option 1	13.3km	Portion 3 of the Farm Nchwaning 267; Remaining Extent of the Farm Mukulu 265; Portion 1 of the Farm Gloria 266; Remaining Extent of the Farm Umtu 281; Remaining Extent of the Farm Olive Pan 282.	The R380 tarmac road; Railway; Assmang Gloria Mine - stockpile area; Assmang Gloria Mine - gravel access road; Umtu Mine - future open cast mining area.
Option 2	13.6km	Portion 3 of the Farm Nchwaning 267; Remaining Extent of the Farm Mukulu 265; Portion 1 of the Farm Gloria 266; Remaining Extent of the Farm Gloria 266; Remaining Extent of the Farm Umtu 281; Remaining Extent of the Farm Olive Pan 282.	The R380 tarmac road; Railway; Assmang Gloria Mine - gravel access road; Umtu Mine - future open cast mining area.
Option 3	14km	Portion 3 of the Farm Nchwaning 267; Remaining Extent of the Farm Mukulu 265; Portion 1 of the Farm Gloria 266; Remaining Extent of the Farm Gloria 266; Remaining Extent of the Farm Umtu 281; Remaining Extent of the Farm Olive Pan 282.	The R31 tarmac road (Van Zylrus road); Umtu Mine - future open cast mining area.
Option 4	16.6km	Portion 3 of the Farm Nchwaning 267; Remaining Extent of the Farm Mukulu 265; Remaining Extent of the Farm Umtu 281; Portion 1 of the farm Olive Pan 282; Remaining Extent of the Farm Olive Pan 282.	The R380 tarmac road; Gravel road.
Option 5	17.5km	Portion 3 of the Farm Nchwaning 267; Remaining Extent of the Farm Mukulu 265; Remaining Extent of the Farm Umtu 281; Portion 1 of the farm Olive Pan 282; Remaining Extent of the Farm Olive Pan 282.	The R31 tarmac road (Van Zylrus road).
Option 6	17.1km	Portion 3 of the Farm Nchwaning 267; Remaining Extent of the Farm Mukulu 265; Remaining Extent of the Farm Umtu 281; Portion 1 of the farm Olive Pan 282; Remaining Extent of the Farm Olive Pan 282.	The R31 tarmac road (Van Zylrus road);

Table 1: Powerline route summary descriptions

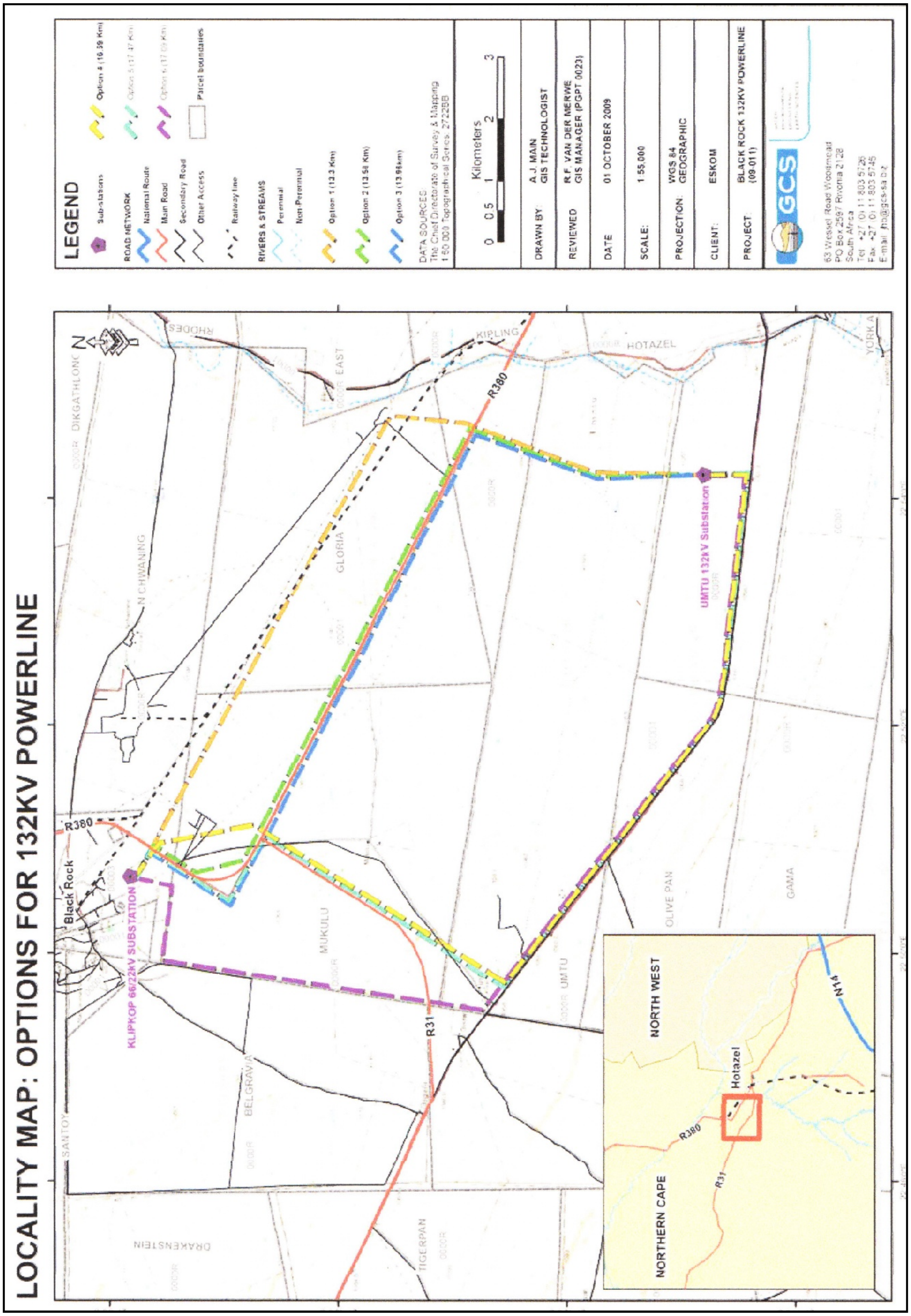


Figure 2: The *Black Rock Powerline Project*: Locality map

The Scoping assessment identified Line Routes 1, 2, and 3 as unsuitable options for the *Black Rock Powerline Project*. The main reason for their unsuitability was the fact that they would cross the future proposed mining works area of the Kalahari Resources Umtu mine. Line Route options 4, 5, and 6 were to be investigated in finer detail for purposes of the EIA.

The Natural Environment: The semi-arid Northern Cape receives an annual rainfall of between 250-500mm, with the rainy season being between October and March. Thunderstorms, characteristically accompanied by lightning, heavy rain, strong winds and sometimes hail, occur during the rainy season. Daily maximum temperatures vary between 30-40°C in January and averaging 17°C in July, with an average minimum temperature of 15°C in September (Ivuzi 2009).

The regional topography is flat, with the Kalahari plains intersected by a few riverbeds, including the Gamagara River, located east of the project area. Rivers are seasonal and do not flow at surface each year. Topographically the area slopes down gradually to the Gamagara River to the east and north east towards the Kuruman River. The area has a rural character with the Black Rock village and mining area forming the residential / commercial hub within the landscape (Ivuzi 2009).

The project area cross-cuts the boundaries of 2 different vegetation types, namely the Kathu Bushveld vegetation type, forming part of the Eastern Kalahari Bushveld Bioregion and the Gordonia Duneveld, which in turn forms part of the Kalahari Duneveld Bioregion. Both of the aforementioned bioregions form part of the Savanna Biome (Ivuzi 2009).

Geologically the Kalahari Manganese Field exists as structurally preserved erosional relicts of the Hotazel Formation below younger cover of late Early Proterozoic Olifantshoek red beds, late Carboniferous – early Permian Karoo Dwyka diamictite and Tertiary Kalahari beds. Virtually all of the deposits are covered by these younger sequences and natural outcrops are restricted to Black Rock, a small hill in the Kalahari deposit. The manganese-bearing Hotazel Formation is conformably underlain by pillow lava, hyaloclastite and jaspellite of the Ongeluk Formation and overlain by Mapedi shales and quartzites. The strata dip gently to the west at approximately 8°. Near the western margin of the deposit, Ongeluk lava and Hotazel manganese deposits have been duplicated by thrusting from the west. The sequence has also been affected by a series of north trending normal faults. These faults post-date the deposition of the overlying Early Proterozoic Olifantshoek red beds; but pre-date the thrust event. Thrusting is related to formation of the Kheiss Orogen some 1,700mya (Ivuzi 2009).

The banded Ironstone and underlying lava, which outcrops at Black Rock, have been forced over the basal layer of the same sequence by a series of thrust faults. No dykes have been encountered during the past 22 years of mining (Ivuzi 2009).

The pedology of the region is typical of the Kalahari, with fine grained sands dominating the physical structure of the soils. The majority of soils are of the orthic phase Hutton. These soils are freely drained, deep and sandy. The Hutton soils have low dryland agricultural potential despite their adequate depth for roots to grow into due to the fact that they are extremely sandy resulting in poor water retention capacity as well as the harsh, dry climatic conditions prevalent in the area. They will require high levels of management to mitigate erosion hazards as they are of aeolian origin and by implication prone to wind transportation (Ivuzi 2009).

2.1) Archaeological Legislative Compliance

The Phase 1 Archaeological Impact Assessment (AIA) was requested by the South African Heritage Resources Agency (SAHRA) mandatory responsible for the National Heritage Resources Act, Act No 25 of 1999 (NHRA 1999).

The Phase 1 AIA was requested as specialist sub-section to the Environmental Impact Assessment (EIA) in compliance with requirements of the Mineral and Petroleum Resources Development Act, No 28 of 2002 (MPRDA 2002), the National Environmental Management Act, No 107 of 1998 (NEMA 1998) and associated regulations (2006), and the NHRA 1999 and associated regulations (2000).

The Phase 1 AIA aimed to locate, identify and assess the significance of cultural heritage resources, inclusive of archaeological deposits / sites, built structures older than 60 years, sites of cultural significance associated with oral histories, burial grounds and graves, graves of victims of conflict and cultural landscapes or viewscapes as defined and protected by the NHRA 1999, that may be affected by the proposed development. Palaeontological deposits / sites as defined and protected by the NHRA 1999 are not included as subject to this report.

2.2) Methodology

The Phase 1 AIA was conducted over a 1 day period (2010-01-04) by one archaeologist. The assessment was done by vehicle (LVD) and foot and limited to a Phase 1 surface survey; no excavation or sub-surface testing was done. GPS co-ordinates were taken with a Garmin GPSmap 60CSx GPS (Datum: WGS84). Photographic documentation was done with a Pentax K20D camera. A combination of Garmap and Google Earth software was used in the display of spatial information.

Site Significance	Field Rating	Grade	Recommended Mitigation
High Significance	National Significance	Grade 1	Site conservation / Site development
High Significance	Provincial Significance	Grade 2	Site conservation / Site development
High Significance	Local Significance	Grade 3A / 3B	Site conservation or extensive mitigation prior to development / destruction
High / Medium Significance	Generally Protected A	-	Site conservation or mitigation prior to development / destruction
Medium Significance	Generally Protected B	-	Site conservation or mitigation / test excavation / systematic sampling / monitoring prior to or during development / destruction
Low Significance	Generally Protected C	-	On-site sampling, monitoring or no archaeological mitigation required prior to or during development / destruction

Table 2: *SAHRA archaeological and cultural heritage site significance assessment and mitigation recommendations*

Archaeological and cultural heritage site significance assessment and associated mitigation recommendations were done according to the system prescribed by SAHRA (2007). The archaeological and cultural environmental grading was done according to the system prescribed by Ivuzi Environmental Consultants / GCS (2009).

2.3) Coverage and Gap Analysis

The Phase 1 AIA assessment focused on the following areas:

- The vicinity surrounding the existing Klipkop Substation to accommodate proposed extension to the station;
- The proposed Umtu Substation area;
- Line Route option 4;
- Line Route option 5; and
- (Portions of) Line route option 6.

2.4) Phase 1 AIA Assessment findings

No archaeological or cultural heritage resources, as defined and protected by the NHRA 1999, were identified during the Phase 1 AIA assessment for the proposed *Black Rock Powerline Project*, Black Rock near Hotazel in the Northern Cape.

General observations include:

1. The Klipkop Substation

An approximate 50m development corridor around the existing Klipkop Substation, situated at approximately S27°08'10.9"; E22°50'40.2", and located on the property Portion 3 of the farm Nchwaning 267, was surveyed to accommodate proposed extensions to the station. The Klipkop Substation is cited a few meters south east of the Assmang Black Rock powerstation. No archeological or cultural heritage resources as defined and protected by the NHRA 1999 were identified during the Phase 1 AIA assessment. Visibility across the assessment area was good; characterized by mantling red Hutton sands with relatively low vegetation. Natural outcrops and contemporary construction waste was present in the assessment area located north of the Klipkop substation.

Figure 3: General view of the existing Klipkop Substation

Figure 4: Contemporary building rubble to the north of the Klipkop Substation

Figure 5: Natural outcrops located north of the Klipkop Substation

Figure 6: General view of the Klipkop Substation with Assmang's Black Rock Substation in the background

The exact location of the proposed extension to the Klipkop Substation is not yet known. Phase 1 AIA assessment results indicated that extensions to all sides would be possible without impacting on any archaeological or cultural heritage resources as defined and protected by the NHRA 1999, to an extent equal to that of the existing, relatively small Klipkop station. ***It is recommended that the proposed extension to the Klipkop Substation, located on Portion 3 of the farm Nchwaning 267, at approximately S27°08'10.9"; E22°50'40.2", proceeds as applied for.***

2. The Umtu Substation

The Umtu Substation will be located on the property Remaining Extent of the Farm Olive Pan 282 at approximately S27°12'19.4"; E22°54'13.5". The assessed area comprised of an approximate 100 x 100m area to accommodate the construction of the substation. No archaeological or cultural heritage resources were present in the vicinity of the proposed Umtu Substation locality. The general area was again typified by the characteristic mantling red Hutton sands with grass cover and scattered trees and shrubs providing for good surface visibility.

Figure 7: General view of the proposed Umtu Substation development area

Figure 8: View of the proposed Umtu Substation area (with the marker visible in the photograph)

Figure 9: View of the Umtu shaft, currently under construction, from the Umtu Substation development area

Proposed development of the Umtu Substation will not impact on any identified archaeological or cultural heritage resources as defined and protected under the NHRA 1999. ***It is recommended that development of the Umtu Substation, to be located on the Remaining Portion of Olive Pan 282, at approximately S27°12'19.4"; E22°54'13.5", proceeds as applied for.***

3. Line Route Option 4

Line Route option 4 comprises of an approximate 16.6km line route. Development will impact on the properties Portion 3 of the Farm Nchwaning 267, Remaining Extent of the Farm Mukulu 265, Remaining Extent of the Farm Umtu 281, Portion 1 of the Farm Olive Pan 282 and Remaining Extent of the Farm Olive Pan 282. Development co-ordinates (datum: WGS84) can briefly be described as:

Klipkop Substation:	S27°08'10.9"; E22°50'40.2"
Co-ordinate 1:	S27°08'26.2"; E22°51'01.3"
Co-ordinate 2:	S27°09'16.4"; E22°51'11.1"
Co-ordinate 3: (Join – Line Route 4 & 5)	S27°09'25.8"; E22°51'01.3"
Co-ordinate 4: (Join – Line Route 4, 5 & 6)	S27°11'23.3"; E22°49'50.8"
Co-ordinate 5:	S27°13'12.7"; E22°52'09.7"
Co-ordinate 6:	S27°13'16.7"; E22°52'22.5"
Co-ordinate 7:	S27°13'28.0"; E22°54'11.3"
Umtu Substation:	S27°12'19.4"; E22°54'13.5".

The Phase 1 AIA assessment covered the total of the 16.6km line route with a 38m development corridor. No archaeological or cultural heritage resources as defined and protected by the NHRA 1999 were identified during the assessment. The general area can again be described as with good visibility and typified by mantling red Hutton sands with relatively low to medium vegetation. A shallow contemporary dump serves as evidence of anthropic sterility to a level of approximately 35cm in depth. In addition a calcrete road, no longer in use by the mine, demarcates a large portion of the proposed development corridor where Line Route option 4 runs directly adjacent to option 5.

Figure 10: View of a portion of proposed Lone Route option 4

Figure 11: A small contemporary dump, supporting sub-surface anthropic sterility to a level of approximately 35cm

Figure 12: General view of the proposed Line Route option 4, after the joint with option 5 and just before the intersection with option 6

Development of the approximate 16.6km Line Route option 4 of the *Black Rock Powerline Project* poses no threat to any identified archaeological or cultural heritage resources. ***It is recommended that development of Line Route option 4 proceeds as applied for should the route option be prioritized for development through the EIA.***

4. Line Route Option 5

Line Route option 5 constitutes an approximate 17.5km line route. Development will impact on the properties Portion 3 of the Farm Nchwaning 267, Remaining Extent of the Farm Mukulu 265, Remaining Extent of the Farm Umtu 281, Portion 1 of the Farm Olive Pan 282 and Remaining Extent of the Farm Olive Pan 282. Development co-ordinates (datum: WGS84) can briefly be described as:

Klipkop Substation:	S27°08’10.9”; E22°50’40.2”
Co-ordinate 8:	S27°08’25.6”; E22°50’49.3”
Co-ordinate 9:	S27°08’04.4”; E22°50’21.5”
Co-ordinate 3: (Join – Line Route 4 & 5)	S27°09’25.8”; E22°51’01.3”
Co-ordinate 4: (Join – Line Route 4, 5 & 6)	S27°11’23.3”; E22°49’50.8”
Co-ordinate 5:	S27°13’12.7”; E22°52’09.7”
Co-ordinate 6:	S27°13’16.7”; E22°52’22.5”
Co-ordinate 7:	S27°13’28.0”; E22°54’11.3”
Umtu Substation:	S27°12’19.4”; E22°54’13.5”.

The Phase 1 AIA assessment covered the approximate 17.5km line route with a 38m development corridor. No archaeological or cultural heritage resources as defined and protected by the NHRA 1999 were identified on the surface of the proposed development area. Visibility across the assessment area, characterized by mantling red Hutton sand with low to medium vegetation, can be described as good.

Figure 13: General view of Line Route option 5 in the vicinity of the Klipkop Substation

Figure 14: General view of Line Route option 5 after the join with option 4

Figure 15: View of the closed access road adjacent to the joint between Line Route options 4, 5 and 6

Development of the approximate 17.5km Line Route option 5 of the *Black Rock Powerline Project* poses no threat to any identified archaeological or cultural heritage resources. ***It is recommended that development of Line Route option 5 proceeds as applied for should the route option be prioritized for development through the EIA.***

5. Line Route Option 6

Line Route option 6 will comprise of an approximate 17.1km line route across the properties Portion 3 of the Farm Nchwaning 267, Remaining Extent of the Farm Mukulu 265, Remaining Extent of the Farm Umtu 281, Portion 1 of the Farm Olive Pan 282 and Remaining Extent of the Farm Olive Pan 282. Development co-ordinates (datum: WGS84) can briefly be described as:

Klipkop Substation:	S27°08’10.9”; E22°50’40.2”
Co-ordinate 10:	S27°08’34.6”; E22°50’36.6”
Co-ordinate 11:	S27°08’31.2”; E22°49’52.8”
Co-ordinate 12:	S27°11’12.0”; E22°49’31.5”
Co-ordinate 4: (Join – Line Route 4, 5 & 6)	S27°11’23.3”; E22°49’50.8”

Co-ordinate 5:	S27°13’12.7”; E22°52’09.7”
Co-ordinate 6:	S27°13’16.7”; E22°52’22.5”
Co-ordinate 7:	S27°13’28.0”; E22°54’11.3”
Umtu Substation:	S27°12’19.4”; E22°54’13.5”.

The Phase 1 AIA assessment covered the majority of the 17.1km Line Route option 6 development area within a 38m wide development corridor. Certain portions were however excluded due to access restrictions by Assmang. No archaeological or cultural heritage resources as defined and protected by the NHRA 1999 were identified on the surface of the assessed portion. The general area is characterized by a red Hutton sand surface cover with low to medium vegetation resulting in good surface visibility.

Figure 16: General view of Line Route option 6 after the joint with options 4 and 5

Figure 17: General view of the closed access road along the joint portion of Line Routes 4, 5 and 6

Development of the approximate 17.1km Line Route option 6 of the *Black Rock Powerline Project* poses no threat to any identified archaeological or cultural heritage resources alongside the assessed portion of the line route. ***It is recommended that development of Line Route option 6 proceeds as applied for should the route option be prioritized for development through the EIA.***

6. Other

General: Cultural heritage periods well represented in the Northern Cape include particularly the Stone Age and Historical / Colonial Period with the Iron Age represented primarily in a narrow band across the north of the province or culturally represented within Historic times. Later Stone Age (LSA) peoples, often referred to as the KhoiSan, were present on the landscape from the LSA to contemporary times. A wide range of archaeological sites could thus have been expected from the general area. However, anthropic use of the landscape is as a rule closely tied to the resources it offers. Within the generally flat topography Black Rock and the Gamogara River comprises the most prominent landscape features, both which yielded archaeological sites, although of varying Industrial Periods.

The absence of archaeological and cultural heritage sites across the proposed *Black Rock Powerline Project* development area and the general low presence of recoded sites within the general area may well be interpreted as a direct result of palaeo-environmental conditions combined with later socio-economic development.

Archaeology: Kusel *et al*. (2009) identified 3 archaeological and cultural heritage sites in their report entitled '*Cultural Heritage Impact Assessment of Manganese Mining Areas on the Farms Belgravia 264, Santoy 230, Gloria 226 and Nchwaning 267, at Black Rock, north of Kuruman, Kgalagadi District Municipality, Northern Cape Province*'. The assessment focused on proposed development areas of Assmang mine and included properties to which access was not possible at the time of the *Black Rock Powerline Project* assessment. Findings of Kusel *et al.* (2009) are thus relevant to the proposed development. The 3 identified sites were not revisited at the time of the assessment, but localities are plotted for purposes of proximity to the *Proposed Black Rock Powerline Project* development area and the sites are briefly discussed according to the Kusel *et al.* (2009) report for interpretive purposes.

- C1 (Cemetery 1) – S27°07'28.7"; E22°49'45.9"

Kusel *et al.* (2009) describe the site as '*…fenced off and has some 60+ graves. The graves are those of black mine workers who died at the mine. The graves are unmarked with no tombstones. Only one grave has a date of 8/7/74. The cemetery most probably represents the graves of black mine workers from the 1940's to the 1970's. The graves are not visited anymore by relatives as no grave goods are present. Most probably these graves are from migrant mine workers from far afield. No information could be obtained from mine officials on the graves though the mine must have a record in its archives.*'

- C2 (Cemetery 2) – S27°10'29.0"; E22°48'28.2"

The site is located in the Assmang mine's nature reserve and comprises of approximately 3 graves described by Kusel *et al.* (2009) as: '*The one grave has a date of September 1926 and is the grave of Diederick Johannes Pretorius. What is strange about the cemetery is that we could find no remains of a homestead or settlement nearby. The cemetery is in open bushveld. This is very strange as early European cemeteries are always near a farm settlement.*'

Neither of the cemeteries will be impacted on by the proposed *Black Rock Powerline Project* development. Current heritage management by Assmang mine is in line with the SAHRA minimum requirements: Both cemeteries are fenced with access for purposes of visitation, albeit none has been recorded over the past few decades.

- S1 (Site 1 – Stone Age) – S27°10’39.0”; E22°54’53.6”

The site is located on the banks of the Gamogara River where lithic artefacts was found eroding out of an approximate 500 x 100m borrow pit. A secondary context to the artefacts was inferred by the team although a direct relationship between the geological pebble member and the prehistoric knapping activities was established. Lithic artefacts were, based on typology assigned a mixed Earlier Stone Age (ESA) / Middle Stone Age (MSA) assignation. Despite anthropic surface sterility of the area the project team did caution against the high probability of sub-surface Stone Age assemblages, a characteristic feature of the Stone Age in the Northern Cape.

The Stone Age site will not be impacted on by the proposed *Black Rock Powerline Project*. No formal conservation measures were prescribed by the team; *in-situ* conservation is inferred.

(Hutton sands are known to vary in depth from approximately 2-30m below the surface in the general Kathu / Kuruman region and may in cases be of quite considerable age with recorded dates in the vicinity of the Vaal River reaching back to approximately 70kya. Despite the general context of Stone Age sites in the region, namely at the interval between the Hutton sand and the underlying calcrete layer, sites may well be present within the Hutton sand member.)

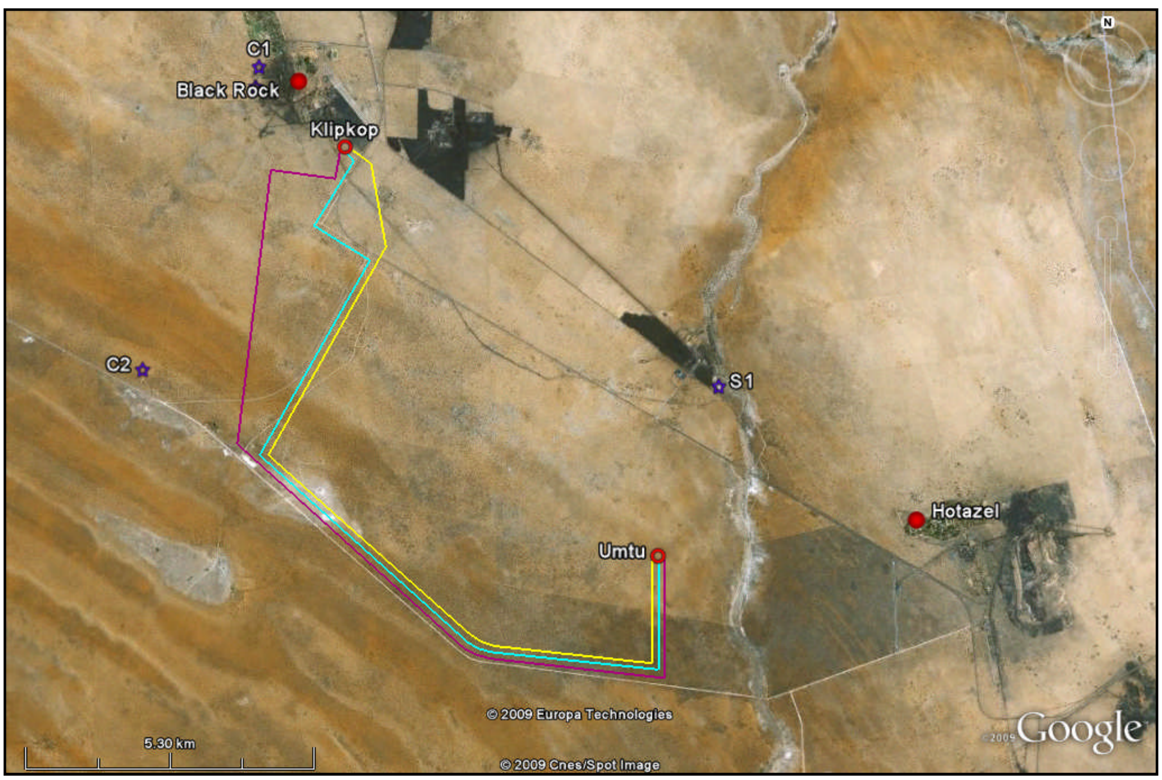


Figure 18: Proposed Line Route options 4, 5 and 6 from the Klipkop to the Umtu Substations in relation to known cultural heritage resources

2.5) Conclusion and Recommendations

The Phase 1 AIA for the proposed *Black Rock Powerline Project*, Black Rock near Hotazel in the Northern Cape, South Africa, which will comprise of extensions to the Klipkop Substation, construction of the Umtu Substation; and one powerline not exceeding 17.5km following proposed Line Route option 4 or 5 or 6, yielded no archaeological or cultural heritage resources as defined and protected by the NHRA 1999.

Three archaeological and cultural heritage sites are known from the general area namely 2 cemeteries and a Stone Age site recorded by Kusel *et al.* (2009). The sites will not be impacted on by the proposed development.

Archaeological and Cultural Environmental Grading:
No known archaeological or cultural heritage resources will be impacted on by the proposed *Black Rock Powerline Project*. The proposed development can thus be described as of ***Low Significance*** with the only potential threat being the uncovering of unknown / unidentified resources during sub-surface excavation as part of the development. All known resources from the general vicinity will be conserved.

[illegible]	[illegible]	[illegible]						[illegible]	[illegible]					
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]														
Klipkop Substation	N/A	4	1	1	1		6	Excavation	-	-	-	-		-
Umtu Substation	N/A	4	1	1	1		6	Excavation	-	-	-	-		-
Line Route 4	N/A	2	1	1	1		4	Excavation	-	-	-	-		-
Line Route 5	N/A	2	1	1	1		4	Excavation	-	-	-	-		-
Line Route 6	N/A	2	1	1	1		4	Excavation	-	-	-	-		-

Table 3: Archaeological and cultural environmental grading

[illegible] Should any archaeological or cultural heritage resources as defined and protected by the NHRA 1999 and not reported on in this report be identified during the course of development the developer should immediately cease operation in the vicinity of the find and report the site to SAHRA.

Recommendations:

It is recommended that, with reference to cultural heritage compliance as per the requirements of the NHRA 1999, the proposed *Black Rock Powerline Project*, Black Rock near Hotazel, Northern Cape, proceeds as applied for including proposed extensions to the Klipkop Substation, construction of the Umtu Substation and development of the most suitable powerline route option (Line Route 4 or 5 or 6), as determined through the EIA.

[illegible]					
[illegible]					
MAP CODE	SITE	TYPE / PERIOD	DESCRIPTION	CO-ORDINATES	PRELIMINARY RECOMMENDATIONS
[illegible]					
KS	Klipkop Substation	-	-	S27°08'10.9"; E22°50'40.2"	*N/A*
US	Umtu Substation	-	-	S27°12'19.4"; E22°54'13.5"	*N/A*
-	Line Route 1	-	-	N/A	*N/A*
-	Line Route 2	-	-	N/A	*N/A*
-	Line Route 3	-	-	N/A	*N/A*
No archaeological or cultural heritage sites were identified within the proposed Black Rock Powerline Project study site					

Table 4: Phase 1 AIA assessment findings – co-ordinate details

1. Ivuzi Environmental Consultants. 2009. Environmental Scoping Report: 132kV Powerline between Klipkop and Umtu Substations in the Northern Cape. Report to Eskom Holdings.

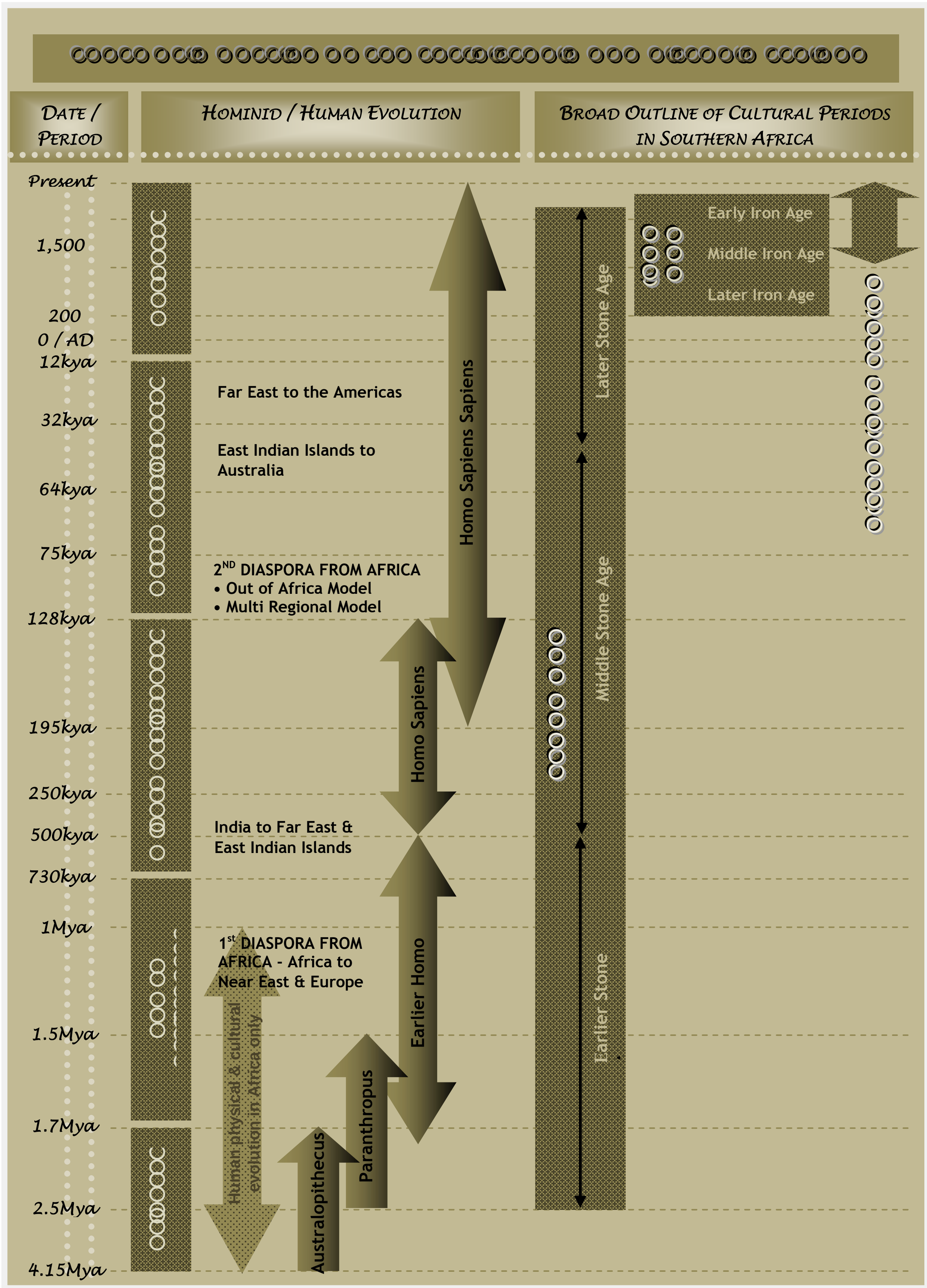
2. Kusel, U., van der Ryst, M. and Kusel, S. 2009. Cultural Heritage Impact Assessment of Manganese Mining Areas on the Farms Belgravia 264, Santoy 230, Gloria 226 and Nchwaining 267, at Black Rock, north of Kuruman, Kgalagadi District Municipality, Northern Cape Province. Report to Assmang mine.

3. South African Government. (No. 28) of 2002. Mineral and Petroleum resources Development Act.

4. South African Government. (No. 107) of 1998. *National Environmental Management Act*.

5. South African Government. (No. 25) of 1999. *National Heritage Resources Act*.

6. South African Heritage Resources Agency. 2007. *Minimum standards for the archaeological and heritage components of impact assessments*. Unpublished guidelines.



Date / Period
Hominid / Human Evolution
Broad Outline of Cultural Periods in Southern Africa
Present
1,500
200
0 / AD
12kya
32kya
64kya
75kya
128kya
195kya
250kya
500kya
730kya
1Mya
1.5Mya
1.7Mya
2.5Mya
4.15Mya
Far East to the Americas
East Indian Islands to Australia
2ND DIASPORA FROM AFRICA
• Out of Africa Model
• Multi Regional Model
India to Far East & East Indian Islands
1st DIASPORA FROM AFRICA - Africa to Near East & Europe
Human physical & cultural evolution in Africa only
Homo Sapiens Sapiens
Homo Sapiens
Earlier Homo
Paranthropus
Australopithecus
Early Iron Age
Middle Iron Age
Later Iron Age
Later Stone Age
Middle Stone Age
Earlier Stone

EXTRACTS FROM THE

[illegible]

[illegible]

Section 2

In this Act, unless the context requires otherwise:

ii. "*Archaeological*" means –

a) material remains resulting from human activity which are in a state of disuse and are in or on land and which are older than 100 years, including artefacts, human and hominid remains and artificial features and structures;

b) rock art, being any form of painting, engraving or other graphic representation on a fixed rock surface or loose rock or stone, which was executed by human agency and which is older than 100 years, including any area within 10 m of such representation;

c) wrecks, being any vessel or aircraft, or any part thereof, which was wrecked in South Africa, whether on land, in the internal waters, the territorial waters or in the maritime culture zone of the Republic,… and any cargo, debris, or artefacts found or associated therewith, which is older than 60 years or which SAHRA considers to be worthy of conservation.

viii. "*Development*" means any physical intervention, excavation or action, other than those caused by natural forces, which may in the opinion of a heritage authority in any way result in a change to the nature, appearance or physical nature of a place, or influence its stability and future well-being, including –

a) construction, alteration, demolition, removal or change of use of a place or structure at a place;

b) carrying out any works on or over or under a place;

c) subdivision or consolidation of land comprising, a place, including the structures or airspace of a place;

d) constructing or putting up for display signs or hoardings;

e) any change to the natural or existing condition or topography of land; and

f) any removal or destruction of trees, or removal of vegetation or topsoil;

xiii. "*Grave*" means a place of interment and includes the contents, headstone or other marker of such a place, and any other structure on or associated with such place;

xxi. "*Living heritage*" means the intangible aspects of inherited culture, and may include –

a) cultural tradition;

b) oral history;

c) performance;

d) ritual;

e) popular memory;

f) skills and techniques;

g) indigenous knowledge systems; and

h) the holistic approach to nature, society and social relationships.

xxxi. "*Palaeontological*" means any fossilised remains or fossil trace of animals or plants which lived in the geological past, other than fossil fuels or fossiliferous rock intended for industrial use, and any site which contains such fossilised remains or trance;

xli. "*Site*" means any area of land, including land covered by water, and including any structures or objects thereon;

xliv. "*Structure*" means any building, works, device or other facility made by people and which is fixed to land, and includes any fixtures, fittings and equipment associated therewith;

[illegible]

Section 3

1) For the purposes of this Act, those heritage resources of South Africa which are of cultural significance or other special value for the present community and for future generations must be considered part of the national estate and fall within the sphere of operations of heritage resources authorities.

2) Without limiting the generality of subsection 1), the national estate may include –

a) places, buildings, structures and equipment of cultural significance;

b) places to which oral traditions are attached or which are associated with living heritage;

c) historical settlements and townscapes;

d) landscapes and natural features of cultural significance;

e) geological sites of scientific or cultural importance

f) archaeological and palaeontological sites;

g) graves and burial grounds, including –

i. ancestral graves;

ii. royal graves and graves of traditional leaders;

iii. graves of victims of conflict

iv. graves of individuals designated by the Minister by notice in the Gazette;

v. historical graves and cemeteries; and

vi. other human remains which are not covered in terms of the Human Tissue Act, 1983 (Act No 65 of 1983)

h) sites of significance relating to the history of slavery in South Africa;

i) movable objects, including –

i. objects recovered from the soil or waters of South Africa, including archaeological and palaeontological objects and material, meteorites and rare geological specimens;

ii. objects to which oral traditions are attached or which are associated with living heritage;

iii. ethnographic art and objects;

iv. military objects;

v. objects of decorative or fine art;

vi. objects of scientific or technological interest; and

vii. books, records, documents, photographic positives and negatives, graphic, film or video material or sound recordings, excluding those that are public records as defined in section 1 xiv) of the National Archives of South Africa Act, 1996 (Act No 43 of 1996).

Section 34

1) No person may alter or demolish any structure or part of a structure which is older than 60 years without a permit issued by the relevant provincial heritage resources authority.

Section 35

3) Any person who discovers archaeological or palaeontological objects or material or a meteorite in the course of development or agricultural activity must immediately report the find to the responsible heritage resources authority, or to the nearest local authority offices or museum, which must immediately notify such heritage resources authority.
4) No person may, without a permit issued by the responsible heritage resources authority –
   a) destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or palaeontological site or any meteorite;
   b) destroy, damage, excavate, remove from its original position, collect or own any archaeological or palaeontological material or object or any meteorite;
   c) trade in, sell for private gain, export or attempt to export from the Republic any category of archaeological or palaeontological material or object, or any meteorite; or
   d) bring onto or use at an archaeological or palaeontological site any excavation equipment or any equipment which assists in the detection or recovery of metals or archaeological and palaeontological material or objects, or use such equipment for the recovery of meteorites.
5) When the responsible heritage resources authority has reasonable cause to believe that any activity or development which will destroy, damage or alter any archaeological or palaeontological site is under way, and where no application for a permit has been submitted and no heritage resources management procedure in terms of section 38 has been followed, it may –
   a) serve on the owner or occupier of the site or on the person undertaking such development an order for the development to cease immediately for such period as is specified in the order;
   b) carry out an investigation for the purpose of obtaining information on whether or not an archaeological or palaeontological site exists and whether mitigation is necessary;
   c) if mitigation is deemed by the heritage resources authority to be necessary, assist the person on whom the order has been served under paragraph a) to apply for a permit as required in subsection 4); and
   d) recover the costs of such investigation from the owner or occupier of the land on which it is believed an archaeological or palaeontological site is located or from the person proposing to undertake the development if no application for a permit is received within two weeks of the order being served.
6) The responsible heritage resources authority may, after consultation with the owner of the land on which an archaeological or palaeontological site or meteorite is situated, serve a notice on the owner or any other controlling authority, to prevent activities within a specified distance from such site or meteorite.

Section 36

3) No person may, without a permit issued by SAHRA or a provincial heritage resources authority –
   a) destroy, damage, alter, exhume or remove from its original position or otherwise disturb the grave of a victim of conflict, or any burial ground or part thereof which contains such graves;
   b) destroy, damage, alter, exhume, remove from its original position or otherwise disturb any grave or burial ground older than 60 years which is situated outside a formal cemetery administered by a local authority; or
   c) bring onto or use at a burial ground or grave referred to in paragraph a) or b) any excavation equipment, or any equipment which assists in the detection or recovery of metals.
4) SAHRA or a provincial heritage resources authority may not issue a permit for the destruction of any burial ground or grave referred to in subsection 3a) unless it is satisfied that the applicant has made satisfactory arrangements for the exhumation and re-interment of the contents of such graves, at the cost of the applicant and in accordance with any regulations made by the responsible heritage resources authority.
5) SAHRA or a provincial heritage resources authority may not issue a permit for any activity under subsection 3b) unless it is satisfied that the applicant has, in accordance with regulations made by the responsible heritage resources authority –
   a) made a concerted effort to contact and consult communities and individuals who by tradition have an interest in such grave or burial ground; and
   b) reached agreements with such communities and individuals regarding the future of such grave or burial ground.
6) Subject to the provision of any other law, any person who in the course of development or any other activity discovers the location of a grave, the existence of which was previously unknown, must immediately cease such activity and report the discovery to the responsible heritage resources authority which must, in co-operation with the South African Police Service and in accordance with regulations of the responsible heritage resources authority –
   a) carry out an investigation for the purpose of obtaining information on whether or not such grave is protected in terms of this Act or is of significance to any community; and
   b) if such grave is protected or is of significance, assist any person who or community which is a direct descendant to make arrangements for the exhumation and re-internment of the contents of such grave or, in the absence of such person or community, make any such arrangements as it deems fit.

Section 38

1) Subject to the provisions of subsections 7), 8) and 9), any person who intends to undertake a development categorised as –
   - a) the construction of a road, wall, powerline, pipeline, canal or other similar form of linear development or barrier exceeding 300 m in length;
   - b) the construction of a bridge or similar structure exceeding 50 m in length;
   - c) any development or other activity which will change the character of a site –
     - i. exceeding 5 000 m² in extent; or
     - ii. involving three or more existing erven or subdivisions thereof; or
     - iii. involving three or more erven or subdivisions thereof which have been consolidated within the past five years; or
     - iv. the costs which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority;
   - d) the rezoning of a site exceeding 10 000 m² in extent; or
   - e) any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority,

   must at the very earliest stages of initiating such a development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development.
2) The responsible heritage resources authority must, within 14 days of receipt of a notification in terms of subsection 1) –
   - a) if there is reason to believe that heritage resources will be affected by such development, notify the person who intends to undertake the development to submit an impact assessment report. Such report must be compiled at the cost of the person proposing the development, by a person or persons approved by the responsible heritage resources authority with relevant qualifications and experience and professional standing in heritage resources management; or
   - b) notify the person concerned that this section does not apply.
3) The responsible heritage resources authority must specify the information to be provided in a report required in terms of subsection 2a) …
4) The report must be considered timeously by the responsible heritage resources authority which must, after consultation with the person proposing the development decide –
   - a) whether or not the development may proceed;
   - b) any limitations or conditions to be applied to the development;
   - c) what general protections in terms of this Act apply, and what formal protections may be applied, to such heritage resources;
   - d) whether compensatory action is required in respect of any heritage resources damaged or destroyed as a result of the development; and
   - e) whether the appointment of specialists is required as a condition of approval of the proposal.

Section 50

7) Subject to the provision of any other law, a heritage inspector or any other person authorised by a heritage resources authority in writing, may at all reasonable times enter upon any land or premises for the purpose of inspecting any heritage resource protected in terms of the provisions of this Act, or any other property in respect of which the heritage resources authority is exercising its functions and powers in terms of this Act, and may take photographs, make measurements and sketches and use any other means of recording information necessary for the purposes of this Act.
8) A heritage inspector may at any time inspect work being done under a permit issued in terms of this Act and may for that purpose at all reasonable times enter any place protected in terms of this Act.
9) Where a heritage inspector has reasonable grounds to suspect that an offence in terms of this Act has been, is being, or is about to be committed, the heritage inspector may with such assistance as he or she thinks necessary –
   - a) enter and search any place, premises, vehicle, vessel or craft, and for that purpose stop and detain any vehicle, vessel or craft, in or on which the heritage inspector believes, on reasonable grounds, there is evidence related to that offence;
   - b) confiscate and detain any heritage resource or evidence concerned with the commission of the offence pending any further order from the responsible heritage resources authority; and
   - c) take such action as is reasonably necessary to prevent the commission of an offence in terms of this Act.
10) A heritage inspector may, if there is reason to believe that any work is being done or any action is being taken in contravention of this Act or the conditions of a permit issued in terms of this Act, order the immediate cessation of such work or action pending any further order from the responsible heritage resources authority.

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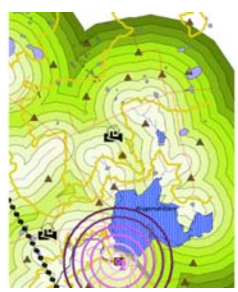
Eskom LTD
Black Rock Proposed 132kV Powerline

Vitae Appendix D: Specialists Reports

Appendix Dii:
Avifauna Impact Assessment

BirdLife South Africa

Giving Conservation Wings

AVIFAUNAL ASSESSMENT OF THE SIX PROPOSED POWERLINE OPTIONS FROM KLIPKOP SUBSTATION TO UMTU SUBSTATION, BLACK ROCK, NORTHERN CAPE

AVIFAUNAL ASSESSMENT OF THE SIX PROPOSED POWERLINE OPTIONS FROM KLIPKOP SUBSTATION TO UMTU SUBSTATION, BLACK ROCK, NORTHERN CAPE

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AVIFAUNAL ASSESSMENT OF THE SIX PROPOSED POWERLINE OPTIONS FROM KLIPKOP SUBSTATION TO UMTU SUBSTATION, BLACK ROCK, NORTHERN CAPE

1. INTRODUCTION AND TERMS OF REFERENCE

BirdLife South Africa was appointed by GCS (Pty) Ltd to undertake an avifaunal assessment of six proposed 132kV powerline options from Klipkop substation to Umtu substation at Black Rock in the Northern Cape. In this regard the terms of reference set out to:

- Determining a baseline of avifaunal communities within the study area
- Identifying possibly IUCN red- listed species occurring or possibly occurring within the study area
- Determining possible impacts that the action (i.e. construction of one of the powerline options) will have on habitats, communities and avifaunal species
- Provide advice on the best alternative route out of an option of six.
- Determine possible mitigation measures based upon an agreed framework

The study area is located just outside the town of Black Rock in the Northern Cape. Six different options for the powerline were provided to the consultant. A map of the study area can be found in Addendum A.

2. METHODS

2.1 Data Compilation

A two day site visit was made by Martin Taylor on 29 -30 September 2009.The purpose of the site visit was to a) evaluate the alternative routes provided and b) complete an onsite avifaunal assessment. Data was compiled by means of a desktop study utilising several sources including feasibility reports, literature and past environmental reports.

2.2 Criteria for Rating Impacts

Each impact identified has been assessed in terms of ***probability*** (likelihood of occurring), ***extent*** (spatial scale), ***duration*** (temporal scale) and ***intensity*** (severity). To enable a scientific approach to the determination of the impact significance (importance), a numerical value will be linked to each rating scale. The sum of the numerical values will define the ***significance***.

Table 2-1 – Probability or likelihood of an impact occurring

Category	Rating	Description
Definite	**4**	The impact will definitely occur.
Probable	**3**	The impact is highly likely to occur.
Possible	**2**	The impact has some possibility, but low likelihood of occurring.
Improbable	**1**	The impact is not likely to occur except in extreme and/or rare conditions.

Table 2-2 – Extent on a spatial scale of an impact occurring

Category	Rating	Description
Site	**1**	Immediate project site
Local	**2**	Up to 5 km from the project site
Regional	**3**	20 km radius from the project site
Provincial	**4**	Provincial
National	**5**	South African
International	**6**	Neighbouring countries/overseas

Table 2-3 – Duration of an impact

Category	Rating	Description
Very short-term	**1**	Less than 24 hours
Short-term	**2**	Less than 1 year
Medium-term	**3**	1 to 5 years
Long-term	**4**	5 to 15 years
Very long-term	**5**	Greater than 15 years
Permanent	**6**	Permanent

Table 2-4 – Intensity

Category	Rating	Description
Very low	0	Where the impact affects the environment in such a way that natural, cultural and social functions are not affected
Low	2	Where the impact affects the environment in such a way that natural, cultural and social functions are only marginally affected
Medium	4	Where the affected environment is altered but natural, cultural and social function and process continue albeit in a modified way
High	6	Where natural. Cultural or social functions or processes are altered to the extent that they will temporarily cease
Very high	8	Where natural, cultural or social functions or processes are altered to the

		extent that they will permanently cease

Table 2-5 - Significance rating

Score	Significance Rating
2-4	Low
5-7	Low to moderate
8-10	Moderate
16-19	Moderate to high
20-24	High

3. BASELINE DESCRIPTION OF RECEIVING ENVIRONMENT

3.1 Vegetation

The largest part of the study area is situated within the Kathu Bushveld vegetation type, which forms part of the Eastern Kalahari Bushveld Bioregion. The vegetation of the study area is generally characterized by a medium-tall tree layer with Camel Thorn *Acacia erioloba* as dominant tree species and scattered individuals of Shepherd's Tree *Boscia albitrunca* and Grey Camel Thorn *Acacia haematoxylon* occurring in places. The shrub layer is, according to Mucina and Rutherford (2006), the most important layer of this vegetation type and contains species such as *A. mellifera, Diospyros lycioides* and *Lycium hirsutum*. The grass layer of the area is variable in cover (Mucina & Rutherford, 2006).

The severity of bird impacts is to a large extent determined by the microhabitat within 100m of the powerline on both sides. This is particularly relevant when the mitigation of bird collisions is discussed. The consultant physically examined the majority of the habitat of Options 1-6 and analysed the remainder of the habitat utilising satellite imagery. Sensitive sections which typically require mitigation measures are dams, ephemeral pans, wetlands, drainage lines and natural grassveld areas. The vegetation was fairly homogenous with no pans or river courses being detected within the study area. A non perennial stream (unnamed) was situated to the east of the study area and would be closest to Options 1, 2 and 3.

Plate 3-1 Typical vegetation within the study area

3.2 Avifauna

3.2.1 General overview

Approximately 445 bird species occur within the Northern Cape across a wide range of different biomes and habitat types. This includes pelagic species such as albatrosses, petrels and so forth. 56 of these species are endemic to South Africa meaning that they do not occur outside of South Africa's borders with a further 42 being classified as near endemics i.e. their distribution reaches just outside of our borders into neighbouring countries. Of the 445 bird species occurring in the Northern Cape, 52 or 11.5% are listed in *The Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland* Status meaning that to a certain degree their existence as a species is threatened.

3.2.2 Community assemblage within the study area

Bird taxa are appropriate indicators for monitoring ecosystem health as individual bird species are associated with particular habitats and groups of bird species (or assemblages) can be used to develop associations with habitats that are predictive of the relative level of anthropogenic disturbance (Canterbury et al. 2000). Given that the vegetation within the study area was homogenous we utilised the MacKinnon List method, a rapid avifaunal assessment technique, to collect bird community data. All species seen or heard were grouped into consecutive lists of equal length and a species accumulation curve was generated from adding those species not recorded on any previous list to the total species number. We defined saturation as the point where the rate of species accumulation over five sample intervals fell below 0.10 (Colwell and Chang 2004). At this point the study area was deemed to have been adequately surveyed with the likelihood of further species being detected being negligible to the amount of survey effort required. For the purposes of this study aerial species such as Martins, Swallows and Swifts were excluded from the data set. The results of the avifaunal assessment are depicted in Figure 3-1. A total of 54 species were detected within the study area. The graph shows an initial high rate of species accumulation during the early stages of the sampling program. As sampling progressed less new species were being recorded which explains the slowdown in the rate of accumulation up until an asymptote is reached after 43 sampling units. Figure 3-1 indicates that the sampling effort for the study area was saturated.

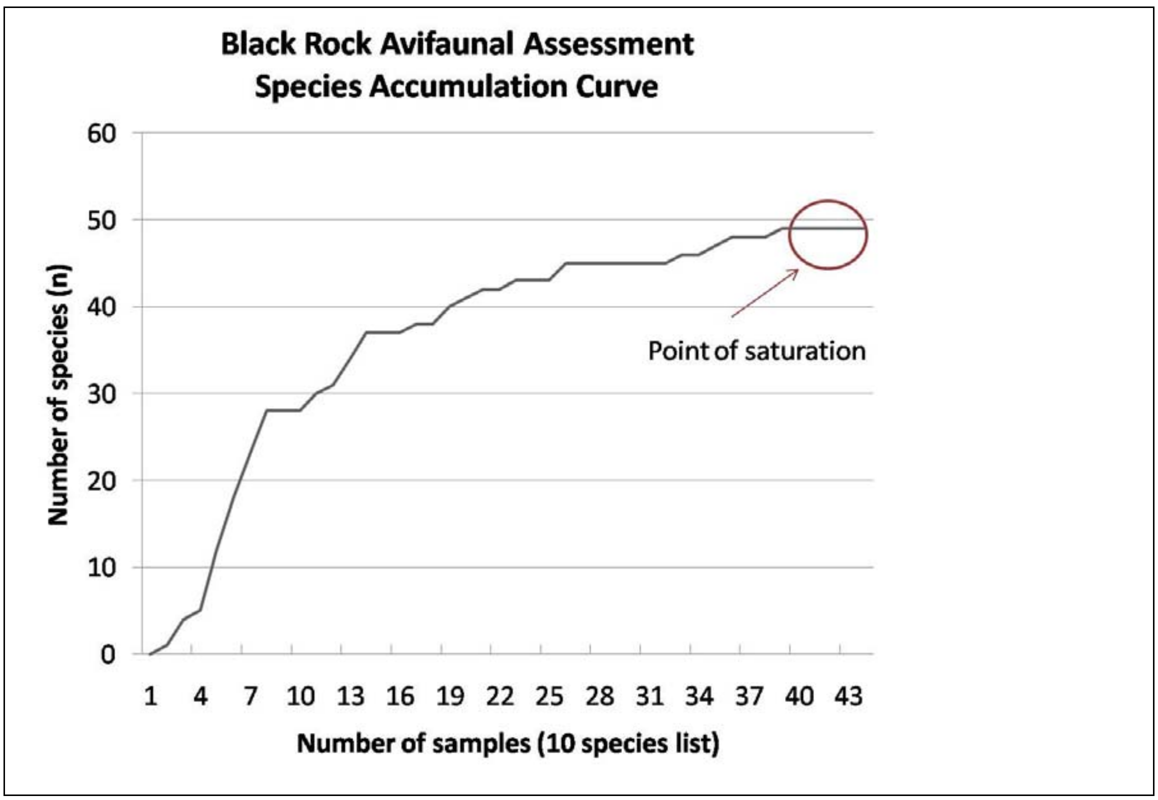

Figure 3-1 – Species accumulation curve for bird assemblage present at the study site

3.2.3 Comment on results of avifaunal survey

We recorded a total of 54 species for the site with White-browed Sparrow Weaver (*Plocepasser mahali*) and Southern Masked Weaver (*Ploceus velatus*) being the most abundant species recorded. Species richness was fairly low but this can be explained by the homogenous nature of the study area. If the study area had contained a variety of different habitats such as ephemeral pans, rivers and so forth the species richness or rather number of species detected would have been higher. It is interesting to note that none of the species that are considered threatened according to *The Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland* were detected on site during the avifaunal assessment. This does not mean that they would not occur within the area and subsequently would not be impacted upon by the powerlines and towers. Species such as Martial Eagle (*Polemaetus bellicosus)* have extremely large home ranges and could very well be found on occasion within the study area. What was of concern was the relatively low number of raptors that were encountered during the survey. We expected to record at least some of the more abundant raptors in the region such as Greater Kestrel (*Falco rupicoloides*) and Black-shouldered Kite (*Elanus caeruleus*) as well as different accipiter's within the woodland vegetation but we did not.

3.3 Endangered Avifaunal Species

Whilst many threatened or rare species may not fulfil vital roles in ecosystem functioning (Dean et al. 1997), they are essential indicators of overall ecosystem health and are initial rivets that signal ecosystem decay. We received a data set of the total number of species that occurred within the Northern Cape and that, according to *The Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland* were classified as falling into an Endangered category. The entire species list is contained in Addendum C. We removed species that would not occur within the area or for which the habitat would be unsuitable, i.e. pelagic species such as albatrosses which are oceanic, etc. The remaining species which may possibly occur on site are recorded in Table 3-1 below.

Table 3-1: Globally threatened species possibly occurring within the study area

Common name	Scientific name	Biome	Red Data Book status	Habitat
Marabou Stork	*Leptoptilos crumeniferus*	NK	Near-threatened	Grassland/Thornveld
Secretarybird	*Sagittarius serpentarius*	S, G	Near-threatened	Grassland
Egyptian Vulture	*Neophron percnopterus*	S, G	Regionally extinct	Grassland/Thornveld
Lappet-faced Vulture	*Torgos tracheliotus*	S	Vuln. / Threatened	Grassland/Thornveld
White-backed Vulture	*Gyps africanus*	S	Vulnerable	Grassland/Thornveld
Kori Bustard	*Ardeotis kori*	NK	Vulnerable	Grassland/Thornveld
Cape Vulture	*Gyps coprotheres*	S, G	Vulnerable / Threatened	Grassland/Thornveld
Red-billed Oxpecker	*Buphagus erythrorhynchus*	S	Near-threatened	Savanna
Bateleur	*Terathopius ecaudatus*	S	Vulnerable	Savanna
Short-clawed Lark	*Certhilauda chuana*	S	Near-threatened	Thornveld
Tawny Eagle	*Aquila rapax*	NK	Vulnerable	Thornveld
Lanner Falcon	*Falco biarmicus*	NK, S	Near-threatened	Varied
Martial Eagle	*Polemaetus bellicosus*	NK, S	Vulnerable	Varied

The above table represents species whose distribution range overlaps with the study area. Whilst the species accumulation curve indicated that we had saturated the study area, it is not inconceivable for these species occur within the study area at some stage – after all birds respond to the sporadic availability of resources such as food and move accordingly. Given this, we have included the possibility that interactions between these Red Data species and the proposed powerline may occur.

4. IMPACT RISK ANALYSIS

4.1 Collision of birds with overhead cables

4.1.1 Description

A collision event is when a bird species collides with the conductors or earth wires of overhead powerlines. In South Africa, bird collisions with powerlines are a major form of unnatural mortality amongst several threatened species as well as other species. Unfortunately the majority of species that are susceptible to collision tend to be long lived, slow reproducing species such as bustards, cranes, korhaaans and different species of waterbird. Due to the slow reproductive nature of the above species, long-term mortalities caused by collisions with powerlines will have a high likelihood on future population's abilities to be able to sustain themselves. It is generally accepted that birds can usually avoid the highly visible bundled conductors but often fail to see the thin ground wire. Typical injuries that result from a powerline collision are impact injuries such as broken necks and legs. Research indicates that there is a correlation between the size of the powerline and the collision risk potential with mortality increasing with voltage size. Species that may possibly occur in the area and that may be involved in collision events are included in **Error! Reference source not found.**.

Table 4-1 - Endangered species within the study area that may be collision suspects

Common name	Scientific name	Biome	Red Data Book status	Habitat
Marabou Stork	*Leptoptilos crumeniferus*	NK	Near-threatened	Game Reserves
Secretarybird	*Sagittarius serpentarius*	S, G	Near-threatened	Grassland
Kori Bustard	*Ardeotis kori*	NK	Vulnerable	Grassland/Thornveld

Whilst the above table lists only endangered species, all korhaan and bustard populations are currently under pressure. According to Anderson (2001), the collision of large terrestrial birds with the wires of utility structures and especially power line, has been determined to be one of the highest mortality factors for this group of birds in South Africa. It is possible that the populations of two southern Africa endemic species namely Ludwig's Bustard (*Neotis ludwigi*) and the Blue Crane (*Anthropoides paradiseus*) may be in decline due to this single mortality factor (Anderson 2000). For species such as Northern Black Korhaan (*Eupoditis afraoides*) and Red-crested Korhaan (*Eupoditis ruficrista*), which were detected in the survey, collision mortalities would probably not have a hugely significant impact on their populations. Ongoing mortalities on a large scale could however have long term affects on Northern Black Korhaan (*Eupoditis afraoides*) and Red-crested Korhaan and as such an effort should be made to minimise the impacts upon these populations. However, for species such as the Kori Bustard (*Ardeotis kori*), which were not detected in the survey but that could possibly occur in the area, collisions would have a large negative impact on their population.

Table 4-2 – Significance rating of bird collisions with overhead powerlines

Activity description and potential impacts	Probability	Extent	Duration	Intensity	Significance	Management measures
Collisions of bird with the overhead power lines.	4	1	5	6	16 Moderate to high (-)	Management measures are provided below
With management measures	2	1	5	4	12 Moderate to high (-)	

4.1.2 Management measures

Two mitigation measures are proposed with regards to the collisions of birds with the overhead cables namely a) alignment of the powerline away from topographical features to thus limit/prevent collisions and b) the fitting of appropriate marking devices (such as bird flappers) to make the line more visible.

Topographical features such as mountains, rivers and valleys also influence the local and migratory movements of birds. Options 1, 2 and 3 all exit the Klipkop substation and run along the R380 before turning south towards the Umtu 132kV substation. At the point where it turns south the line would run parallel to a non-perennial stream (**Error! Reference source not found.**). Given that collisions form one of the largest threat to birds in the region it is recommended that these options be rejected due to their proximity to the stream. Option 4, 5 and 6 which run south from the Klipkop Station to the R31 before turning east towards the Umtu 132kV substation would be the preferred options as they stay away from any type of river course. An additional factor favouring the options running along the R31 as opposed to the R380 is that the R341 is utilised far less than the R380. Given that passing vehicles may flush birds which occasionally then fly into power lines and telephone lines) as korhaans and bustards, the less travelled option would possibly be a better option.

Bird marking devices have proved to be extremely effective in preventing bird collisions by making the line more visible to birds. The two most commonly used marking devices in South Africa are Bird Flight Diverters and Bird Flappers. Bird Flight Diverters were developed in Europe and have shown to have been able to reduce the collision rate of birds significantly (in certain cases up to 60%) by increasing the visibility of the powerline (Alonso and Alonso 1999). BFD are static and typically require less maintenance. Bird flappers are a South African invention and, if applied correctly, have proven to be more effective than the Bird Flight Diverter in comparative experiments. It has largely replaced the BFD as a mitigation device for bird collisions within South Africa. Bird flappers are susceptible to failure and have a life expectancy of three to five years (van Rooyen 2008). Bird flappers should only be installed should the line cross any streams or so forth. Provided that Options4, 5 or 6 are selected and not Options 1, 2 or 3 then there is no need to place flappers on the lines.

4.2 Electrocution of birds on the tower structure

4.2.1 Description

Electrocution refers to a scenario whereby a bird perches on an electrical structure and causes an electrical short circuit by bridging the gap between live components and or live and earthed components (van Rooyen 2004). The larger transmission lines from 220kV to 765kV upwards are not a threat to large raptors and other birds which are vulnerable to electrocution and in a number of cases have proved to be beneficial by providing roosting and nesting sites. However the smaller lines (such as a 132kV line (older designs) and depending on the tower design) can be dangerous to birds. Birds that are typically the cause of this are the larger species with corresponding large wingspans which can bridge the gaps, such as raptors and storks. A table containing endangered species which could occur within the area is included in Table 4-3 With regards to electrocutions of the above nature and that of 132kV lines it is not generally a concern as the components are too far apart for species with even the largest wingspan to cause an electrocution.

Table 4-3 - Endangered species possibly occurring within the study area capable of electrocution events

Common name	Scientific name	Biome	Red Data Book status	Habitat
Marabou Stork	*Leptoptilos crumeniferus*	NK	Near-threatened	Game Reserves
Secretarybird	*Sagittarius serpentarius*	S, G	Near-threatened	Grassland
Lappet-faced Vulture	*Torgos tracheliotos*	S	Vuln. / Threatened	Grassland/Thornveld
White-backed Vulture	*Gyps africanus*	S	Vulnerable	Grassland/Thornveld
Kori Bustard	*Ardeotis kori*	NK	Vulnerable	Grassland/Thornveld
Cape Vulture	*Gyps coprotheres*	S, G	Vulnerable / Threatened	Grassland/Thornveld
Tawny Eagle	*Aquila rapax*	NK	Vulnerable	Thornveld
Martial Eagle	*Polemaetus bellicosus*	NK, S	Vulnerable	Varied

In flattish landscapes, typical of the study area, large raptors will instinctively look for the highest vantage point on which to perch. Given that the towers will be the highest structures in the area, raptors will be landing on the structures and it is imperative that the design of the tower is such that it is impossible for a large raptor to touch two live components.

Table 4-4 – Significance rating of bird electrocution events with overhead powerlines

Activity description and potential impacts	Probability	Extent	Duration	Intensity	Significance	Management measures
Electrocution of birds with the overhead power lines.	4	1	2	0	7 Low to moderate (-)	Management measures are provided below
With management measures	1	1	2	0	3 Low (-)	

4.2.2 Mitigation measures

Discussions with the representative from Eskom indicated that it is planned to utilise the mono pole bird friendly structure which will significantly minimise the number of electrocutions on the powerlines. An image of the Eskom 132kV mono pole structure as well as the drawings illustrating the mono pole bird friendly structure can be found in Addendum D.

4.3 Impact on local bird community due to disturbance

4.3.1 Description

Disturbance would occur during the construction and maintenance periods. For shy and sensitive species this may result in an impact especially during the breeding season. Options 1,2, 3 and 4 will all at a certain stage run adjacent to roads that are in use (The R380 in the case of Options 1, 2 and 3 and the R31 in the case of Option 4). The amount of disturbance that bird communities adjacent to the road corridors are exposed to is already significant. The additional disturbance created through the construction and ongoing maintenance will be minimal and should not have any significant impact upon the local bird community.

Table 4-5 – Significance rating of impact on bird community due to disturbance

Activity description and potential impacts	Probability	Extent	Duration	Intensity	Significance	Management measures
Impact on local bird community due to disturbance.	4	1	2	0	7 Low to moderate (-)	Management measures are provided below
With management measures	2	1	1	0	4 Low (-)	

4.3.2 Management measures

The recommendations with regards to minimising the amount of impact that habitat disturbance are as follows:

- Habitat clearance must remain at an absolute minimum.
- Staff members responsible for the erection of the powerlines must remain within the designated work areas

- The Environmental Control Officer should be briefed on the need to notify the ornithologist with the Northern Cape Department of Environment, Tourism and Conservation should any breeding birds be found within the servitude and in particular large breeding species such as korhaans and bustards.

4.4 Impact on local bird community due to habitat loss

4.4.1 Description

A certain amount of habitat will be lost during the establishment and erection of the tower structures and the clearing of the servitude. This amount of habitat loss is minimal and will not have any impact on local bird communities.

Table 4-6 – Significance rating of impact on bird community due to habitat loss

Activity description and potential impacts	Probability	Extent	Duration	Intensity	Significance	Management measures
Impact on local bird community due to habitat loss	4	1	2	0	7 Low to moderate (-)	Management measures are provided below
With management measures	2	1	2	0	5 Low to moderate (-)	

4.4.2 Management measures

- If possible the servitude should follow existing roads where possible and should not cut across habitat. The purpose of this is to minimise the amount of fragmentation occurring within habitat and to rather lose habitat.
- All construction and maintenance activities must be undertaken in accordance with Eskom Transmissions environmental best practise standards. All construction and access roads should be restricted as much as possible.

4.5 Impacts of bird species upon the powerline

4.5.1 Bird pollution (Streamers and faeces build up)

4.5.1.1 Description

A streamer is when a bird defecates and releases a stream of faeces which creates an air gap intrusion between the conductor and the earthed structure. The fault appears to flash across the air gap (i.e. between the live conductor and the tower steelwork which is earthed) and does not follow an insulator creepage as observed on pollution faults. Species which create streamers large enough to create this type of situation are typically your large species such as vultures and herons. A flashover occurs when an insulator string gets coated with pollutant which then causes the insulator to function incorrectly. When the pollutant is wet, the coating becomes conductive, insulation breaks down and a flashover occurs. This is created by a build up of bird faeces over a period of time on a line. Species that occur on site that could possibly impact upon the powerline are included in Table 4-7.

Table 4-7 - Species that may impact on the powerline through pollution events

Common name	Scientific name	Biome	Red Data Book status	Habitat
Marabou Stork	*Leptoptilos crumeniferus*	NK	Near-threatened	Game Reserves
Secretarybird	*Sagittarius serpentarius*	S, G	Near-threatened	Grassland
Lappet-faced Vulture	*Torgos tracheliotos*	S	Vuln. / Threatened	Grassland/Thornveld
White-backed Vulture	*Gyps africanus*	S	Vulnerable	Grassland/Thornveld
Kori Bustard	*Ardeotis kori*	NK	Vulnerable	Grassland/Thornveld
Cape Vulture	*Gyps coprotheres*	S, G	Vulnerable / Threatened	Grassland/Thornveld
Tawny Eagle	*Aquila rapax*	NK	Vulnerable	Thornveld
Martial Eagle	*Polemaetus bellicosus*	NK, S	Vulnerable	Varied

Table 4-8 – Significance rating of impact of birds on the powerline due to pollution events

Activity description and potential impacts	Probability	Extent	Duration	Intensity	Significance	Management measures
Impact on local bird community due to habitat loss	2	1	5	4	12 Moderate (-)	Management measures are provided below
With management measures	1	1	5	2	9 Low to moderate (-)	

4.5.1.2 Management measures

Eskom has indicated that it intends to utilise the mono pole bird-friendly structure. The design of the tower needs to incorporate perch deterrents in the area directly above the insulator strings to ensure that bird species are not given the opportunity to defecate on the string.

4.5.2 Bird nests on the tower structures

4.5.2.1 Description

As mentioned above, certain structures (220kV and up) have proven to be beneficial to certain raptors by providing roosting and nesting sites in areas where natural alternatives are scarce. This is especially true in the Northern Cape where there is a lack of suitable nesting and roosting sites. However the smaller transmission lines can pose a problem. The construction of bird nests on the smaller transmission lines have the potential to cause faults by creating an air gap intrusion. Species such as crows are famous for the different materials (such as pieces of wire) they collect which in turn can cause flashovers. The faults created by nests can also result in veld fires due to the nesting material catching fire as well as surrounding veld.

Table 4-9 – Species capable of nesting on the tower structure

Common name	Scientific name	Biome
Black Stork	*Ciconia nigra*	S, G, NK
Marabou Stork	*Leptoptilos crumeniferus*	NK
Yellow-billed Stork	*Mycteria ibis*	G, S
Secretarybird	*Sagittarius serpentarius*	S, G
Lappet-faced Vulture	*Torgos tracheliotus*	S
White-backed Vulture	*Gyps africanus*	S
Tawny Eagle	*Aquila rapax*	NK
Martial Eagle	*Polemaetus bellicosus*	NK, S
Bateleur	*Terathopius ecaudatus*	S
Kori Bustard	*Ardeotis kori*	NK
Sociable Weaver	*Philetairus socius*	NK
Cape Crow	*Corvus capensis*	SK
Pied Crow	*Corvus albus*	NK
White-necked Raven	*Corvus albicollis*	NK
Red-billed Buffalo-Weaver	*Bubalornis niger*	S
White-browed Sparrow-Weaver	*Plocepasser mahali*	S, NK

Table 4-10 – Significance rating of impact of birds on the powerline due to pollution events

Activity description and potential impacts	Probability	Extent	Duration	Intensity	Significance	Management measures
Impact on local bird community due to habitat	2	1	5	2	10	Management measures are

Activity description and potential impacts	Probability	Extent	Duration	Intensity	Significance	Management measures
loss					Moderate (-)	provided below
With management measures	0	1	5	0	9 Low to moderate (-)	

4.5.2.2 Mitigation measures

Eskom has indicated that it intends to utilise the mono pole bird-friendly structure. The design of the tower needs to incorporate perch deterrents in the area directly above the insulator strings to ensure that bird species are not given the opportunity to nest above these strings.

5. CONCLUSION AND RECOMMENDATIONS

This section concludes the avifaunal assessment completed on the Black Rock 132kV powerline project. In terms of the original terms of reference to the consultant we have:

- Completed a baseline of avifaunal communities within the study area

A rapid avifaunal assessment of the study area was completed the results of which are in Section 2 of the report.

- Identified possible IUCN listed species occurring or possibly occurring within the study area

This has been completed in Section 3 of the report.

- Determined possible impacts that the action (i.e. construction of one of the powerline options) would have on communities and endangered avifaunal species

This has been completed in section 4 of the report. The most significant threat to bird communities, and Red Data species in particular, would be from collisions with the overhead lines. Mitigation measures to try and prevent or minimise these collisions have been put forward which include a) placing bird flappers on the overhead wires and b) routing the powerline along option 4, 5 and 6 which avoids the riverbed which Options 1, 2,and 3 would run parallel to.

- Provide advice on the best alternative route out of an option of 6 (Options 4 and 5).

In terms of routing the powerline, our conclusion that the best routes with regards to reducing possible bird mortalities (including those relating to endangered species) was options 4 and 5.

- Determined possible mitigation measures based upon an agreed framework

An ideal situation would be that no species would be injured or killed due to an interaction with electricity infrastructure or that transmission was not interrupted due to an electrocution event. Unfortunately this is not the case and these types of interactions are inevitable and will happen. What is important is to ensure that the correct measures are put in place to minimise the number of interactions. Where possible we have recommended possible mitigation measures the most important being the a) Design of the tower structure itself – Eskom intend to utilise a mono pole bird friendly tower which mitigates this possible impact and b) the placement of devices to attempt to minimise the amount of collisions.

Provided the recommended mitigation measures are employed as well as above mentioned tower design the consultant does not feel that this erection and operation of the 132kV powerline will have a negative impact upon local bird communities occurring within the study area.

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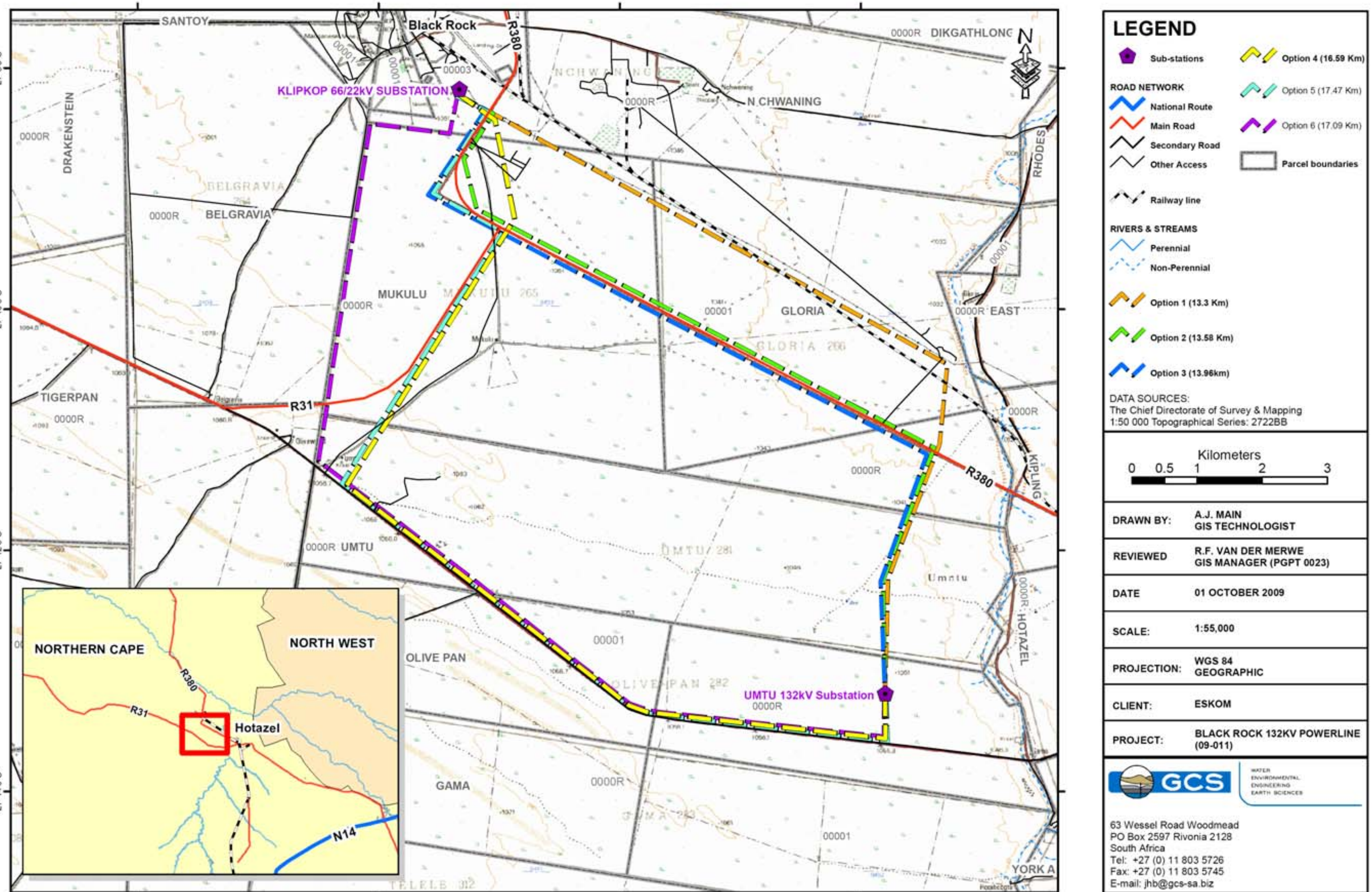
Addendum A – Locality Map of the Study Area

LOCALITY MAP: OPTIONS FOR 132KV POWERLINE



Addendum B - Species List for the Study Site

Black Rock Avifaunal Assessment – Bird Species List for the Study Area

October 2009

Order seen	Rob. No.	Common name	Afrikaanse naam	Scientific name	Biome	Status	Red Data Book status	S.A. endemic	N.C. endemic	Habitat
1	473	Crested Barbet	Kuifkophoutkapper	*Trachyphonus vaillantii*	S	Common				Savanna
2	764	Cape Glossy Starling	Kleinglansspreeu	*Lamprotornis nitens*	S, NK	Common		NE		Thornveld, Woodland
3	706	Fairy Flycatcher	Feevlieëvanger	*Stenostira scita*	NK	Common		E		Thornveld
4	373	Grey Go-away-bird	KwLvoNl	*Corythaixoides concolor*	S	Common				Woodland
5	801	House Sparrow	Huismossie	*Passer domesticus*	NK	Abundant				Gardens, Towns
6	355	Laughing Dove	Rooiborsduifie	*Streptopelia senegalensis*	S, NK	Abundant				Diverse
7	354	Cape Turtle-Dove	Gewone Tortelduif	*Streptopelia capicola*	S, NK	Abundant				Diverse
8	557	Cape Penduline-Tit	Kaapse Kapokvoël	*Anthoscopus minutus*	NK	Common		E/ NE		Thornveld
9	577	Olive Thrush	Olyflyster	*Turdus olivaceus*	NK	Common				Varied
10	465	Acacia Pied Barbet	Bonthoutkapper	*Tricholaema leucomelas*	SK	Common		NE		Savanna
11	483	Golden-tailed Woodpecker	Goudstertspeg	*Campethera abingoni*	S	Common				Thornveld
12	698	Fiscal Flycatcher	Fiskaalvlieëvanger	*Sigelus silens*	S, NK	Common		E		Diverse
13	779	Marico Sunbird	Maricosuikerbekkie	*Cinnyris mariquensis*	S	Common				Thornveld
14	878	Yellow Canary	Geelkanarie	*Serinus flaviventris*	NK	Common		NE		Karoo, Coastal scrub
15	375	African Cuckoo	Afrikaanse Koekoek	*Cuculus gularis*	S	Common				Savanna
16	567	African Red-eyed Bulbul	Rooioogtiptol	*Pycnonotus nigricans*	NK	Common		NE		Varied
17	739	Crimson-breasted Shrike	Rooiborslaksman	*Laniarius atrococcineus*	S	Common		NE		Thornveld
18	589	Familiar Chat	Gewone Spekvreter	*Cercomela familiaris*	NK	Common				Varied
19	457	African Grey Hornbill	GrysneushoringvoNl	*Tockus nasutus*	S	Common				Woodland
20	438	European Bee-eater	Europese Byvreter	*Merops apiaster*	NK	Common				Diverse
21	541	Fork-tailed Drongo	Mikstertbyvanger	*Dicrurus adsimilis*	S	Common				Savanna
22	703	Pririt Batis	Priritbosbontrokkie	*Batis pririt*	NK	Common		NE		Woodland, Thornveld

23	621	Chestnut-vented Tit-Babbler	Bosveldtjeriktik	*Parisoma subcaeruleum*	NK	Common		NE		Diverse
24	685	Black-chested Prinia	Swartbandlangstertjie	*Prinia flavicans*	NK, S	Common		NE		Diverse
25	237	Red-crested Korhaan	Boskorhaan	*Eupodotis ruficrista*	S	Common		NE		Savanna
26	743	Brown-crowned Tchagra	Rooivlerktjagra	*Tchagra australis*	S	Common				Woodland, Thickets
27	454	Common Scimitarbill	Swartbekkakelaar	*Rhinopomastus cyanomelas*	S	Common				Woodland
28	595	Anteating Chat	Swartpiek	*Myrmecocichla formicivora*	NK, G	Common		E		Grassland
29	697	Chat Flycatcher	Grootvlieëvanger	*Bradornis infuscatus*	NK	Common		NE		Karoo, Desert scrub
30	799	White-browed Sparrow-Weaver	Koringvoël	*Plocepasser mahali*	S, NK	Very common				Thornveld
31	239	Northern Black Korhaan	Witvlerkkorhaan	*Eupodotis [a.] afraoides*	NK	Common				Grassland
32	486	Cardinal Woodpecker	Kardinaalspeg	*Dendropicos fuscescens*	NK	Common				Diverse
33	651	Long-billed Crombec	Bosveldstompstert	*Sylvietta rufescens*	NK, S	Common				Woodland, Savanna
34	741	Brubru	Bontroklaksman	*Nilaus afer*	S	Common				Woodland
35	425	White-backed Mousebird	WitkruismuisvoNl	*Colius colius*	NK, SK	Common		E/NE		Thornveld
36	814	Southern Masked-Weaver	Swartkeelgeelvink	*Ploceus velatus*	NK	Very common				Savanna, Grassland
37	194	Red-billed Francolin	Rooibekfisant	*Pternistes adspersus*	S	Common		NE		Thornveld
38	356	Namaqua Dove	Namakwaduif	*Oena capensis*	NK	Common				Grassland, Savanna
39	398	Pearl-spotted Owlet	Witkoluil	*Glaucidium perlatum*	S	Common				Thornveld
40	834	Green-winged Pytilia	Gewone Melba	*Pytilia melba*	NK	Common				Grassland
41	552	Ashy Tit	Akasiagrysmees	*Parus cinerascens*	NK	Common		NE		Thornveld
42	845	Violet-eared Waxbill	Koningblousysie	*Granatina Granatina*	S	Common				Woodland, Savanna
43	449	Purple Roller	Groottroupant	*Coracias naevia*	S	Uncommon				Thornveld
44	884	Golden-breasted Bunting	Rooirugstreepkoppie	*Emberiza flaviventris*	S	Common				Thornveld, Plantations
45	803	Cape Sparrow	Gewone Mossie	*Passer melanurus*	NK	Very common		NE		Grassland
46	447	Lilac-breasted Roller	Gewone Troupant	*Coracias caudata*	S	Common				Savanna
47	615	Kalahari Scrub-Robin	Kalahariwipstert	*Cercotrichas paena*	NK, S	Common		NE		Thornveld

48	459	Southern Yellow-billed Hornbill	Geelbekneushoring voNl	*Tockus leucomelas*	S	Common		NE		Woodland
49	445	Swallow-tailed Bee-eater	Swaelstertbyvreter	*Merops hirundineus*	S	Common				Diverse
50	804	Southern Grey-headed Sparrow	Gryskopmossie	*Passer diffusus*	NK, S	Common				Woodland
51	481	Bennett's Woodpecker	Bennettse Speg	*Campethera bennettii*	S	Uncommon				Savanna
52	563	Southern Pied Babbler	Witkatlagter	*Turdoides bicolor*	S	Common				Savanna
53	802	Great Sparrow	Grootmossie	*Passer motitensis*	S	Common				Thornveld
54	162	Southern Pale Chanting Goshawk	Bleeksingvalk	*Melierax canorus*	NK	Common				Varied

Addendum C - Red Data Species Possibly Occurring within the Northern Cape

Black Rock Avifaunal Assessment – Red Data Bird Species List for the Northern Cape

October 2009

Rob. No.	Common name	Afrikaanse naam	Scientific name	Biome	Status	Red Data Book status	S.A. endemic	N.C. endemic	Habitat
88	Saddle-billed Stork	Saalbekooievaar	*Ephippiorhynchus senegalensis*	NK	Incommon	Endangered			Water
334	Damara Tern	Damarasterretjie	*Sterna balaenarum*	O	Rare	Endangered			Ocean
17	Southern Giant-Petrel	Reusenellie	*Macronectes giganteus*	O	Common	Near-threatened			Ocean
18	Northern Giant-Petrel	Grootnellie	*Macronectes halli*	O	Common	Near-threatened			Ocean
32	White-chinned Petrel	Bassiaan	*Procellaria aequinoctialis*	O	Common	Near-threatened			Ocean
49	Great White Pelican	Witpelikaan	*Pelecanus onocrotalus*	O	Common	Near-threatened			Water
56	Cape Cormorant	Trekduiker	*Phalacrocorax capensis*	O	Common	Near-threatened	NE		Ocean
59	Crowned Cormorant	Kuifkopduiker	*Phalacrocorax coronatus*	O	Uncommon	Near-threatened	E		Ocean
84	Black Stork	Grootswartooievaar	*Ciconia nigra*	S, G, NK	Rare	Near-threatened			Water
89	Marabou Stork	Maraboe	*Leptoptilos crumeniferus*	NK	Uncommon	Near-threatened			Game Reserves
90	Yellow-billed Stork	Nimmersat	*Mycteria ibis*	G, S	Uncommon	Near-threatened			Water
96	Greater Flamingo	Grootflamink	*Phoenicopterus ruber*	O, NK, S	Common	Near-threatened			Water
97	Lesser Flamingo	Kleinflamink	*Phoenicopterus minor*	O, S, G	Common	Near-threatened			Water
118	Secretarybird	SekretarisvoNl	*Sagittarius serpentarius*	S, G	Uncommon	Near-threatened			Grassland
167	Pallid Harrier	Witborsvleivalk	*Circus macrourus*	G, S	Uncommon	Near-threatened			Grassland
168	Black Harrier	Witkruisvleivalk	*Circus maurus*	G, NK	Uncommon	Near-threatened			Grassland
171	Peregrine Falcon	Swerfvalk	*Falco peregrinus*	NK, S	Rare	Near-threatened			Cliffs
172	Lanner Falcon	Edelvalk	*Falco biarmicus*	NK, S	Uncommon	Near-threatened			Varied
234	Blue Korhaan	Bloukorhaan	*Eupodotis caerulescens*	NK	Common	Near-threatened	E		Grassland
244	African Black Oystercatcher	Swarttobie	*Haematopus moquini*	O	Common	Near-threatened	E		Ocean
247	Chestnut-banded Plover	Rooibandstrandkiewiet	*Charadrius pallidus*	NK	Uncommon	Near-threatened			Wetlands, Pans
322	Caspian Tern	Reusesterretjie	*Sterna caspia*	O	Common	Near-threatened			Water
****	Eastern Long-billed Lark	Overberglangbeklewerik	*Certhilauda [c.] semitorquata*	F	Common	Near-threatened	E		Farmlands
501	Short-clawed Lark	Kortkloulewerik	*Certhilauda chuana*	S	Uncommon	Near-threatened	E		Thornveld
510	Sclater's Lark	Namakwalewerik	*Spizocorys sclateri*	NK	Uncommon	Near-threatened	E		Stony desert scrub
772	Red-billed Oxpecker	Rooibekrenostervoël	*Buphagus erythrorhynchus*	S	Rare	Near-threatened			Savanna
****	Eastern Long-billed Lark	Overberglangbeklewerik	*Certhilauda [c.] semitorquata*	F	Common	Near-threatened	E		Farmlands
120	Egyptian Vulture	Egiptiese AasvoNl	*Neophron percnopterus*	S, G	Rare	Regionally extinct			Grassland
124	Lappet-faced Vulture	SwartaasvoNl	*Torgos tracheliotus*	S	Rare	Vuln. / Threat?			Grassland

3	African Penguin	Brilpikkewyn	*Spheniscus demersus*	O	Common	Vulnerable	E		Ocean
****	Indian Yellow-nosed Albatross	Indiese Geelneusalbatros	*Thalassarche carteri*	O	Uncommon	Vulnerable			Ocean
50	Pink-backed Pelican	Kleinpelikaan	*Pelecanus rufescens*	G, S	Uncommon	Vulnerable			Water
53	Cape Gannet	Witmalgas	*Morus capensis*	O	Common	Vulnerable	E		Ocean
57	Bank Cormorant	Bankduiker	*Phalacrocorax neglectus*	O	Common	Vulnerable	E		Ocean
77	White-backed Night-Heron	Witrugnagreier	*Gorsachius leuconotus*	G	Uncommon	Vulnerable			Water
121	Hooded Vulture	MonnikaasvoNl	*Necrosyrtes monachus*	S	Uncommon	Vulnerable			Grassland
123	White-backed Vulture	WitrugaasvoNl	*Gyps africanus*	S	Uncommon?	Vulnerable			Grassland
125	White-headed Vulture	WitkopaasvoNl	*Trigonoceps occipitalis*	S	Uncommon	Vulnerable			Grassland
132	Tawny Eagle	Roofarend	*Aquila rapax*	NK	Uncommon	Vulnerable			Thornveld
140	Martial Eagle	BreNkoparend	*Polemaetus bellicosus*	NK, S	Uncommon	Vulnerable			Varied
146	Bateleur	Berghaan	*Terathopius ecaudatus*	S	Uncommon	Vulnerable			Savanna
165	African Marsh-Harrier	Afrikaanse Vleivalk	*Circus ranivorus*	NK, S	Uncommon	Vulnerable			Marshlands
182	Greater Kestrel	Grootrooivalk	*Falco rupicoloides*	NK, S, G	Common	Vulnerable			Diverse
208	Blue Crane	BloukraanvoNl	*Anthropoides paradisea*	NK, G	Common	Vulnerable	E		Grassland
211	Corn Crake	Kwartelkoning	*Crex crex*	G	Uncommon	Vulnerable			Grassland
230	Kori Bustard	Gompou	*Ardeotis kori*	NK	Uncommon	Vulnerable			Grassland
231	Denham's Bustard	Veldpou	*Neotis denhami*	SK	Uncommon	Vulnerable			Grassland
232	Ludwig's Bustard	Ludwigse Pou	*Neotis ludwigii*	NK	Uncommon	Vulnerable	NE		Savanna
393	African Grass-Owl	Grasuil	*Tyto capensis*	G	Uncommon	Vulnerable			Grassland, Marshes
504	Red Lark	Rooilewerik	*Certhilauda burra*	SK	Common	Vulnerable	E		Shrubland, dunes
122	Cape Vulture	KransaasvoNl	*Gyps coprotheres*	S, G	Uncommon	Vulnerable / Threat?	E		Grassland

Addendum D – Eskom Tower Structures

Image of Eskom 132kV bird friendly mono pole structure

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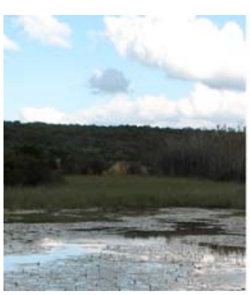
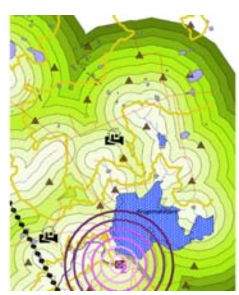
Black Rock Proposed 132kV Powerline

Vitae Appendix D: Specialists Reports

Appendix Diii:
Ecological Impact Assessment




ECOLOGICAL REPORT: BLACK ROCK POWERLINE PROJECT

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October 2009

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ECOLOGICAL REPORT: BLACK ROCK POWERLINE PROJECT

1. INTRODUCTION

1.1 Background Information

This report forms part of an Environmental Impact Assessment (EIA) for the construction of a 132 kV powerline in the vicinity of Black Rock in the Northern Cape Province (see locality insert – Figure 1), by Eskom through Assmang Ltd.

Six options for the location of the proposed powerline were identified during the initial stages of the EIA process, where after only three options, namely Options 4, 5 and 6 (Figure 1) (hereinafter referred to as "the study area"), were selected for further investigation. The reason for the omission of Options 1 to 3 from these investigations is that potential future mining developments on the farm Umtu No. 281, District of Kuruman by Hotazel Manganese Mines would necessitate the re-routing of the powerline in these areas in future, which renders these options non-viable.

1.2 Construction process

The proposed 132 kV powerline will be located within a 31 m wide servitude running along one of the three options mentioned in Section 1.1 and illustrated in Figure 1. The construction of the proposed powerline will, however, not involve the clearing of the vegetation of the entire servitude area: only larger plants will be destructed or trimmed in order to allow access by construction- and, at a later stage, maintenance vehicles.

1.3 Aims of the study

The aims of this ecological study are as follows:

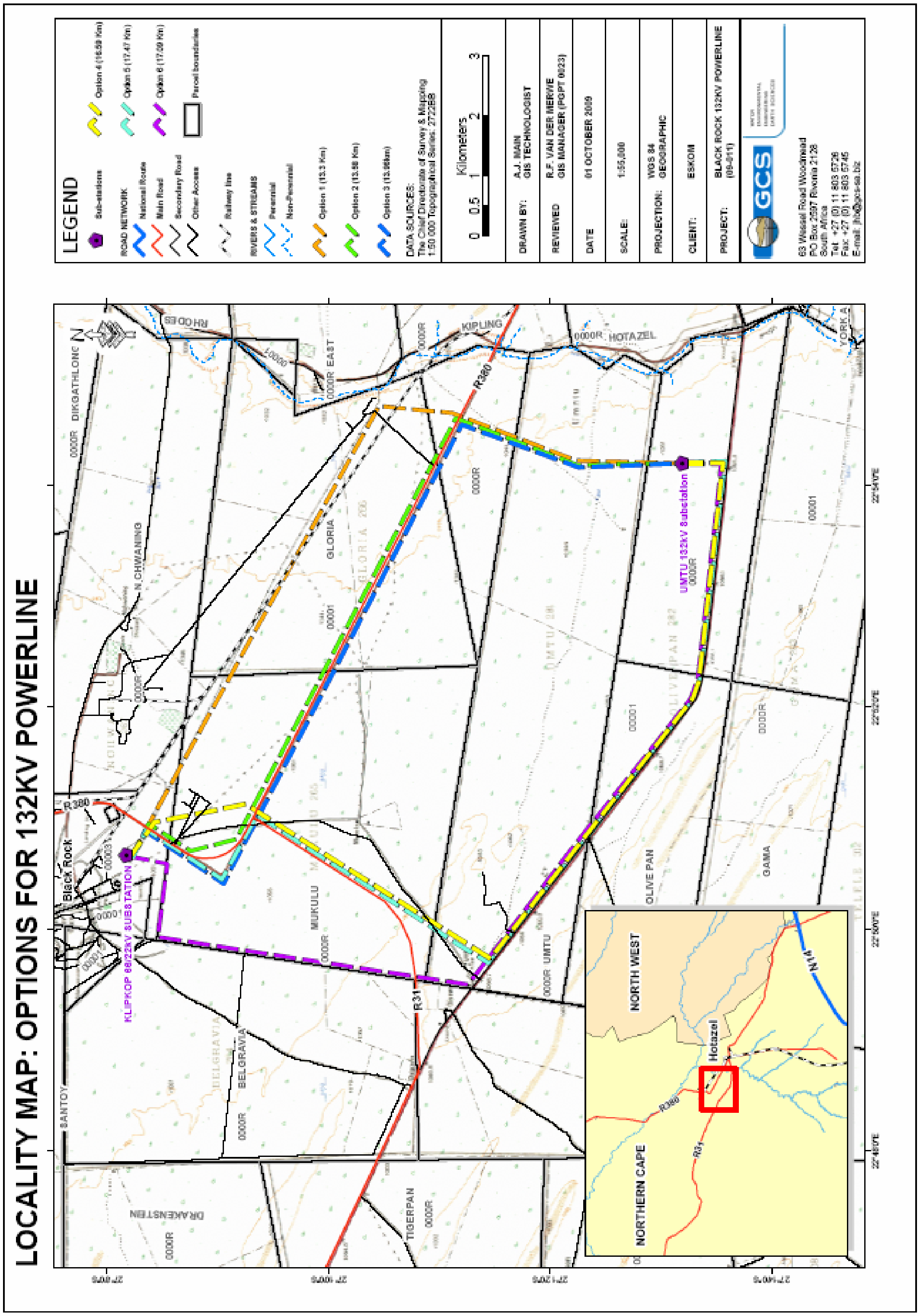

Figure 1. Locality map: Options for the placement of the proposed 132 kV powerline.

- The geo-referencing of individuals of plant species of conservation importance;
- The mapping of populations of plant species of conservation importance;
- The compilation of a list of animal species frequenting the area and plant species found in the study area;
- Determining the state of disturbance of the natural environment of the study area; and
- Using the information as listed above to assess and mitigate the anticipated impact of the proposed construction of the 132 kV powerline on the fauna and flora of the study area.

2. METHODOLOGY

The largest parts of the lines indicating Options 4, 5 and 6, i.e. the three potential locations of the proposed powerline, as indicated in Figure 1, were traversed on foot on 24 and 25 October 2009 (i.e. prior to significant spring or summer rains falling in the area) in order to:

- Get a clear indication of the state of disturbance of the natural environment of these areas;
- Geo-reference individuals of protected plant species with the aid of a hand-held Global Positioning System (GPS), mainly for mapping purposes, but also for future permit applications, if required; and
- Compile a record of plant and animal species encountered on-route.

During the above-mentioned field surveys, geo-referencing was done by following a straight centre line along Options 4, 5 and 6 and recording all plants of conservation importance within approximately 15.5 m of this line towards each respective side of the line. This was done in order to ensure that individuals of all protected plant species occurring within the 31 m wide servitude within which the proposed powerline will be constructed, were recorded.

In addition to the field work performed, as detailed above, a desk top study was also undertaken with the focus on the vegetation of the study area and surrounds, as well as the animal species frequenting the area.

Lastly, an indication of animal species frequenting the study area and surrounds was obtained via conversations with farmers and land owners based in the area.

3. RESULTS

3.1 GENERAL DESCRIPTION OF THE VEGETATION OF THE STUDY AREA

As is evident from Figure 2, the study area falls within the boundaries of two different vegetation types, namely the Kathu Bushveld vegetation type (SVk 12) (which forms part of the Eastern Kalahari Bushveld Bioregion) and the Gordonia Duneveld (SVkd 1) (which forms part of the Kalahari Duneveld Bioregion). Both of the aforementioned bioregions form part of the Savanna Biome (Mucina & Rutherford, 2006).

3.1.1 Kathu Bushveld (SVk 12)

According to Mucina and Rutherford (2006:522), the vegetation of the Kathu Bushveld vegetation type is characterised by a medium-tall tree layer with Camel Thorn Tree *Acacia erioloba* occurring in places. Mucina and Rutherford (2006:522) add, however, that this vegetation type is mostly regarded as open veld and that the Shepherd's Tree *Boscia albitrunca* is the prominent tree species found in the area. (It should be noted here that, in contradiction to the aforementioned statement of Mucina and Rutherford (2006:522), the results of this study indicate that although a number of very large *B. albitrunca* individuals do occur in the area, *A. erioloba* is, in fact, far more common and prominent in the study area than the aforementioned species). The shrub layer of this vegetation type is regarded as being very important, with species such as *Acacia mellifera, Diospyros lycioides* and *Lycium hirsutum* commonly found. The grass layer of this vegetation type varies in cover (Mucina & Rutherford, 2006:522).

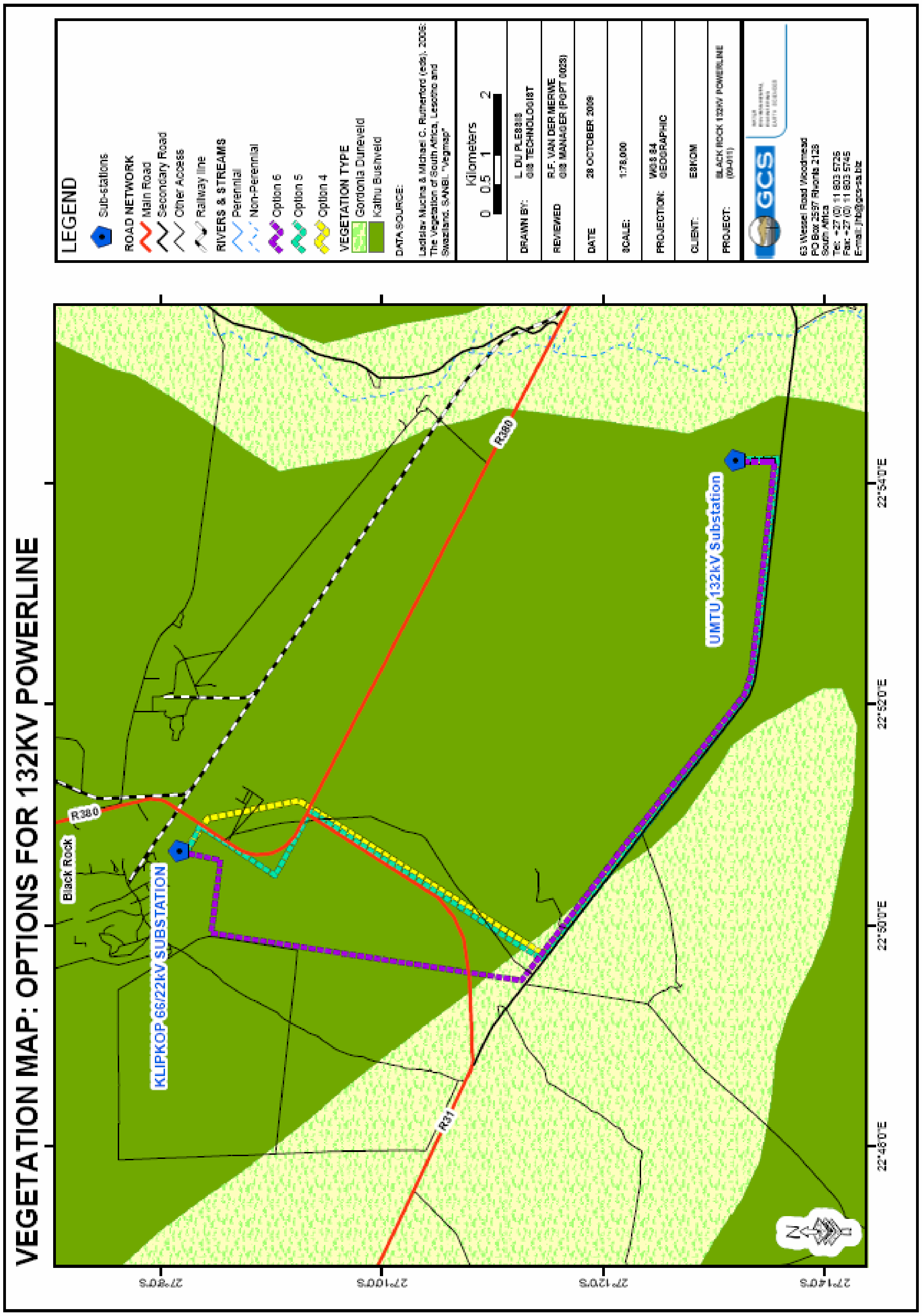

Figure 2. Vegetation types found in the study area.

Traversing the study area on foot confirmed that the largest part thereof is indeed situated within the Kathu Busveld vegetation type (as is illustrated in Figure 2), based on the general description of this vegetation type given above.

3.1.2 Gordonia Duneveld (SVkd 1)

According to Mucina and Rutherford (2006:525) the landscape of the Gordonia Duneveld is characterised by parallel dunes cresting approximately three to eight metres above the plains. The vegetation found in this vegetation type can be described as an open shrubland with ridges of grassland, the latter which is dominated by *Stipagrostis amabilis* on the dune crests and Grey Camel Thorn *Acacia haematoxylon* on the dune slopes. *A. mellifera* can be found on the lower slopes, with *Rhigozum trichotomum* occurring in the interdune straaten (Mucina & Rutherford, 2006:525).

It was confirmed while traversing the study area on foot that a gradual transition from the Kathu Bushveld into the Gordonia Duneveld can indeed be noted in the south-western and western parts of the study area (which forms part of Option 6). This transition is also visible in Figure 3, with the highest concentration of *Acacia haematoxylon* occurring in this area. The latter species is generally associated with “deep, red, sandy soils” (Coates Palgrave, 2002:283), “sand dunes” (Van Rooyen, 2001:28) and “deep Kalahari sand between dunes” (Van Wyk & Van Wyk, 1997:494), which is also characteristic of the Gordonia Duneveld.

3.2 PLANT SPECIES RECORDED WITHIN THE STUDY AREA

A list of all the plant species recorded in the study area during the site visit conducted on 24 and 25 October 2009 is attached hereto as Appendix A. Species of conservation importance are highlighted in green, while alien weeds and invasive plants are highlighted in red.

3.2.1 Tree species protected in terms of the National Forests Act, 1998 (Act No. 84 of 1998)

Three of the tree species found in the study area are protected in terms of Section 12 of the National Forests Act, 1998 (Act No. 84 of 1998), namely Camel Thorn *A.*

erioloba (Photo Plate 1), Shepherd's Tree *B. albitrunca* (Photo Plate 2) and Grey Camel Thorn *A. haematoxylon* (Photo Plate 3).

The Camel Thorn Tree *A. erioloba* is one of the major tree species of the desert regions (Coates Palgrave, 2002:278) and is regarded as a keystone species in the Kalahari (Van Rooyen, 2001:26). [Van Rooyen (2001:26) defines the term "keystone species" as "a species upon which many other plant and animal species depend".] The pods and leaves (with a protein content of 17%) of this tree act as excellent food source to both livestock and game (Van Wyk & Van Wyk, 1997:492; Van Rooyen, 2001:26), while the shade that this tree provides in hot desert regions is, according to Coates Palgrave (2002:279) of "immense value" and "cannot be overestimated". According to Van Rooyen (2001:26) the life cycles of many mammals, birds and insects are intimately associated with these trees, which oftentimes provide the main source of both food and shelter. *A. erioloba* is, however, a slow-growing species and because it develops a very long tap-root, it is difficult or impossible to transplant (Coates Palgrave, 2002:279).

The Shepherd's Tree *B. albitrunca* is often referred to as "the tree of life" in the arid areas where it occurs, as it provides sustenance to both man and animals (Coates Palgrave, 2002:225). The leaves of this tree, with its high vitamin A content and a protein content of 14% (Van Rooyen, 2001:24), act as a nourishing fodder and are heavily browsed by both livestock and game (Van Wyk & Van Wyk, 1997:164; Coates Palgrave, 2002:225). According to Van Wyk and Van Wyk (1997:164) *B. albitrunca* also acts as a larval food plant for butterflies of the family Pieridae. The Shepherd's Tree furthermore plays an important ecological role in the Kalahari by forming a cavern of cool shade in a region that is oftentimes hot and shadeless: The temperature on the shaded sandy surface beneath this tree can be as much as 20°C less than in the full sun (Van Rooyen, 2001:24). Some people hold these trees in such deep regard that its destruction is forbidden (Coates Palgrave, 2002:225). The seeds of *B. albitrunca* germinate with relative ease, but after this growth appears to be unpredictable (Coates Palgrave, 2002:225).

The Grey Camel Thorn *A. haematoxylon* is endemic to the southern and south-western Kalahari (Van der Walt & Le Riche, 1999:47; Van Rooyen, 2001:28). This species is, like *A. erioloba* and *B. albitrunca*, a valuable food source and source of shade in the arid areas in which it occurs (Van der Walt & Le Riche, 1999:47).

Photo Plate 1. Camel Thorn *Acacia erioloba*.

Photo Plate 2. Shepherd's Tree *Boscia albitrunca*.

Photo Plate 3. Grey Camel Thorn *Acacia haematoxylon*.

According to Section 15 of the National Forests Act, 1998 (Act No. 84 of 1998), no person may cut, disturb, damage or destroy any of the above-mentioned protected trees, or possess, collect, remove, transport, export, donate, purchase or sell or in any other manner acquire or dispose of any protected tree or any forest product derived from a protected tree without a license from the Department of Water Affairs and Forestry (except in terms of an exemption of this subsection published by the Minister in the Gazette on the advice of the council).

Figure 3 gives a visual representation of the distribution of individuals of the aforementioned three protected tree species, namely A. *erioloba*, *A. haematoxylon* and *B. albitrunca*, throughout large parts of the study area. [The GPS coordinates of all these individuals are attached hereto as Appendix B.] From Figure 3 it is clear that a relatively large number of protected trees occur within the borders of the study area: A total of 956 individuals and/or clusters of the aforementioned species were recorded during field surveys (please note that hybrids of *A. erioloba* and *A. haematoxylon* are also included in this figure, as is evident from Figure 3).

Based only on the data plotted in Figure 3, i.e. the distribution of protected tree species in the study area, it is clear that Option 6 can be regarded as the least desirable option for the location of the proposed powerline for the following reasons:

- The highest concentration of *A. haematoxylon* recorded in the study area occurs along this route;
- The highest concentration of *B. albitrunca* recorded in the study area occurs along this route;
- The highest concentration of particularly large individuals of *B. albitrunca* (indicated in Figure 3 as red dots and described in the legend as “rare – should not be disturbed) occurs along this route; and
- Quite a number of hybrids of *A. erioloba* and *A. haematoxylon* were recorded along this route.

Based on the data plotted in Figure 3 Options 4 and 5 are very similar with regard to the number and types of protected tree species occurring in both these areas.

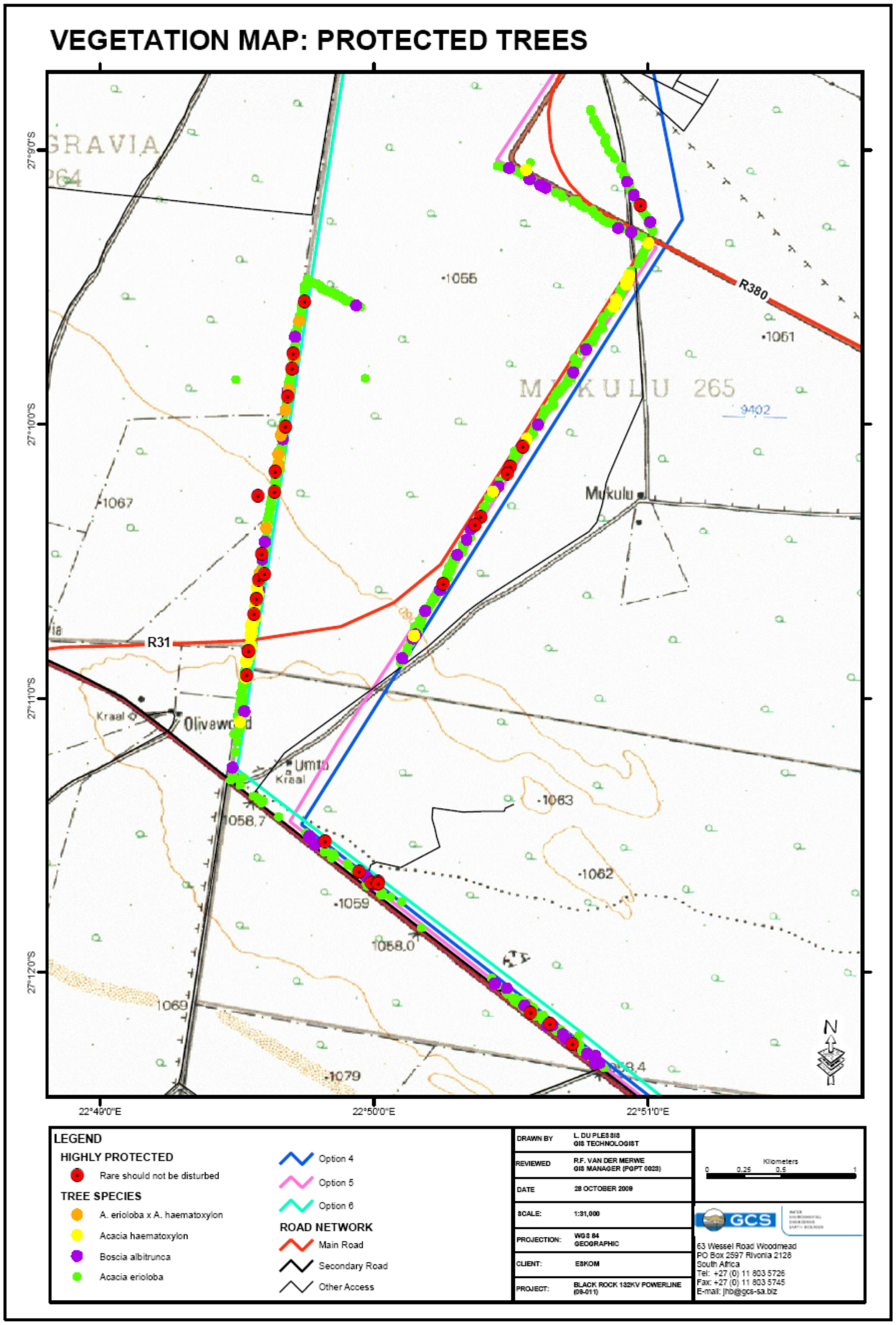

Figure 3. Individuals of tree species protected in terms of Section 12 of the National Forests Act, 1998 located within the study area.

3.2.2 Plant species protected in terms of the Nature and Environmental Conservation Ordinance, 1974 (Ordinance No. 19 of 1974)

Two of the plant species recorded within the study area (refer to Appendix A) are protected in the Northern Cape Province in terms of the Nature and Environmental Conservation Ordinance, 1974 (Ordinance No. 19 of 1974), namely *Nerine laticoma* and *Pergularia daemia* var*. daemia*.

According to the requirements of Section 63 of the aforementioned Ordinance, no person shall without a permit take any of the following actions:

- Pick any protected flora; and/or
- Pick any flora on a public road or on the land on either side of such road within a distance of ninety metres from the centre of such road; and/or
- Pick any protected or indigenous unprotected flora on land of which he is not the owner, without the permission of the owner of such land or of any person authorised by such owner to grant such permission.

3.2.3 Alien weeds and invasive plants recorded within the study area

Two alien weeds and invasive plants, declared as such in terms of the Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983), as amended, were recorded within the borders of the study area. These are: White-flowered Mexican Poppy *Argemone ochroleuca* subsp. *ochroleuca* and Prickly Pear *Opuntia* spp. Both of these species are classified as Category 1 Weeds in terms of the aforementioned Act and both were recorded on the farm Mukulu No. 265, where Options 4 and 5 overlap.

A. ochroleuca subsp. *ochroleuca* is known to invade roadsides, wasteland, abandoned lands, cultivated lands, recently cleared or disturbed areas, riverbanks and riverbeds (Bromilow, 1996:232; Henderson, 2001:29).

Opuntia spp. Is a succulent, branched shrub or tree invading an array of different habitats, but mainly dry and rocky places in savanna and karoo areas (Henderson, 2001:89).

3.3 LEVEL OF DISTURBANCE OF THE NATURAL ENVIRONMENT OF THE STUDY AREA

As is evident from Figure 1, Options 4, 5 and 6 follow exactly the same route from the Umtu Substation (towards the east of the study area) up to a point situated within the farm Umtu No. 281, located towards the west of the study area. This section of the study area, i.e. where the three options overlap, passes through the Umtu Game Farm belonging to Hotazel Manganese Mines (which was recently sub-contracted to a third party). Signs of over-stocking, such as *A. mellifera* encroachment and areas with no grass cover at all (Photo Plate 4), are evident in parts of this game farm. Other disturbances to the natural environment of this area include the old Vanzylsrus gravel road running alongside Options 4, 5 and 6, as well as an old borrow pit located right next to the study area. It is therefore clear that, although part of this section of the study area runs through a game farm, the natural environment is no longer in a pristine condition.

The following three sections of this document detail the level of disturbance of each of the three options from the point where the three lines no longer overlap, as described above.

3.3.1 The level of disturbance of the natural environment: Option 4

Where Options 4 and 5 split from Option 6, the former two lines follow a north-north-easterly direction until it intersects the R380, which connects Black Rock and Hotazel. A large section of this line runs alongside the tar R31 connecting Black Rock and Vanzylsrus.

During the site visit conducted in October 2009 it was noted that a large number of dead trees and branches were present in this area. Locals were also found chopping down trees and transporting wood from the study area in large quantities. It appears as if locals are frequently visiting the area to collect fire wood and, in the process, are destroying large numbers of protected trees. In addition to the destruction of the trees found in the area, a number of snares were also found in and removed from this area.

A public picnic spot located alongside the R31, under a shady *A. erioloba* tree, is the source of a certain degree of pollution in the area, with plastic bags, containers,

Photo Plate 4. Signs of over-stocking are evident in the Umtu Game Farm.

bottles and cans visible up to some distance from this spot.

In addition to the disturbances as detailed above, Options 4 and 5 are intersected by a gravel road twice (Figure 1).

Where Option 4 crosses the R380 and splits from Option 5, it follows a north-north-westerly line to the Klipkop Substation (Figure 1). The latter section of Option 4 covers a section that is not regarded as being in a disturbed condition, except for a number of foot paths and some prospecting boreholes drilled in the area in the past.

3.3.2 The level of disturbance of the natural environment: Option 5

Where Options 4 and 5 split (at the R31 and R380 intersection), Option 5 continues in a west-north-westerly direction alongside an existing powerline until it reaches the Klipkop substation. This entire section has therefore been disturbed in the past (during the construction of the older powerline, as well as during routine and maintenance visits and inspections) and therefore it would be ideal if the proposed powerline could run alongside the older powerline within the same (previously disturbed) servitude.

3.3.3 The level of disturbance of the natural environment: Option 6

Where Option 6 splits from Options 4 and 5 (Figure 1), it continues in a north-north-westerly direction, following the western boundaries of the farms Umtu No. 281 and Belgravia No. 264. Except for the aforementioned boundary fences, some camp fences and one area where Option 6 is intersected by the R31, no other disturbances were recorded in this area. The natural environment of this area is generally in a very good and near-pristine condition and for this reason, along with the fact that relatively high concentrations of all three protected tree species occur in this area (Figure 3 and Section 2.2.1), it is highly recommended that Option 6 not be selected for the construction of the proposed powerline.

3.4 MAMMAL SPECIES KNOWN TO FREQUENT THE STUDY AREA

Table 1 lists the mammal species that were either recorded within the borders of the study area during the field surveys conducted in October 2009, or are known to frequent the area.

Table 1. Mammal species recorded within the boundaries of study area, or known to frequent the study area and surrounds.

NO.	LATIN NAME	COMMON NAME
1	*Lepus capensis*	Cape Hare
2	*Suricata suricatta*	Suricate
3	*Xerus inauris*	Cape Ground Squirrel
4	*Antidorcas marsupialis*	Springbok
5	*Otocyon megalotis*	Bat-eared Fox
6	*Canis mesomelas*	Black-backed Jackal
7	*Caracal caracal*	Caracal
8	*Sylvicapra grimmia*	Common Duiker
9	*Oryx gazella*	Gemsbok
10	*Phacochoerus aethiopicus*	Warthog
11	*Pelea capreolus*	Grey Rhebok
12	*Tragelaphus strepsiceros*	Kudu
13	*Manis temminckii*	Pangolin
14	*Hystrix africaeaustralis*	Porcupine
15	*Pedetes capensis*	Spring Hare
16	*Raphicerus campestris*	Steenbok
17	*Orycteropus afer*	Aardvark
18	*Atelerix frontalis*	Hedgehog
19	*Vulpes chama*	Silver Jackal
20	*Ictonyx striatus*	Striped Polecat

[Please note that in light of the fact that a separate avifaunal specialist study was conducted by a suitably qualified specialist for the purpose of this EIA, the inclusion of avifaunal detail was considered to fall outside the scope of the present study and was therefore omitted.]

3.4.1 Mammal species protected in terms of the Nature and Environmental Conservation Ordinance, 1974 (Ordinance No. 19 of 1974)

The following of the mammal species listed in Table 1 are protected in the Northern Cape Province under the Nature and Environmental Conservation Ordinance, 1974 (Ordinance No. 19 of 1974): Pangolin *M. temminckii*, Aardvark *O. afer*, Steenbok *R. campestris*, Gemsbok *O. gazella*, Grey Rhebok *P. capreolus,* Hedgehog *A. frontalis*, Kudu *T. strepciseros,* Bat-eared Fox *O. megalotis,* Silver Jackal *V. chama,* Springbok A. *marsupialis*, Common Duiker *S. grimmia* and Warthog *P. aethiopicus*. The Pangolin M. temminckii is classified as “endangered”, while the remainder of the aforementioned species are classified as “protected”.

According to Section 27 of the aforementioned Ordinance, no person shall without a permit hunt or be in possession of any endangered wild animal or the carcase of any such animal. In addition hereto, no person shall, subject to the provisions of subsections (2) and (3) of Section 27, hunt any protected wild animal during any hunting season, unless he is the holder of a permit or of a licence in the prescribed form issued to him by the Director, a receiver of revenue or any person authorised to do so by the Director on payment of the prescribed fee, or at any other time unless he is the holder of a permit to do so.

4. <u>ANTICIPATED IMPACTS AND PROPOSED MITIGATION MEASURES</u>

Based on the results of this study, as is detailed in Section 2, Table 2 lists all the anticipated impacts of the proposed construction of a 132 kV powerline within the study area on its fauna and flora. Anticipated impacts were rated according to the GCS Impact Evaluation Rating Scale (Appendix C). The probability rating is indicated by “P”, the extent by “E”, the duration by “D”, the intensity by “I” and the significance by “S”.

Table 2. Anticipated impacts, impact ratings and proposed mitigation and/or management measures.

NO.	ANTICIPATED IMPACTS	IMPACT RATING	PROPOSED MITIGATION MEASURE(S)	MITIGATED IMPACT RATING
<u>Construction Phase</u>				
1	The destruction of protected tree species for site clearing purposes.	P = 3 E = 1 D = 2 I = 4 **S = 10**	Avoid destruction wherever possible and replace with trimming where possible. (A permit should be obtained beforehand if destruction or trimming is planned.)	P = 1 E = 1 D = 2 I = 2 **S = 6**
2	The destruction of protected plant species for site clearing purposes.	P = 3 E = 1 D = 2 I = 4 **S = 10**	Avoid destruction wherever possible and where destruction cannot be altogether avoided, appoint suitably qualified specialists to sweep areas to be cleared prior to construction in order to relocate such plants to e.g. botanical gardens or nurseries. (A permit should be obtained beforehand if destruction is planned.)	P = 2 E = 1 D = 2 I = 2 **S = 7**
3	The destruction of protected tree and/or plant species by workers for medicinal use or use as fire wood.	P = 3 E = 2 D = 2 I = 4 **S = 11**	Give awareness training to workers re. the conservation status of protected plants prior to the commencement of construction and implement a fining system where individuals who are caught destructing protected trees or plants for whatever purpose are penalised financially.	P = 2 E = 1 D = 2 I = 2 **S = 7**
4	The setting of snares or traps for the killing of mammals by workers.	P = 3 E = 3 D = 2 I = 4 **S = 12**	Draft and Implement a strict “no poaching” policy. Give awareness training to workers re. the total prohibition of poaching in the study area and surrounds and implement a fining system where individuals who are caught poaching are penalised financially.	P = 2 E = 2 D = 2 I = 2 **S = 8**

Table 2 (contd.). Anticipated impacts, impact ratings and proposed mitigation and/or management measures.

NO.	ANTICIPATED IMPACTS	IMPACT RATING	PROPOSED MITIGATION MEASURE(S)	MITIGATED IMPACT RATING
Construction Phase (contd.)				
5	The destruction of habitats of animals dependant on protected trees at some stage during their life cycle.	P = 3 E = 2 D = 2 I = 4 **S = 11**	Avoid destruction wherever possible and replace with trimming where possible. (A permit should be obtained beforehand if destruction or trimming is planned.)	P = 1 E = 1 D = 2 I = 2 **S = 6**
6	A decrease in the number of food sources available to animals.	P = 3 E = 2 D = 2 I = 2 **S = 9**	Avoid destruction wherever possible and replace with trimming where possible. (A permit should be obtained beforehand if destruction or trimming is planned.)	P = 1 E = 1 D = 2 I = 2 **S = 6**
7	A decrease in the number of shade trees available to animals.	P = 3 E = 2 D = 2 I = 2 **S = 9**	Avoid destruction wherever possible and replace with trimming where possible. (A permit should be obtained beforehand if destruction or trimming is planned.)	P = 1 E = 1 D = 2 I = 2 **S = 6**
8	An increase in instances of littering by workers working in the area, which may lead to animal suffocations and deaths.	P = 3 E = 2 D = 2 I = 2 **S = 9**	Draft and Implement a strict "no littering" policy. Give awareness training to workers re. the total prohibition of littering in the study area and surrounds and implement a fining system where individuals who are caught littering are penalised financially. Also ensure that an adequate number of covered rubbish receptacles are available during construction.	P = 2 E = 2 D = 2 I = 2 **S = 8**

Table 2 (contd.). Anticipated impacts, impact ratings and proposed mitigation and/or management measures.

NO.	ANTICIPATED IMPACTS	IMPACT RATING	PROPOSED MITIGATION MEASURE(S)	MITIGATED IMPACT RATING
Construction Phase (contd.)				
9	An increase in the possibility of veld fires as a result of discarded cigarette stumps or fires made by workers.	P = 2 E = 2 D = 2 I = 4 **S = 10**	Fires should only be made in cleared areas in structures specifically constructed for this purpose. Workers should be given awareness training regarding the fire hazard of the area. Fire extinguishers should be available on site.	P = 1 E = 2 D = 2 I = 4 **S = 9**
Operational Phase				
13	An increase in the number of alien weeds and invasive plants in disturbed areas.	P = 3 E = 1 D = 4 I = 2 **S = 10**	Limit vegetation clearing to the absolute minimum and control individuals of alien weeds and invasive plants in disturbed areas according to the requirements of Regulations 15(a) and (e) of the regulations made in terms of Section 29 of the Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983).	P = 3 E = 2 D = 2 I = 4 **S = 11**
14	The disturbance or destruction of protected tree species during routine maintenance visits to the area.	P = 2 E = 1 D = 5 I = 2 **S = 10**	Avoid destruction wherever possible and replace with trimming where possible. (A permit should be obtained beforehand if destruction or trimming is planned.)	P = 1 E = 1 D = 2 I = 2 **S = 6**

Table 2 (contd.). Anticipated impacts, impact ratings and proposed mitigation and/or management measures.

NO.	ANTICIPATED IMPACTS	IMPACT RATING	PROPOSED MITIGATION MEASURE(S)	MITIGATED IMPACT RATING
Operational Phase (contd.)				
15	The disturbance or destruction of protected plant species during routine maintenance visits to the area.	P = 2 E = 1 D = 5 I = 2 **S = 10**	Avoid destruction wherever possible. (A permit should be obtained beforehand if destruction is planned.)	P = 1 E = 1 D = 5 I = 2 **S = 9**
16	Littering by employees visiting the site for routine inspections or maintenance purposes, which may lead to animal suffocations and deaths.	P = 2 E = 2 D = 5 I = 2 **S = 11**	Draft and Implement a strict "no littering" policy. Give awareness training to workers re. the total prohibition of littering in the study area and surrounds and implement a fining system where individuals who are caught littering are penalised financially. Also ensure that a covered rubbish receptacle is available during routine inspections.	P = 2 E = 2 D = 2 I = 2 **S = 8**
17	Veld fires caused by smoking in the area during routine maintenance visits.	P = 1 E = 2 D = 5 I = 4 **S = 12**	Workers should be given awareness training regarding the fire hazard of the area. Inspection and maintenance vehicles should be equipped with fire extinguishers.	P = 1 E = 2 D = 2 I = 4 **S = 9**

In addition to rating each anticipated impact, measures were proposed for the management and/or mitigation of each anticipated impact. A second impact rating was then awarded to each anticipated impact, assuming that the latter impact rating would be accurate after implementation of the relevant proposed mitigation or management measure.

5. SUMMARY

Based on the findings of this study, Option 6 is the least desirable location for the proposed 132 kV powerline. The latter option is located in an area that is not currently regarded as being in a highly disturbed state and a large number and variety of protected tree species can be found in this area. It is strongly suggested that Option 6 **not** be selected as location for the proposed powerline.

Options 4 and 5 are more suitable as location for the proposed powerline, as these areas are already in a disturbed state (Option 5 more so than Option 4) and contain a smaller variety and number of protected trees.

It is anticipated that the implementation of the mitigation and management measures proposed in Section 3 will lessen the impact of the proposed development on the natural environment of the study area, regardless of whether Option 4 or 5 is selected.

6. REFERENCES

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APPENDIX A

List of species recorded within the borders of the study area

LIST OF SPECIES

AMARYLLIDACEAE

Nerine laticoma

ASCLEPIADACEAE

Pergularia daemia var. *daemia*

ASPARAGACEAE

Asparagus bechuanicus

ASTERACEAE

Felicia muricata

BIGNONIACEAE

Rhigozum obovatum
Rhigozum trichotomum

BORAGINACEAE

Ehretia rigida

CACTACEAE

Opuntia spp.

CAPPARACEAE

Boscia albitrunca
Cadaba aphylla

CELASTRACEAE

Gymnosporia buxifolia

COMBRETACEAE

Terminalia sericea

COMPOSITAE

Pentzia spp.

CUCURBITACEAE

Acanthosicyos naudinianus

EBENACEAE

Diospyros lycioides

FABACEAE

Elephantorrhiza elephantina
Senna italica subsp. *arachoides*

LILIACEAE

Protasparagus spp.
Sansevieria aethiopica

MIMOSACEAE

Acacia erioloba
Acacia haematoxylon
Acacia hebeclada subsp. *hebeclada*
Acacia karroo
Acacia mellifera subsp*. detinens*

Dichrostachys cinerea

PAPAVERACEAE

Argemone ochroleuca subsp. *ochroleuca*

POACEAE

Aristida congesta
Aristida meridionalis
Digitaria eriantha
Eragrostis chloromelas
Eragrostis curvula
Eragrostis lehmanniana
Melinis repens
Schmidtia kalariensis
Schmidtia pappophoroides
Stipagrostis uniplumis

RHAMNACEAE

Ziziphus mucronata

SCROPHULARIACEAE

Aptosimum elongatum
Peliostomum leucorrhizum

SELAGINACEAE

Selago dinteri subsp. *pseudodinteri* (=*Walafrida saxatilis*)

SOLANACEAE

Lycium hirsutum

TILIACEAE

Grewia flava
Grewia retinervis

VISCACEAE

Viscum rotundifolium

ZYGOPHYLLACEAE

Tribulus terrestris

APPENDIX B

GPS co-ordinates of individuals of tree species protected in terms of Section 12 of the National Forests Act, 1998 located within the study area

SPECIES	GPS COORDINATES		NO.	NOTE
	SOUTH	EAST		
Acacia erioloba	27°11,300'	22°49,477'	1	
Acacia erioloba	27°11,287'	22°49,485'	1	
Acacia erioloba	27°11,291'	22°49,492'		Dead
Acacia erioloba	27°11,289'	22°49,521'	1	
Acacia erioloba	27°11,317'	22°49,511'	1	
Acacia erioloba	27°11,358'	22°49,561'	1	
Acacia erioloba	27°11,366'	22°49,579'	1	
Acacia erioloba	27°11,368'	22°49,577'	1	
Acacia erioloba	27°11,383'	22°49,588'	1	
Acacia erioloba	27°11,381'	22°49,591'	1	
Acacia erioloba	27°11,382'	22°49,591'	2	
Acacia erioloba	27°11,374'	22°49,598'	1	Dead
Acacia erioloba	27°11,433'	22°49,654'	1	
Acacia erioloba	27°11,433	22°49,653'	1	
Acacia erioloba	27°11,493'	22°49,752'	1	
Boscia albitrunca	27°11,504'	22°49,765'	1	
Boscia albitrunca	27°11,507'	22°49,764'	1	
Boscia albitrunca	27°11,532'	22°49,786'	1	
Acacia erioloba	27°11,530'	22°49,791'	1	
Boscia albitrunca	27°11,521'	22°49,822'	1	Huge. Do not destroy!
Acacia erioloba	27°11,561'	22°49,820'	1	
Acacia erioloba	27°11,562'	22°49,821'	1	
Acacia erioloba	27°11,563'	22°49,826'	1	
Acacia erioloba	27°11,566'	22°49,849'	1	
Acacia erioloba	27°11,583'	22°49,847'	1	
Acacia erioloba	27°11,573'	22°49,857'	1	
Acacia erioloba	27°11,570'	22°49,856'	1	
Acacia erioloba	27°11,604'	22°49,904'	1	
Acacia erioloba	27°11,610'	22°49,908'	1	
Acacia erioloba	27°11,628'	22°49,932'	1	
Acacia erioloba	27°11,629'	22°49,935'	1	
Boscia albitrunca	27°11,633'	22°49,946'	1	Huge. Do not destroy!
Acacia erioloba	27°11,643'	22°49,952'	1	
Boscia albitrunca	27°11,648'	22°49,969'	1	
Boscia albitrunca	27°11,654'	22°49,976'	1	
Acacia erioloba	27°11,665'	22°49,978'	1	
Acacia erioloba	27°11,677'	22°49,972'	1	
Acacia erioloba	27°11,687'	22°49,975'	1	
Acacia erioloba	27°11,684'	22°49,980'	1	
Boscia albitrunca	27°11,683'	22°49,997'	1	
Boscia albitrunca	27°11,683'	22°49,997'	1	
Boscia albitrunca	27°11,672'	22°49,990'	1	Big. Do not destroy!
Boscia albitrunca	27°11,670'	22°50,017'	1	Big. Do not destroy!
Boscia albitrunca	27°11,677'	22°50,015'	1	Big. Do not destroy!
Acacia erioloba	27°11,717'	22°50,025'	1	
Acacia erioloba	27°11,721'	22°50,028'	1	
Acacia erioloba	27°11,711'	22°50,031'	1	

SPECIES	GPS COORDINATES		NO.	NOTE
	SOUTH	EAST		
Acacia erioloba	27°11,726'	22°50,062'	1	
Acacia erioloba	27°11,744'	22°50,102'	1	
Acacia erioloba	27°11,839'	22°50,174'	1	
Acacia erioloba	27°12,023'	27°50,430'	1	
Acacia erioloba	27°12,022'	22°50,431'	1	
Acacia erioloba	27°12,040'	22°50,438'	1	
Boscia albitrunca	27°12,041'	22°50,442'	1	
Acacia erioloba	27°12,048'	22°50,451'	1	
Acacia erioloba	27°12,071'	22°50,481'	1	
Boscia albitrunca	27°12,059'	22°50,487'	1	
Acacia erioloba	27°12,060'	22°50,490'	1	
Acacia erioloba	27°12,080'	22°50,489'	1	
Acacia erioloba	27°12,095'	22°50,506'	1	
Acacia erioloba	27°12,095'	22°50,509'	1	Dead
Acacia erioloba	27°12,094'	22°50,518'	1	
Acacia erioloba	27°12,102'	22°50,518'	1	
Acacia erioloba	27°12,104'	22°50,514'	1	
Acacia erioloba	27°12,107'	22°50,519'	1	
Acacia erioloba	27°12,114'	22°50,528'	1	
Acacia erioloba	27°12,113'	22°50,534'	1	
Acacia erioloba	27°12,116'	22°50,536'	1	
Acacia erioloba	27°12,102'	22°50,540'	1	
Acacia erioloba	27°12,127'	22°50,543'	1	
Acacia erioloba	27°12,120'	22°50,548'	1	
Acacia erioloba	27°12,120'	22°50,551'	1	
Boscia albitrunca	27°12,121'	22°50,551'	1	
Acacia erioloba	27°12,135'	22°50,551'	1	
Acacia erioloba	27°12,121'	22°50,564'	1	
Acacia erioloba	27°12,120'	22°50,565'	1	
Acacia erioloba	27°12,119'	22°50,568'	1	Dead
Acacia erioloba	27°12,113'	22°50,562'	1	
Acacia erioloba	27°12,112'	22°50,562'	1	
Acacia erioloba	27°12,113'	22°50,559'	4	
Boscia albitrunca	27°12,145'	22°50,571'	1	Huge. Do not destroy!
Acacia erioloba	27°12,132'	22°50,583'	1	
Acacia erioloba	27°12,129'	22°50,585'	1	
Acacia erioloba	27°12,158'	22°50,588'	1	
Acacia erioloba	27°12,161'	22°50,591'	2	
Acacia erioloba	27°12,160'	22°50,599'	1	
Acacia erioloba	27°12,160'	22°50,611'	1	
Acacia erioloba	27°12,160'	22°50,614'	1	Dead
Acacia erioloba	27°12,157'	22°50,614'	1	Dead
Acacia erioloba	27°12,157'	22°50,620'	1	
Acacia erioloba	27°12,173'	22°50,618'	1	
Acacia erioloba	27°12,177'	22°50,616'	1	
Acacia erioloba	27°12,177'	22°50,627'	1	
Acacia erioloba	27°12,186'	22°50,626'	1	
Acacia erioloba	27°12,187'	22°50,629'	1	

SPECIES	GPS COORDINATES		NO.	NOTE
	SOUTH	EAST		
Acacia erioloba	27°12,187'	22°50,630'	1	
Boscia albitrunca	27°12,196'	22°50,634'	1	
Acacia erioloba	27°12,182'	22°50,637'	1	
Boscia albitrunca	27°12,186'	22°50,643'	1	Big. Do not destroy!
Acacia erioloba	27°12,188'	22°50,645'	1	
Acacia erioloba	27°12,190'	22°50,642'	1	
Acacia erioloba	27°12,192'	22°50,645'	1	
Acacia erioloba	27°12,191'	22°50,638'	1	
Boscia albitrunca	27°12,193'	22°50,652'	1	
Boscia albitrunca	27°12,194'	22°50,650'	1	
Boscia albitrunca	27°12,195'	22°50,651'	1	
Boscia albitrunca	27°12,193'	22°50,654'	1	
Acacia erioloba	27°12,206'	22°50,660'	1	
Acacia erioloba	27°12,206'	22°50,663'	1	
Acacia erioloba	27°12,207'	22°50,664'	1	
Acacia erioloba	27°12,211'	22°50,663'	1	
Acacia erioloba	27°12,212'	22°50,666'	1	
Acacia erioloba	27°12,217'	22°50,671'	1	
Acacia erioloba	27°12,212'	22°50,675'	1	
Acacia erioloba	27°12,210'	22°50,677'	1	
Acacia erioloba	27°12,209'	22°50,682'	1	
Acacia erioloba	27°12,219'	22°50,684'	1	
Acacia erioloba	27°12,217'	22°50,688'	1	
Acacia erioloba	27°12,224'	22°50,684'	1	
Boscia albitrunca	27°12,226'	22°50,690'	1	
Acacia erioloba	27°12,224'	22°50,693'	1	
Acacia erioloba	27°12,223'	22°50,693'	1	Dying
Acacia erioloba	27°12,223'	22°50,696'	1	
Acacia erioloba	27°12,231'	22°50,694'	1	
Acacia erioloba	27°12,232'	22°50,695'	1	
Acacia erioloba	27°12,232'	22°50,699'	1	Dying
Acacia erioloba	27°12,234'	22°50,703'	1	
Acacia erioloba	27°12,239'	22°50,703'	4	
Boscia albitrunca	27°12,242'	22°50,702'	1	
Acacia erioloba	27°12,251'	22°50,707'	1	
Acacia erioloba	27°12,255'	22°50,712'	1	
Acacia erioloba	27°12,250'	22°50,722'	1	
Acacia erioloba	27°12,251'	22°50,724'	1	
Acacia erioloba	27°12,252'	22°50,724'	1	
Acacia erioloba	27°12,254'	22°50,735'	1	
Boscia albitrunca	27°12,262'	22°50,724'	1	Big. Do not destroy!
Acacia erioloba	27°12,264'	22°50,725'	1	
Acacia erioloba	27°12,265'	22°50,725'	1	
Acacia erioloba	27°12,265'	22°50,753'	1	
Acacia erioloba	27°12,232'	22°50,749'	1	
Acacia erioloba	27°12,287'	22°50,760'	1	
Acacia erioloba	27°12,292'	22°50,763'	1	
Acacia erioloba	27°12,289'	22°50,773'	1	
Acacia erioloba	27°12,297'	22°50,780'	1	

SPECIES	GPS COORDINATES		NO.	NOTE
	SOUTH	EAST		
Boscia albitrunca	27°12,297'	22°50,780'	1	
Acacia erioloba	27°12,298'	22°50,787'	1	
Acacia erioloba	27°12,298'	22°50,793'	1	Dead
Acacia erioloba	27°12,301'	22°50,792'	1	
Acacia erioloba	27°12,302'	22°50,791'	1	
Acacia erioloba	27°12,308'	22°50,800'	1	
Acacia erioloba	27°12,307'	22°50,789'	1	
Acacia erioloba	27°12,322'	22°50,803'	1	
Acacia erioloba	27°12,311'	22°50,809'	1	
Acacia erioloba	27°12,304'	22°50,809'	1	
Boscia albitrunca	27°12,305'	22°50,810'	1	
Acacia erioloba	27°12,330'	22°50,812'	1	
Boscia albitrunca	27°12,329'	22°50,809'	1	
Boscia albitrunca	27°12,332'	22°50,820'	1	
Boscia albitrunca	27°12,333'	22°50,823'	1	
Acacia erioloba	27°12,337'	22°50,831'	1	
Acacia erioloba	27°12,344'	22°50,835'	1	
Acacia erioloba	27°12,350'	22°50,842'	1	
Acacia erioloba	27°11,271'	22°49,484'	1	
Acacia erioloba	27°11,270'	22°49,484'	1	
Boscia albitrunca	27°11,254'	22°49,484'	1	
Acacia erioloba	27°11,197'	22°49,495'	1	
Acacia erioloba	27°11,161'	22°49,501'	1	
Acacia erioloba	27°11,133'	22°49,491'	1	
Acacia erioloba	27°11,132'	22°49,489'	1	
Acacia erioloba	27°11,130'	22°49,500'	1	
Acacia erioloba	27°11,128'	22°49,500'	1	
Acacia erioloba	27°11,116'	22°49,505'	1	
Acacia erioloba	27°11,115'	22°49,505'	1	
Acacia erioloba	27°11,114'	22°49,512'	1	
Acacia erioloba	27°11,111'	22°49,509'	1	
Acacia erioloba	27°11,107'	22°49,512'	1	
Acacia erioloba	27°11,100'	22°49,516'	1	
Acacia erioloba	27°11,094'	22°49,507'	2	Dead
Acacia haematoxylon	27°11,088'	22°49,511'	1	
Acacia erioloba	27°11,082'	22°49,516'	2	
Acacia erioloba	27°11,072'	22°49,508'	1	
Acacia erioloba	27°11,067'	22°49,505'	1	
Acacia erioloba	27°11,066'	22°49,502'	1	
Acacia erioloba	27°11,064'	22°49,508'	1	
Acacia erioloba	27°11,053'	22°49,512'	1	
Acacia erioloba	27°11,047'	22°49,509'	1	
Acacia erioloba	27°11,045'	22°49,511'	1	
Acacia erioloba	27°11,044'	22°49,508'	1	
Acacia erioloba	27°11,045'	22°49,507'	2	
Acacia erioloba	27°11,043'	22°49,508'	1	
Acacia erioloba	27°11,041'	22°49,516'	1	
Acacia erioloba	27°11,043'	22°49,517'	1	
Acacia erioloba	27°11,043'	22°49,517'	1	

SPECIES	GPS COORDINATES		NO.	NOTE
	SOUTH	EAST		
Acacia erioloba	27°11,040'	22°49,519'	1	
Boscia albitrunca	27°11,049'	22°49,527'	1	
Acacia erioloba	27°11,043'	22°49,516'	1	
Acacia erioloba	27°11,040'	22°49,512'	1	
Acacia erioloba	27°11,034'	22°49,517'	1	
Acacia erioloba	27°11,033'	22°49,514'	1	
Acacia erioloba	27°11,026'	22°49,518'	1	
Acacia erioloba	27°11,024'	22°49,517'	1	
Acacia erioloba	27°11,024'	22°49,510'	1	
Acacia erioloba	27°11,021'	22°49,511'	1	
Acacia erioloba	27°11,019'	22°49,514'	1	
Acacia erioloba	27°11,019'	22°49,518'	1	
Acacia erioloba	27°11,014'	22°49,521'	1	
Acacia erioloba	27°11,015'	22°49,523'	1	
Acacia erioloba	27°11,010'	22°49,517'	1	
Acacia erioloba	27°11,005'	22°49,513'	1	
Acacia erioloba	27°11,006'	22°49,517'	1	
Acacia erioloba	27°11,002'	22°49,514'	1	
Acacia erioloba	27°10,996'	22°49,524'	1	
Acacia erioloba	27°10,993'	22°49,524'	1	
Acacia erioloba	27°10,992'	22°49,524'	1	
Acacia erioloba	27°10,991'	22°49,522'	1	Dead
Acacia erioloba	27°10,988'	22°49,515'	1	
Acacia erioloba	27°10,984'	22°49,513'	1	
Acacia erioloba	27°10,980'	22°49,516'	1	
Acacia erioloba	27°10,978'	22°49,517'	1	
Acacia erioloba	27°10,978'	22°49,516'	1	
Acacia erioloba	27°10,970'	22°49,522'	1	
Acacia erioloba	27°10,968'	22°49,519'	1	
Acacia erioloba	27°10,968'	22°49,522'	1	Dead
Acacia erioloba	27°10,968'	22°49,521'	1	
Acacia erioloba	27°10,960'	22°49,521'	1	
Acacia erioloba	27°10,956'	22°49,528'	1	
Acacia erioloba	27°10,954'	22°49,524'	1	
Acacia erioloba	27°10,951'	22°49,523'	1	
Acacia erioloba	27°10,948'	22°49,521'	1	
Acacia erioloba	27°10,944'	22°49,524'	1	
Acacia erioloba	27°10,943'	22°49,526'	1	
Acacia erioloba	27°10,943'	22°49,526'	1	Dead
Acacia erioloba	27°10,941'	22°49,528'	1	
Acacia erioloba	27°10,941'	22°49,531'	1	
Acacia erioloba	27°10,940'	22°49,527'	1	
Acacia erioloba	27°10,939'	22°49,526'	1	
Acacia erioloba	27°10,936'	22°49,528'	1	
Acacia erioloba	27°10,936'	22°49,531'	1	
Acacia erioloba	27°10,936'	22°49,530'	1	
Acacia erioloba	27°10,933'	22°49,531'	1	
Acacia erioloba	27°10,931'	22°49,530'	1	
Acacia erioloba	27°10,931'	22°49,536'	1	

SPECIES	GPS COORDINATES SOUTH	GPS COORDINATES EAST	NO.	NOTE
Acacia erioloba	27°10,926'	22°49,534'	1	
Acacia erioloba	27°10,927'	22°49,533'	1	
Acacia haematoxylon	27°10,927'	22°49,531'	1	
Acacia erioloba	27°10,925'	22°49,529'	1	
Acacia erioloba	27°10,923'	22°49,529'	1	
Acacia erioloba	27°10.920'	22°49,527'	1	
Acacia erioloba	27°10,916'	22°49,529'	1	
Boscia albitrunca	27°10,916'	22°49,536'	1	Big. Do not destroy!
Acacia erioloba	27°10,913'	22°49,535'	2	
Acacia erioloba	27°10,908'	22°49,528'	1	
Acacia erioloba	27°10,905'	22°49,527'	1	
Acacia erioloba	27°10,904'	22°49,531'	1	
Acacia erioloba	27°10,904'	22°49,530'	1	
Acacia erioloba	27°10,901'	22°49,531'	1	
Acacia erioloba	27°10,899'	22°49,534'	1	
Acacia erioloba	27°10,899'	22°49,535'	1	
Acacia erioloba	27°10,891'	22°49,533'	1	
Acacia erioloba	27°10,891'	22°49,534'	1	
Acacia erioloba	27°10,891'	22°49,538'	1	
Acacia erioloba	27°10,891'	22°49,539'	1	
Acacia erioloba	27°10,878'	22°49,532'	1	
Acacia erioloba	27°10,877'	22°49,533'	1	
Acacia erioloba	27°10,876'	22°49,533'	1	
Acacia erioloba	27°10,875'	22°49,534'	1	
Acacia haematoxylon	27°10,870'	22°49,534'	1	
Acacia haematoxylon	27°10,866'	22°49,534'	1	
Acacia haematoxylon	27°10,867'	22°49.536'	1	
Acacia haematoxylon	27°10,867'	22°49,537'	1	
Acacia erioloba	27°10,867'	22°49,542'	1	
Acacia erioloba	27°10,866'	22°49,541'	1	
Acacia haematoxylon	27°10,862'	22°49,538'	1	
Acacia erioloba	27°10,857'	22°49,538'	1	
Acacia erioloba	27°10,855'	22°49,537'	1	
Acacia erioloba	27°10,847'	22°49,541'	1	
Acacia erioloba	27°10,849'	22°49,546'	1	
Acacia haematoxylon	27°10,844'	22°49,546'	1	
Acacia haematoxylon	27°10,835'	22°49,542'	1	
Acacia haematoxylon	27°10,828'	22°49,541'	1	Big. Do not destroy!
Boscia albitrunca	27°10,828'	22°49,542'	1	Big. Do not destroy!
Acacia haematoxylon	27°10,818'	22°49,550'	3	
Acacia haematoxylon	27°10,813'	22°49,548'	2	
Acacia haematoxylon	27°10,811'	22°49,547'	1	
Acacia haematoxylon	27°10,811'	22°49,547'	1	
Acacia erioloba	27°10,807'	22°49,551'	1	
Acacia haematoxylon	27°10,807'	22°49,550'	1	
Acacia erioloba	27°10,801'	22°49,549'	1	
Acacia erioloba	27°10,801'	22°49,549'	1	
Acacia erioloba	27°09,933'	22°50,651'	3	
Acacia erioloba	27°09,929'	22°50,660'	1	

SPECIES	GPS COORDINATES		NO.	NOTE
	SOUTH	EAST		
Acacia erioloba	27°09,912'	22°50,652'	1	
Acacia erioloba	27°09,895'	22°50,662'	1	
Acacia erioloba	27°09,891'	22°50,665'	2	
Acacia erioloba	27°09,892'	22°50,672'	1	
Acacia erioloba	27°09,887'	22°50,675'	1	
Acacia erioloba	27°09,881'	22°50,672'	2	
Acacia erioloba	27°09,883'	22°50,675'	1	
Acacia erioloba	27°09,880'	22°50,679'	1	
Acacia erioloba	27°09,879'	22°50,676'	1	
Acacia erioloba	27°09,874'	22°50,679'	1	
Acacia erioloba	27°09,867'	22°50,693'	1	
Acacia erioloba	27°09,865'	22°50,692'	2	
Acacia erioloba	27°09,854'	22°50,706'	1	
Acacia erioloba	27°09,851'	22°50,707'	1	
Acacia erioloba	27°09,852'	22°50,702'	1	
Acacia erioloba	27°09,845'	22°50,711'	1	
Acacia erioloba	27°09,836'	22°50,722'	1	Dead
Acacia erioloba	27°09,835'	22°50,721'	1	
Acacia erioloba	27°09,834'	22°50,721'	1	
Acacia erioloba	27°09,836'	22°50,711'	1	
Acacia erioloba	27°09,841'	22°50,707'	1	
Acacia erioloba	27°09,816'	22°50,718'	1	
Acacia erioloba	27°09,816'	22°50,725'	1	
Boscia albitrunca	27°09,811'	22°50,729'	1	
Acacia erioloba	27°09,811'	22°50,728'	2	
Acacia erioloba	27°09,809'	22°50,725'	1	
Acacia erioloba	27°09,807'	22°50,725'	1	
Acacia erioloba	27°09,806'	22°50,725'	1	
Acacia erioloba	27°09,806'	22°50,726'	1	
Acacia erioloba	27°09,800'	22°50,727'	1	
Acacia erioloba	27°09,797'	22°50,732'	1	
Acacia erioloba	27°09,794'	22°50,734'	1	
Acacia erioloba	27°09,788'	22°50,730'	1	
Acacia erioloba	27°09,783'	22°50,740'	1	Dead
Acacia erioloba	27°09,773'	22°50,747'	1	Dead
Acacia erioloba	27°09,760'	22°50,732'	1	
Acacia erioloba	27°09,735'	22°50,760'	1	
Acacia erioloba	27°09,726'	22°50,771'	2	
Acacia erioloba	27°09,727'	22°50,770	1	
Boscia albitrunca	27°09,728'	22°50,775'	1	
Acacia erioloba	27°09,726'	22°50,774'	1	
Acacia erioloba	27°09,725'	22°50,774'	1	
Acacia erioloba	27°09,722'	22°50,774'	1	
Acacia erioloba	27°09,712'	22°50,776'	1	
Acacia erioloba	27°09,714'	22°50,777'	1	
Acacia erioloba	27°09,714'	22°50,782'	1	
Acacia erioloba	27°09,707'	22°50,783'	1	
Acacia erioloba	27°09,694'	22°50,797'	1	
Acacia erioloba	27°09,700'	22°50,801'	1	

SPECIES	GPS COORDINATES		NO.	NOTE
	SOUTH	EAST		
Acacia erioloba	27°09,697'	22°50,801'	1	
Acacia erioloba	27°09,685'	22°50,802'	1	
Acacia erioloba	27°09,681'	22°50,810'	2	
Acacia erioloba	27°09,669'	22°50,809'	2	
Acacia erioloba	27°09,662'	22°50,816'	1	
Acacia erioloba	27°09,661'	22°50,815'	2	
Acacia erioloba	27°09,656'	22°50,827'	2	
Acacia erioloba	27°09,649'	22°50,832'	1	
Acacia erioloba	27°09,650'	22°50,835'	1	Dead
Acacia erioloba	27°09,621'	22°50,832'	1	
Acacia erioloba	27°09,611'	22°50,839'	1	
Acacia erioloba	27°09,610'	22°50,841'	1	
Acacia erioloba	27°09,588'	22°50,859'	1	Dead
Acacia erioloba	27°09,590'	22°50,864'	1	
Acacia erioloba	27°09,581'	22°50,872'	1	
Acacia haematoxylon	27°09,574'	22°50,876'	1	
Acacia erioloba	27°09,572'	22°50,884'	1	
Acacia erioloba	27°09,559'	22°50,887'	1	
Acacia haematoxylon	27°09,557'	22°50,886'	1	
Acacia haematoxylon	27°09,553'	22°50,888'	1	
Acacia erioloba	27°09,552'	22°50,889'	1	
Acacia haematoxylon	27°09,548'	22°50,886'	1	
Acacia haematoxylon	27°09,546'	22°50,885'	1	
Acacia erioloba	27°09,536'	22°50,896'	2	
Acacia erioloba	27°09,534'	22°50,898'	1	
Acacia erioloba	27°09,534'	22°50,898'	2	
Acacia erioloba	27°09,530'	22°50,902'	1	
Acacia erioloba	27°09,520'	22°50,899'	1	
Acacia erioloba	27°09,518'	22°50,900'	1	Dead
Acacia erioloba	27°09,517'	22°50,898'	1	
Acacia erioloba	27°09,513'	22°50,901'	1	
Acacia erioloba	27°09,513'	22°50,906'	1	
Acacia erioloba	27°09,505'	22°50,901'	1	
Acacia erioloba	27°09,504'	22°50,911'	1	
Acacia erioloba	27°09,494'	22°50,918'	1	
Acacia haematoxylon	27°09,493'	22°50,922'	1	
Acacia erioloba	27°09,486'	22°50,926'	1	
Acacia erioloba	27°09,485'	22°50,927'	1	
Acacia haematoxylon	27°09,485'	22°50,925'	1	
Acacia haematoxylon	27°09,480'	22°50,921'	1	
Acacia erioloba	27°09,481'	22°50,916'	1	
Acacia erioloba	27°09,477'	22°50,918'	1	
Acacia haematoxylon	27°09,470'	22°50,930'	1	
Acacia erioloba	27°09,468'	22°50,932'	1	
Acacia erioloba	27°09,465'	22°50,932'	1	
Acacia erioloba	27°09,464'	22°50,933'	1	
Acacia erioloba	27°09,463'	22°50,931'	1	
Acacia erioloba	27°09,461'	22°50,931'	2	
Acacia haematoxylon	27°09,458'	22°50,932'	1	

SPECIES	GPS COORDINATES		NO.	NOTE
	SOUTH	EAST		
Acacia erioloba	27°09,457'	22°50,935'	1	
Acacia erioloba	27°09,458'	22°50,936'	1	
Acacia erioloba	27°09,454'	22°50,939'	1	
Acacia erioloba	27°09,444'	22°50,937'	1	
Acacia erioloba	27°09,442'	22°50,940'	1	
Acacia erioloba	27°09,416'	22°50,966'	1	
Acacia erioloba	27°09,409'	22°50,969'	1	
Acacia erioloba	27°09,408'	22°50,969'	1	
Acacia erioloba	27°09,400'	22°50,972'	1	
Acacia erioloba	27°09,395'	22°50,976'	1	
Acacia erioloba	27°09,394'	22°50,976'	2	
Acacia erioloba	27°09,394'	22°50,983'	1	
Acacia erioloba	27°09,382'	22°50,982'	1	
Acacia erioloba	27°09,376'	22°50,982'	1	
Acacia erioloba	27°09,377'	22°50,986'	1	
Acacia erioloba	27°09,374'	22°50,988'	1	
Acacia erioloba	27°09,360'	22°50,992'	1	
Acacia erioloba	27°09,356'	22°50,999'	1	
Acacia haematoxylon	27°09,342'	22°51,004'	1	
Acacia erioloba	27°09,340'	22°51,006'	2	
Acacia erioloba	27°09,339'	22°51,007'	1	
Acacia erioloba	27°09,336'	22°51,006'	1	
Acacia erioloba	27°09,335'	22°51,006'	1	
Acacia erioloba	27°09,947'	22°50,628'	1	
Acacia erioloba	27°09,947'	22°50,628'	1	
Acacia erioloba	27°09,948'	22°50,627'	1	
Acacia erioloba	27°09,948'	22°50,623'	1	
Acacia erioloba	27°09,948'	22°50,626'	1	
Acacia erioloba	27°09,947'	22°50,627'	1	
Acacia erioloba	27°09,945'	22°50,627'	1	
Acacia erioloba	27°09,950'	22°50,630'	1	
Acacia erioloba	27°09,951'	22°50,630'	1	
Acacia erioloba	27°09,958'	22°50,621'	2	
Acacia erioloba	27°09,963'	22°50,621'	3	
Acacia erioloba	27°09,969'	22°50,617'	1	
Acacia erioloba	27°09,971'	22°50,615'	1	
Acacia erioloba	27°09,989'	22°50,609'	1	
Boscia albitrunca	27°10,003'	22°50,600'	1	
Acacia erioloba	27°10,002'	22°50,590'	2	
Acacia erioloba	27°10,017'	22°50,587'	1	
Acacia erioloba	27°10,020'	22°50,585'	1	
Acacia erioloba	27°10,033'	22°50,586'	1	Fallen over.
Acacia erioloba	27°10,035'	22°50,577'	1	
Acacia erioloba	27°10,041'	22°50,573'	1	
Acacia erioloba	27°10,041'	22°50,573'	1	
Acacia erioloba	27°10,041'	22°50,572'	1	
Acacia erioloba	27°10,045'	22°50,572'	1	
Acacia erioloba	27°10,046'	22°50,562'	1	
Acacia erioloba	27°10,055'	22°50,560'	1	

SPECIES	GPS COORDINATES		NO.	NOTE
	SOUTH	EAST		
Acacia haematoxylon	27°10,055'	22°50,559'	1	
Acacia erioloba	27°10,066'	22°50,555'	1	
Acacia erioloba	27°10,066'	22°50,556'	1	
Acacia erioloba	27°10,066'	22°50,558'	1	
Acacia erioloba	27°10,077'	22°50,554'	1	
Acacia erioloba	27°10,075'	22°50,549'	1	
Acacia erioloba	27°10,073'	22°50,547'	1	
Acacia erioloba	27°10,081'	22°50,543'	1	
Boscia albitrunca	27°10,083'	22°50,543'	1	
Boscia albitrunca	27°10,083'	22°50,544'	1	Big. Do not destroy!
Acacia erioloba	27°10,084'	22°50,544'	1	
Acacia erioloba	27°10,084'	22°50,545'	1	
Acacia erioloba	27°10,090'	22°50,537'	1	
Acacia erioloba	27°10,101'	22°50,532'	1	
Acacia erioloba	27°10,098'	22°50,515'	1	
Acacia erioloba	27°10,118'	22°50,510'	1	
Acacia erioloba	27°10,120'	22°50,512'	1	
Acacia erioloba	27°10,123'	22°50,513'	1	
Acacia erioloba	27°10,121'	22°50,509'	1	
Acacia erioloba	27°10,131'	22°50,508'	1	
Acacia erioloba	27°10,152'	22°50,497'	1	
Boscia albitrunca	27°10,154'	22°50,498'	1	Big. Do not destroy!
Acacia erioloba	27°10,165'	22°50,495'	1	
Boscia albitrunca	27°10,180'	22°50,488'	1	Big. Do not destroy!
Acacia erioloba	27°10,181'	22°50,492'	1	
Acacia erioloba	27°10,192'	22°50,481'	1	
Acacia erioloba	27°10,207'	22°50,459'	1	
Boscia albitrunca	27°10,228'	22°50,455'	1	
Acacia erioloba	27°10,237'	22°50,449'	1	
Acacia erioloba	27°10,245'	22°50,447'	1	
Boscia albitrunca	27°10,248'	22°50,439'	1	
Acacia haematoxylon	27°10,248'	22°50,436'	1	
Acacia erioloba	27°10,257'	22°50,432'	1	
Acacia erioloba	27°10,264'	22°50,428'	1	Dead
Acacia erioloba	27°10,269'	22°50,419'	1	
Acacia erioloba	27°10,271'	22°50,422'	1	
Acacia erioloba	27°10,300'	22°50,406'	1	
Acacia erioloba	27°10,302'	22°50,402'	1	
Boscia albitrunca	27°10,340'	22°50,390'	1	Big. Do not destroy!
Boscia albitrunca	27°10,367'	22°50,369'	1	Big. Do not destroy!
Acacia erioloba	27°10,368'	22°50,368'	1	
Acacia erioloba	27°10,379'	22°50,369'	1	
Acacia erioloba	27°10,385'	22°50,362'	1	
Boscia albitrunca	27°10,384'	22°50,354'	1	
Acacia erioloba	27°10,387'	22°50,354'	1	Dead
Acacia erioloba	27°10,413'	22°50,354'	1	
Acacia erioloba	27°10,423'	22°50,340'	1	
Boscia albitrunca	27°10,423'	22°50,340'	1	Fallen over.
Acacia erioloba	27°10,431'	22°50,338'	1	

SPECIES	GPS COORDINATES		NO.	NOTE
	SOUTH	EAST		
Acacia erioloba	27°10,432'	22°50,336'	1	
Acacia erioloba	27°10,436'	22°50,335'	1	
Acacia erioloba	27°10,444'	22°50,333'	1	
Acacia erioloba	27°10,448'	22°50,331'	1	
Acacia erioloba	27°10,445'	22°50,326'	1	
Acacia erioloba	27°10,441'	22°50,325'	1	
Acacia erioloba	27°10,440'	22°50,325'	1	
Acacia erioloba	27°10,442'	22°50,325'	1	
Acacia erioloba	27°10,459'	22°50,322'	1	
Acacia erioloba	27°10,464'	22°50,322'	1	
Acacia erioloba	27°10,468'	22°50,326'	1	
Acacia erioloba	27°10,485'	22°50,293'	1	
Acacia erioloba	27°10,479'	22°50,308'	1	
Boscia albitrunca	27°10,478'	22°50,306'	1	
Acacia erioloba	27°10,481'	22°50,302'	1	
Acacia erioloba	27°10,483'	22°50,302'	1	
Acacia erioloba	27°10,490'	22°50,297'	1	
Acacia erioloba	27°10,496'	22°50,297'	1	
Acacia erioloba	27°10,496'	22°50,298'	1	
Acacia erioloba	27°10,497'	22°50,296'	1	
Acacia erioloba	27°10,501'	22°50,288'	1	
Acacia erioloba	27°10,509'	22°50,290'	1	
Acacia erioloba	27°10,511'	22°50,288'	1	
Acacia erioloba	27°10,514'	22°50,282'	1	
Acacia erioloba	27°10,515'	22°50,283'	1	
Acacia erioloba	27°10,515'	22°50,283'	1	
Acacia erioloba	27°10,521'	22°50,285'	1	
Acacia erioloba	27°10,520'	22°50,275'	3	
Acacia erioloba	27°10,532'	22°50,272'	1	
Acacia erioloba	27°10,539'	22°50,279'	4	
Acacia erioloba	27°10,541'	22°50,271'	1	
Acacia erioloba	27°10,543'	22°50,273'	1	
Acacia erioloba	27°10,543'	22°50,267'	1	
Acacia erioloba	27°10,546'	22°50,268'	1	
Acacia erioloba	27°10,550'	22°50,272'	1	
Acacia erioloba	27°10,563'	22°50,273'	1	
Acacia erioloba	27°10,560'	22°50,266'	1	
Acacia erioloba	27°10,560'	22°50,264'	1	
Acacia erioloba	27°10,571'	22°50,258'	1	
Acacia erioloba	27°10,577'	22°50,262'	1	
Boscia albitrunca	27°10,582'	22°50,253'	1	Big. Do not destroy!
Acacia erioloba	27°10,588'	22°50,245'	1	Dead
Acacia erioloba	27°10,601'	22°50,244'	1	
Boscia albitrunca	27°10,605'	22°50,242'	1	
Acacia erioloba	27°10,605'	22°50,238'	1	
Acacia erioloba	27°10,614'	22°50,230'	1	
Acacia erioloba	27°10,624'	22°50,229'	1	
Acacia erioloba	27°10,625'	22°50,230'	1	
Acacia erioloba	27°10,633'	22°50,219'	1	Dead

SPECIES	GPS COORDINATES		NO.	NOTE
	SOUTH	EAST		
Acacia erioloba	27°10,639'	22°50,222'	1	Dead
Acacia erioloba	27°10,650'	22°50,211'	1	
Acacia erioloba	27°10,650'	22°50,209'	1	
Acacia erioloba	27°10,655'	22°50,211'	5	
Acacia erioloba	27°10,659'	22°50,207'	1	
Acacia erioloba	27°10,660'	22°50,207'	1	
Acacia erioloba	27°10,670'	22°50,203'	1	
Acacia erioloba	27°10,671'	22°50,203'	1	
Acacia erioloba	27°10,673'	22°50,192'	1	
Acacia erioloba	27°10,680'	22°50,198'	1	
Acacia erioloba	27°10,683'	22°50,192'	1	
Boscia albitrunca	27°10,682'	22°50,188'	1	
Acacia erioloba	27°10,686'	22°50,188'	1	
Acacia erioloba	27°10,687'	22°50,185'	2	
Acacia erioloba	27°10,695'	22°50,183'	1	
Acacia erioloba	27°10,703'	22°50,176'	1	
Acacia erioloba	27°10,704'	22°50,180'	1	
Acacia erioloba	27°10,716'	22°50,169'	2	
Acacia erioloba	27°10,717'	22°50,167'	1	
Acacia erioloba	27°10,722'	22°50,173'	1	
Acacia erioloba	27°10,733'	22°50,170'	1	
Acacia erioloba	27°10,739'	22°50,160'	1	
Acacia erioloba	27°10,739'	22°50,151'	1	
Acacia erioloba	27°10,742'	22°50,150'	1	
Acacia erioloba	27°10,754'	22°50,151'	1	
Acacia erioloba	27°10,756'	22°50,155'	1	
Acacia erioloba	27°10,754'	22°50,165'	1	
Acacia erioloba	27°10,755'	22°50,164'	1	
Boscia albitrunca	27°10,768'	22°50,153'	1	
Acacia erioloba	27°10,766'	22°50,152'	1	
Acacia erioloba	27°10,766'	22°50,151'	1	
Acacia haematoxylon	27°10,773'	22°50,147'	1	
Acacia erioloba	27°10,773'	22°50,146'	1	
Acacia erioloba	27°10,778'	22°50,147'	1	
Acacia erioloba	27°10,782'	22°50,149'	6	
Acacia erioloba	27°10,783'	22°50,144'	1	
Boscia albitrunca	27°10,784'	22°50,144'	1	
Acacia erioloba	27°10,789'	22°50,142'	1	
Acacia erioloba	27°10,792'	22°50,135'	1	
Acacia erioloba	27°10,802'	22°50,133'	3	
Acacia erioloba	27°10,817'	22°50,123'	1	
Acacia erioloba	27°10,817'	22°50,124'	1	
Acacia erioloba	27°10,818'	22°50,125'	1	
Acacia erioloba	27°10,824'	22°50,123'	1	
Acacia erioloba	27°10,828'	22°50,122'	15	
Acacia erioloba	27°10,834'	22°50,118'	1	
Acacia erioloba	27°10,836'	22°50,117'	1	
Boscia albitrunca	27°10,855'	22°50,105'	1	
Acacia erioloba	27°10,867'	22°50,101'	4	

SPECIES	GPS COORDINATES		NO.	NOTE
	SOUTH	EAST		
Acacia erioloba	27°10,868'	22°50,098'	1	
Acacia erioloba	27°10,871'	22°50,098'	3	
Acacia erioloba	27°10,779'	22°49,545'	1	
Acacia erioloba	27°10,779'	22°49,546'	1	
Acacia haematoxylon	27°10,773'	22°49,549'	1	
Acacia haematoxylon	27°10,765'	22°49,553'	1	
Acacia haematoxylon	27°10,760'	22°49,557'	3	
Acacia erioloba	27°10,758'	22°49,554'	7	
Acacia haematoxylon	27°10,738'	22°49,553'	2	
Acacia haematoxylon	27°10,734'	22°49,556'	10	
Acacia haematoxylon	27°10,733'	22°49,553'	1	
Acacia haematoxylon	27°10,726'	22°49,560'	1	
Acacia haematoxylon	27°10,726'	22°49,557'	7	
Acacia erioloba	27°10,714'	22°49,566'	1	
Acacia haematoxylon	27°10,704'	22°49,568'	1	
Boscia albitrunca	27°10,693'	22°49,563'	1	Huge. Do not destroy!
Acacia erioloba	27°10,674'	22°49,563'	1	
Acacia erioloba	27°10,671'	22°49,564'	1	
Acacia erioloba	27°10,668'	22°49,564'	1	
Acacia haematoxylon	27°10,664'	22°49,567'	1	
Acacia erioloba	27°10,653'	22°49,567'	1	
Acacia erioloba	27°10,654'	22°49,571'	3	
Acacia erioloba	27°10,647'	22°49,563'	1	Dead
Acacia erioloba	27°10,647'	22°49,573'	1	
Acacia erioloba	27°10,638'	22°49,570'	1	
Acacia erioloba	27°10,638'	22°49,572'	1	
Boscia albitrunca	27°10,637'	22°49,571'	1	Big. Do not destroy!
Acacia haematoxylon	27°10,634'	22°49,573'	1	
Acacia haematoxylon	27°10,630'	22°49,574'	1	
Acacia erioloba	27°10,630'	22°49,577'	1	
Acacia erioloba	27°10,629'	22°49,577'	2	
Acacia erioloba	27°10,630'	22°49,578'	1	
Boscia albitrunca	27°10,262'	22°49,577'	1	Big. Do not destroy!
Acacia haematoxylon	27°10,624'	22°49,577'	1	
Acacia haematoxylon	27°10,622'	22°49,578'	1	
Acacia erioloba	27°10,619'	22°49,582'	7	
Acacia erioloba	27°10,609'	22°49,582'	1	
Boscia albitrunca	27°10,606'	22°49,579'	1	
Acacia erioloba	27°10,602'	22°49,574'	1	
Acacia haematoxylon	27°10,596'	22°49,574'	1	
Acacia erioloba	27°10,594'	22°49,580'	1	
Acacia erioloba	27°10,591'	22°49,581'	1	
Acacia erioloba	27°10,572'	22°49,583'	1	
Boscia albitrunca	27°10,567'	22°49,579'	1	Big. Do not destroy!
Acacia haematoxylon	27°10,566'	22°49,584'	1	
Acacia erioloba	27°10,558'	22°49,587'	2	
A. erioloba x A. haematoxylon	27°10,558'	22°49,586'	1	

SPECIES	GPS COORDINATES SOUTH	EAST	NO.	NOTE
A. erioloba x A. haematoxylon	27°10,543'	22°49,583'	1	
Acacia erioloba	27°10,539'	22°49,591'	1	
Acacia erioloba	27°10,530'	22°49,588'	1	
Acacia erioloba	27°10,521'	22°49,594'	1	
Acacia erioloba	27°10,507'	22°49,590'	1	
Acacia erioloba	27°10,506'	22°49,593'	1	
Boscia albitrunca	27°10,494'	22°49,594'	1	
Acacia erioloba	27°10,484'	22°49,597'	1	
Acacia erioloba	27°10,483'	22°49,597'	1	Dead
Boscia albitrunca	27°10,474'	22°49,591'	1	Huge. Do not destroy!
Acacia erioloba	27°10,469'	22°49,591'	1	
Acacia erioloba	27°10,462'	22°49,601'	1	
Acacia erioloba	27°10,460'	22°49,602'	1	
Boscia albitrunca	27°10,548'	22°49,601'	1	Big. Do not destroy!
Acacia erioloba	27°10,458'	22°49,603'	1	Dead
Acacia erioloba	27°10,452'	22°49,602'	1	
Acacia erioloba	27°10,450'	22°49,599'	1	
Acacia erioloba	27°10,448'	22°49,601'	1	
Acacia erioloba	27°10,441'	22°49,604'	1	
Acacia erioloba	27°10,438'	22°49,609'	1	
Acacia erioloba	27°10,430'	22°49,603'	2	
Boscia albitrunca	27°10,430'	22°49,602'	1	
Acacia erioloba	27°10,427'	22°49,601'	1	
Acacia erioloba	27°10,416'	22°49,606'	1	
Acacia erioloba	27°10,389'	22°49,609'	1	
Acacia erioloba	27°10,387'	22°49,614'	1	
Acacia erioloba	27°10,382'	22°49,612'	1	
A. erioloba x A. haematoxylon	27°10,379'	22°49,608'	1	
Acacia haematoxylon	27°10,378'	22°49,608'	1	
Acacia erioloba	27°10,374'	22°49,612'	1	
Acacia erioloba	27°10,362'	22°49,609'	1	
Acacia erioloba	27°10,359'	22°49,618'	4	Dead
Acacia erioloba	27°10,346'	22°49,612'	3	
Acacia erioloba	27°10,345'	22°49,616'	2	
Acacia erioloba	27°10,339'	22°49,614'	1	
Acacia erioloba	27°10,337'	22°49,614'	2	
Acacia erioloba	27°10,329'	22°49,619'	1	
Acacia erioloba	27°10,315'	22°49,617'	1	
Acacia erioloba	27°10,315'	22°49,617'	1	
Acacia erioloba	27°10,306'	22°49,626'	1	
Acacia erioloba	27°10,305'	22°49,624'	1	Dead
Acacia erioloba	27°10,292'	22°49,620'	5	
Acacia erioloba	27°10,282'	22°49,624'	1	
Acacia erioloba	27°10,274'	22°49,628'	1	
Acacia erioloba	27°10,266'	22°49,627'	1	
Boscia albitrunca	27°10,248'	22°49,638'	1	Big. Do not destroy!

SPECIES	GPS COORDINATES SOUTH	GPS COORDINATES EAST	NO.	NOTE
A. erioloba x A. haematoxylon	27°10,248'	22°49,638'	1	
Acacia erioloba	27°10,240'	22°49,636'	1	Dead
Acacia erioloba	27°10,221'	22°49,646'	1	
Acacia erioloba	27°10,218'	22°49,644'	1	
Acacia erioloba	27°10,211'	22°49,640'	1	
Acacia erioloba	27°10,209'	22°49,639'	1	
Acacia erioloba	27°10,189'	22°49,642'	3	
Acacia erioloba	27°10,185'	22°49,645'	1	
Acacia erioloba	27°10,185'	22°49,642'	1	
Acacia erioloba	27°10,174'	22°49,639'	1	
Boscia albitrunca	27°10,173'	22°49,640'	1	Big. Do not destroy!
Acacia erioloba	27°10,174'	22°49,639'	1	
Acacia erioloba	27°10,172'	22°49,641'	1	
Acacia erioloba	27°10,164'	22°49,643'	1	
Acacia erioloba	27°10,163'	22°49,651'	1	
Acacia erioloba	27°10,155'	22°49,649'	2	
A. erioloba x A. haematoxylon	27°10,150'	22°49,651'	1	
Acacia erioloba	27°10,144'	22°49,649'	1	
Acacia erioloba	27°10,144'	22°49,647'	1	
Acacia erioloba	27°10,144'	22°49,647'	1	
Acacia erioloba	27°10,136'	22°49,655'	1	
Acacia erioloba	27°10,130'	22°49,649'	1	Dead
Acacia erioloba	27°10,127'	22°49,649'	1	
Acacia haematoxylon	27°10,125'	22°49,654'	1	
Acacia erioloba	27°10,123'	22°49,655'	1	
Acacia erioloba	27°10,122'	22°49,651'	1	
Acacia erioloba	27°10,166'	22°49,658'	1	
Acacia erioloba	27°10,110'	22°49,660'	1	
A. erioloba x A. haematoxylon	27°10,111'	22°49,652'	1	
Acacia erioloba	27°10,110	22°49,650'	1	
Acacia erioloba	27°10,108'	22°49,651'	4	
Acacia erioloba	27°10,101'	22°49,651'	1	
Acacia erioloba	27°10,099'	22°49,652'	1	
Acacia erioloba	27°10,090'	22°49,662'	1	
Acacia erioloba	27°10,080'	22°49,663'	1	Huge.
Acacia erioloba	27°10,079'	22°49,664'	1	
Boscia albitrunca	27°10,056'	22°49,669'	1	
A. erioloba x A. haematoxylon	27°10,040'	22°49,661'	1	
Acacia erioloba	27°10,037'	22°49,660'	1	
Acacia erioloba	27°10,032'	22°49,668'	1	
A. erioloba x A. haematoxylon	27°10,022'	22°49,667'	1	
A. erioloba x A. haematoxylon	27°10,012'	22°49,675'	1	
Boscia albitrunca	27°10,010'	22°49,677'	1	Big. Do not destroy!
Acacia erioloba	27°09,997'	22°49,677'	1	

SPECIES	GPS COORDINATES SOUTH	GPS COORDINATES EAST	NO.	NOTE
Acacia erioloba	27°09,996'	22°49,673'	1	
Acacia erioloba	27°09,993'	22°49,672'	1	
Acacia erioloba	27°09,994'	22°49,673'	2	
Acacia erioloba	27°09,991'	22°49,674'	1	
A. erioloba x A. haematoxylon	27°09,948'	22°49,679'	1	
Acacia erioloba	27°09,938'	22°49,680'	1	
Acacia erioloba	27°09,924'	22°49,680'	1	
Boscia albitrunca	27°09,897'	22°49,686'	1	Big. Do not destroy!
Acacia erioloba	27°09,894'	22°49,689'	1	
Boscia albitrunca	27°09,878'	22°49,687'	1	
A. erioloba x A. haematoxylon	27°09,873'	22°49,690'	1	
Acacia erioloba	27°09,860'	22°49,691'	1	
Acacia erioloba	27°09,854'	22°49,689'	1	
Acacia erioloba	27°09,850'	22°49,689'	1	
Acacia erioloba	27°09,848'	22°49,694'	1	
Acacia erioloba	27°09,842'	22°49,691'	1	
Acacia erioloba	27°09,840'	22°49,692'	1	
Acacia erioloba	27°09,838'	22°49,693'	1	
Acacia erioloba	27°09,838'	22°49,496'	1	
Acacia erioloba	27°09,834'	22°49,969'	1	
Acacia erioloba	27°09,832'	22°49,696'	1	
Acacia erioloba	27°09,829'	22°49,695'	1	
Acacia erioloba	27°09,827'	22°49,696'	1	
Acacia erioloba	27°09,808'	22°49,695'	1	
Acacia erioloba	27°09,803'	22°49,704'	1	Dead
Boscia albitrunca	27°09,802'	22°49,706	1	
Boscia albitrunca	27°09,797'	22°49,701'	1	Huge. Do not destroy!
Acacia erioloba	27°09,777'	22°49,705'	1	
Acacia erioloba	27°09,773'	22°49,706'	2	
Acacia erioloba	27°09,760'	22°49,704'	4	
A. erioloba x A. haematoxylon	27°09,757'	22°49,709'	1	
A. erioloba x A. haematoxylon	27°09,755'	22°49,709'	1	
Acacia erioloba	27°09,754'	22°49,711'	3	
Boscia albitrunca	27°09,740'	22°49,705'	1	Big. Do not destroy!
Acacia erioloba	27°09,718'	22°49,711'	3	
Acacia erioloba	27°09,706'	22°49,713'	1	
Acacia erioloba	27°09,704'	22°49,714'	1	
Boscia albitrunca	27°09,682'	22°49,713'	1	Huge. Do not destroy!
Acacia erioloba	27°09,664'	22°49,714'	1	
Acacia erioloba	27°09,661'	22°49,719'	1	
Acacia erioloba	27°09,647'	22°49,721'	1	
Acacia erioloba	27°09,636'	22°49,724'	5	
Acacia erioloba	27°09,635'	22°49,727'	1	
Acacia erioloba	27°09,635'	22°49,728'	1	

SPECIES	GPS COORDINATES SOUTH	GPS COORDINATES EAST	NO.	NOTE
Acacia erioloba	27°09,634'	22°49,726'	1	
Acacia erioloba	27°09,628'	22°49,722'	1	
Acacia erioloba	27°09,624'	22°49,726'	1	
A. erioloba x A. haematoxylon	27°09,624'	22°49,728'	1	
Acacia erioloba	27°09,623'	22°49,731'	1	
Acacia erioloba	27°09,613'	22°49,732'	1	
Acacia erioloba	27°09,605'	22°49,730'	2	
Acacia erioloba	27°09,603'	22°49,733'	1	
Acacia erioloba	27°09,597'	22°49,737'	1	
Acacia erioloba	27°09,595'	22°49,737'	1	
Acacia erioloba	27°09,587'	22°49,735'	2	
Acacia erioloba	27°09,579'	22°49,735'	1	Dead & fallen over.
Acacia erioloba	27°09,567'	22°49,736'	4	
Boscia albitrunca	27°09,554'	22°49,747'	1	Huge. Do not destroy!
Acacia erioloba	27°09,536'	22°49,746'	1	
Acacia erioloba	27°09,513'	22°49,746'	1	
Acacia erioloba	27°09,505'	22°49,747'	8	
Acacia erioloba	27°09,499'	22°49,746'	1	
Acacia erioloba	27°09,497'	22°49,747'	2	
Acacia erioloba	27°09,498'	22°49,750'	1	
Acacia erioloba	27°09,479'	22°49,759'	1	
Acacia erioloba	27°09,480'	22°49,759'	4	
Acacia erioloba	27°09,470'	22°49,757'	3	Dead.
Acacia erioloba	27°09,476'	22°49,764'	1	
Acacia erioloba	27°09,479'	22°49,768'	1	
Acacia erioloba	27°09,483'	22°49,769'	1	
Acacia erioloba	27°09,483'	22°49,775'	6	
Acacia erioloba	27°09,489'	22°49,785'	1	
Acacia erioloba	27°09,489'	22°49,786'	1	
Acacia erioloba	27°09,488'	22°49,788'	3	
Acacia erioloba	27°09,489'	22°49,790'	3	
Acacia erioloba	27°09,488'	22°49,792'	2	Dead.
Acacia erioloba	27°09,493'	22°49,797'	1	
Acacia erioloba	27°09,495'	22°49,801'	1	
Acacia erioloba	27°09,496'	22°49,804'	1	
Acacia erioloba	27°09,498'	22°49,807'	9	
Acacia erioloba	27°09,506'	22°49,809'	1	
Acacia erioloba	27°09,506'	22°49,810'	1	
Acacia erioloba	27°09,508'	22°49,812'	1	
Acacia erioloba	27°09,510'	22°49,822'	1	
Acacia erioloba	27°09,512'	22°49,822'	4	
Acacia erioloba	27°09,515'	22°49,826'	1	
Acacia erioloba	27°09,516'	22°49,827'	2	
Acacia erioloba	27°09,519'	22°49,845'	5	
Acacia erioloba	27°09,522'	22°49,846'	1	
Acacia erioloba	27°09,522'	22°49,854'	4	

SPECIES	GPS COORDINATES		NO.	NOTE
	SOUTH	EAST		
Acacia erioloba	27°09,523'	22°49,857'	1	
Acacia erioloba	27°09,525'	22°49,863'	2	
Acacia erioloba	27°09,531'	22°49,863'	4	
Acacia erioloba	27°09,531'	22°49,871'	1	
Acacia erioloba	27°09,533'	22°49,877'	1	
Acacia erioloba	27°09,539'	22°49,890'	1	
Acacia erioloba	27°09,543'	22°49,885'	4	
Acacia erioloba	27°09,551'	22°49,895'	1	
Acacia erioloba	27°09,553'	22°49,904'	1	
Acacia erioloba	27°09,551'	22°49,909'	1	
Acacia erioloba	27°09,551'	22°49,910'	1	
Acacia erioloba	27°09,558'	22°49,923'	1	
Acacia erioloba	27°09,563'	22°49,929'	1	
Boscia albitrunca	27°09,568'	22°49,936'	1	
Acacia erioloba	27°09,573'	22°49,952'	1	
Acacia erioloba	27°09,319'	22°50,985'	2	
Acacia erioloba	27°09,316'	22°50,977'	1	
Acacia erioloba	27°09,316'	22°50,974'	1	
Acacia erioloba	27°09,311'	22°50,961'	1	
Acacia erioloba	27°09,310'	22°50,960'	1	
Acacia erioloba	27°09,309'	22°50,959'	7	
Acacia erioloba	27°09,307'	22°50,949'	1	
Acacia erioloba	27°09,307'	22°50,948'	1	
Acacia erioloba	27°09,307'	22°50,946'	1	
Acacia erioloba	27°09,306'	22°50,946'	1	
Boscia albitrunca	27°09,300'	22°50,939'	1	
Acacia erioloba	27°09,299'	22°50,937'	1	
Acacia erioloba	27°09,298'	22°50,936'	1	
Acacia erioloba	27°09,290'	22°50,907'	1	
Acacia erioloba	27°09,284'	22°50,898'	1	
Acacia erioloba	27°09,287'	22°50,895'	1	
Boscia albitrunca	27°09,286'	22°50,893'	1	
Acacia erioloba	27°09,275'	22°50,896'	1	
Acacia erioloba	27°09,278'	22°50,894'	1	
Acacia erioloba	27°09,277'	22°50,889'	1	
Acacia erioloba	27°09,272'	22°50,880'	3	
Acacia erioloba	27°09,271'	22°50,879'	2	
Acacia erioloba	27°09,271'	22°50,877'	1	
Acacia erioloba	27°09,268'	22°50,863'	1	
Acacia erioloba	27°09,267'	22°50,859'	1	
Acacia erioloba	27°09,268'	22°50,856'	1	
Acacia erioloba	27°09,263'	22°50,853'	1	
Acacia erioloba	27°09,262'	22°50,851'	1	
Acacia erioloba	27°09,259'	22°50,840'	1	
Acacia erioloba	27°09,257'	22°50,837'	1	
Acacia erioloba	27°09,245'	22°50,820'	1	
Acacia erioloba	27°09,239'	22°50,821'	1	
Acacia erioloba	27°09,235'	22°50,806'	1	
Acacia erioloba	27°09,233'	22°50,807'	1	

SPECIES	GPS COORDINATES		NO.	NOTE
	SOUTH	EAST		
Acacia erioloba	27°09,235'	22°50,807'	1	
Acacia erioloba	27°09,232'	22°50,806'	1	
Acacia erioloba	27°09,227'	22°50,804'	1	
Acacia erioloba	27°09,225	22°50,800'	1	
Acacia erioloba	27°09,220'	22°50,799'	1	
Acacia erioloba	27°09,213'	22°50,770'	1	
Acacia erioloba	27°09,211'	22°50,769'	1	
Acacia erioloba	27°09,203'	22°50,754'	1	
Acacia erioloba	27°09,195'	22°50,748'	1	
Acacia erioloba	27°09,185'	22°50,743'	1	
Acacia erioloba	27°09,185'	22°50,727'	1	
Acacia erioloba	27°09,185'	22°50,724'	1	
Acacia erioloba	27°09,171'	22°50,688'	1	
Acacia erioloba	27°09,161'	22°50,683'	1	
Acacia erioloba	27°09,158'	22°50,663'	1	
Acacia erioloba	27°09,141'	22°50,634'	1	
Acacia erioloba	27°09,140'	22°50,634'	1	
Acacia erioloba	27°09,141'	22°50,635'	2	
Boscia albitrunca	27°09,137'	22°50,627'	1	
Acacia erioloba	27°09,136'	22°50,627'	1	
Boscia albitrunca	27°09,128'	22°50,609'	1	
Acacia erioloba	27°09,126'	22°50,601'	1	
Acacia erioloba	27°09,114'	22°50,583'	1	
Boscia albitrunca	27°09,107'	22°50,569'	1	
Acacia erioloba	27°09,103'	22°50,562'	1	
Acacia erioloba	27°°09,092'	22°50,558'	1	
Acacia erioloba	27°09,091'	22°50,544'	1	
Acacia erioloba	27°09,091'	22°50,543'	1	
Acacia haematoxylon	27°09,072'	22°50,557'	1	
Acacia erioloba	27°09,071'	22°50,556'	1	
Acacia erioloba	27°09,047'	22°50,571'	1	
Acacia erioloba	27°09,085'	22°50,536'	2	
Acacia erioloba	27°09,083'	22°50,533'	1	
Acacia erioloba	27°09,075'	22°50,515'	1	
Acacia erioloba	27°09,074'	22°50,514'	1	
Acacia erioloba	27°09,074'	22°50,511'	1	
Acacia erioloba	27°09,068'	22°50,498'	2	
Boscia albitrunca	27°09,067'	22°50,494'	1	
Acacia erioloba	27°09,069'	22°50,484'	1	
Acacia erioloba	27°09,062'	22°50,468'	1	
Acacia erioloba	27°09,060'	22°50,462'	1	
Acacia erioloba	27°09,058'	22°50,451'	1	
Acacia erioloba	27°09,300'	22°51'020'	1	
Acacia erioloba	27°09,296'	22°51'020'	1	
Acacia erioloba	27°09,293'	22°51'019'	1	
Acacia erioloba	27°09,286'	22°51,014'	1	
Acacia erioloba	27°09,277'	22°51,011'	1	
Acacia erioloba	27°09,273'	22°51,005'	1	
Boscia albitrunca	27°09,264'	22°51,009'	1	

SPECIES	GPS COORDINATES SOUTH	GPS COORDINATES EAST	NO.	NOTE
Acacia erioloba	27°09,265'	22°51,011'	1	
Acacia erioloba	27°09,262'	22°51,001'	1	
Acacia erioloba	27°09,248'	22°51,001'	1	Dead.
Acacia erioloba	27°09,238'	22°50,991'	1	Dead.
Acacia erioloba	27°09,225'	22°50,983'	1	
Acacia erioloba	27°09,224'	22°50,982'	1	
Acacia erioloba	27°09,211'	22°50,976'	1	
Boscia albitrunca	27°09,201'	22°50,973'	1	Huge. Do not destroy!
Acacia erioloba	27°09,195'	22°50,967'	1	
Acacia erioloba	27°09,184'	22°50,958'	1	
Acacia erioloba	27°09,174'	22°50,957'	8	
Acacia erioloba	27°09,167'	22°50,950'	1	
Boscia albitrunca	27°09,165'	22°50,949'	1	
Acacia erioloba	27°09,163'	22°50,949'	1	
Acacia erioloba	27°09,154'	22°50,945'	1	
Acacia erioloba	27°09,152'	22°50,938'	1	
Acacia erioloba	27°09,132'	22°50,934'	1	
Acacia erioloba	27°09,131'	22°50,937'	1	
Acacia erioloba	27°09,120'	22°50,929'	1	
Acacia erioloba	27°09,117'	22°50,927'	1	
Boscia albitrunca	27°09,117'	22°50,926'	1	
Acacia erioloba	27°09,109'	22°50,922'	1	
Acacia erioloba	27°09,106'	22°50,919'	1	
Acacia erioloba	27°09,097'	22°50,920'	1	
Acacia erioloba	27°09,094'	22°50,913'	1	
Acacia erioloba	27°09,092'	22°50,913'	1	
Acacia erioloba	27°09,079'	22°50,912'	5	
Acacia erioloba	27°09,071'	22°50,900'	1	
Acacia erioloba	27°09,060'	22°50,905'	1	
Acacia erioloba	27°09,031'	22°50,881'	1	
Acacia erioloba	27°09,028'	22°50,879'	1	
Acacia erioloba	27°09,015'	22°50,871'	1	
Acacia erioloba	27°09,015'	22°50,871'	2	
Acacia erioloba	27°09,012'	22°50,866'	1	
Acacia erioloba	27°09,000'	22°50,857'	1	
Acacia erioloba	27°08,979'	22°50,847'	1	
Acacia erioloba	27°08,969'	22°50,844'	1	
Acacia erioloba	27°08,955'	22°50,846'	1	
Acacia erioloba	27°08,933'	22°50,828'	1	
Acacia erioloba	27°08,916'	22°50,820'	1	
Acacia erioloba	27°08,909'	22°50,815'	1	
Acacia erioloba	27°08,891'	22°50,802'	1	
Acacia erioloba	27°08,888'	22°50,807'	1	
Acacia erioloba	27°08,859'	22°50,793'	1	
Acacia erioloba	27°08,853'	22°50,793'	1	

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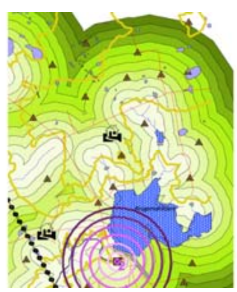
Eskom LTD
Black Rock Proposed 132kV Powerline

Vitae Appendix D: Specialists Reports

Appendix Div:
Soils Impact Assessment

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Soil Investigation In Black Rock

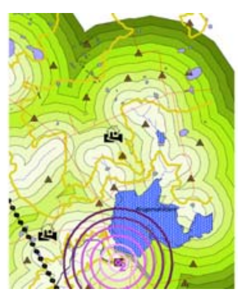
Report

Version - 1

October 09

Client Name: Assmang Manganese
Project Number: 09-011




Soil Investigation In Assmang Black Rock Manganese Mine

Report
Version - 1

October 09

Client logo

Assmang Black Rock Manganese Mine
09/011

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EXECUTIVE SUMMARY

The Assmang Black Rock Manganese Mine soil survey was conducted to aid in the development of an environmental development programme as well as to determine the optimum route for powerline construction from a total of six alternative routes provided. Routes one to three were withdrawn due to the fact that they are affected by opencast mining operations along their routes and therefore the study only took into consideration routes four to six. To this end, standard soil survey methods were used to describe the soil types of the various possible power line routes in order to describe the soils, erosion hazard, land capability and use, and to give an Environmental Impact Assessment as well as contribute to an Environmental Management Programme. From a soils perspective, no single route is preferred over the others as they all have similar soils.

The major soil forms encountered are of the orthic phase Hutton. These soils are freely drained, deep and sandy.

Soils Option Route 4,5 and 6

Route Option	Broad Soil Group	Soil Forms	Distance (km)
4	Red sand	deep Hutton	16.25
5	Red sand	deep Hutton	17.15
6	Red sand	deep Hutton	16.79

These soils have low dryland agricultural potential despite their adequate depth for roots to grow into due to both that they are sandy and thus have poor water retention capacity as well as the harsh dry climatic conditions prevalent in the area. They will further require high levels of management to mitigate erosion hazards as they are of aeolian origin and are thus prone to wind transportation.

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1. INTRODUCTION

Assmang Black Rock Manganese Mine appointed GCS (Pty) Ltd to undertake a pedological survey of the Assmang Black Rock Power Line in order to aid in the development of an environmental development programme as well as to determine the optimum route for powerline construction from three alternatives provided namely option routes 4 -6. The survey was carried out in September, 2009.

The objectives of the survey are to:

- provide baseline information of the soil resources on site (distribution, types, depth, suitability for agriculture, physical and chemical characteristics, fertility and erodibility
- assess the various sites in relation to their intended usage and the possible impacts of these to the surrounding environment
- conduct an Environmental Impact Assessment for the soils, land capability and use
- choose a preferred powerline route based on findings of pedological studies for route development
- recommend mitigation measures for the identified impacts

2. LEGISLATIVE REQUIREMENTS

The act of relevance to this study is the National Environmental Management Act 107 of 1998 (NEMA) 23(2B) which emphasises the need to identify and predict potential impacts on the environment, risks and consequences and alternatives for mitigation of activities in order to minimise negative impacts.

Risk assessment was conducted in line with this act.

3. GLOSSARY OF TERMS

Base status – a qualitative expression of base saturation.
Coarse sand – (1) A soil separate consisting of particles 2,0-0,5 mm in diameter. (2) A sand grade class with coarse sand more than 20% and fine sand plus very fine sand (i.e. 0,25-0,05 mm diameter) less than 60% of the sand fraction.
Concretion – a nodule made up of concentric accretions
Cutan – cutans occur on the surfaces of peds or individual particles (sand grains, stones). They consist of material which is usually finer than, and that has an organisation different to the material that makes up the surface on which they occur. They originate through deposition, diffusion or stress. Synonymous with clayskin, clay film, argillan.

Erosion – the group of processes whereby soil or rock material is loosened or dissolved and removed from any part of the earth's surface.

Fine sand – (1) a soil separate consisting of particles 0,25-0,1 mm in diameter. (2) A soil texture class with fine sand plus very fine sand (i.e. 0,25-0,05 mm in diameter) more than 60% of the sand fraction.

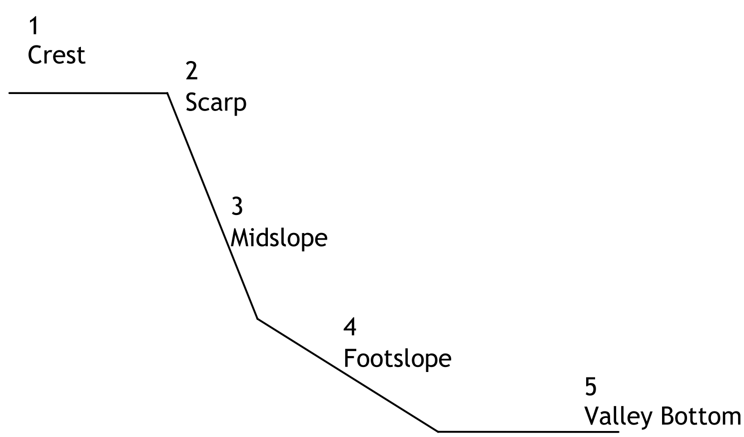
Fine textured soils – soils with a texture of sandy clay, silty clay or clay.

Goethite – α-FeO.Oh. An hydrated ferric oxide, usually yellowish in colour. Dimorphous with lepidocrocite Y-FeO.Oh.

Hardpan – a massive material enriched with and strongly cemented by sesquioxides, chiefly iron oxides (known asferricrete, diagnostic hard plinthite, ironpan, mgubane, ouklip, laterite hardpan) silica (silcrete, dorbank) or lime (diagonostic hardpan carbonate horizon, calcrete). Ortstein hardpans are cemented by iron oxides and organic matter.

Land Capability – the ability of land to meet the needs of one or more uses under defined conditions of management.

Landscape Positions



Land Type – (1) A type of land with specified characteristics. (2) In South Africa, it has been used as a map unit denoting land, mappable at 1:250,000 scale, over which there is a marked uniformity of climate, terrain form and soil pattern.

Land use – the use to which land is put.

Mottling – a mottled or variegated pattern of colours is common is many soil horizons. It may be the result of various processes *inter alia* hydromorphy, illuviation, biological activity, and rock weathering in freely drained conditions (i.e. saprolite). It is described by noting (i) the colour of the matrix and colour or colours of the principal mottles, and (ii) the pattern of mottling. The latter is given in terms of abundance [few (2%), common, (2 to 20%) of the exposed surface, or many(>20%)], size [fine(<5 mm), medium (5 to 15 mm in diameter) along the greatest dimension, or coarse(>15 mm), contrast (faint, distinct or prominent), form (circular, elongated-vesicular, or streaky) and the nature of the boundaries or the mottles (sharp, clear of diffuse); of these, abundance, size and contrast are the most important.

Pedology – the branch of soil science that treats soils as natural phenomena, including their morphological, physical, chemical, mineralogical and biological properties, their genesis, their classification and their geographical distribution.

Expansible clay – clay minerals such as the smectites that exhibit interlayer swelling when wetted, or clayey soils which, on account of the presence of swelling clay minerals, swell when wetted and shrink with cracking when dried. The latter are also known as heaving soils.

Texture, soil – the relative proportions of the various size separates in the soil as described by the classes of soil texture shown in the soil texture chart. The pure sand, sand, loamy sand, sandy loam and sandy clay loam classes are further subdivided according to the relative percentages of the coarse, medium and fine sand subseparates.

Vertic, diagnostic A horizon – A horizons that have both a high clay content and a predominance of smectitic clay minerals possess the capacity to swell and shrink markedly in response to moisture changes. Such expansive materials have a characteristic appearance: structure is strongly developed, ped faces are shiny, and consistence is highly plastic when moist and sticky when wet.

4. DESCRIPTION OF THE PROPOSED PROJECT

4.1 Surface Infrastructure

Infrastructure which will be erected at the project includes mono-poles, powerlines and an access road.

It is anticipated that the following specific ancillary activities will take place during the various stages of the mine life:

4.2 Construction Phase

- Vegetation clearing
- Ground digging
- Pole, powerline and cement transportation and storage
- power line erection

4.3 Operational Phase

The following activities will take place during the operational phase:

- maintenance

5. STUDY AREA

5.1 Location

Assmang Black Rock Manganese Mine is located on the farms Santoy 230 IS and Nchwaning 267, in the Kuruman Magisterial District, Northern Cape Province. The town of Hotazel is located approximately 15 km to the south-east of Black Rock. The Hotazel Provincial road R31 passes approximately 6 km to the south-west.

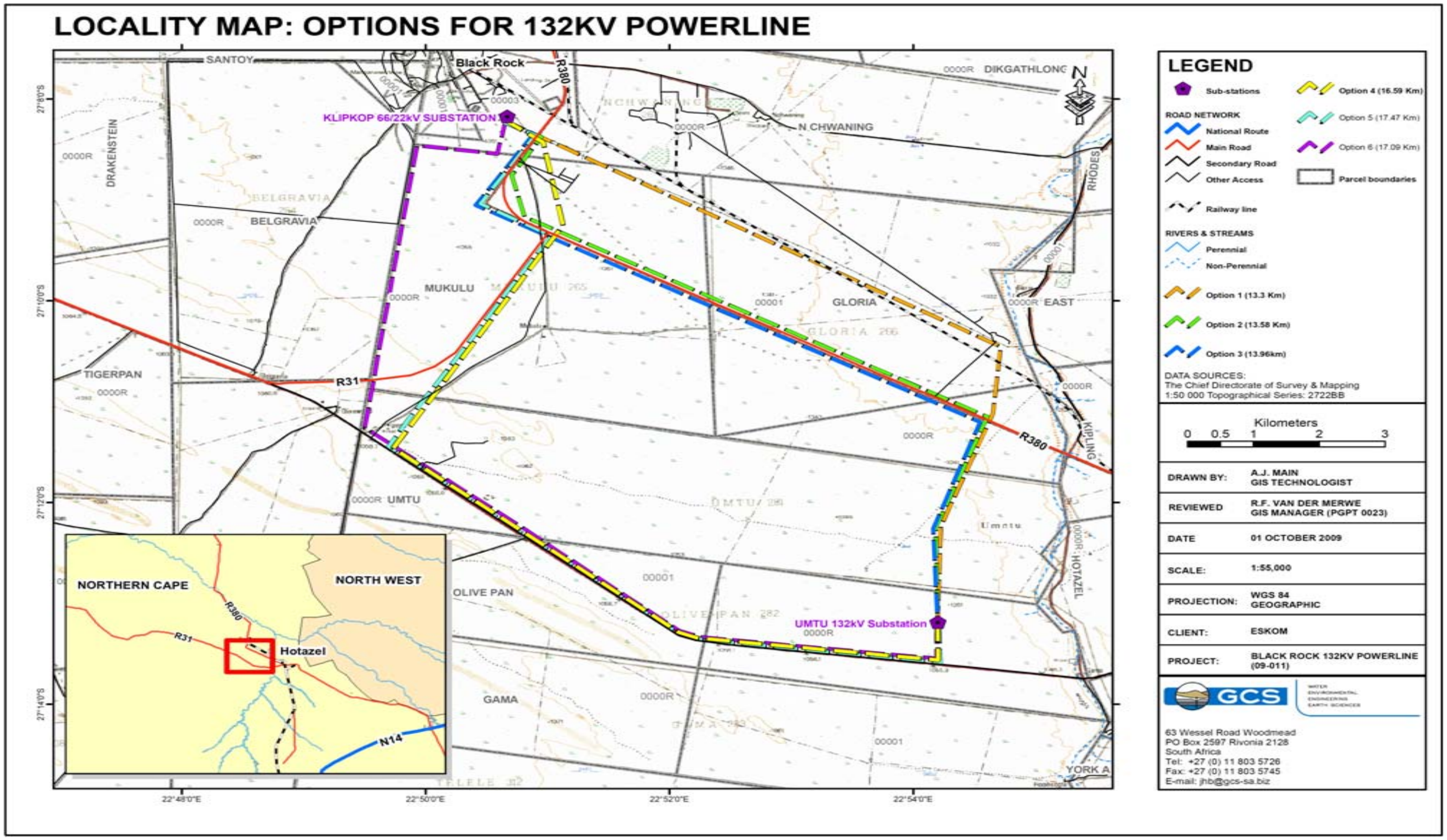


Figure 1. Location Map

5.2 Site Details

The study area is comprised of an existing Klipkop 22kv substation plant to the north and has a site which is to be developed for the second Umntu 132kv substation to the south. The proposed powerline will link these two substations. The site lies between 1 054 and 1 069 metres above sea level, with the highest point in the west. The terrain is comprised of predominantly flat ground with slopes of no more than 1-2%.

5.3 Geology

The geology of the study area consists of Aeolian sand of Recent age with occasional outcrops of Tertiary Kalahari beds (surface limestone, silcrete and sandstone) in the riverbeds, (Geological Survey, 1986).

6. METHODOLOGY

The AGIS website which is managed by the National Department of Agriculture, was used to view the 1:250,000 Land Type maps of the survey area. These maps are of a small scale and have been compiled using basic aerial photographic interpretation of the area, with limited field verification. They are a good first approximation and in combination with the geological maps (1:250,000) are useful as a base line from which to work. Google Earth images of the study area were also used to look at the current land use of the various sites.

6.1 Field Observations

The soils were investigated using a hand-held soil auger to a maximum depth of 1 200 mm (or shallower, if a restricting layer such as rock was encountered), on a grid of approximately 150 x 150 metres buffered at 100 metres, which was established using a hand-held gps. All the relevant soil properties (horizons, colour, structure, texture, calcareousness, drainage, etc) at each observation point were noted and the soils were classified according to the South African Soil Classification System (Soil Classification Working Group, 1991). Similar soils were grouped together into mapping units. Specifically the study area is divided into routes 4, 5 and 6.

Representative topsoil and subsoil samples were collected from each route option for laboratory analysis. In total, six samples were collected from three sites SP1, SP2 and SP3 and were analysed at the Institute for Soil Climate and Water laboratory for the following in accordance to the standard prescribed methods (Non-Affiliated Soil Analysis Work Committee, 1990):

- Particle Size Distribution (coarse, medium, fine and very fine sand; coarse and fine silt, as well as clay)
- $pH_{(KCl)}$
- Cation Exchange Capacity (CEC) and exchangeable cations
- Exchangeable Sodium Percentage (ESP)
- Organic Carbon % (Walkey Black)
- Phosphorus (Bray 1)
- Electrical Conductivity (EC)
- Sodium Adsorption Ration (SAR)
- Zinc

7. SOILS

7.1 Soil Maps

The various soil forms identified (Appendix A) were grouped together into soil map units based on the dominant soil form and family, effective depth and soil texture. As an example, Table 1 and 2 gives the information provided in the soils map Appendix A. The map units are shown on the soil map as in the following example:

dHu

where dHu represents the map unit; in this case deep Hutton soils.

Table 1.: Soils in Black Rock (Appendix A)

SOIL FORM SUMMARY - Black Rock					
Broad Soil Unit	Map Legend	Soil Form	Diagnostic Horizons	Route Option	Distance (km)
Red apedal	dHu	Hutton	Orthic A/red apedal B	4	16.25
Red apedal	dHu	Hutton	Orthic A/red apedal B	5	17.15
Red apedal	dHu	Hutton	Orthic A/red apedal B	6	16.79

Table 2. Summary of Soil Forms In Black Rock (Appendix A)

Black Rock SOIL LEGEND						
Soil Unit	Dominant Soil Form & Family	Average Depth (mm)	Texture Class	General Description of Soils Occurring	Land Capability	Agricultural Potential
dHu	Hutton 3100	>1200	Sand	Very deep; yellowish-red sandy topsoil on sandy subsoil.	Arable	Low

7.2 Land Capability:

The Land capability classes were determined using the Chamber of Mines Guidelines for the Rehabilitation of Mined Land (2007) as appears in Table 3. Table 4 summarises the information provided in the Land Capability and Use Maps, Appendices C and D.

Table 3. Criteria for pre-mining land capability

Criteria for wetland (Land Capability Class I)

Land with organic soils or supporting hydrophillic vegetation where soil and vegetation processes are water determined.

Criteria for arable land (Land Capability Class II)

- Land, which does not qualify as a wetland;
- The soil is readily permeable to a depth of 750 mm;
- The soil has a pH value of between 4.0 and 8.4;
- The soil has a low salinity and SAR;
- The soil has less than 10 % (by volume) rocks or pedocrete fragments larger than 100 mm in the upper 750 mm;
- Has a slope (in %) and erodibility factor (K) such that their product is < 2.0;
- Occurs under a climate regime of crop yields that are at least equal to the current national average for these crops;

Criteria for grazing land (Land Capability Class III)

- Land which does not qualify as wetland or arable land
- Has soil, or soil-like material, permeable to roots of native plants, that is more than 250 mm thick and contains less than 50 % by volume of rocks or pedocrete fragments larger than 100 mm
- Supports, or is capable of supporting , a stand of native or introduced grass species, or other forage plants utilisable by domesticated livestock or game animals on a commercial basis.

Criteria for wilderness land (Land Capability Class IV)

Land which does not qualify as wetland, arable land or grazing land, usually steep and/or rocky

Table 4. Land Capability Map for Black Rock (Appendix B)

Areas and Percentages of Land Capability Classes for Black Rock Site			
Land Capability Class	Soil Unit	Route Option	Distance (km)
Arable	dHu	4	16.25
Arable	dHu	5	17.15
Arable	dHu	6	16.79

7.3 Land Use

The Land use classes were determined using the Chamber of Mines Guidelines for the Rehabilitation of Mined Land (2007). Table 5 summarises the information provided in the Land Use Maps, Appendix C.

Table 5. Land Use Map for Black Rock (Appendix C)

Current Land Use Soil Unit	Route Option	Distance (km)
Grassland	4	16.25
Grassland	5	17.15
Grassland	6	16.79

7.4 Soil Utilization (Stripping) Guide:

The soil utilization guide (Table 6) was carried out by taking into account the average depth of the top and subsoil to a limiting layer, Appendix D.

Table 6. Soil Utilization Guide Map for Black Rock (Appendix D)

Soil Unit	Route Option	Stripping Depth (m)
dHu	4	>1.2
dHu	5	>1.2
dHu	6	>1.2

7.5 Suitability of Soils for Agriculture

6.5.1 Red apedal soils

The very deep Hutton soils are well-drained and generally occur in flattish footslope positions. Textures are predominantly sandy and are eutrophic i.e have a high base status. They have a red pigment due to the presence of the mineral haematite. Soils present a red pigment if the content of haematite oxides exceeds 15% and the presence of this oxide indicates oxidizing conditions. Although these soils have sufficient depth for roots to grow into, they are however not suitable for dryland cropping as they have poor water storage capacity as well as poor ability to retain water for use in dry spells due to the very sandy nature as well as the fact that the average rainfall for the area is low, 200 – 400 mm per annum.

7.6 Soil Analytical Data

The location of sample points of the topsoil and subsoil collected for analysis are marked SP1 to SP3 on the soil map. The analysis results are shown in Table 7.

Table 7. Soil Analysis Results

Sample Site	SP 1 Option 4_A	SP 1 Option 4_B	SP 2 Option 5_A	SP 2 Option 5_B	SP 3 Option 6_A	SP 3 Option 6_B	Optimum Range
GPS Coordinate	27°10'26.8"S 22°48'41.5" E		27°10'26.8"S 22°48'41.5" E		27°10'26.8"S 22°48'41.5" E		
Laboratory Reference	2956	2957	2958	2959	2960	2961	
7 Fraction PSA (%)							
Coarse Sand (2-0.5 mm):	5.1	8.8	2.7	2.0	8.3	11.5	
Medium Sand (0.5-0.25mm)	15.8	15.7	14.3	14.1	14.9	15.8	
Fine Sand (0.25-0.106mm)	55.0	54.4	64.2	64.7	55.5	51.7	
Vf sand (0.106-0.05mm)	15.5	13.2	13.1	13.2	14.6	13.9	**15 - 25 %**
Coarse Silt (0.05-0.02mm)	2.6	2.6	1.6	1.4	2.3	3.1	
Fine Silt (0.05-0.002mm)	1.0	0.1	0.7	0.8	0.2	0.1	
Clay (<0.002 mm)	3.1	4.7	2.5	3.2	3.5	3.3	
Texture Chart	fisa	fisa	fisa	fisa	fisa	fisa	
Exchangeable Cations cmol(+)kg^{-1} soil							
Ca	1.686	1.791	1.063	1.065	0.729	1.107	
Mg	0.470	0.707	0.640	0.842	0.267	0.476	
K	0.142	0.173	0.090	0.175	0.113	0.130	
Na	0.016	0.016	0.013	0.022	0.015	0.023	
S value	**4.72**	**2.11**	**3.21**	**2.14**	**3.21**	**3.21**	**2.14**
CEC cmol(+)kg^{-1} clay	2.037	3.443	2.262	3.239	4.397	1.921	**>5**
pH$_{KCl}$	5.83	5.76	5.06	5.52	4.53	5.04	**6.2-7.3**
ESP (%)	0.79	0.38	0.57	0.68	0.34	1.19	
Organic Carbon (%)	0.16	-	0.09	-	0.11	-	**0.56-1.16**
P (Bray 1) (mg/kg)	13.27	7.23	11.07	5.56	7.89	4.03	**30+**
EC (mS.m^{-1})	171	7	5	4	4	5	**< crop threshold**
SAR	0.159	0.305	0.228	0.327	0.228	0.294	**<1**
Zinc (ppm)	1.66	0.52	0.45	0.68	0.56	0.60	**>2**
Soil Form	Hutton		Hutton		Hutton		
Soil Family	Stella		Stella		Stella		
Code	Hu 3100		Hu 3100		Hu 3100		
Degree of leaching	Eutrophic		Eutrophic		Eutrophic		
Present Land Use	Grassland		Grassland		Grassland		
Broad Soil Group	deep Hu		deep Hu		deep Hu		

7.6.1 Soil Analysis Interpretation

7.6.1.1 Soil Texture

Soil texture is defined as the relative proportions of the various soil separates in a soil which are comprised of sand, silt and clay (Brady and Weil, 1999). Soil texture influences soil properties such as porosity, water-holding capacity, permeability and erodibility. The samples showed texture contents dominated by fine sand for the A and B horizons.

7.6.1.2 Soil pH

Soil pH refers to the relationship between H^+ and OH^- ions. These ions relate to each other in a definite ratio and it is therefore common to ignore one of them. By convention, the H^+ ions are usually considered even in the case of a strong base. Soil pH ranges are commonly described as in Table 9:

Table 9. Soil pH Ranges

Soil pH(KCl)									
Extremely Acid	Very strongly acid	Strongly acid	Medium acid	Slightly acid	Neutral	Mildly alkaline	Moderately alkaline	Strongly alkaline	Very strongly alkaline
< 4,5	4,5-5,0	5,1-5,5	5,6-6,0	6,1-6,5	6,6-7,3	7,4-7,8	7,9-8,4	8,5-9,0	>9,0

From the analysis results provided, the $pH_{(KCl)}$ range of the samples is very strongly acid to medium acid.

7.6.1.3 Electrical Conductivity

Electrical Conductivity (EC_e) is a measure of the ability of the soil saturation extract to conduct electricity. The Chamber of Mines specifies that for a soil to be defined as arable, it must have an EC of less than 400 mS/m at 25°C and an Exchangeable Sodium Percentage (ESP) of less than 15 % throughout the upper 0.75 m of soil. The samples showed EC figures way below the 400mS/m mark although the EC figure for sample 4A is relatively high. The ESP % figures for all the samples is low. It should be noted that the 400 mS/m EC_e value provided is arbitrary and that EC values should rather be based on the yield levels where various plant crop species first reduce below the full yield potential (threshold levels) (Table 10).

TABLE 10. Salt tolerance of common agricultural crops (USDA, 2009), expressed as electrical conductivity of the soil saturation extract at the threshold when crop yield first reduces below the full yield potential ($EC_{e,\ threshold}$).

Crop	ECe threshold ($mS.m^{-1}$)
a. Small Vegetables	
Cabbage	100 - 180
Carrots	100
Spinach	200 - 320
b. Roots and Tubers	
Potato	170
Sweet Potato	150 - 250
Turnip	90
c. Legumes	
Beans	100
Peas	150
Soyabeans	500
d. Forages	
Alfalfa	200
Clover	150

7.6.1.4 Organic Carbon

Organic matter (determined by the amount of organic carbon) is broadly defined as the total complement of organic substances present in soil, including living organisms of various sizes, organic residues in various stages of decomposition and dark coloured humus consisting of non-humic and humic substances (Fertilizer Handbook, 2007). Humus is relatively stable and has a major effect on various soil characteristics and processes that play a role in soil fertility.

The organic matter content of the soils is extremely low. The organic matter content of a soil is important in determining the soil erodibility factor “K” and the N mineralisation potential.

7.6.1.5 Exchangeable Cations

The term exchangeable basic cations refers to calcium, magnesium, potassium and sodium. The amounts of exchangeable cations normally follow the trend Ca>Mg>K>Na. **The results show high levels for exchangeable cations in the profile.** This is to be expected, given the average annual rainfall the area receives.

7.6.1.6 Soil Fertility

The samples returned values indicating that the soils have lower than acceptable levels of zinc reserves as well as very low phosphorus levels.

7.6.1.7 Water Table

No soil water table was encountered in the study area at the time when the survey was conducted, (October, 2009).

7.7 Erosion Hazard and Slope

The critical slope for soil erosion to occur has got to be determined for land to be regarded as arable. The specification for land to be regarded as arable is that the product of percent slope and soil erodibility factor K, must not exceed 2.0(Chamber of Mines, 2001). This minimum erosion slope was calculated for all three points sampled as these are classified as having arable capability, using the nomograph of Wischmeier, Johnson and Cross (1971) and results for these are shown in Table 1.

The “K” value can also be used to determine the erodibility of a particular soil form. Erodibility is defined as the vulnerability or susceptibility of a soil to erosion. It is a function of both the physical characteristics of that soil and the treatment of the soil. Erodibility ratings are:

Resistant	“K” factor = <0.15
Moderate	“K” factor = 0.15-0.35
Erodible	“K” factor = 0.35-0.45
Highly erodible	“K” factor = >0.45

The following five soil parameters, have been shown by research to have a major effect in determining erodibility:

i) The mass percentage of the fraction between limiting diameters of 0.1 mm and 0.002 mm (very fine sand plus silt)

ii) The mass percentage of the fraction between 0.1 mm and 2.0 mm diameter (residue of sand fraction)

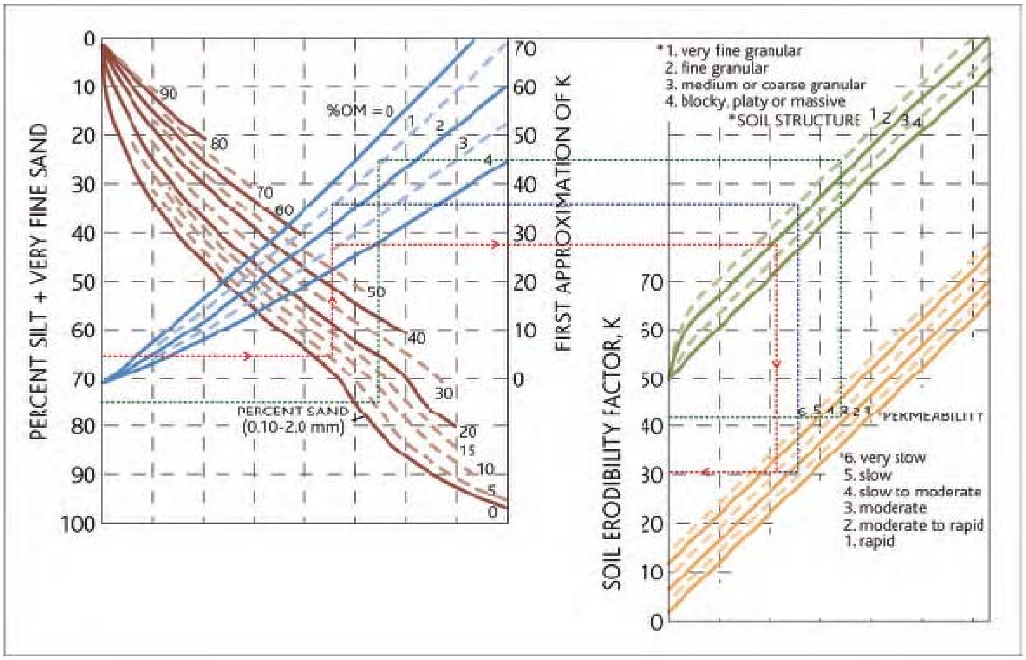
iii) Organic matter content obtained by multiplying the organic carbon content (g per 100g soil, Walkley-Black method) by a factor of 1.72

iv) A numerical index of soil structure (Figure 2)

v) A numerical index of soil permeability (Figure 2).

Different permeability values may often be found for various horizons of a soil, but the surface horizon is to be used. It should be noted however, that the index of soil permeability (which is the most subjective of the five parameters) refers to the soil profile as a whole. For permeability, the controlling layer is often below the surface and the Chamber of Mines (2007), has given the following guide for codes 4, 5 and 6:

- Soils with a fragipan or cemented subsoil horizon are coded 6
- Permeable surface soils underlain by massive clay or silty clay are coded 5
- Moderately permeable top soils overlying a silty clay or silty clay loam with weak blocky structure are coded 4, or 3 if subsoil structure is moderate or strong and texture is coarser than silty clay loam.



The soil erodibility nomograph of Wischmeier, Johnson and Cross (1971)

Figure 2. Soil Erodibility Nomograph of Wischmeier, Johnson and Cross (1971)

Table 1. Soil Parameters Used to determine Erosion Hazard

SOIL PARAMETERS USED						RESULTS OBTAINED		
SOIL SAMPLE	MASS PERCENTAGE OF		ORGANIC MATTER %	SOIL STRUCTURE (type and size)	SOIL PERMEABILITY BASED ON CONTROLLING SOIL HORIZON (whole profile)	SOIL ERODIBILITY FACTOR K (from nomograph)	MAXIMUM CRITICAL SLOPE FOR ARABLE LAND	
	vf sand + silt (0.1-0.002)mm	sand residue (0.1-2.0)mm					%	Degrees
Option 4	19.1	75.9	1	fine granular	rapid	0.10	20	11.3
Option 5	15.4	81.2	1	fine granular	rapid	0.07	28.5	15.9
Option 6	17.1	78.7	1	fine granular	rapid	0.06	33.3	18.4

Option 4 Index of Erosion (IOE)
= K x Slope (%)
= 0.10 x 2%
= **0.2, less than 2.0**
=> resistance to erosion

Option 5 Index of Erosion (IOE)
= K x Slope (%)
= 0.07 x 2%
= **0.14, less than 2.0**
=> moderate susceptibility to erosion

Option 6 Index of Erosion (IOE)
= K x Slope (%)
= 0.06 x 2%
= **0.12, less than 2.0**
=> moderate susceptibility to erosion

9 Risk Rating

9.1 Explanation of various factors

The various impacts will be rated using the following aspects:

Activity refers to the cause that is likely to have an impact.

Impact refers to the effect of the cause

Probability refers to the likelihood for an impact occurring and is rated 0-3 as follows:

- 0, less than 40 % chance for occurrence
- 1, 40 to 70 % chance for occurrence
- 2, 70 to 90 % chance for occurrence;
- 3 > 90 % chance for occurrence

Extent refers to the degree to which an event is localised or not and is rated 1-6 as follows:

- 1, immediate site
- 2, up to 5 km from site
- 3, 20 km radius from site
- 4, provincial
- 5, South Africa
- 6, neighbouring states

Duration refers to the time period an impact is felt, and is rated 1-4 as follows:

- 1, less than 1 year
- 2, 1 to 5 years
- 3, 5 to 10 years
- 4, 10 to 15 years

Intensity refers to the severity of the impact and is rated 0-4 as follows:

- 0 no effect on the environment;
- 1 marginal effect on the environmet
- 2 moderate effect on the environmet
- 3 high effect on the environmet
- 4 very high effect on the environmet

The **significance** is the summation of all the above ratings such that:

S = E+D+M+P; where:

S = Significance weighting

E = Extent

D = Duration

M = Magnitude

P = Probability

The ratings then refer:

- 2 - 4, low,
- 5 – 7, low to moderate
- 8 – 10, moderate
- 11 – 13, moderate to high
- 14 – 16, high
- 17 – 19, very high.

9.2 Potential Risks

9.2.1 Construction Phase

The powerline routes will have an access track along the powerline. The impact on the soils stripped during the construction phase will be high since the existing soils and land capability will be largely destroyed. The magnitude of the impact will be immediate and will reduce to low once rehabilitation is implemented. Due to the sensitivity of theses soils to erosion, it is important that they be managed carefully to avoid erosion.

9.2.2 Operational Phase

The magnitude of the impact will be low since the existing soils and land capability will have already been largely destroyed.

Table 2. Risk Rating Table (Construction Phase) - Powerline

Activity contributing to impact	Impact	Probability	Extent	Duration	Intensity	Significance
Vegetation removal	Loss of soil	3	1	6	3	13
	With management measures	1	1	1	1	4
Topsoil stripping	Loss of soil	3	1	6	3	13
	With management measures	1	1	1	1	4
Wind blowing	Soil loss	3	1	6	3	13
	With management measures	1	1	1	1	4

Table 11. Risk Rating Table (Operational Phase) -Powerline

Activity contributing to impact	Impact	Probability	Extent	Duration	Intensity	Significance
Wind blowing	Soil loss	3	4	2	2	11
	With Management Measures	1	1	1	1	4

10. ENVIRONMENTAL MANAGEMENT PROGRAMME

10.1 Construction Phase

10.1.1 Powerline

Environmental Parameter	Impact Description	Management Measures	Action Plan	Frequency	Responsible Person
Vegetation Removal	Loss of soil due to exposed surface	Rehabilitate immediately after pole installation	Work soils in the dry state and ensure rehabilitation soon after completion	Daily	Environmental Manager
Soil stripping	Loss of soil	Stockpile stripped soils in dermacated area Rehabilitate immediately after pole installation	Visually inspect worked areas to ensure that rehabilitation is carried out	Daily	Environmental Manager
Wind blowing	Loss of soil on bare surfaces	Spray stockpiles with mist and irrigate rehabilitated areas to minimise loss to wind	Visually inspect worked areas to ensure that rehabilitation is carried out	Daily	Environmental Manager

10.2 Operational Phase

10.2.1 Powerline

Environmental Parameter	Impact Description	Management Measures	Action Plan	Frequency	Responsible Person
Wind blowing	Loss of soil due to exposed surface	Ensure sufficient grass cover in worked areas as well as access tracks	Re-plant work area to grass Visually inspect access route to ensure good grass stand or rehabilitate if necessary	Quarterly	Environmental Manager Environmental Manager

11. POWERLINE ROUTE SELECTION

A most suitable route for the powerline had to be selected from the six routes presented as options 1-6. Options 1, 2 and 3 were deemed non feasible as they go through or close to the vicinity of an opencast mine. The selection process thus relates to options 4, 5 and 6.

Option 4.

The route begins at the Umtu Substation and runs north-westerly along the R31 for approximately 9.5 km before turning in a north-easterly direction and heading to the Klipkop substation (Figure 1). The route has a 31m diameter servitude across the powerline. The powerline does not cut across any wetland landscape. The area along which this route runs is generally flat with slopes of no more the 2-3 %. This route is characterised by deep sandy soils that are particularly susceptible to wind erosion.

Option 5.

Like option 4, this route too begins at the Umtu Substation and runs north-westerly along the R31 for approximately 9.5 km before turning in a north-easterly direction and heading to the Klipkop substation, but deviates from option 4 route approximately 2 km off the Klipkop substation, (Figure 1). The route has a 31m diameter servitude across the powerline. The powerline does not cut across any wetland landscape. The area along which this route runs is generally flat with slopes of no more the 2-3 %. This route is characterised by deep sandy soils that are particularly susceptible to wind erosion.

Option 6.

Like options 4 and 5, this route too begins at the Umtu Substation and runs north-westerly along the R31 for approximately 10 km before turning in a north-easterly direction in the vicinity of a game park and heading to the Klipkop substation, (Figure 1). The route has a 31m diameter servitude across the powerline. The powerline does not cut across any wetland landscape. The area along which this route runs is generally flat with slopes of no more the 2-3 %. This route is characterised by deep sandy soils that are particularly susceptible to wind erosion.

All three routes present the same soil conditions and are generally found along the same landscape position. From a soils perspective, no one route is superior over the other.

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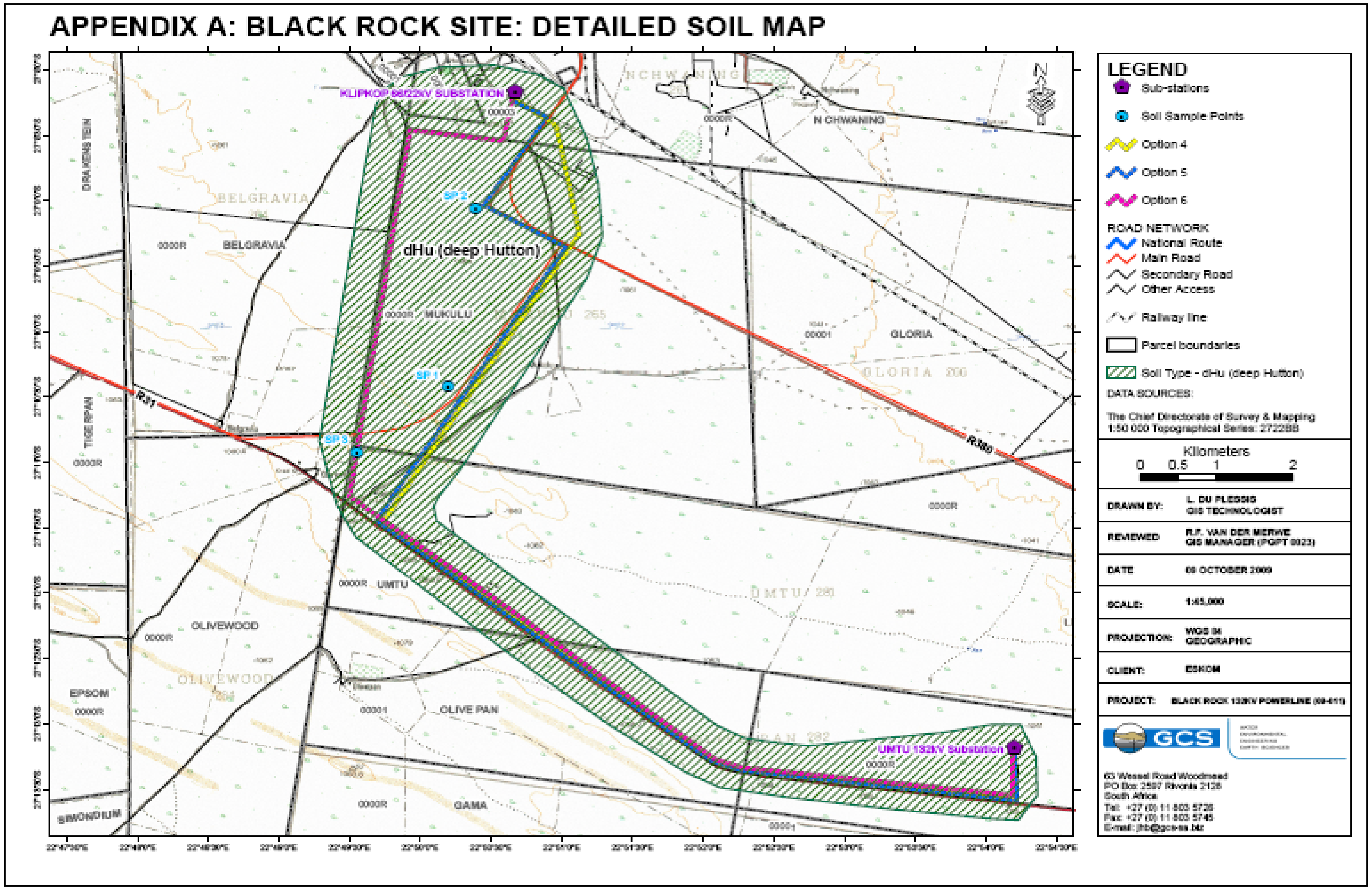
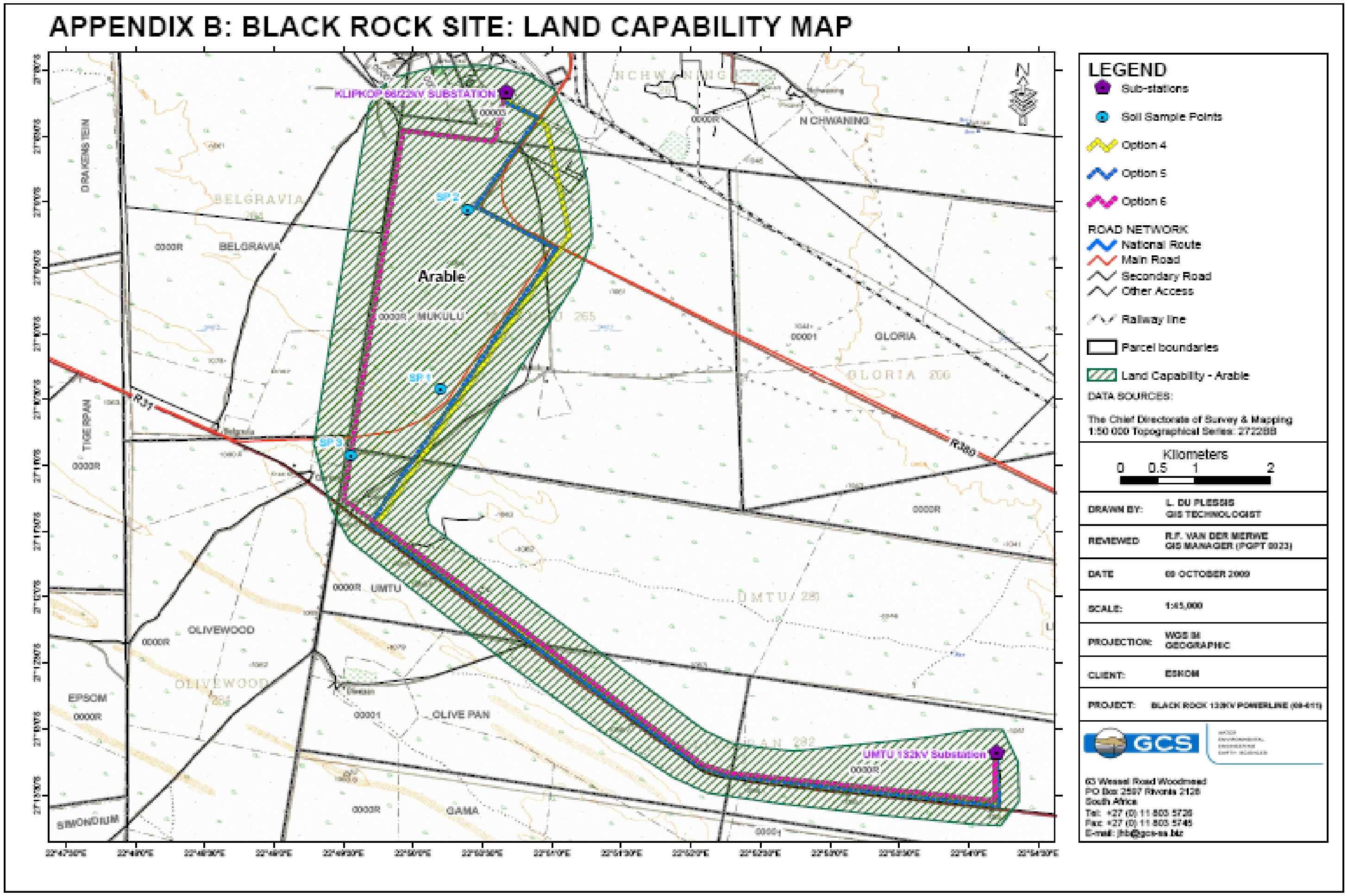
APPENDICES

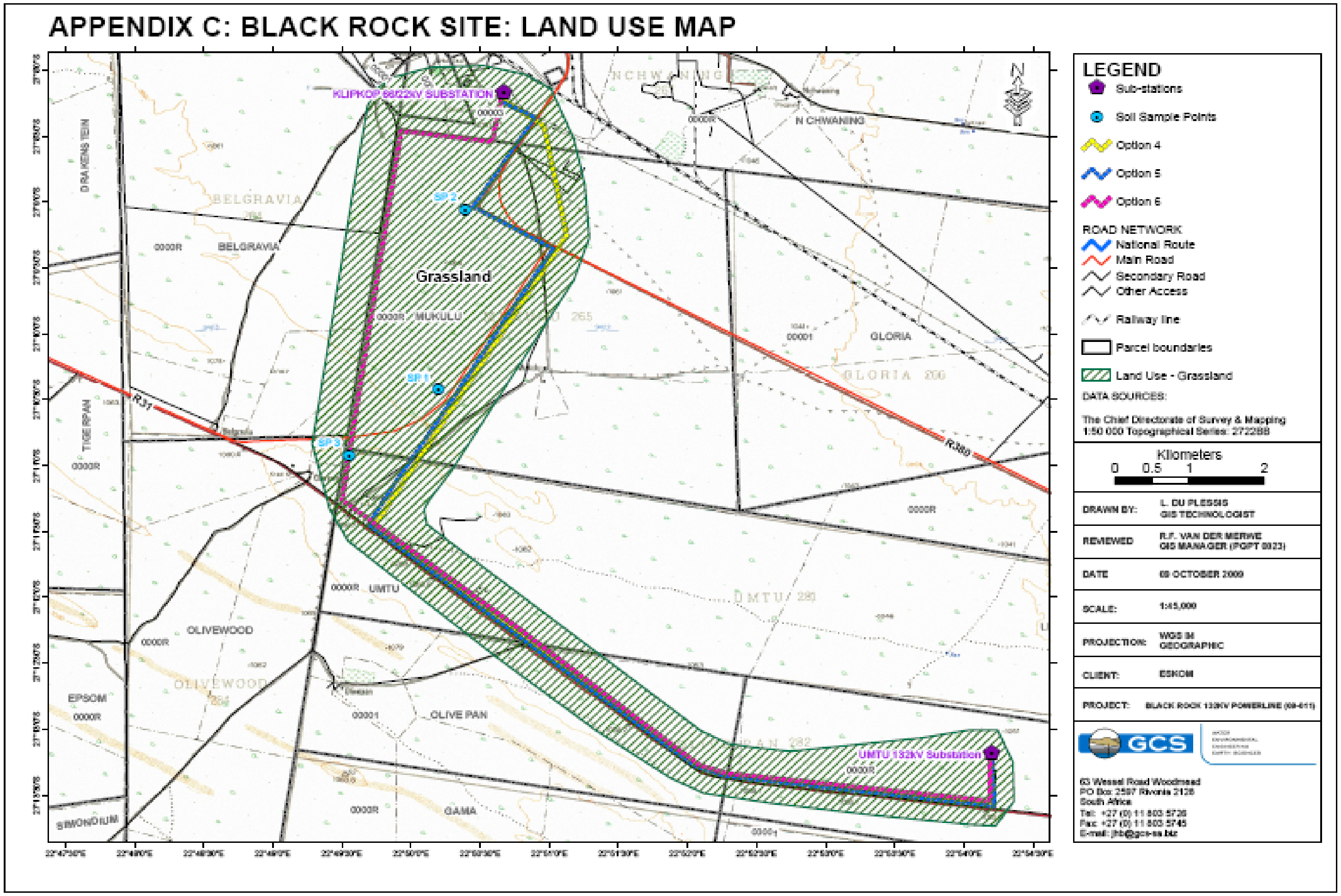
Soil Map for Black Rock



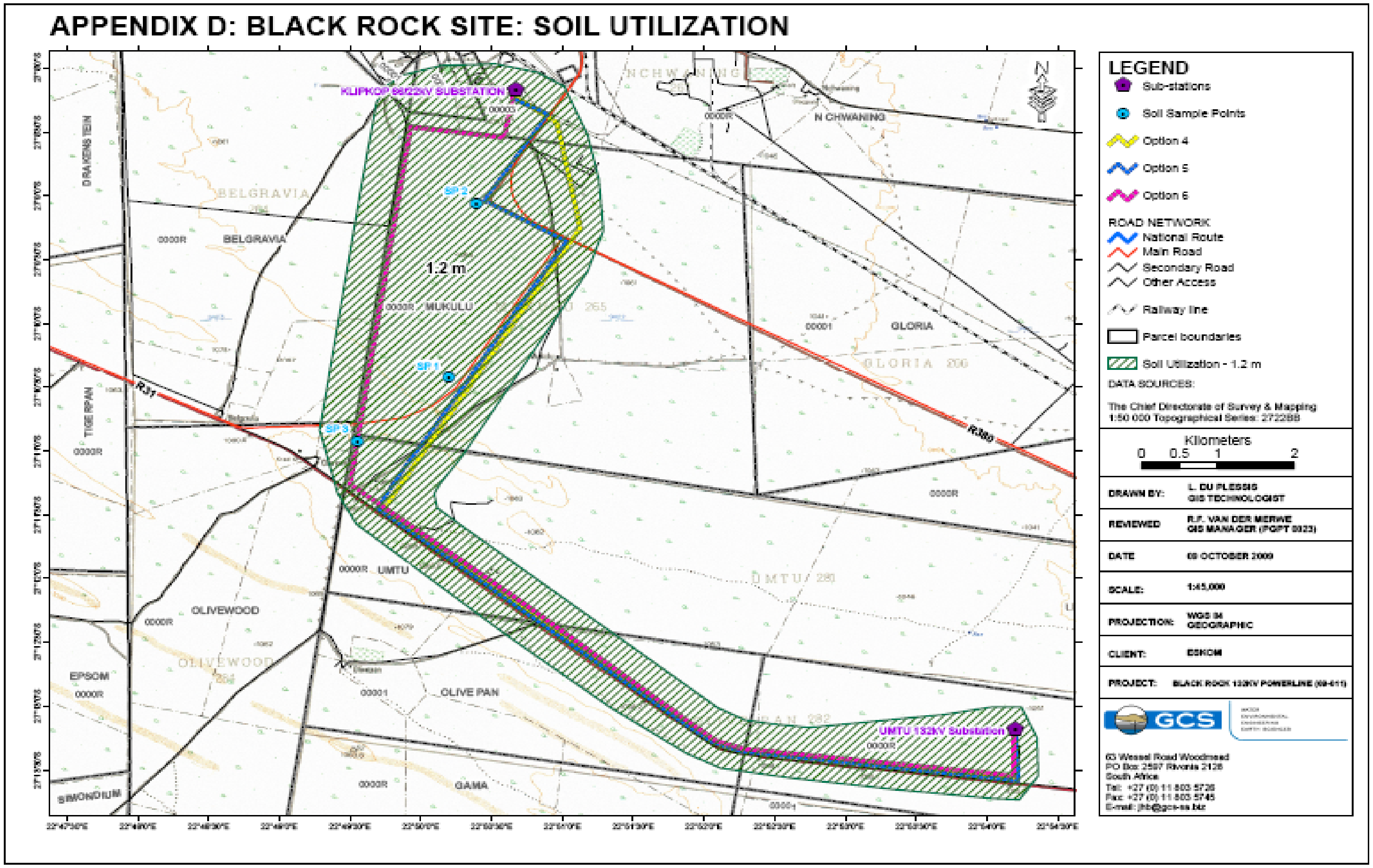
Land Capability Map for Black Rock



Land Use Map for Black Rock



Soil Utilization Guide for Black Rock



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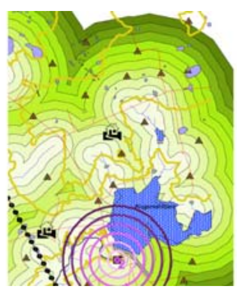
Eskom LTD
Black Rock Proposed 132kV Powerline

Vitae Appendix D: Specialists Reports

Appendix Dv:
Hydrological (Surface water) Impact Assessment

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Black Rock Power Lines Hydrological Assessment

Report

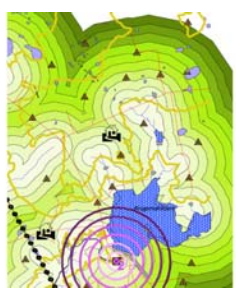
version - 1

October 2009

Client Name: Assmang (Pty) Ltd
Black Rock Manganese Mine

Project Number: 09-011




GCS (Pty) ltd.
Johannesburg Durban Kimberley
Directors: AC Johnstone (Managing) SE Scawthon (Financial) AH Barbour (Non-exec)* V Cresswell (Non-exec)*
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Hydrological Assessment

Report
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1. INTRODUCTION

GCS (Pty) Ltd was appointed to undertake the hydrological investigation for the impacts of constructing power lines for Black Rock Manganese Mines. The purpose of this study is to assess the impacts of these power lines on the natural surface water and determine any detrimental affects that they may have on the hydrological system for this area. The power lines are to run between two power sub-stations and the total distance of the lines is approximately 16km. There are a few different routes for the power lines, to be considered.

1.1 Definitions

In this report any expression to which a meaning has been assigned, shall have the meaning so assigned, unless the context indicates otherwise-

"clean water system", includes any dam, other form of impoundment, canal, works, pipeline and any other structure or facility constructed for the retention or conveyance of un-contaminated water;

"**water system**", includes any dam, any other form of impoundment, canal, works, pipeline and any other structure or facility constructed for the retention or conveyance of water;

1.2 Legal Aspects

The principal Act, which is administrated by The Department of Water Affairs and Forestry (DWAF), is the National Water Act, 1998 (Act 36 of 1998). Attention is drawn to the strict provisions in the Water Act to control pollution of water. Pollution in terms of water refers to the alteration of the physical, chemical or biological properties of water so as to render it less fit for other uses.

1.4 Site Location

The Black Rock site is found in the Northern Cape, roughly 80km from Kuruman. The power lines will cross the following farms; Mukulu 265, Umtu 281, N Chwaning 267 and Olive Pan 282. It falls under the magisterial district of Kuruman in the Northern Cape Province.

The proposed power lines run an approximate distance of 16km and don't cross any streams, dams pans or wetlands.

1.5 Responsible Water Authority

The Department of Water Affairs and Forestry (Northern Cape) Kimberly Office performs water quality management in this region.

1.6 Project Objectives

The objectives of this study is to assess the area where the power lines will be constructed and determine what effect this would have on the surrounding surface water of the catchment. The purpose of this is to then calculate the risk of this construction to determine, from an environmental point of view, if the gains of this construction outweigh the risk to the environment.

1.8 Catchment Analysis

1.8.1 Regional Climate

the project area is situated high in the Northern Cape in an area that marks the start of the Kalahari Desert. With this in mind it can be considered a very water scarce region with an average annual rainfall of 289mm. It is characterised by a summer rainfall climate. The average midday temperatures range from 17.5°C in June to 32.6°C in January. The temperature often can drop below 0°C during the cool nights of winter.

1.8.2 Mean Annual Precipitation (MAP)/Mean Annual Evaporation (MAE)

The Mukulu Rainfall Station 0392640 was not used for its information on MAP and MAE instead the Department of Water Affairs and Forestry was consulted in order to obtain a more concessive record. The closest reliable rainfall station to the project area is the Olifantshoek Station at Olifants Dam. It has rainfall records from December 1959 to September 2000 and S-Pan evaporation data over the same time period. From this record the average monthly values and the average annual values were calculated. The MAP is 320.4mm while the MAE is 2165.6mm.

Table 1: MAP/MAE (mm)

Month	Average	Average

	Rainfall	Evaporation
January	59.6	276.1
February	52.1	221.6
March	63.3	191.9
April	33.4	139.8
May	14.1	105.3
June	5.3	79.9
July	3.2	90.7
August	5.5	132.6
September	5.8	180.6
October	19	234.9
November	27.4	266.6
December	32.7	293.2
Total Average	**320.4**	**2165.6**

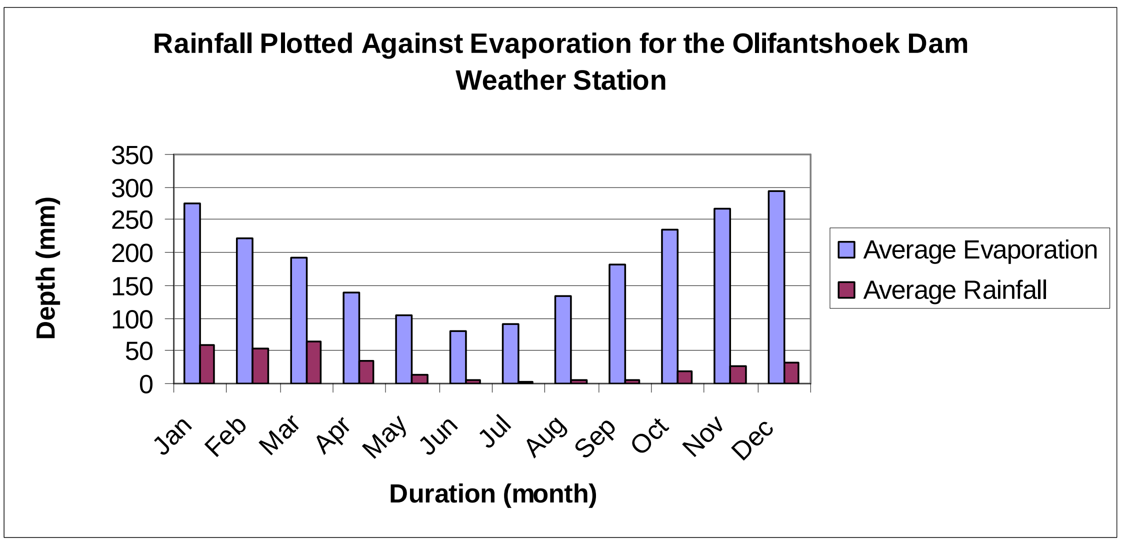


Figure 1: MAP/MAE

1.8.3 Design Rainfall

The Design Rainfall is used for a particular return period for design calculation purposes. Rainfall is the primary input needed in order to generate flow sequences. The design rainfall used was taken from the SAWB (South African Weather Bureau) station 0392640 – Mukulu Rainfall Station.

Table 2: Design Rainfall Depths

Station Name	Mukulu					
NUMBER	0392640					
Return Period (years)	**2**	**5**	**10**	**20**	**50**	**100**
Design Rainfall (mm)	44	62	75	89	106	121

1.8.4 Quaternary Catchments and Sub Basins

A catchment or water shed is derived from the topographical landscape. It is sectioned by a water divide, a high land separating two or more water systems. A catchment is the land and water surface area that contributes to the discharge at the system outlet. A catchment can be determined by the outlet and as the outlet (point of discharge) moves down stream so the catchment size increases, until it is at its largest where it enters the sea.

The project area falls within the Quaternary Catchment D41K (Ga-Mogara River Catchment) and D41M (Kuruman River Catchment), from the DWAF data base. Therefore the power lines run across the divide of the Quaternary Catchments. The power lines start in the quaternary catchment D41M and run straight across the divide into quaternary catchment D41K, this is however not a steep divide as the terrain in this area is very flat.

1.8.5 Existing River Systems and Surface Water

The start of the power lines, where they will run from the current sub-station is approximately 9.8km from where the Kuruman and Ga-Mogara Rivers split. The Ga-Mogara River then flows South and passes the other sub-station, where the power lines finish, 1.8km to the East. The Kuruman however flows from the divergence of the two rivers towards the East, away from the project area.

1.8.6 Soil Permeability and Classification

The major soil forms encountered are of the orthic phase Hutton. These are a very sandy soil group. The soils have a very low water retention as they are very sandy, this means they are highly permeable and they are also very deep. It will however be unlikely that overland flow would occur, except for extreme flooding conditions. The problem with this soil is it has a very low agricultural potential and therefore it is difficult to cultivate. For this reason the vegetation stability is very low and therefore is vegetation is removed it must be replaced as wind erosion will occur if the soil is left bare.

1.9 Overview of Hydrological Principles

1.9.1 Storm Water Management Principles

The management of Stormwater is important as it limits erosion, therefore ensuring a sustainable solution. Therefore during construction if any stormwater falls it must be diverted around possible contaminated areas, such as cement powder that will be used to fill the holes and secure the poles for the power lines. See pollution prevention principles below.

1.9.2 Pollution Prevention Principles

Pollution prevention and minimisation have to be addressed first. Where complete pollution prevention is not possible, management measures have to be implemented to minimise water quality deterioration and impacts as far as possible. The main objective with water and waste management is thus the protection of the environment, specifically water resources and public health.

The most effective management tool against the pollution of water resources remains good housekeeping and ongoing maintenance. To this end, inspections and maintenance must be carried out on a regular basis. This would be ensuring that during construction of the power lines there is no spillage of cement powder, or any fuels that may be used. If any of these spillages occur they must be cleaned immediately, not allowing them to seep into the soil.

1.10 Hydrological Analysis

For this project there will be very little if any affect on the streamflow as the power lines will take up very little surface area on the ground and water will be able to flow around the poles without any hindrance. This is considering that the construction is managed correctly. Below are some pictures that show the type of power line to be constructed for this project, these will be used to in describing risk and management measures.

2. RISK ASSESSMENT AND MANAGEMENT MEASURES

2.1 Construction Phase

Figure 2: Installing Power Line

This picture illustrates the affect that the construction will have on the natural environment. It shows the vegetation to be disturbed in the immediate area as well as the service road on the right hand side. These exposed areas of bare soil will be of concern for overland flow. The area in the picture has a richer soil than the Block Rock Project Area and also a higher density of vegetation. To expose this soil in the Black Rock area it will get blown and washed away. Also it will be very difficult for vegetation to grow back and therefore could affect overland flow and hence streamflow.

2.1.1 Risk Associated with Construction Phase

Taking the above picture into account the risks that stand during construction are to disturb the vegetation and soil in the area. As discussed above in section 1.8.6 the soil is highly permeable, having very low water retention characteristics. Therefore it is difficult for plant life to reestablish. If the vegetation does not grow and the area is not rehabilitated by the client then the exposed soil will easily be blown away, it will also be carried away during intense storms where overland flow can carry soil into the river system. This will be detrimental for rivers as there will be an increase in sediment transportation which will deteriorate the quality of the water. Another problem with not rehabilitating the land correctly is that when this soil is removed it will form holes and dongas; these will act as traps during rainfall events stopping the water from flowing over the surface and therefore altering streamflow.

Figure 3: Illustrates the affect the construction had on the surrounding area

2.2 Operation Phase

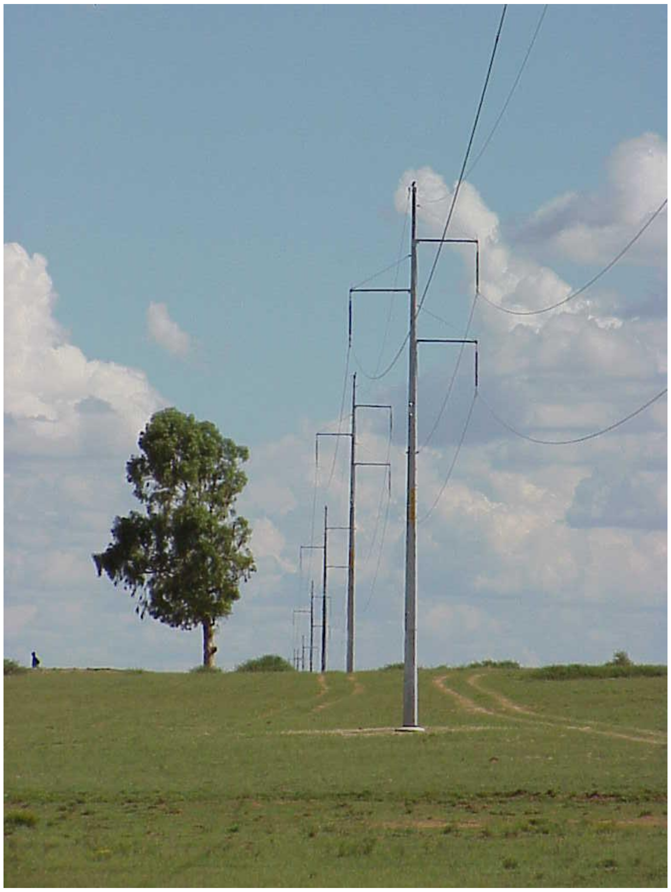


Figure 4: Power Lines during Operation

The picture above gives an indication on the disturbance that the power lines will have on the ground surface. From this picture it can be seen that the pole takes a very small surface area over the land surface. Rainfall will not be affected by the cables as the size is insignificant.

2.2.1 Risk Associated with Operation Phase

During operation phase their will be very little risk associated with the power lines, directly. However one risk is the service road, as seen in Figure 4 above. This road will form during construction as heavy traffic will be passing along the path of the power lines to transport material. These tracks will then be stripped of vegetation which will battle to reestablish itself. This would definitely be the case in the think red sand that is found in the Black Rock area.

2.3 Closure Phase

Figure 5: Picture taken near to the Power Line Path

The picture above is a simple illustration of the result of this vegetation being disturbed. This has become a sand pit after being used occasionally for a parking area. The vegetation dies back when disturbed and does not return to its original state.

2.3.1 Risk Associated with Closure Phase

The risk on surface water of not rehabilitating the land properly is that the soil becomes exposed. This exposed soil is then extremely vulnerable to wind and water. When a storm hits or heavy wind the soil is then moved into a river course. Here the soil is washed into the river and silts up within the stream. This is risk to the water quality of that stream and could cause buildup of sediment therefore changing the river bed and altering flow.

2.4 Risk Assessment Factors

The **nature** is a description of what causes the effect, what will be affected and how it will be affected.

The **extent** is a description wherein it is indicated whether the impact will be local (limited to the immediate area or site of development), regional, national or international. A score of between 1 and 5 is assigned as appropriate (with a score of 1 being low and a score of 5 being high).

The **duration** is a description wherein it is indicated whether:

- the lifetime of the impact will be of a very short duration (0–1 years) – assigned a score of 1
- the lifetime of the impact will be of a short duration (2-5 years) - assigned a score of 2
- medium-term (5–15 years) – assigned a score of 3
- long term (> 15 years) - assigned a score of 4
- Permanent - assigned a score of 5.

The **intensity** is quantified on a scale from 0-4, where a score is assigned:

- 0 is small and will have no effect on the environment;
- 1 is low and will cause a slight impact on processes;
- 2 is moderate and will result in natural, cultural and social functions continuing but in a modified way;
- 3 is high (natural, cultural and social functions are altered to the extent that they temporarily cease); and
- 4 is very high natural, cultural and social functions permanently cease.

The **probability** of occurrence describes the likelihood of the impact actually occurring. Probability is estimated on a scale of 1-5, and a score assigned:

- where 1 is very improbable (probably will not happen);
- Assigned a score of 2 is improbable (some possibility, but low likelihood);
- Assigned a score of 3 is probable (distinct possibility);
- Assigned a score of 4 is highly probable (most likely); and
- Assigned a score of 5 is definite (impact will occur regardless of any prevention measures).

The **significance** is determined through a synthesis of the characteristics described above (refer formula below) and can be assessed as low, low-moderate, moderate, moderate-high or high. The significance is determined by combining the criteria in the following formula:

$S = E+D+M+P$; where:

S = Significance weighting

E = Extent

D = Duration

M = Magnitude

P = Probability

The significance weightings for each potential impact are as follows:

- 2 - 4 points: Low (i.e. where this impact would not have a direct influence on the decision to develop in the area),
- 5 – 7 points: Low – Medoerate (i.e. where impacts may have slight influence on decision making, unless affectively mitigated),
- 8 - 10 points: Moderate (i.e. where the impact could influence the decision to develop in the area unless it is effectively mitigated),
- 11 – 13 points Moderate – High (i.e. where the impact should have an influence on the decision process to develop, however implementation of mitigation measures will soften the decision.
- 14 – 16 points: High (i.e. where the impact must have an influence on the decision process to develop in the area),
- 17 – 19 points Very High (i.e. where the impact is detrimental and the decision should be made not to continue with development.

2.5 Risk Assessment and Mitigation Tables

Table 3: Risk Rating Construction Phase

Aspect	Activity description and potential impacts on the environment	Probability	Extent	Duration	Intensity	Significance	Management Measurements	Action Plan
Sediment/Transport Erosion	Construction will lead to the removal of vegetation, leaving bare soil surfaces. When it rains it will lead towards sediment being picked up and carried off, leaving eroded surfaces	3	1	1	2	7 - Low - Moderate	Holes must be filled after digging and vegetation must be replaced immediately after construction	After a pole is implemented and the cables are installed all bare surfaces will be reestablished
	With management measures	1	1	1	1	4 - Low		
Stream Flow Reduction	Where eroded soil has made holes water will temporarily dam, preventing overland flow to a small extent	2	1	1	2	6 - Low to Moderate	All holes and depressions caused by the construction must be filled and left like before	areas stripped of vegetation and soil must be replaced
	With management measures	1	1	1	1	4 - Low		
Removal of Vegetation	During construction vegetation will be removed in order to dig holes	3	1	1	2	7 - Low Moderate	Vegetation will be removed during the construction process, it is essential that it be replaced after construction has finished	All bare surfaces must be planted with indigenous vegetation, if possible the vegetation removed should be used
	With management measures	3	1	1	1	6 - Low to Moderate		
Deterioration of Water Quality	In the constuction phase some fuels may be spilt as well as sedement lost which will both affect the water quality	2	2	1	2	7 - Low Moderate	All fuels and waste used should be placed and stored in a controlled manner	Any foreign Materials will be included in this and managed correctly o keep environment clean
	With management measures	1	1	1	1	4 - Low		

Table 4: Risk Rating Closure Phase

Aspect	Activity description and potential impacts on the environment	Probability	Extent	Duration	Intensity	Significance	Management Measurements	Action Plan
Sediment/Transport Erosion	During operation serviceand maintenance vehicles will be used, this will cause a track to form. This track will become bare soil, during the rain this soil will be washed into the rivers	2	2	3	2	9 - Moderate	Different routes could be taken to try and alleviate the pressure on one particullar track	this will be managed by drawing up different routes for different technitians
	With management measures	1	1	3	1	6 - Low to Moderate		
Stream Flow Reduction	Where erosion has taken place and dongas are formed overland flow will get trapped, therefore reducing the streamflow	2	2	1	2	7 - Low Moderate	All vegetation will be replaced to ensure less erosion will form and therefore less runoff will be trapped	By replacing vegetation after it has been disturbed any any way
	With management measures	1	1	1	1	4 - Low		
Removal of Vegetation	Some vegetation may further be removed after construction phase, by service vehicles	3	2	3	3	11 - Moderate to High	Different routes can be taken and if the issues persists then a gravel road could be constructed	
	With management measures	0	1	3	0	4 - Low		
Deterioration of Water Quality	Soil could be washed or carried by wind from disturbed ares such as tracks made by service vehicles, this will increase sediment in the rivers	2	1	2	2	7 - Low Moderate	Soil exposure must be limited as explained above	
	With management measures	1	1	1	1	4 - Low		

Table 5: Risk Rating Closure Phase

Aspect	Activity description and potential impacts on the environment	Probability	Extent	Duration	Intensity	Significance	Management Measurements	Action Plan
Sediment/Transport Erosion	Closure will result in heavy vehicles removing the poles and cables, these will destroy vegetation, exposing soil	2	1	1	2	6 - Low to Moderate	Rehabilitation must be carried out correctly	Vegetation must be replaced and soil must be covered before closure is finished
	With management measures	1	1	1	1	4 - Low		
Stream Flow Reduction	If material is left lying around or holes are created these could hinder overland flow	1	1	1	2	5 - Low to Moderate	The surface and slopes of the land must be rehabilitated back to prestine conditions	All left over material must be collected and removed
	With management measures	0	1	1	0	2 - Low		
Removal of Vegetation	Vegetation will be removed as power lines are taken out, also heavy vehicles will destroy vegetative cover	3	2	1	2	8 - Moderate	All vegetative matter must be returned to natural conditions	Indigenous vegetation must be replaced where bare surfaces exist
	With management measures	1	1	1	1	4 - Low		
Deterioration of Water Quality	If vegetation is not replaced then bare soil could be carried off by wind and water	2	2	2	3	9 - Moderate	As above mentioned vegetative cover must be rehabilitated back to its original state	
	With management measures	1	2	1	1	5 - Low to Moderate		

3. DISCUSSION AND CONCLUSION

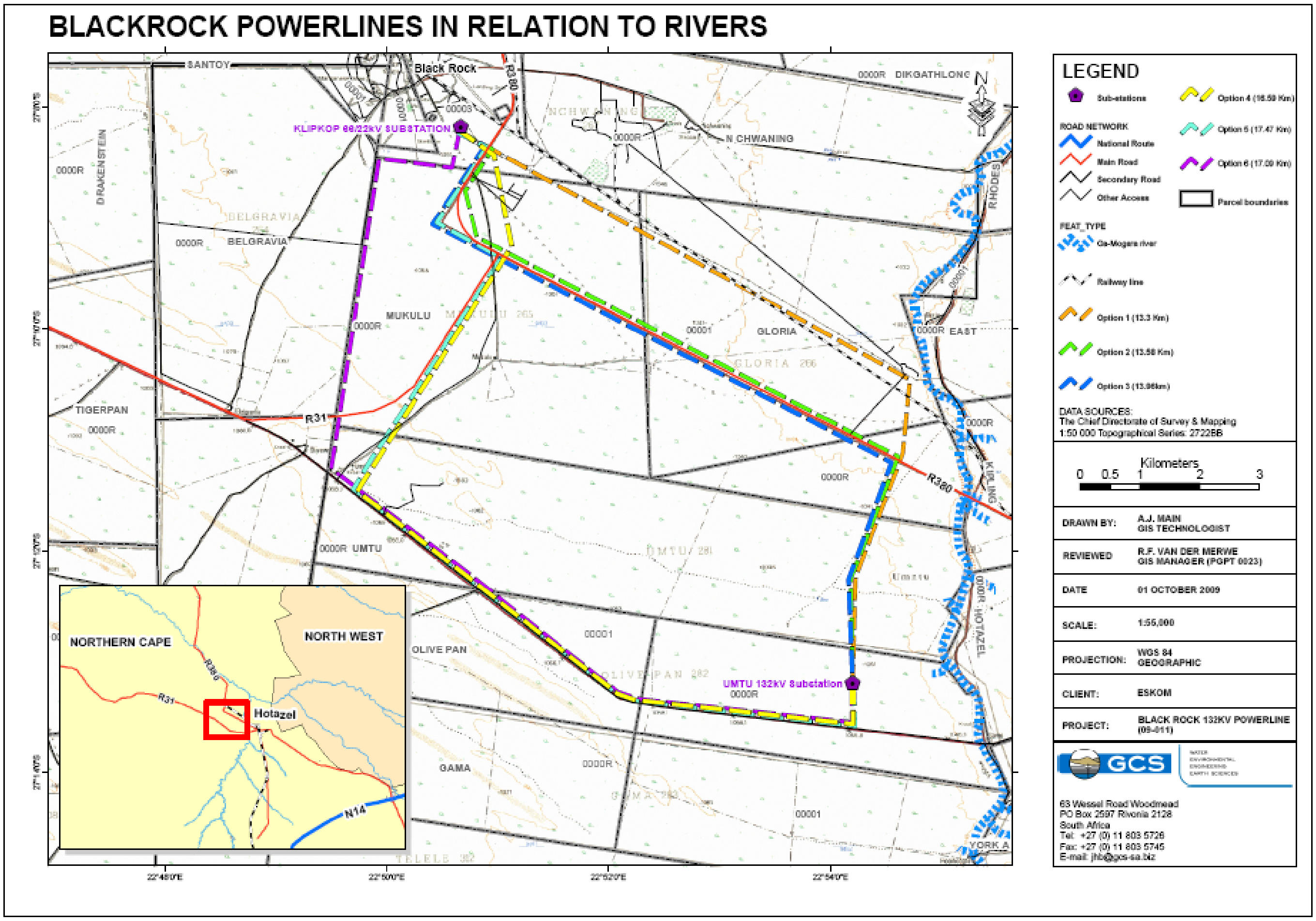
The purpose of this project was to assess the risk from a surface water perspective of constructing power lines for the Black Rock Manganese Mine outside of Kuruman. The aim is to construct power lines from one sub-station to another; this is to give power to a new mine that is going to be constructed at a later sage.

The climate and rainfall were taken into account and the area was assessed for any surface water. Because of the very sandy soils and low rainfall of 289mm per year, there is not much in terms of surface water in this area; including no wetlands or pans close to the path of the power lines. The closest river is the Ga-Mogara, a non-perennial river that is 1.8km away from the power line.

The power line does not cross or come very close to any surface water. Also it has a very small and insignificant surface footprint in relation to the size of the Ga-Mogara River catchment. Therefore there is very little or no risk associated with flow; however there is a slight risk when it comes to erosion and subsequently water quality. This is because the vegetation in this area is very vulnerable and will be lost if it is removed or disturbed. The soil consists of deep red sands and is highly permeable therefore it will be difficult for vegetation to re-establish after being removed or damaged. If bare soil is left as a result of the vegetation being removed then the soil could be washed or blown away in a storm. This will cause erosion and the silt may build up in the Ga-Mogara reducing the water quality.

The risks stated above are however very insignificant and therefore there will be minimal affect on the surface water, even under poor management strategies. Therefore there would seem to be little evidence from as surface water perspective as to why the project should not move forward.

Appendix A: Map Illustrating Power Line Options and Rivers



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Eskom LTD
Black Rock Proposed 132kV Powerline

Vitae Appendix D: Specialists Reports

Appendix Dvi:
Visual Impact Assessment

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Black Rock 132kV Power line

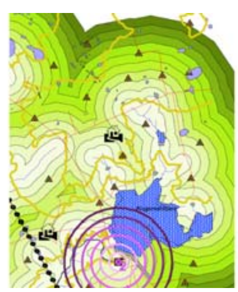
Visual Impact Assessment Report

November 2009

Client Name:

Project Number: 09 -011

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Black Rock 132kV Power Line VIA Report Visual Impact Assessment Report

November 2009

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EXECUTIVE SUMMARY

GCS (Pty) Ltd (GCS) was appointed by ESKOM to complete a Visual Impact Assessment. This Visual Impact Assessment (VIA) is a specialist study that forms part of the Black Rock 132kV power line EIA Report and addresses the visual affects of the proposed Black Rock 132kV power line on the receiving environment.

The proposed overhead power line construction will entail a linear development of approximately 16 kilometers with 36 meters wide servitude between the Klipkop and Umtu Substations. Eskom is currently considering six (6) possible routes for the location of the power line. For the purposes of this study only the preferred route (option 5) were assess.

The study area is characterised by a relative flat landscape with elevations between 1020 metres above mean sea level (mamsl) and 1080mamsl. Generally the land use is composed of a mixture of vacant/unspecified land, residential, and mining land use activities (Please refer to Figure 5). The area has a rural character with the Black Rock village and mining area forming the residential/commercial hub within the landscape.

The activities that are expected to cause visual impacts during construction and operational phases were identified. The criteria used to determine the magnitude of these visual impacts includes the area from which the project can be seen (the viewshed), the viewing distance, the capacity of the landscape to visually absorb structures and forms placed upon it (the visual absorption capacity), and the appearance of the project from important or critical viewpoints (sensitivity). When the magnitude of impact is qualified, the significance of the impact can be predicted taking into account the extent, duration and probability of the proposed activity.

It was determined that the magnitude of the visual impact of the proposed 132kV power line would be MODERATE and that the significance of this impact would be MODERATE to LOW NEGATIVE for the construction phase and MODERATE NEGATIVE for the operational phase. With successful mitigating measures the significance can be reduced to MODERATE to LOW. Limited surface disturbance and prompt rehabilitation are prerequisite conditions if the severity of impact is to be reduced.

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LIST OF ACRONYMS

Acronym	Explanation
DMA	District Management Area
EIA	Environmental Impact Assessment
EMP	Environmental Management Programme
kV	KiloVolts
mamsl	Metres above mean sea level
MPRDA	Mineral and Petroleum Resources Development Act
VAC	Visual Absorption Capability

1 INTRODUCTION

GCS (Pty) Ltd (GCS) was appointed by ESKOM to complete a Visual Impact Assessment. This Visual Impact Assessment (VIA) is a specialist study that forms part of the proposed Black Rock 132kV power line EIA Report and addresses the visual affects of the proposed Black Rock 132kV power line on the receiving environment.

1.1 Background and Brief

It is the intention of Eskom Holdings Limited (Eskom), through Assmang Limited Black Rock Manganese Mine (Assmang Black Rock), to construct an overhead power line with a capacity of 132 kiloVolts (kV) between the Klipkop Substation and the Umtu Substation, located in the Kgalagadi District within the Northern Cape Province. The proponent for this project is Assmang Black Rock Mine.

The purpose of the construction of the 132kV overhead power line is to provide the Assmang Black Rock mine with sufficient electricity which the mine will require for their proposed expansion projects in the near future. As part of the construction of the 132kV overhead power line, the existing Klipkop Substation (located on Portion 3 of the farm Nchwaning 267) will be upgraded. The upgrade of the Klipkop Substation will be beneficial to the local Black Rock Village and farms in the surrounding areas, whose power supply is provided by the mine.

The proposed overhead power line construction will entail a linear development of approximately 16 kilometers with 36 meters wide servitude between the Klipkop and Umtu Substations. Eskom is currently considering six (6) possible routes for the location of the power line.

This VIA assesses the visual impacts of the 132kV power line (Option 5 only, as identified as the preferred route) and includes the extent of the view catchment area, or what is known as the 'zone of visual influence' of the project (approximate 5 km buffer area around the operations). The purpose of this VIA is to determine the impact of the proposed project on the visual and aesthetic character of the study area. The rationale for this VIA is that the proposed infrastructure may fundamentally alter the landscape character and sense of place of the local environment. The primary objective of this VIA is therefore to describe the potential impact of this activity on the visual character and sense of place of the area. This assessment will therefore have the following secondary objectives:

- Determine the visual character of the study areas by evaluating environmental components such as topography, current land use activities, surrounding land use activities, etc;
- Identify elements of particular visual quality that could be affected by the proposed activity; and
- Recommend mitigation measures to reduce the potential visual impacts generated by the proposed activity.

1.2 Legislation and Guidelines

There are no specific legal requirements in the National Environmental Management Act (Act No. 107 of 1998) (NEMA) or the Mineral and Petroleum Resources Development Act (Act No 28 of 2002) (MPRDA) that specifically regulate activities that may infringe on the visual attributes of a region.

The National Heritage Resources Act (Act No. 25 of 1999) provides legislative protection for listed or proclaimed sites, such as urban conservation areas, nature reserves and proclaimed scenic routes and requires that these areas are protected against physical and aesthetic change.

Visual pollution is controlled, to a limited extent, by the Advertising on Roads and Ribbons Act (Act No. 21 of 1940), which deals mainly with signage on public roads.

The *'Guideline for involving visual & aesthetic specialists in EIA processes,'* by Oberholzer (2005) has been developed to provide guidelines and general good practices for the specialist visual input into the EIA process in South Africa. These guidelines are used extensively and will be used as a guide for this assessment (Please refer to Appendix A).

2 STUDY APPROACH

2.1 Method

To evaluate the impacts of the proposed activity, the inherent scenic value of the landscape first needs to be determined. Data collected during a site visit allowed for a comprehensive description and valuation of the receiving environment. The following method was used for the project:

- Site visit - one field survey was undertaken (28 -30 September 2009) and the study area scrutinized to the extent that the receiving environment could be documented and adequately described;
- Project components - the physical characteristics of the project components were described and illustrated;
- Determine the setting, visual character and land use of the area surrounding the route, and the sense of place;
- Define the extent of the affected visual environmental, the viewing distance and the critical views/visual receptors that may be affected by the proposed project;
- Determine the Visual Absorption Potential (ability of the landscape to accommodate the proposed project from a visual perspective);
- The significance of the visual and landscape impacts is assessed;
- Rate the impact on the visual environment of the proposed development; and
- Suggest measures that could mitigate the negative impacts of the proposed 132kV power line.

2.2 Assumptions and Limitations

The following assumptions and limitations are applicable to this study:

- The basis for this assessment is that scenic wilderness areas form the core of eco-tourism due to the high positive aesthetic appeal;
- Conceptual layout plans and designs of the proposed infrastructure as received in October 2009 where used for the purposes of this assessment. Any changes to these are not addressed within this report.
- This level of assessment excludes surveys to establish viewer preference and thereby their sensitivity. For example; localised visual perceptions of the economically depressed communities of the population may be influenced rather by the short term economic and job opportunities that will exist rather than the direct visual perception of the project; and
- The major limitation of this study is the unavoidable subjectivity relating to the assessment of the visual impact. Findings will also be restricted to information on hand, as well as the quality of spatial data.

3 DESCRIPTION OF THE BASELINE CONDITIONS

3.1 Overview of the Activity

It is the intention of Eskom, through Assmang Black Rock, to construct an overhead power line with a capacity of 132kV between the Klipkop Substation and the Umtu Substation, located in the Kgalagadi District within the Northern Cape Province. The activity will take place in two phases namely construction phase and operational phase.

The proposed overhead power line construction will entail a linear development of approximately 16 kilometers with 36 meters wide servitude between the Klipkop and Umtu Substations. Eskom proposed to use a mono-pole type D structure of approximately 25m in height (Please refer to Figure 1 and 2).

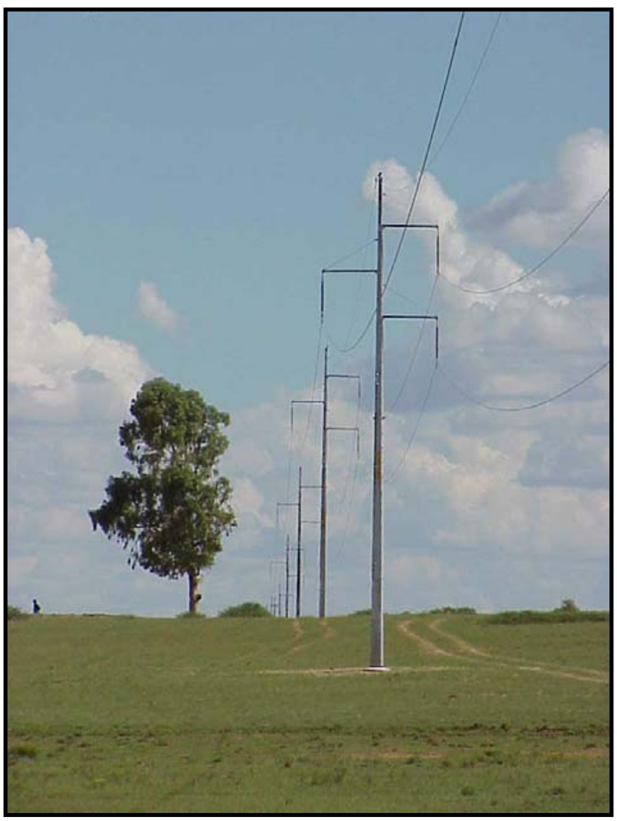

Figure 1: An example of the proposed mono-pole type D to be used for the proposed 132kV Power Line. Note the relative small footprint.

Figure 2: Anticipated construction activities during the construction phase of the 132kV power line.

4 DESCRIPTION OF THE ENVIRONMENT

The following sections discuss the environmental parameters which have a direct impact on the aesthetic value of the area.

4.1 Topography

The project area catheterised by a relative flat landscape with elevations between 1020 metres above mean sea level (mamsl) and 1080mamsl. The topography slopes down gradually to the Ga-Mogara River to the east and to the north east towards the Kuruman River (Please refer to Figure 11, Appendix B).

4.2 Hydrology

The Ga-Mogara River runs approximately 1300m – 9000m east of the proposed 132kV power line and runs in a northerly direction. It eventually drains into the Kuruman River approximately 12 kilometres to the northeast (Please refer to Figure 10, Appendix B).

4.3 Vegetation

The proposed 132kV power line intersects mainly with the Kathu Bushveld and Gordonia Duneveld vegetation types, according to the Vegetation Atlas of South Africa, Lesotho and Swaziland (Please refer to Figure 3 and Figure 12, Appendix B). The level of transformation in the study area is relatively low especially along the R31 secondary road, but increases to the north (The Black Rock Settlement and mining area) and eastern part of the study area.

Figure 3: Typical vegetation cover within the study area.

4.4 Transportation Networks

Transportation routes with in the area include (Please refer to Figure 10, Appendix B):

- The R380 main road runs in a northwest direction and connects Black Rock with Kuruman via Hotazel.
- The R31 secondary road crosses the study area in a southeast - northeast direction and connects the R380 main road with the settlement of Van Zylsrus to the northwest.
- A single lane railway line enters the project area from the south southeast from Sishen and terminates at Black Rock.

4.5 Land Use

Generally the land use is composed of a mixture of vacant/unspecified land, residential, and mining land use activities (Please refer to Figure 13, Appendix B).

Mining activities dominates the project area and are predominantly situated in the northern and to eastern section of the study area. Most of the mines are owned by either Assmang or BHP Billiton.

A small number of farmsteads and dwellings are located throughout the study area, with the largest concentration of permanent residences located within the Black Rock Village.

4.6 Sense of Place

Central to the concept of sense of place is that the landscape requires uniqueness and distinctiveness. The primary informant of these qualities is the spatial form and character of the natural landscape taken together with the cultural transformations and traditions associated with the historic use and habitation of the area.

The immediate landscape around the proposed 132kV power line, especially to the northeast, is characterized by mining activities and associated infrastructure (Please refer to Figure 4). To the southern and western section of study area the sense of place is more strongly associated with farming activities and a sense of remoteness prevails.

Figure 4: Exiting power line grid near the Black Rock mining area traversing the R380 main road.

It has been established that the study area presents a medium sense of place primarily because of the combination mining activities at Black Rock and remote farming areas surrounding it. The impact on sense of place can be substantially reduced by adhering to the mitigating measures suggested in Section 7 of this document.

4.7 Visual Quality and Character

The two largest factors that have formed the basis of the economy of the Kgalagadi District Management Area (DMA) are the commercial farms throughout the whole area and the mines in the south eastern section of the DMA. Not only do the mines provide jobs to hundreds of people, but it is also the reason why the towns of Hotazel and Black Rock were planned in the first place. Recently tourism has also joined the economic stables of the area and could become a very large factor in the future.

The Northern Cape is a unique part of South Africa with exceptional natural and cultural attributes. The Province has the potential to become the preferred adventure and ecotourism destination in South Africa that is recognized for its cultural heritage and special interest tourism offering through the responsible development of natural and cultural resources. The Province has however not capitalized on its full potential as a tourism destination and lies largely undiscovered to both the sizable domestic and high yield international markets. As tourism has the potential to significantly contribute to economic growth, diversification and transformation, social development and upliftment and the preservation of natural and cultural heritage in the Northern Cape (Please refer to Figure 5) (SDP, 2007).

Figure 5: Signage on the R380 main road (note the Kgalagdi District Municipality tourism promotional board in the background.

Tourist destinations in the area surrounding Black Rock are the Tswalu Kalahari Reserve, Skerpion Park 4x4 Trail and Kalahari Tsamma 4x4 Trail. Other ecological areas with the surrounding area include the Belgravia Game Farm which are is used by local residents (Please refer to Figure 6).

It is clear that the visual character and quality of the area should remain intact to order to realise the benefits of tourism as mentioned above.

Figure 6: Entrance to the Belgravia Game Farm.

5 IDENTIFICATION OF LANDSCAPE IMPACTS

Various risk sources for the visual impact have been identified for the construction and operation phases and can be classified as negative.

5.1 Construction Phase

It should be noted that the visual impact during the construction phase, although temporary, could be significant. This could be attributed to a number of factors including the following:

- Dust generated due to construction activities, earthworks, hauling and site clearance;
- Large denuded areas as a result of site clearance;
- Visual intrusion of site camp, vehicles and associated infrastructure;
- Visual intrusion of stockpiles and material storage areas;
- Presence of lighting at night (construction camp); and

- Visual intrusion due to change in sense of place, increased activity and traffic in the area.

These impacts however would be temporary and can be managed through the consideration of a project specific environmental management plan to include the visual mitigation measures outlined in section 7.

5.2 Operational Phase

The activities that are expected to cause visual impacts during construction would be:

- The erection of the 132kV power line, could remain aesthetically incompatible with surrounding landscape. The pylons may not blend in with the landscape and this may result in a permanent change to the existing visual quality of visually sensitive areas;
- Vegetation clearing is required to trim, cut or clear the minimum number of trees and vegetation necessary for the safe mechanical construction and electrical operation of the 132 kV power line and may will result in visual scarring; and
- The potential scarring of the landscape due to the creation of cleared cut-lines and new roads/tracks.

6 IMPACT DESCRIPTION AND ASSESSMENT

6.1 The Visual Analysis

This section describes the aspects which have been considered in order to determine the intensity of the visual impact on the area. The criteria includes the area from which the project can be seen (the viewshed), the viewing distance, the capacity of the landscape to visually absorb structures and forms placed upon it (the visual absorption capacity), and the appearance of the project from important or critical viewpoints (sensitivity).

6.1.1 The Viewshed

A viewshed analysis is carried out to define areas, which contain all possible observation sites from which the proposed infrastructure would be visible.

Topographic data was captured for the site at 20m contour intervals to create the Digital Elevation Model (DEM). The DEM was draped over the topographic data to complete the model used to generate the viewshed analysis.

The visibility analysis considers the worst-case scenario, using line-of-sight i.e. ignoring trees and other structures and is based on topography alone. This assists the process of identifying possible affected viewers and the extent of the effected environment.

Figure 13, Appendix B, spatially depicts the viewshed area and the areas which have direct visibility of the proposed infrastructure. A single analysis viewshed for the proposed 132kV power line was used, meaning that the figures show all the points from which the proposed 132kV power line can be seen (incorporating an offset height of 25m for the proposed infrastructure and an offset height of 2m for observation points). The total area which has a direct visual connection amounts to 21,295.9ha (98.5%).

The viewshed indicates that the 132kV power line will be extremely visible when viewed from the the R31 road. This is mainly due to the short distance between the R31 road and the proposed 132kV power line servitude. The viewhed also indicates that the proposed 132kV power line will be is visible for at least 3km along the R380 main road when it crosses the road at two points. Although only a small portion of the R380 main road may be affected, (specifically where the 132kV power line traverses the R380 main road) the presence of the exiting power line network in the area, just next to the newly proposed power line servitude, may “absorb” any additional negative visual affects due to the proposed infrastructure (Refer to Figure 4).

According the to viewshed it is also possible to see the proposed 132 kV power line from the Belgravia Game Farm, although it was determined that the local vegetation cover and relative long distance will limit extended views and any visual impact from the camping site within the Game Farm (Please refer to Figure 8).

Figure 8: The camping site within the Belgravia Game Farm.

It is also apparent from the viewshed that the Olivewood farmstead will be able to see the proposed 132kV power line. During the site visit it was determined that the relative long distance and vegetation cover (garden and structures at Olivewood farmstead) will limit extensive views and will mitigate the visual impact extensively (Please refer to Figure 9).

Figure 9: The garden at Olivewood farmstead.

The remaining affected area can be classified as remote as no major sensitive viewing point is affected negatively.

Using the criteria in Table 1, visibility of the proposed 132kV power line from the surrounding areas during the construction and operational phases will be high. Visibility can be reduced after mitigation measures have been correctly adhered to according to this report.

Table 1: Viewshed evaluation for proposed 132kV power line

High	Moderate	Low
If the project and its infrastructure is visible from over half the zone of potential influence, and/or views are mostly unobstructed.	If the project and its infrastructure are visible from less that half the zone of potential influence, and/or views are partially obstructed.	If the project and its infrastructure is visible from less than a quarter of the zone of potential influence, and/or views are mostly obstructed.

6.1.2 The Viewing Distance

The visual impact of an object in the landscape diminishes at an exponential rate as the distance between the observer and the object increases (Hull and Bishop, 1988). Thus, the visual impact at 1000m would be approximately a quarter of the impact as viewed from 500m. Consequently, at 2000m, it would be one sixteenth of the impact at 500m.

The 'zone of potential influence' (the area defined as the radius about the centre point of the project beyond which the visual impact of the most visible features will be insignificant) was established at 5km. Over 5km the impact of the proposed infrastructure would have diminished considerably due to the diminishing effect of distance and atmospheric conditions (haze) on visibility. On the other hand the visual impact of the project components within a distance of 500m or less would be at its maximum.

View distance is rated using four increments of severity, each with their respective qualification and contribution to visual impact (Refer to Table 2 below).

Table 2: View distance evaluation for proposed 132kV power line

	High Exposure (significant contribution to visual impact)	Moderate Exposure (moderate contribution to visual impact)	Low Exposure (minimal influence on visual impact)	Insignificant Exposure (negligible influence on visual impact)
Residents	0 – 500 m	500m – 1 km	*1 – 2.5 km*	Over 2.5 - 5 km
Tourist	*0 – 500 m*	*500m – 1 km*	1 – 2.5 km	Over 2.5 - 5 km
Motorist	*0 – 500 m*	*500m – 1 km*	*1 – 2.5 km*	Over 2.5 - 5 km

From the viewshed analyses (Please refer to Figure 14, Appendix B) it is clear that the proposed 132kV power line (35% of its length) will be located within the <500m radius from either the R31 secondary road or the R380 main road. Therefore, the proposed 132kV power line would be in the immediate foreground to middle ground of these sensitive views.

The Olivewood farmstead is located within the 1km to 2.5km range. Therefore, the proposed 132kV power line would be in the middle ground and background of this sensitive view and as a result will have a low visual exposure from this viewing point.

6.1.3 The Visual Absorption Capacity

Visual Absorption Capacity (VAC) signifies the ability of the landscape to accept additional human intervention without serious loss of character and visual quality or value. VAC is founded on the characteristics of the physical environment such as:

Degree of Visual Screening

A degree of visual screening is provided by landforms, vegetation cover and/or structures such as buildings. For example, a high degree of visual screening is present in an area that is mountainous and is covered with a forest compared to an undulating an mundane landscape covered in grass.

Terrain variability

Terrain variability reflects the magnitude of topographic elevation and diversity in slope variation. A highly variable terrain will be recognised as one with great elevation differences and a diversity of slope variation creating talus slopes, cliffs and valleys. An undulating landscape with a monotonous and repetitive landform will be an example of a low terrain variability.

Land Cover

Land cover refers to the perceivable surface of the landscape and the diversity of patterns, colours and textures that are presented by the particular land cover (i.e. urbanised, cultivated, forested, etc).

Areas which have a high visual absorption capacity are able to easily accept objects so that their visual impact is less noticeable. Conversely areas with low visual absorption capacity will suffer a higher visual impact from structures imposed on them.

Viewpoints representative of views experienced by residents, tourists, and motorists through the study area were used for the photographic simulations. The before and after simulations illustrated in Appendix D, show the proposed activity superimposed onto the existing landscape scene. The simulations illustrate the visual absorption potential of the affected landscape when viewed from various sensitive receptor positions within the study area.

It is apparent from the simulations that the landscape surrounding the proposed operations ability to 'visually absorb' the proposed 132kV power line is moderate due to the following:

- The proposed 132kV power line is situated on a less diverse landform type;
- The degree of visual screening is minimal along the R31 and R380 roads (immediate vicinity, <20m from road surface) , although some vegetation cover further away (>20m from the road surface)limits extended views; and
- The shape and dimensions of the proposed 132kV power line is in disparity with the natural environment.
- In areas where the proposed 132kV power line traverses the R380 main road the visual absorption of the proposed 132kV power line is anticipated to be high as a result of the existing power lines in the area as this new power line is not anticipated to add significantly to the existing impact (Please refer to figure 4).

The landscape therefore has a medium to low visual absorption (depending on location) capacity and will suffer a moderate to low visual impact from the proposed activity imposed on it.

Table 3: Visual absorption capacity evaluation for the proposed 132kV power line

Criteria	**High (Low Impact)**	**Medium (Moderate Impact)**	**Low (High Impact)**
Visual Absorption Capacity (VAC)	*The ability of the landscape to easily accept visually a particular development because of its diverse landform, vegetation and texture.*	*The ability of the landscape to less easily accepts visually a particular development because of a less diverse landform, texture and vegetation.*	The ability of the landscape not to visually accept a proposed development because of a uniform texture, flat slope and limited and limited vegetation cover.

6.1.4 Critical Viewpoints

Traffic routes such as the R380 main road and the R31 secondary road, residential areas (Black Rock Village), farmsteads, eco-tourism attractions (Belgravia Game Farm) and undeveloped rural areas with high scenic value were regarded as critical view zones against which the visual impact would be evaluated. Critical views were determined during the field trip and from the 1:50 000 topographical maps.

Viewer groups are a collection of viewers that are involved with similar activities and experience similar views of the proposed development. Within the receiving environment, specific visual receptors experience different views of the proposed development. They will be affected due to the alteration of their views and are therefore identified as part of the receiving and affected environment. The visual receptors are grouped according to the similarities in views. The visual receptors included in this study are:

- Residents;
- Tourists; and
- Motorists.

The visual receptors will be affected because of alterations to their views due to the proposed project. In order to determine the sensitivity of these visual receptors a commonly used rating system is utilised (Please refer to Appendix C). This is a generic classification of visual receptors and enables the visual impact specialist to establish a logical and consistent visual receptor sensitivity rating for viewers who are involved in different activities without engaging in extensive public surveys.

Residents

In the case of static views, such as views from buildings, the visual relationship between a activity and the landscape will not change. The cone of vision is relatively wide and the viewer tends to scan back and forth across the landscape. Residents of the affected environment are therefore classified as visual receptors of *high* sensitivity owing to their sustained visual exposure to the proposed development as well as their attentive interest towards their living environment.

Tourists

Tourists are regarded as visual receptors of exceptionally *high* sensitivity. Their attention is focused towards the landscape which they essentially utilise for enjoyment purposes and appreciation of the quality of the landscape. Although the R31 road isn't the main route to the Kgalagadi Transfrontier Park, tourist using it may have high expectations for unspoilt views along this route.

Figure 7: Road signage pointing to the Kgalagadi Transfrontier Park via the R31 road.

Motorists

Motorists are generally classified as visual receptors of *low* sensitivity due to their momentary views and experience of the proposed development. Under normal conditions, views from a moving vehicle are dynamic as the visual relationship between the activity is constantly changing as well as the visual relationship between the activity and the landscape in which they are seen. The view cone for motorists, particularly drivers, is generally narrower than for static views. Motorists will therefore show *low* levels of sensitivity as their attention is focused on the road and their exposure to roadside objects is brief.

6.2 The Visual Impact

Visual impact is defined as the significance and/or magnitude of changes to visual quality of the area resulting from a development or change in land use that may occur in the landscape.

Significance or magnitude is a measure of the response of viewers to the changes that occur. It represents the interaction between humans and the landscape changes that they observe. The response to visible changes in the landscape may vary significantly between individuals.

Perception results from the combination of the extent to which the activity are visible (level of visibility) and the response of individuals to what they see. A major influence on the perception of people in relation to the activity will be the visual character and quality of the landscape in which they would be located. Natural landscape areas such as national parks and mountain areas are valued for their high visual quality. The expansion of mining activities and associated infrastructure may be seen as a negative impact on these areas of high visual quality.

The potential visual impact of the proposed activity will primarily result from changes to the visual character of the area within the viewshed. The nature of these changes will depend on measurable factors are such as viewing distance, the visual absorption capacity of the surrounding landscape and the scale of the surrounding environment and landform. Other factors are subjective, such as the visual perception of people viewing the activity.

6.2.1 Magnitude of Visual Impact

The magnitude of visual impact is determined using the viewshed, viewing distance, visual absorption capability and the viewer sensitivity criteria.

Table 4 below summarises the results of the criteria used to determine the magnitude of the visual impact. These results are based on worst-case scenarios when the impact of all aspects is taken together.

Table 4: Magnitude evaluation for proposed 132kV power line

	Quality of Visual Resource	**Viewshed**	**Visual Distance**	**VAC**	**Sensitivity**	**Visual Impact (Magnitude)**
Prior to construction	Moderate to Low					
Construction Phase & Operational Phase Assuming mitigation is successful)		High Impact	High to Low Impact	Moderate to Low impact	High to Low Impact	Moderate Impact
Closure Phase (Assuming mitigation is successful)		-	-	-	-	-

According to the results tabulated above in Table 4 the magnitude of visual impact associated with 132kV power line during the construction and operational phase will be moderate.

6.2.2 Significance of Visual Impact

The significance of impact was determined using a ranking scale, based on terminology from GSC.

When the magnitude of impact is qualified, the significance of the impact can be predicted taking into account the extent, duration and probability of the proposed activity (Please refer to Appendix E).

Table 5: Significance Evaluation for the proposed 132kV power line

	Management	Extent	Duration	Probability	Intensity	Significance	Status	Confidence
Construction Phase	**Without Mitigation**	1	1	3	2	7 Low - Moderate	Negative	4
	With Mitigation	1	1	2	1	5 Low – Moderate	Negative	4
Operational Phase	**Without Mitigation**	1	6	2	1	10 Moderate	Negative	4
	With Mitigation	1	6	1	1	9 Moderate	Negative	4
Closure Phase	**Without Mitigation**	-	-	-	-	-	-	-
	With Mitigation	-	-	-	-	-	-	-

It is considered that the significance of the impact is moderate to low for the construction phase and moderate for the operational phase due to the fact that it is of low intensity, but permanent duration.

7 MITIGATION MEASURES

The aim of mitigation is to avoid, reduce and where possible remedy or offset, any significant negative (adverse) effects on the environment arising from the proposed activity (GLVIA; 2008).

In considering measures to effect mitigation, there are three rules to consider. Mitigation measures should be:

- Economically feasible;
- Effective (time allowed for implementation and provision for management/maintenance); and
- Visually acceptable (within the context of the existing landscape).

To address these measures the following principles should be considered:

- Mitigation should be planned to fit into the existing landscape character. They should respect and build upon landscape distinctiveness;
- Mitigation should primarily aim to blend the proposed development into its surroundings and generally reduce its visibility; and
- It should be recognised that many mitigation measures, especially planting/rehabilitation, are not immediately effective.

7.1 General Recommendations

The visual impact during operational phase will be moderately significant as little can be done about reducing the primary visual impact the transmission power line (312kV) cannot be screened completely due to its dimensions nor can it be moved to more visually suitable positions. The mitigation measures for the proposed activity will need to focus on effective rehabilitation of the disturbed areas.

7.1.1 Construction and Operational Phase

During the construction and operational phase the following mitigation measure are recommended:

- During construction of the proposed 132kV power line, construction roads will require an effective dust suppression management programme, such as regular wetting and/or the use of non-polluting chemicals that will retain moisture in the road surface;
- Minimise the extent of cleared areas to only those necessary for completion of the works;
- Decrease the height of material stockpiles and locate these areas away from view of road users;
- Appropriately site the construction camp as well as other storage areas and consider screening through the erection of shade cloth visual barrier;
- Site ablution facilities out of view of road users;

- Temporarily revegetate open areas whilst construction is underway and fully rehabilitate and revegetate the site once construction has ceased. This should be done to restrict extended periods of exposed soil;
- Avoid the unnecessary removal of vegetation for the power line servitudes and limit access to the servitude (during both construction and operational phases along exiting access roads; and
- Utilise exiting power line servitudes where possible.

8 CONCLUSION

The potential visual impact of the proposed Black Rock 132kV power line has been evaluated against international accepted criteria to determine the impact it will have on the landscape character and the viewers that have been identified in the study area.

Visual impacts would result from the construction, operation and closure phase of the proposed 132kV power line. Specifically, impacts would result from the proposed 132kV power line being seen from sensitive viewpoints (especially tourists) and the negative effects (relating primarily to visibility and visual absorption capability) on the scenic quality and sense of place of the landscape of the proposed site.

It was determined that the magnitude of the visual impact of the proposed 132kV power line would be MODERATE and that the significance of this impact would be MODERATE to LOW NEGATIVE for the construction phase and MODERATE NEGATIVE for the operational phase. With successful mitigating measures the significance can be reduced to MODERATE to LOW. Limited surface disturbance and prompt rehabilitation are prerequisite conditions if the severity of impact is to be reduced.

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APPENDIX A: GUIDELINE FOR INVOLVING VISUAL & AESTHETIC SPECIALISTS IN EIA PROCESSES

Table 6 depicts the general expected level of visual impacts for various types of developments and environments. According to the categorisation of visual impacts (Oberholzer: 2005) the proposed 132kV power line is expected to have a moderate visual impact.

Table 6: Categorisation of visual impacts (Oberholzer, 2005)

Type of environment	Type of development (Low to high intensity)				
	Category 1 development	**Category 2 development**	**Category 3 development**	**Category 4 development**	**Category 5 development**
Protected/wild areas of international, national, or regional significance	Moderate visual impact expected	High visual impact expected	High visual impact expected	Very high visual impact expected	Very high visual impact expected
Areas or routes of high scenic, cultural or historical significance	Minimal visual impact expected	Moderate visual impact expected	High visual impact expected	High visual impact expected	Very high visual impact expected
Areas or routes of medium scenic, cultural or historical significance	Little or no visual impact expected	Minimal visual impact expected	**Moderate visual impact expected**	High visual impact expected	High visual impact expected
Areas or routes of low scenic, cultural or historical significance / disturbed	Little or no visual impact expected. Possible benefits	Little or no visual impact expected	Minimal visual impact expected	Moderate visual impact expected	High visual impact expected
Disturbed or degraded sites / run-down urban areas / wasteland	Little or no visual impact expected. Possible benefits	Little or no visual impact expected. Possible benefits	Little or no visual impact expected	Minimal visual impact expected	Moderate visual impact expected

Table 7: Key to categories of development (Oberholzer, 2005)

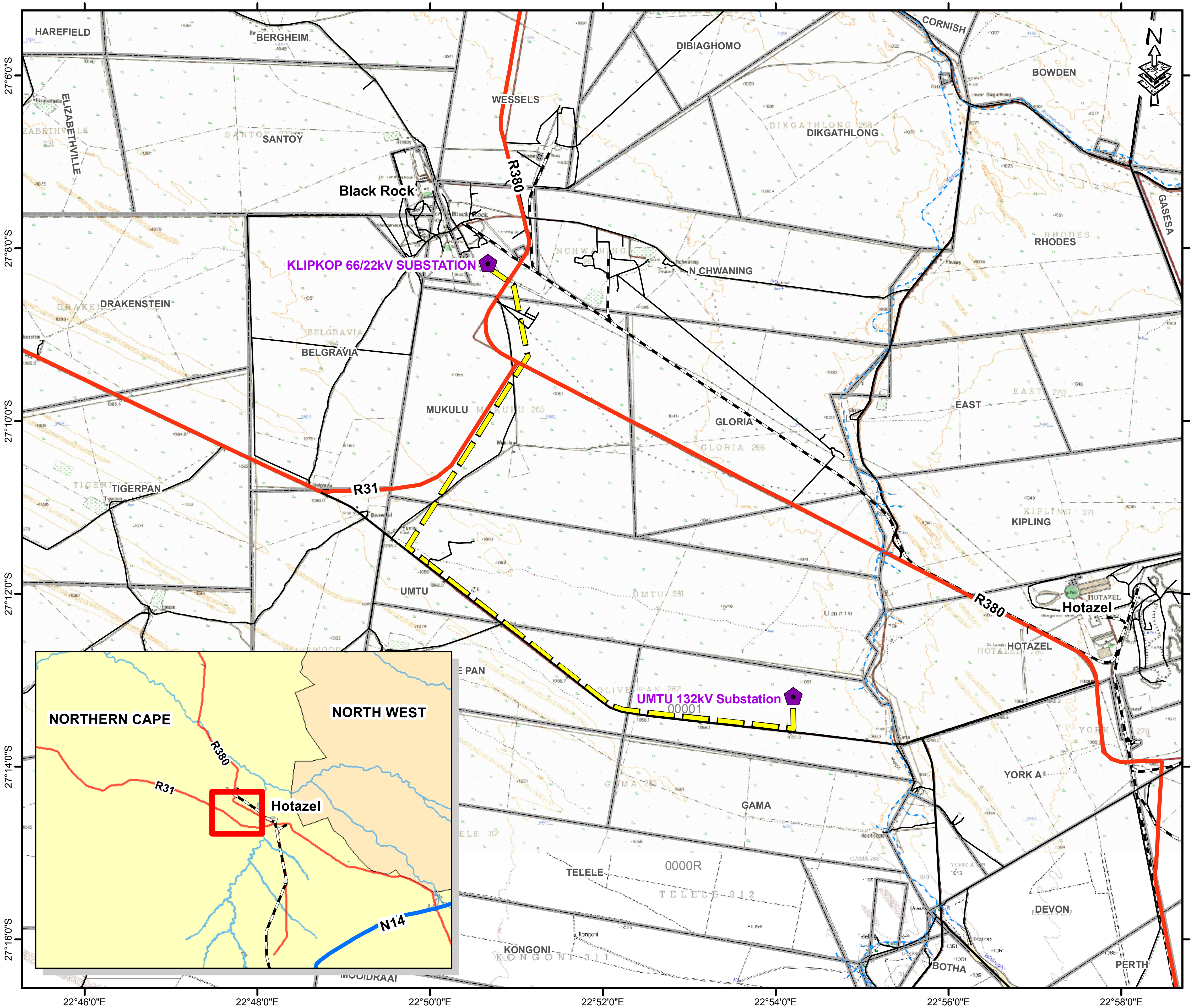
Category 1 development:
e.g. nature reserves, nature-related recreation, camping, picnicking, trails and minimal visitor facilities.
Category 2 development:
e.g. low-key recreation / resort / residential type development, small-scale agriculture / nurseries, narrow roads and small-scale infrastructure.
Category 3 development:
e.g. low density resort / residential type development, golf or polo estates, low to medium-scale infrastructure.
Category 4 development:
e.g. medium density residential development, sports facilities, small-scale commercial facilities / office parks, one-stop petrol stations, light industry, medium-scale infrastructure.
Category 5 development:
e.g. high density township / residential development, retail and office complexes, industrial facilities, refineries, treatment plants, power stations, wind energy farms, power lines, freeways, toll roads, large-scale infrastructure. Large-scale development of agricultural land and commercial tree plantations. Quarrying and mining activities with related processing plants.

This VIA will therefore conform to the requirements of a level three assessment as identified by Oberholzer (2005) which requires the realisation of the following:

- Identification of issues raised in scoping phase, and site visit;
- Description of the receiving environment and the proposed project;
- Establishment of view catchment area, view corridors, viewpoints and receptors;
- Indication of potential visual impacts using established criteria;
- Inclusion of potential lighting impacts at night;
- Description of alternatives, mitigation measures and monitoring programmes; and

APPENDIX B: MAPS

FIGURE 10: BLACKROCK 132KV POWER LINE LOCALITY



LEGEND

Sub-stations

ROAD NETWORK

- National Route
- Main Road
- Secondary Road
- Other Access

Railway line

RIVERS & STREAMS

- Perennial
- Non-Perennial

Option 4 (16.59 Km)

Parcel boundaries

DATA SOURCES:
The Chief Directorate of Survey & Mapping
1:50 000 Topographical Series: 2722BB & BD

Kilometers
0 1.25 2.5 5

DRAWN BY:	R.F. VAN DER MERWE GIS MANAGER (PGPT 0023)
REVIEWED	R.F. VAN DER MERWE GIS MANAGER (PGPT 0023)
DATE	01 OCTOBER 2009
SCALE:	1:85,000
PROJECTION:	WGS 84 GEOGRAPHIC
CLIENT:	ESKOM
PROJECT:	BLACK ROCK 132KV POWERLINE (09-011)

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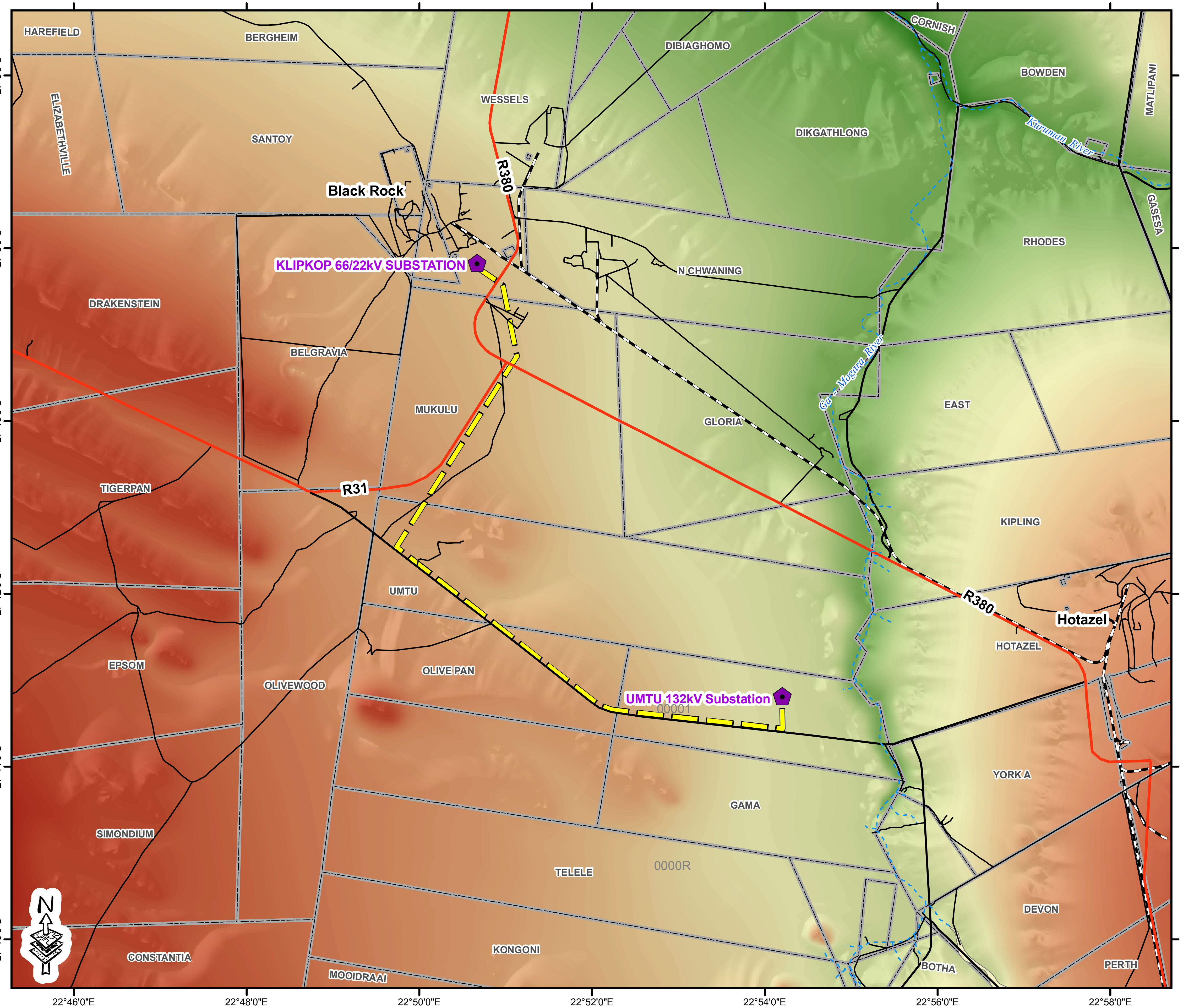
Fax: +27 (0) 11 803 5745
E-mail: jhb@gcs-sa.biz

FIGURE 11: BLACKROCK 132KV POWER LINE TOPOGRAPHY



LEGEND

Sub-stations

ROAD NETWORK
- Main Road
- Secondary Road
- Other Access

Railway line

RIVERS & STREAMS
- Perennial
- Non-Perennial

Option 4 (16.59 Km)

Parcel boundaries

Elevation (m)
High : 1090
Low : 1000

DATA SOURCES:
The Chief Directorate of Survey & Mapping
1:50 000 Topographical Series: 2722BB & BD

Kilometers
0 1.25 2.5 5

DRAWN BY:	R.F. VAN DER MERWE GIS MANAGER (PGPT 0023)
REVIEWED	R.F. VAN DER MERWE GIS MANAGER (PGPT 0023)
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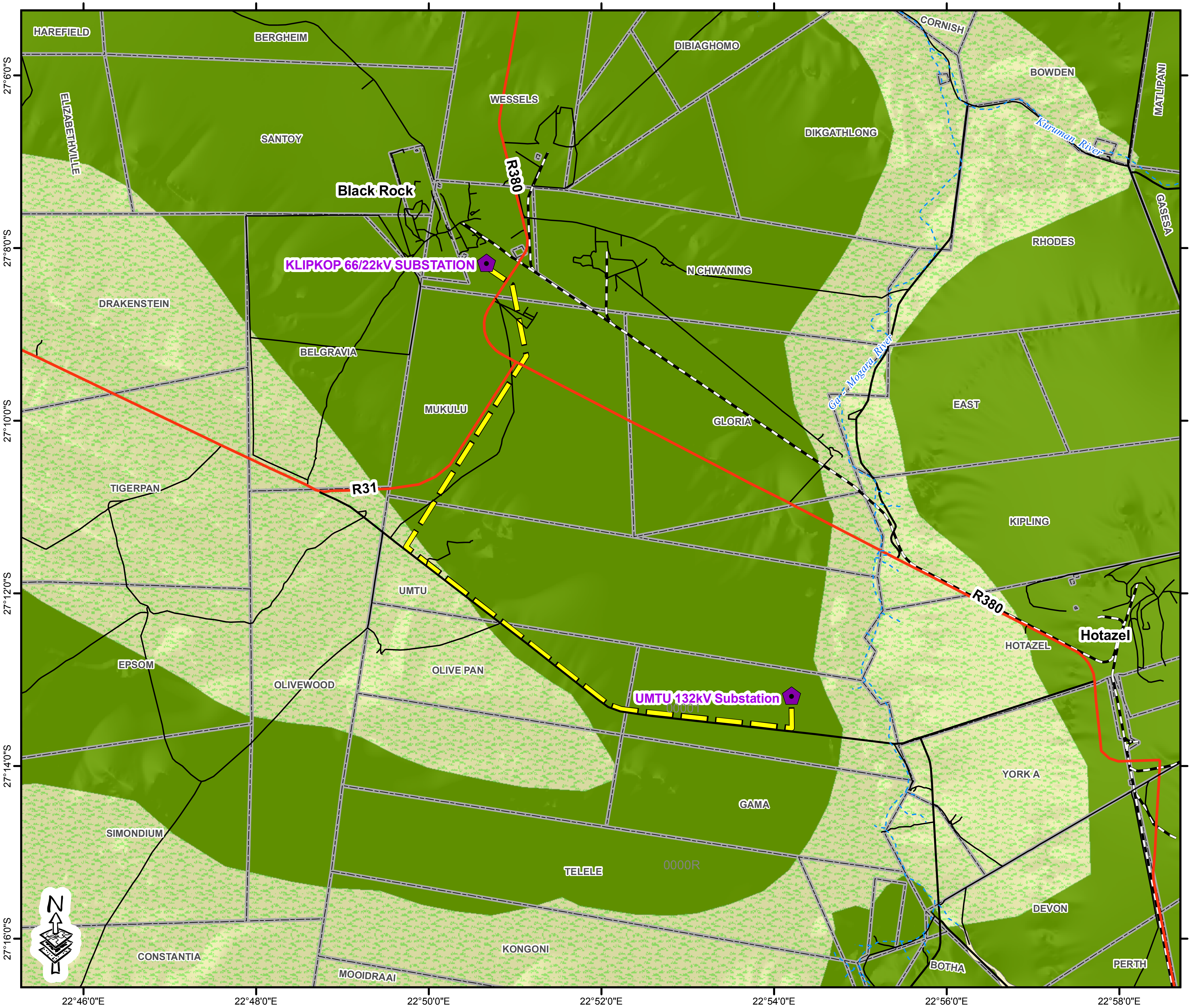
FIGURE 12: BLACKROCK 132KV POWERLINE VEGETATION



LEGEND

- Sub-stations
- Gordonia Duneveld
- Kathu Bushveld

ROAD NETWORK

- Main Road
- Secondary Road
- Other Access

RIVERS & STREAMS

- Perennial
- Non-Perennial

- Railway line
- Option 4 (16.59 Km)
- Parcel boundaries

DATA SOURCE:

Ladislav Mucina & Michael C. Rutherford (eds). 2006: The Vegetation of South Africa, Lesotho and Swaziland. SANBI. "Vegmap"

Kilometers
0 1.25 2.5 5

DRAWN BY:	R.F. VAN DER MERWE GIS MANAGER (PGPT 0023)
REVIEWED	R.F. VAN DER MERWE GIS MANAGER (PGPT 0023)
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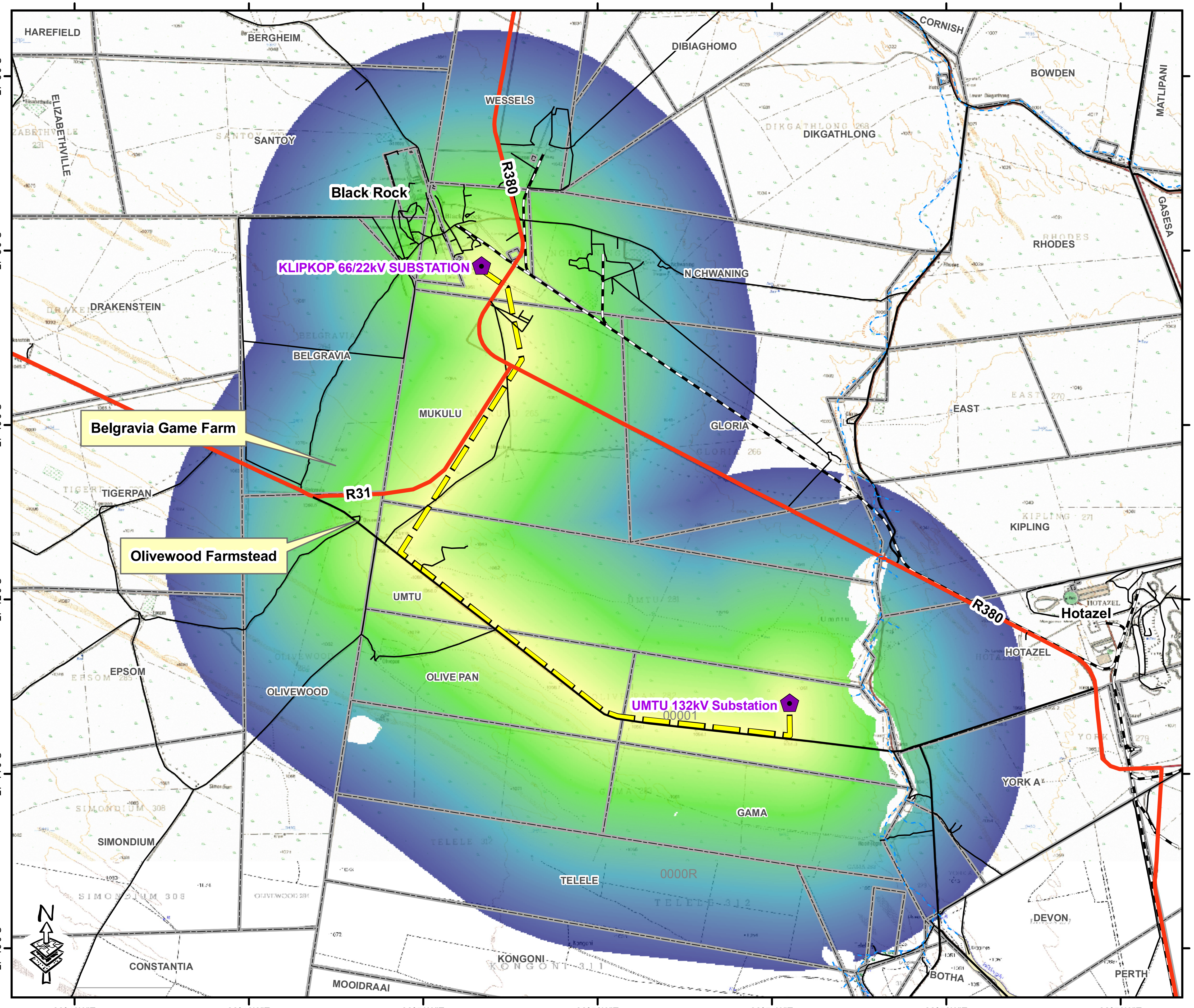
FIGURE 14: BLACKROCK 132KV POWER LINE VIEWSHED



LEGEND

Sub-stations

Parcel boundaries

ROAD NETWORK

Main Road

Secondary Road

Other Access

Railway line

RIVERS & STREAMS

Perennial

Non-Perennial

Option 4 (16.59 Km)

High : 1.04505

Low : 1

DATA SOURCES:
The Chief Directorate of Survey & Mapping
1:50 000 Topographical Series: 2722BB & BD

Kilometers
0 1.25 2.5 5

DRAWN BY:	R.F. VAN DER MERWE GIS MANAGER (PGPT 0023)
REVIEWED	R.F. VAN DER MERWE GIS MANAGER (PGPT 0023)
DATE	01 OCTOBER 2009
SCALE:	1:85,000
PROJECTION:	WGS 84 GEOGRAPHIC
CLIENT:	ESKOM
PROJECT:	BLACK ROCK 132KV POWERLINE (09-011)

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APPENDIX C: VISUAL RECEPTOR SENSITIVITY

Table 8: Visual receptor sensitivity

VISUAL RECEPTOR SENSITIVITY	DEFINITION (Adopted from GLVIA 2008)
Exceptional	Views from major tourist or recreational attractions or viewpoints promoted for or related to appreciation of the landscape, or from important landscape features.
High	Users of all outdoor recreational facilities including public and local roads or tourist alternatives whose attention or interest may be focussed on the landscape; Communities where the development results in changes in the landscape setting or valued views enjoyed by the community; Residents with views affected by the development.
Moderate	People engaged in outdoor sport or recreation (other than appreciation of the landscape).
Low	People at their place of work or focussed on other work or activity; Views from urbanised areas, commercial buildings or industrial zones; People travelling through or passing the affected landscape on transport alternatives.

APPENDIX D: SIMULATIONS

Figure 15: View from the R31 road in a south-western direction (before).

Figure 16: View from the R31 road in a south-western direction (after).

Figure 17: A view from the R380 road in a north eastern direction (before).

Figure 18: A view from the R380 road in a north eastern direction (after).

Note almost no visual impact from this viewpoint due to the relative long distance.

APPENDIX E: CRITERIA FOR SIGNIFICANCE OF IMPACT ASSESSMENT

Duration

The duration of the impact during construction will be very short term due to the relatively short construction period and the rehabilitation of the disturbed areas. Operational life for the proposed 132kV power line is permanent (Please refer table 9).

Table 9: Duration level chart and description

Category	Rating	Description
Very short-term	1	Less than 1 year
Short-term	2	1 to 5 years
Medium-term	3	5 to 10 years
Long-term	4	10 to 15 years
Very long-term	5	Greater than 15 years
Permanent	6	Permanent

Extend

Whether the impact will occur on a scale limited to the site, local/sub-regional, or will occur at a national or international scale.

Table 10: Extend level chart and description

Category	Rating	Description
Site	1	Immediate project site
Local	2	Up to 5 km from the project site
Regional	3	20 km radius from the project site
Provincial	4	Provincial
National	5	South African
International	6	Neighbouring countries/overseas

Probability of occurrence

Table 11: Probability of occurrence chart and description

Category	Rating	Description
Definite	3	More than 90 percent sure of a particular fact or of the likelihood of that impact occurring
Probable	2	70 to 90 percent sure of a particular fact or of the likelihood of that impact occurring
Possible	1	40 to 70 percent sure of a particular fact or of the likelihood of that impact occurring
Improbable	0	0 Less than 40 percent sure of a particular fact or of the likelihood of that impact occurring

Intensity

Table 12: Intensity chart and description

Category	Rating	Description
Very low	0	Where the impact affects the environment in such a way that natural, cultural and social functions are not affected
Low	1	Where the impact affects the environment in such a way that natural, cultural and social functions are only marginally affected
Medium	2	Where the affected environment is altered but natural, cultural and social function and processes continue albeit in a modified way
High	3	Where natural, cultural or social functions or processes are altered to the extent that they will temporarily cease
Very high	4	Where natural, cultural or social functions or processes are altered to the extent that they will permanently cease

Significance

Table 13: Significance rating

Category	Rating
2 - 4	Low
5 - 7	Low to Moderate
8 - 10	Moderate
11 - 13	Moderate to High
14 - 16	High
17 - 19	Very High

Level of Confidence

Table 14: Confidence level chart and description

	Information, knowledge and experience of the project			
Information, and knowledge of the study area		**3B**	**2B**	**1B**
	3A	9	6	3
	2A	6	4	2
	1A	3	2	1

3a – A high level of information is available of the study area in the form of recent aerial photographs, GIS data, documented background information and a thorough knowledge base could be established during site visits, surveys etc. The study area was readily accessible.

2a – A moderate level of information is available of the study area in the form of aerial photographs GIS data and documented background information and a moderate knowledge base could be established during site visits, surveys etc. Accessibility to the study area was acceptable for the level of assessment.

1a – Limited information is available of the study area and a poor knowledge base could be established during site visits and/or surveys, or no site visit and/or surveys were carried out.

3b – A high level of information and knowledge is available of the project in the form of up-to-date and detailed engineering/architectural drawings, site layout plans etc. and the visual impact assessor is well experienced in this type of project and level of assessment.

2b – A moderate level of information and knowledge is available of the project in the form of conceptual engineering/architectural drawings, site layout plans etc. and/or the visual impact assessor is moderately experienced in this type of project and level of assessment.

1b – Limited information and knowledge is available of the project in the form of conceptual engineering/architectural drawings, site layout plans etc. and/or the visual impact assessor has a low experience level in this type of project and level of assessment. (Adapted from Oberholzer. B, 2005)

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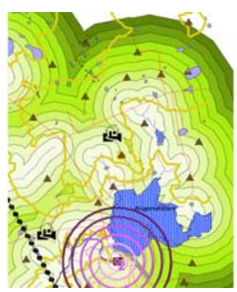
Eskom LTD
Black Rock Proposed 132kV Powerline

Appendix E: Public Participation

Ei: List of Stakeholders and Interested and Affected Parties
Eii: Background Information Document
Eiii: Proof of Site Notices
Eiv: Proof of Advertisements




Appendix E: Public Participation

Appendix Ei: Interested and Affected Parties (I&APs)

I&APs

Farm Name	Portion Number	Surface Owner
Nchwaning 267	3	Assmang Ltd
Mukulu 265	0 (REM)	Assmang Ltd
Gloria 266	1	Assmang Ltd
Gloria 266	0 (REM)	Samancor Manganese
East 270	0 (REM)	Mr. J.N. Pretorius
Kipling 271	0 (REM)	Assmang Ltd
Hotazel 280	0 (REM)	Samancor Manganese
Umtu 281	0 (REM)	Kalagadi Manganese
Olive Pan 282	1	Mr. L.P. van der Walt
Olive Pan 282	0 (REM)	Kalagadi Manganese

Authorities

Department	Contact Person
Department of Mineral Resources	M. Makoeoe
	N. Arends
Department of Tourism, Environment and Conservation	B. Mdindani
Department of Water and Environmental Affairs	S. Dywili
	Neo Leburu
Department of Agriculture	W. Uys
Gamagara Local Municipality	I. Matebesi
Kgalagani District Municipality	M. Mmoiemang
South Afican Heritage Resource Agency - N. Cape	T. Anderson

Appendix Eii: Background Information Document (BID)

BACKGROUND INFORMATION DOCUMENT

PROPOSED CONSTRUCTION OF A 132KV POWERLINE BETWEEN KLIPKOP AND UMTU SUBSTATIONS, NORTHERN CAPE

ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

Date: November 2009

PURPOSE OF THIS DOCUMENT

- Provides an overview of the Scoping and Environmental Impact Assessment (EIA) process for the construction of a 132 kV powerline between Klipkop and Umtu Substations, Northern Cape.
- Invites you, as an Interested and Affected Party (I&AP), to participate in the EIA process; and
- Provides you as an I&AP with the opportunity to raise issues and to contribute to the Environmental Management Plan (EMP) for the project.

INTRODUCTION

It is the intention of Eskom Holdings Limited (ESKOM), through Assmang Limited's (Assmang) Black Rock Manganese Mine, to construct an overhead powerline with a capacity of 132 kiloVolts (kV) between the Klipkop Substation and the Umtu Substation, located in the Kgalagadi District within the Northern Cape Province.

The proposed overhead powerline construction will entail a linear development with a 31 m wide servitude (15.5m either side of centre line) between the Klipkop and Umtu Substations. The final route of the proposed powerline still needs to be finalised. But six possible alternative routes are being considered.

The construction of a powerline falls within the ambit of the Environmental Impact Assessment (EIA) Regulations promulgated in terms of

Section 24 of the National Environmental Management Act (Act 107 of 1998) (NEMA).

Ivuzi (Pty) Ltd (Ivuzi) is an independent company of consultants that have been appointed by ESKOM to conduct the environmental

investigations and public participation process (PPP) for the construction of a 132kV powerline between the Klipkop and Umtu Substations in terms of the NEMA.

PROJECT DESCRIPTION

The proposed construction is located within the Kgalagadi District, Northern Cape (**Figure 1** overleaf). Six possible alternative routes are currently being considered. The length of the shortest proposed alternative powerline route is approximately 13km, while the longest proposed alternative powerline route is approximately 17km. The construction process will entail the following:

- The building of a ±13 km 132kV chickadee line between Umtu and Klipkop Substations;
- The extension of Klipkop Substation's yard;
- The installation of a 132/66kV 40MVA transformer bay;
- The installation of a 132kV busbar and feeder bay;
- The installation of 3 x 132kV CT's;
- The installation of 3 x 132kV VT's;
- The installation of a complete 66kV feeder bay on the existing Wessels line;
- The installation of a complete 66kV feeder bay on the existing Hotazel line;
- The installation of 6 x 66kV VT's on 66kV busbars;
- The installation of 2 x 66kV busbar isolators; and
- The installation of a lightning mast 2 x 14 meters.

THE EIA PROCESS BEING FOLLOWED AND LISTED ACTIVITIES:

The aim of the EIA process is to identify and assess the potential impacts associated with the proposed project and to develop measures through which potential negative biophysical and socio-economic impacts can be mitigated and positive benefits can be enhanced.

An Application for Environmental Authorisation was submitted to the Department of Water and Environmental Affairs (DWEA) in terms of the Government Notice's R386 & R387 of the NEMA. The following listed activities have been triggered by the proposed development:

<u>GNR 386: Basic Assessment</u>

- *Activity 12: "The transformation or removal of indigenous vegetation of 3 hectares or more."*

- *Activity 14: "The construction of masts of any material or type of any height, including those used for telecommunication broadcasting and radio transmission, but excluding: (a) masts of 15 meters and lower exclusively used i. by radio amateurs; or ii. for lighting purposes (b) flag poles and lighting conductor poles."*

- *Activity 15: "The construction of a road that is wider than 4 meters or that has a reserve wider than 6 meters, excluding roads that falls within the ambit of another listed activity or which area access roads of less than 30 meters long."*

- *Activity 16: "The transformation of undeveloped, vacant or derelict land to – (b) Residential, mixed, retail, commercial, industrial or institutional use where such development does not constitute infill and where the total area to be transformed is bigger than 1 hectare."*

<u>GNR 387: Full Scoping and EIA:</u>

- *Activity 1(l): "The construction of facilities or infrastructure, including associated structures or infrastructure for the transmission and distribution of electricity above the ground with a capacity of 120 kilovolts or more."*

- *Activity 2: "Any development activity, including associated structures and infrastructure, where the total area of the developed area is, or is intended to be, 20 hectares or more."*

The EIA process will provide the authorities and interested and/or affected parties (I&APs) with clear, accurate and understandable information about the anticipated environmental impacts associated with the proposed development.

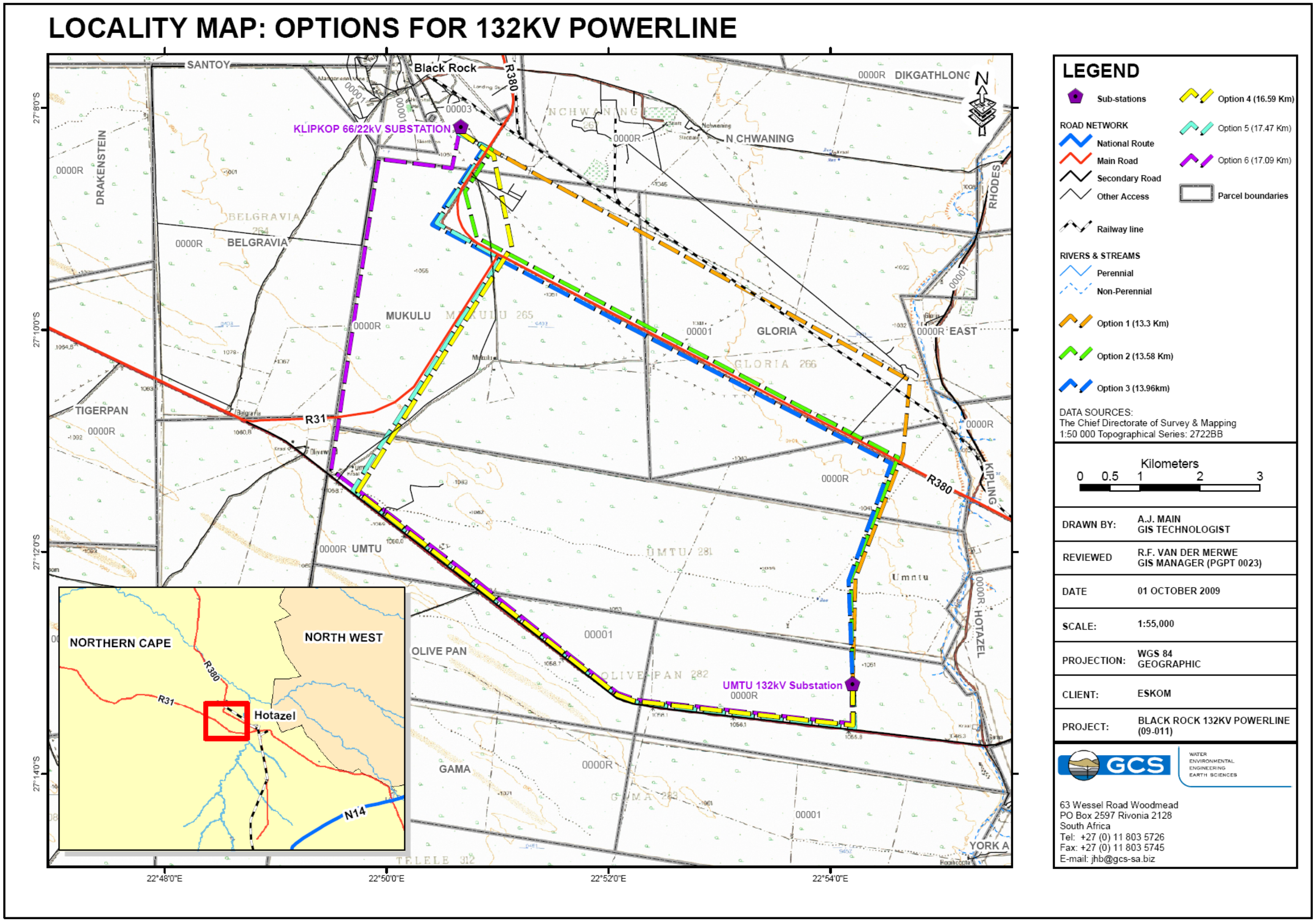
PUBLIC PARTICIPATION PROCESS WILL INCLUDE THE FOLLOWING:

- The proposed development will be **advertised** in a local newspaper and on the site;
- The **adjacent landowners, tenants and resident's associations** (I &APs) are to be informed directly, in writing, of the application for environmental authorization for the proposed development;
- **Authorities and service providers** will be informed of the application;
- Interested and affected parties are to be given a **30 day period** within which to lodge any objections;
- If necessary, a **public meeting** will be held to discuss the objections and/or comments raised by interested and affected parties (I & APs);
- After the 30 day period has expired, a **Scoping Report** is to be written. This report will identify the significant issues raised by environmental specialists and I & AP's and will outline the Plan of Study;
- The **I & APs** will be given access to this report and will be given a further **30 days** to comment on its contents.
- These comments (if any) will be included in the **Scoping Report**, which will be submitted to the Northern Cape Province Department of Tourism, Environment & Conservation.
- The **Authority** will then have **30 days** to review the Scoping Report.
- Once the Scoping Report has been accepted by the Authority, the Environmental Impact Assessment Report and draft Environmental Management Programme will be compiled. The I&AP's will have **30 days** to comment on these documents.
- The Authorities then have **60 days** to review these documents and make a decision.
- The I&APs will be informed of the decision and will have **10 days** from being informed of the decision to appeal.

The following flowchart provides a summary of the above-mentioned information:

Note: Dates may vary due to the availability of information and/or Authority review delays.

Figure 1: Locality Map



PUBLIC PARTICIPATION

WHO ARE THE INTERESTED AND AFFECTED PARTIES (I&APs)?

The I&APs are the persons who will be directly or indirectly involved and/or affected by the project.

Your role as an I&AP is to:

- Register with the environmental consultants, who will include you on a database of I&APs in order for you to receive future project information and/or formally record issues and concerns;
- Attend public events to obtain further information, interact on a one-to-one basis with the project team, and/or raise issues and concerns; and
- Contact the consultants to obtain further information and / or raise issues and concerns.

PUBLIC MEETINGS

A public meeting will be scheduled, if necessary, once the advertisement period has lapsed. The dates for the public meeting will be confirmed with all registered I&APs. This meeting will also act as a focus group meeting.

AVAILABILITY OF REPORTS

The environmental reports associated with this project will include a Scoping Report , inclusive of a Plan of Study for the Environmental Impact Assessment (EIA), and the EIA and Environmental Management Plan (EMP), which will be submitted to all the registered I&AP’s for comments for a period of 30 days. These reports will then be submitted to DWEA on completion. All I&AP’s will be informed of the availability of these reports prior to them being made available.

REGISTRATION FORM AND COMMENT SHEET FOR THE PROPOSED CONSTRUCTION OF 132 KV POWERLINE BETWEEN KLIPKOP AND UMTU SUBSTATIONS LOCATED IN THE KGALAGADI DISTRICT IN THE NORTHERN CAPE
GCS REF NUMBER: 09-011

Postal Address		
		Postal Code:
Street Address		
		Postal Code:
Telephone No.		
Fax No.		
Cell No.		
Email Address		

Who else do you think should be included in the process? (Please include contact details if possible)

Do you require any additional information at this stage? If yes, please specify.

Please write your comments and questions here:

Please return completed forms to:

	CECILE VOSLOO	or	TRUDY GOLIATH
TEL:	053 802 6370		011 803 5726
FAX:	053 802 6371		011 803 5745
EMAIL:	cecile@gcs-sa.biz		trudy@gcs-sa.biz

P. O. Box 3386
Diamond
Kimberley
8305

P.O. Box 2597
Rivonia
Johannesburg
2128

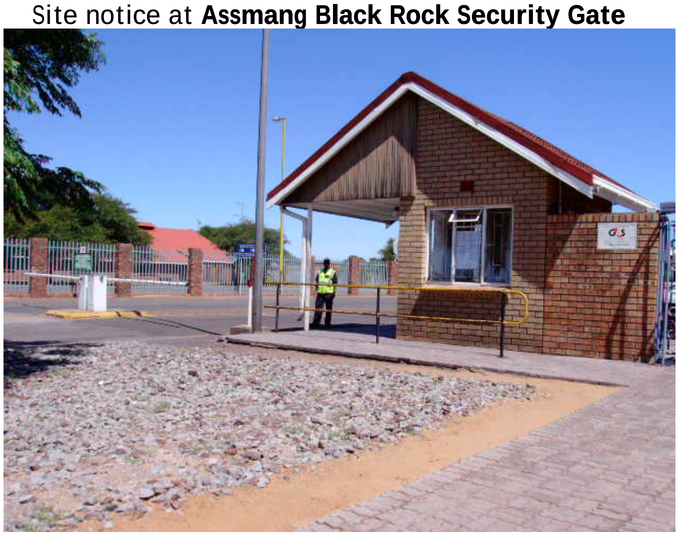
Appendix Eiii: Site notices

Site Notice at **R31 road** to Van Zylrus (immediate route of the proposed powerline)

Site Notice at **Black Rock Village Library**

Site notice at **Black Rock Village Supermarket**

Site notice at **Assmang Black Rock Security Gate**



Appendix Eiv: Advertisements

Diamond Fields Advertiser (20 October 2009)

Tenders

CONSTRUCTION OF A 132 KV POWERLINE BETWEEN KLIPKOP AND UMTU SUBSTATIONS FOR BLACK ROCK MINING OPERATIONS IN TERMS OF SECTION 24 OF THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT (NEMA) (ACT 107 OF 1998)

It is the intention of Eskom Holdings Limited (Eskom), through Assmang Limited Black Rock Manganese Mine (Assmang Black Rock), to construct an overhead powerline with a capacity of 132 kilovolts (kV) between the Klipkop Substation and the Umtu Substation, located in the Kgalagadi district within the Northern Cape Province. The proponent for this project is Assmang Black Rock Mine.

The purpose of the construction of the 132 kV overhead powerline is to provide the Assmang Black Rock Mine with sufficient electricity which the mine will require for their proposed expansion projects in the near future. As part of the construction of the 132 kV overhead powerline, the existing Klipkop Substation (located on Portion 3 of the farm Nchwaning 267) will be upgraded. The upgrade of the Klipkop Substation will be beneficial to the local Black Rock Village and farms in the surrounding areas, whose power supply is provided by the mine.

The proposed overhead powerline construction will entail a linear development of approximately 16 kilometres with 36 metres wide servitude between the Klipkop and Umtu Substations. Eskom is currently considering six (6) possible routes for the location of the powerline. The final route of the proposed powerline still needs to be finalised through thorough environmental investigation.

The construction of a powerline falls within the ambit of the Environmental Impact Assessment (EIA) Regulations promulgated in terms of Section 24 of the National Environmental Management Act (NEMA) (Act 107 of 1998) and will consist of the following activities in accordance with GN R 386 and GN R 387; GG No 28753 of 21/04/2006:

GN R 386, Activity 12:	The transformation or removal of indigenous vegetation of 3 hectares or more;
GN R 386, Activity 14:	The construction of masts of any material or type of any height, including those used for telecommunication broadcasting and radio transmission, but excluding: (a) masts of 15 metres or lower exclusively used (i) by radio amateurs; or (ii) for lighting purposes (b) flag poles and lighting conductor poles.
GN R 386, Activity 15:	A construction of a road that is wider than 4 metres or that has a reserve wider than 6 metres, excluding roads that falls within the ambit of another listed activity or which area access roads of less than 30 metres long.
GN R 386, Activity 16:	The transformation of undeveloped, vacant or derelict land to: (b) Residential, mixed, retail, commercial, industrial or institutional use where such development does not constitute infill and where the total area to be transformed is bigger than 1 hectare.
GN R 387, Activity 1(l):	The construction of facilities or infrastructure, including associated structures or infrastructure for the transmission and distribution of electricity above the ground with a capacity of 120 kilovolts or more.
GN R 387, Activity 2:	Any development activity, including associated structures or infrastructure, where the total area of the development area is, or is intended to be, 20 hectares or more.

GCS (Pty) Ltd as an independent company of environmental consultants has been appointed by ESKOM to conduct the environmental investigations and public participation process for the construction of the 132 kV powerline between the Klipkop and Umtu Substations in terms of the NEMA.

In accordance with the NEMA, Interested and Affected Parties (I&APs) are invited to participate by registering their interest and are encouraged to submit comments regarding the proposed project to GCS (Pty) Ltd. Should you wish to obtain additional information and raise issues, questions or concerns, please contact the persons below:

Cecile Vosloo GCS (Pty) Ltd PO Box 3386 DIAMOND 8305 Tel: (053) 802-6370 (08:00 – 13:00) Fax: (053) 802-6371 E-mail: cecile@gcs-sa.biz	or	Trudy Goliath GCS (Pty) Ltd PO Box 2597 RIVONIA 2128 Tel: (011) 803-5726 (o/h) Fax: (011) 803-5745 E-mail: trudy@gcs-sa.biz

Kalahari Bulletin (22 October 2009)

NETADS 24
netads2.com

Kalahari Bulletin
Tel. 053 712 1472 • 053 712 0303

19 Kennisgewings

DANKIE, M & I MOTORS, vir julle goeie diens. Dankie, Marné, vir die raverkoop-diens. Die Here seën julle. Rudie Roos

KERSMARK: NG KERK KURUMAN. 31 Oktober 2009 vanaf 09:00. Eetgoed en Kersgeskenke.

21 Ontspanning en vermaak

JUMPING CASTLES AND WATER WORMS for hire. For the best prices. ☎Deirdré Nieuwoudt 053 712 0877. 22 Breë Street, Kuruman

22 Persoonlik

Bedanking
Wyle Smittie Smit. Baie dankie aan almal wat ons bygestaan het tydens Smittie se siekte en oorlye. Vir elke ruiker, kaartjie, bord eetgoed en sommer net jul nabyheid. Dit word opreg gewaardeer. Drien, kinders, kleinkinders en familie.

30 Allerlei te koop

DOMPELPOMPE: Tweedehandse dompelpompe te koop asook herstel van pompe, met 'n waarborg. Skakel Jannie 072 755 7689

ESSYS ROSE & STRUIKE te koop. ☎073 389 0716/ 053 384 0308

VIERWIELSLEEPWA vir vervoer van motors of bakkies. Prys R17 000.00 ☎083 524 4985

41 Spesiale dienste

FLORDEK-MATTE EN BLINDINGS: Ons installeer volvloermatte en alle tipe blindings teen die beste pryse. ☎Aubrey 072 747 1991

HANDYMAN/NUTSMAN: Algemene herstelwerk asook swets- en metaalwerk. ☎Schalk 082 828 1425

HYDRO CLEAN: Laat u matte en meubels professioneel stoom-skoonmaak teen die beste pryse! ☎Aubrey 072 747 1991

KURUMAN-DIERE-KLINIEK. Kliniekure: Ma.-Vr. 08:00-17:30. Sa. 09:00-12:00. Konsultasies per afspraak. Skakel 053 712 3037. Sel 082 553 1130

NC GLASS & ALUMINIUM SERVICES
Vir alle glas-, stort- en skuifdeure, asook aluminiumvensterrame, blindings en trellisdeure. ☎Klits: 083 305 3398/ 053 712 3111

NC LAPAS
Vir nuwe lapas, binnebraais, asook onderhoud en herstelwerk aan bestaande lapas. Kom kyk gerus ook na ons groot verskeidenheid paalmeubels! ☎Klits: 083 305 3398/ 053 712 3111

NC PLUMBING SERVICES
Vir alle loodgieter-, bou-, teël-, verfwerk asook riool-verstoppings, ens.
Jou nommer 1 om te skakel. Ook agente vir De Walt-kraggereedskap ☎Klits: 083 305 3398/ 053 712 3111

STOOMSKOONMAAK van volvloermatte en bekleedsels van sitkamerstelle ☎Daniel Meyers by: 072 870 2269/072 182 4009

VIR ALLE staal- en sweiswerke. Klein of groot. Vir pryse skakel Tonie by 084 250 2567

VIR SKADUNET- AFDAKKE teen sakpas-pryse skakel Jannie by 082 877 3071

58 Spysenìering

CUNNINGHAM TEETUIN
Slegs oop op Vrydae 09:30-17:00 en Saterdae 09:30-13:00. Kom geniet die gebak van die dag en iets te drinke. ☎073 226 6225

Eksklusiewe spyseniering vir intieme groepe (maksimum 20 mense) in 'n aangename atmosfeer. ☎Edna 082 567 5973/ Bernice 063 557 2373

60 Vakansie-akkommodasie

Vakansieakkommodasie/ Hartenbos tot Diaz.
Woonstel 100 m van strand. 1-27 Des. R1 050 p.d. Woonstel 100 m van strand. 1-23 Des. R1 050 p.d. 3 slk, 2 badk. R1 050 p.d. slaapplek vir 6, hele vakansie oop. 3 slk, 2 badk, stap na strand. R1 000 p.d. 1-24 Des. 3 slk, 2 badk, modern, seesig. R1 050 p.d. Hele Des. oop. 3 slk, 2 badk, R850 p.d. oop van 1-19 Des. 3 slk, 2 badk, R1 000 p.d. Oop hele vakansie. Huis: Hartenbos. 3 slk, 1 badk, stort, oop hele vakansie, R1 350 p.d.
Huis: Danabaai. 3 slk, 2 badk, modern, seesig. R950 p.d. Oop hele vakansie. ☎ Susan Keuler 083 996 0802

71 Te koop: bakkies

1994 Mazda Drifter 2.6, petrol, LWB, t/b, t/b, CD, r/c, rails, 4x4, R38 000. ☎072 472 8686

1995 Isuzu KB 280D, D/kaj R58 000. 1997 Ford Bantam 1.3, R24 500. ☎072 472 8686/ 071 851 4854. Schweizer-Reneke.

1997 Toyota Raider 2.8D, 4x4, b/h, t/b, r/t, CD, new tyres, rails and en mags, R54 000. ☎072 472 8686

1x 2.5 Isuzu Diesel R35 000 1x 2.8 TD met kap, l/r, k/s vir R50 000. 1 MITSIBISHI 4-TON TROK MET TRALIES R50 000. ☎082 551 4622

73 Te koop: motors

2006 FORD BANTAM 1.6 XLT vir R79 000. ☎083 252 5380

1999 Toyota Tazz 1.6 Sport, R24 000. 1992 Toyota Corolla 1.6, R17 000. ☎072 472 8686. Schweizer-Reneke.

2002 BMW 320D. 151 000 km. Uitstekende toestand. R165 000. ☎083 698 7174

BARGAIN: 1996 Opel Kadette 1.4. Lady owner, fuel saver, excellent condition, photo available. R14 500. ☎072 472 8686

GESOEK vir kontant: motors, antieke motors, bakkies, lorries, trekkers, karavane, ens. ☎072 472 8686 thinus.rossouw@vox.co.za

LAAT WEET watter tipe voertuig u soek, ek sal 'n foto MMS of e-pos. Thinus, Schweizer-Reneke 072 472 8686

WIL U 'n voertuig koop? Besoek webblad: http://kalahariads.blinkweb.com ☎Thinus 072 472 8686/ 053 963 1400

88 Te huur: huise

95 Te koop: besighede

FOR SALE: Business Columbia Curtain Centre. Interested parties can contact Karen Richardson ☎053 712 0041/ 082 341 1440

Winsgewende Puffs & Necks-besigheid te koop. Eienaar moet verkoop weens gesondheid. ☎Elsie 082 826 1491. Leon 079 171 0029

99 Te koop: huise

105 Te huur: eiendomme

LOKAAL in industriële gebied, Kuruman. Werks- of pakplek. Groot 100 vierkante meter. ☎083 524 4985

111 Betrekkings aangebied

BOILERMAKER APPRENTICES
We are looking for suitable persons to train as Boilermakers.
Candidates should have:
- Grade 12 Certificate
- At least N2 qualification in welding/ boilermaking.
Interested applicants may fax their CV and qualifications to 086 509 8866

DIESEL MECHANIC APPRENTICES
We are looking for suitable persons to train as Diesel Mechanics.
Candidates should have:
- Grade 12 Certificate
- At least N2 qualification in motor/diesel mechanics.
Interested applicants may fax their CV and qualifications to 086 509 8866

CONSTRUCTION OF A 132 KV POWERLINE BETWEEN KLIPKOP AND UMTU SUBSTATIONS FOR BLACK ROCK MINING OPERATIONS IN TERMS OF SECTION 24 OF THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT (NEMA) (ACT 107 OF 1998)

It is the intention of Eskom Holdings Limited (Eskom), through Assmang Limited Black Rock Manganese Mine (Assmang Black Rock), to construct an overhead powerline with a capacity of 132 kiloVolts (kV) between the Klipkop Substation and the Umtu Substation, located in the Kgalagadi District within the Northern Cape Province. The proponent for this project is Assmang Black Rock Mine.

The purpose of the construction of the 132kV overhead powerline is to provide the Assmang Black Rock mine with sufficient electricity which the mine will require for their proposed expansion projects in the near future. As part of the construction of the 132kV overhead powerline, the existing Klipkop Substation (located on Portion 3 of the farm Nchwaning 267) will be upgraded. The upgrade of the Klipkop Substation will be beneficial to the local Black Rock Village and farms in the surrounding areas, whose power supply is provided by the mine.

The proposed overhead powerline construction will entail a linear development of approximately 16 kilometres with 36 metres wide servitude between the Klipkop and Umtu Substations. Eskom is currently considering six (6) possible routes for the location of the powerline. The final route of the proposed powerline still needs to be finalised through thorough environmental investigation.

The construction of a powerline falls within the ambit of the Environmental Impact Assessment (EIA) Regulations promulgated in terms of Section 24 of the National Environmental Management Act (NEMA) (Act 107 of 1998) and will consist of the following activities in accordance with GN R 386 and GN R 387; GG No. 28753 of 21/04/2006:

GN R 386, Activity 12:	The transformation or removal of indigenous vegetation of 3 hectares or more;
GN R 386, Activity 14:	The construction of masts of any material or type of any height, including those used for telecommunication broadcasting and radio transmission, but excluding: (a) masts of 15 metres or lower exclusively used (i) by radio amateurs; or (ii) for lighting purposes (b) flag poles and lighting conductor poles.
GN R 386, Activity 15:	A construction of a road that is wider than 4 metres or that has a reserve wider than 6 metres, excluding roads that fall within the ambit of another listed activity or which area accesses roads of less than 30 metres long.
GN R 386, Activity 16:	The transformation of undeveloped, vacant or derelict land to: (b) Residential, mixed, retail, commercial, industrial or institutional use where such development does not constitute infill and where the total area to be transformed is bigger than 1 hectare.
GN R 387, Activity 1(l):	The construction of facilities or infrastructure, including associated structures or infrastructure for the transmission and distribution of electricity above the ground with a capacity of 120 kilovolts or more.
GN R 387, Activity 2:	Any development activity, including associated structures or infrastructure, where the total area of the development area is, or is intended to be, 20 hectares or more.

GCS (Pty) Ltd as an independent company of environmental consultants has been appointed by ESKOM to conduct the environmental investigations and public participation process for the construction of the 132 kV powerline between the Klipkop and Umtu Substations in terms of the NEMA.

In accordance with the NEMA, Interested and Affected Parties (I&APs) are invited to participate by registering their interest and are encouraged to submit comments regarding the proposed project to GCS (Pty) Ltd. Should you wish to obtain additional information and raise issues, questions or concerns, please contact the persons below:

Cecile Vosloo	or	**Trudy Goliath**
GCS (Pty) Ltd		GCS (Pty) Ltd
P.O. Box 3386		PO Box 2597
DIAMOND		RIVONIA
8305		2128
Tel. 053 802 6370 (08:00 – 13:00)		Tel. 011 803 5726 (o/h)
Fax: 053 802 6371		Fax 011 803 5745
E-mail: cecile@gcs-sa.biz		E-mail: trudy@gcs-sa.biz

BETREKKINGS

Licencewise Training requires the service of the following personnel.

The candidates must have the following minimum qualifications:

- Grade 12 or N3.
- Must have experience as an Operator on Surface and Underground mining machines and equipment:
- Surface Mining Equipment - Dump trucks articulated and rigid body dump trucks, front end loaders, excavators, TLB's, Bull Dozers, tractors, drill rigs, grader, Mobile Cranes Code 36. Underground mining Equipment – LHD's, Drill Riggs, Roof Bolters, Mobile Scalers, Dozer, Grader, UV's, Bell Scaler, Manitou's, AD Haulers.
  The candidates must have experience working at a mine and must also be familiar with the Mine Health and Safety act.
- Experience Essential, Candidates must be 28 years or Older, The candidates will be tested on all the machines.
- Preference will be given to qualified, registered assessors. The salary and perks will be negotiable.

Please contact Marius Heystek on 072 404 4042.
Tel/fax 011 896 2292 or e-mail yur CV to licencewise1@mweb.co.za

Kalahari Bulletin (21 January 2010)

99 Te koop: huise

ERA REAL ESTATE Kuruman

•Betree die mark - Kathu
3-slk-woning met ingeboude kaste. Loopafstand van laerskool. Geleë in 'n stil area. Groot motorafdak. Goeiebelegging
R495 000
Cecilia 073 555 5223

•Huis met winkel en erf - Kuruman
Gerieflike 3-slk/3-badk-woning met moderne kombuis met oogstrelige oond. Lieflike kuierplek met ingeboude braai. Plus 1-slk-w/stel
PLUS 689-vk m-erf
R910 000
Cecile 082 775 3165

•Beleggingsmoontlikhede - Wrenchville
3-slk, 1 badk, sitkamer. Woning wat veilig omhein is.
R480 000
Andrew 082 537 0704

•Luukse gastehuis - Kuruman
Spiksplinternuut! 4-ster! Baie goeie netto wins, baie uitbreidingsmoontlikhede!
R5 350 000
Annalie 082 852 2095

•Reg geprys - Kuruman
'n Netjiese 3-slk/2-badk-woning met 2 leefareas, buitebraai en veilige omheining.
R656 000
Carol 072 968 4950

•Absolute tranquility - Kuruman
An amazing tourism opportunity on 568 ha. Borders of the Kalahari. Experience our peacefulness and beauty
R4 700 000
Carol 072 968 4950

ERA REAL ESTATE Kuruman

Op soek na 'n huurder vir u eiendom? Ek kan u help met verhurings aan reeds goedgekeurde huurders.
Dorothy 082 948 2032

R7 150
3 slk/1-badk-woning met ruim, moderne kombuis, binnebraaikuierplek en 'n dubbelmotorhuis
Cecile 082 775 3165

R11 000
Plek vir 6. Gesamentlike kombuis, 4 groot kamers met kogreeling
Cecile 082 775 3165

RE/MAX

TE HUUR
3 slaapkamers, 2 badkamers.
R5 500 p.m.
5 slaapkamers, 3 badkamers, dub-motorhuis.
R7 700 p.m.

TE KOOP
3 slaapkamers, 2-slaapkamer-woonstel.
R899 000.
3 slaapkamers, 1 badkamer, 1 afdak.
R760 000.
3 slaapkamers, 2 badkamers, braaiarea. Enkel-m/huis. 5 afdakke.
R1,6 miljoen.
4 slaapkamers. Ideale leefhuis vir groot gesin. Dub. Garlewe.
R1,55 miljoen.

Skakel
Elretha 083 561 6705
Lizette 083 173 3852

KAMEELDORING EIENDOMME

TE HUUR:
5-slk-huis, 2 b/k. D/motorhuis. R7 700 p.m.
3-slk-huis, 2 b/k. D/motorhuis. R6 500 p.m.
3-slk-huis, 2 b/k. Afdak. R6 000 p.m.
3-slk-huis, 2 b/k. Enkelmotorhuis. R5 000 p.m.

TE KOOP
5-slk/2-b/k-huis, D/motorhuis R1,250 milj.
3-slk/1 b/k Enkelmotorhuis. R670 000.
3 slk, 2 b/k, D/M + 2 woonstelle. Lapa. Swembad R1,350 milj.
3-slk-huis 2 b/k. D/motorhuis. R980 000.

Skakel:
Frikkie 073 273 1762
Marietjie: 072 854 8777.
Kantoor: 053 712 0228
Faks 052 712 0228

NOORDKAAP EIENDOMME
Ons het onder andere die volgende eiendomme te koop.
1. Industriële eiendom met groot stoor en kantore: R550 000 plus BTW.
2. Ontwikkelingserf. Reeds gehersoneer vir ongeveer 15 wooneenhede. Alle dienste is beskikbaar. R700 000, plus BTW. Skakel Albert by 083 412 6218

105 Te huur: eiendomme

LOKAAL in industriële gebied, Kuruman. Groot 100 m² Huur R2850.00 per maand. 083 524 4985

Veritas Eiendomme

TE HUUR:
3 SLK, 2 B/K
R5 500 p.m.
3 SLK, 2 B/K, D/M/H
R6 000 p.m.
3 SLK, 1 B/K, E/M/H
R4 900 p.m.
4 SLK, 2 B/K, D/M/H
R6 500 p.m.
(einde Februarie 2010)

TE KOOP:
Verskeie erwe en woonhuise.
Lieflike Woonhuis te Kimberley.

Skakel ons gerus vir navrae
Elize 083 383 8372

AANDAG ALLE ADVERTEERDERS
Die gebruik van die letter "A", leestekens soos "!" of "@" of die gebruik van syfers met die doel om die advertensie na die bopunt van die klassifikasie-lys te skuif, is streng verbode.
SMALLS NOTICE

111 Betrekkings aangebied

AGENTE GESOEK!!
Begin eie besigheid. Het u eie vervoer? Skakel 082 366 9051 / 082 491 5071

Databklerke benodig
Wil u ekstra geld verdien? Volgens eie ure, in dollars in u Suid-Afrikaanse bankrekening met of sonder 'n rekenaar? SMS u naam en adres vir nodige inligting na 074 148 1394

KATHU:
Groot gevestigde finansiële instelling benodig die dienste van 'n gekwalifiseerde finansiële adviseur in Kathu. Faks CV's aan 086 535 2777

Vacancies at DVD Engineering:
- Fitters
- Boilermakers
- Face Preps with barring & competency B
Fax CV and qualifications/certificates to 086 555 3480.

122 Boedels

KBVS Prokureurs

ALETTA SOPHIA VAN RENSBURG
In die boedel van wyle ALETTA SOPHIA VAN RENSBURG
Beroep: PENSIOENARIS
Datum van afsterwe: 04/04/2009
Identiteitsnommer: 290121 0023 082
Laaste adres: HEUWELSIG NR 12, DOLOMIETSTRAAT, KURUMAN, 8460
Boedelnommer: 924/2009
Die eerste en finale likwidasie- en distribusierekening in bogemelde boedel sal vir 'n tydperk van 21 dae vanaf 22 JANUARIE 2010 ter insae lê by die Meester van die Hooggeregshof, Kimberley en van die Landdros, KURUMAN.
GETEKEN te KURUMAN op die 12de dag van Januarie 2010.
KBVS PROKUREURS
POSBUS 566
BEAKESTRAAT 51
KURUMAN
8460

MARIA JOHANNA CATHARINA WESSELS
In die boedel van wyle MARIA JOHANNA CATHARINA WESSELS
Identiteitsnommer: 281026 0010 088 en nagelate gade HENDRIK ALBERTUS WESSELS
Identiteitsnommer: 421100 5018 083 van Kareelaan 36, KURUMAN distrik KURUMAN
Boedelnommer: 900/2009.
Kennis geskied hiermee dat die eerste en finale likwidasie- en distribusierekening ter insae sal lê by die kantore van die Meester van die Hooggeregshof, Kimberley en die Landdros Kuruman vir 'n tydperk van 21 dae gereken vanaf 22 Januarie 2010.
OUDITEURE: FOURIE, BESTER EN KRUGER OUDITEURE
HANMAR GEBOU, STEWARTSTRAAT 32, KURUMAN, 8460

SEBULOAEMANG FANK OAGENG
In die boedel van wyle SEBULOAEMANG FANK OAGENG en nagelate gade MASETSWANA LENA OAGENG, woonagtig in die Distrik van Kuruman, Distrik Kuruman
Boedelnommer: 2580/2007
Kennis geskied hiermee dat die eerste en finale likwidasie- en distribusierekening in bogenoemde boedel ter insae sal lê by die Kantoor van die Meester van die Hooggeregshof te MMABATHO en 'n afskrif daarvan by die Landdroskantoor, KURUMAN, vir 'n tydperk van 21 (EEN EN TWINTIG) dae vanaf 22 JANUARIE 2010.
PROKUREURS: DUVENHAGE & VAN DER MERWE
POSBUS 41
KURUMAN
8460

AANDAG ALLE ADVERTEERDERS
Die gebruik van die letter "A", leestekens soos "!" of "@" of die gebruik van syfers met die doel om die advertensie na die bopunt van die klassifikasie-lys te skuif, is streng verbode.
SMALLS NOTICE

KENNISGEWINGS

ASSMANG LTD - BLACK ROCK MANGANESE MINE
PROPOSED 132kV POWERLINE PROJECT

ENVIRONMENTAL IMPACT ASSESSMENT FOR POWERLINE
DEAT REF NO: 12/12/20/1616

Notice is given in terms of Chapter 5 of Act No. 107 of 1998: National Environmental Management Act, and the corresponding regulations.

It is the intention of Eskom Holdings Limited (Eskom), through Assmang Limited (Assmang) Black Rock Manganese mine, to construct an overhead powerline with a capacity of 132 kiloVolts (kV) between the Klipkop Substation and the Umtu Substation, located in the Kgalagadi District within the Northern Cape Province.

The purpose of the construction of the 132kV overhead powerline is to provide the Assmang Black Rock Manganese mine with sufficient electricity which the mine will require for their proposed expansion projects in the near future. As part of the construction of the 132kV overhead powerline, the existing Klipkop Substation (located on portion 3 of the farm Nchwaning 267) will be upgraded.
The upgrade of the Klipkop Substation will be beneficial to the local Black Rock Village and farms in the surrounding areas, whose power supply is provided by the mine. The final route of the proposed powerline still needs to be finalised.

The construction of a powerline falls within the ambit of the Environmental Impact Assessment (EIA) Regulations promulgated in terms of Section 24 of the National Environmental Management Act (NEMA) (Act 107 of 1998).

In terms of Chapter 5 of NEMA and the GNR 386 and 387 in Government Gazette No. 28753 of 21 April 2006, Eskom is required to conduct an Environmental Assessment and submit a Basic Assessment and/or an Environmental Impact Assessment Report (EIA) and an Environmental Management Programme (EMP) to the Department of Environmental Affairs and Tourism (DEAT), in respect of the listed activities in GNR 386 and 387. The following listed activities will be applied for, under GNR 386, No. 12, 14, 15, 16 and under GNR 387, No. 1(l), 2. All activities will be encompassed in a holistic full EIA Report, as recommended by DEAT.

Ivuzi (Pty) Ltd has been appointed as the independent environmental consultants to undertake the necessary environmental investigations required for the proposed powerline project, and to guide through the mandatory environmental processes.

The Scoping Report is available for review and comments. **The report is available at the following venues:**
- **The public library at the Black Rock Village; and**
- **The Assmang Black Rock Manganese Mine.**

If you wish to receive an electronic copy on CD in PFD format contact Ivuzi at the following contact details:

Contact Person:	Cecile Vosloo	or	Contact Person:	Trudy Goliath
E-mail:	cecile@gcs-sa.biz		E-mail:	trudyg@gcs-sa.biz
Fax:	053 802 6371		Fax:	011 803 5745
Postal address:	PO Box 3386 Diamond 8305		Postal Address:	PO Box 2597 Rivonia 2128

The Scoping Report review period is 30 days, all comments, suggestions and issues must be given to Ivuzi at details above and must be received **before 15 February 2010.**

BETREKKINGS

TSANTSABANE

7 eleven · exel · BIMBO'S

VAKATURE:

TSANTSABANE 7/11 POSTMASBURG

ADMINISTRATIEWE KLERK

Die aansoeker moet beskik oor die volgende:
- Graad 12
- Administratiewe ondervinding
- Rekenaarvaardigheid (Word en Excel)
- Moet onder druk kan werk
- Goeie kommunikasievaardighede ('common sense')

Stuur asb. CV vir aandag
A. Wahl,
e-posadres: Annemarie@jimbos.co.za
Telefoon nr: 053 313 1101

VEILINGS

NOORDKAAP LEWENDEHAWE VRYBURG BIED MET TROTS AAN

2de ALLE RAS BOKVEILING

Woensdag 3 Feb. 2010 - 11:00 - TE VRYBURG SKOUGRONDE

AANBOD:	RAMME -	OOIE
BOERBOKKE	5	150
KALAHARI REDS	5	100
SAVANNA	5 (Stoet)	60
(Algehele uitverkoping van Stoet)		
SKILLERBOKKE	5	45
APPELBOKKE	5	60
(Algehele uitverkoping van Kudde)		
MOZAMBIQUE BOKKE		10
DRIEKLEUR BOKKE		10

435 BOKKE

AFSLAERSNOTA: Hierdie is goeie geleentheid om AFRIKA bokke te bekom. Die Savanna stoetbokke is een van die beste kuddes in die land.

MOET NIE HIERDIE VEILING MIS LOOP NIE.

VERKOOPSTERME: Slegs kontant of bankgewaarborgde tjeks, elektroniese bankdienste ook beskikbaar.

LEWENDEHAWE KOOP BPK NOORDKAAP VRYBURG LIVESTOCK CO-OP LTD

NAVRAE: NKLH - 053 927 3871 Christo vd Merwe: 082 444 4952 Bertie Aucamp: 082 772 8821 Danie du Preez: 083 441 0214

SALE IN EXECUTION

In the High Court of South Africa (Northern Cape Division) Case No 1593/09

In the matter between:

METSON MANUFACTURING CC Plaintiff

and

DANIE JACOBSZ t/a DANIE JACOBSZ LANDBOUDIENSTE Defendant

In pursuance of a judgment of the above Honourable Court, dated 5 November 2009, and a Warrant of Execution dated 2 December 2009, the undermentioned movable goods will be sold in execution by Public Auction to the highest bidder at the

Sheriff of the High Court, 23 Kerk Street, Hopetown on Friday, 7 May 2010 at 10:00

THE GOODS TO BE SOLD ARE THE FOLLOWING:

2-Axle Semi-trailer.

3-Axle Semi-trailer.

CONDITIONS OF SALE:

1. The sale is for cash.
2. The goods are sold voerstoots and no guarantee is furnished.
3. The Purchaser shall be liable to pay VAT, if any, in respect of the sale.

Signed and dated at Kimberley on this the 26th March 2010.

ELLIOTT, MARIS, WILMANS & HAY
Attorneys for Plaintiff
Cheapside, Stockdale Street
Kimberley
EAP/NJ/K2857

THE SHERIFF
High Court, Hopetown

DFAMEL16/04CL

GEREGTELIKE VERKOPING

In die Landdroshof vir die distrik van Kimberley gehou te Kimberley Saak nr: 8174/09

In die saak tussen:

HENRI COETZEE h/a L COETZEE PROKUREUR Eiser

en

MNR JAMES GALLOWAY Verweerder

Kragtens 'n Vonnis van bogenoemde Agbare Hof gedateer 9 Maart 2010 en 'n Lasbrief tot Eksekusie sal die ondergemelde goedere op

5 Mei 2010 om 10:00 te Shadow's Pub & Grill, Schreinerstraat, Kimberley

deur die Balju aan die hoogste bieder geregtelik verkoop word, naamlik:

1 x Panasonic Televisie (Flats creen); 27 x Kroegstoele; 2 x Acer Rekenaar Monitors en Hardeskyf; 1 x Acer Hardeskyf; 1 x Defy Dubbeldeur Yskas; 1 x Scotsman Yskas; 2 x Dubbeldeur Yskaste; 1 x JVC Sound System en 4 Luidsprekers; 1 x 5-sitplek Leerstel; 1 x Samsung Drukker; 1 x Acer Skerm en Dell Sleutelbord.

Geteken te Kimberley op hierdie 14de dag van April 2010.

L COETZEE POKUREUR
Prokureur vir die Eiser
Roylglen Office Park
h/v Memorialweg en Welgevondenlaan, Kimberley
Verw: L Coetzee

DFAMEL16/04CL

For all your Auction Advertising

Tel: 053 832 6261

Classifieds

MAGARENG MUNICIPALITY

ERRATUM

PUBLIC NOTICE CALLING FOR INSPECTION: OF VALUATION ROLL AND LODGING OF OBJECTIONS

Notice is hereby given in terms of Section 49(1) (a) (i) of the Local Government: Property Rates Act, 2004 (Act No 6 of 2004), hereinafter referred to as "Act" that the valuation roll for the financial commencing **1 July 2010** is opened for public inspection at the Magareng Municipal Civic Centre, Magrietha Prinsloo Street, Warrenton from the **15 April 2010** to the **28 May 2010**.

An invitation is hereby is hereby made in terms of Section 49(1) (a) (i) of the Act that any owner of property or other person who desires should lodge an objection with the Municipal Manager in respect of any matter reflected in, or omitted from the valuation roll within the above-mentioned period.

Attention is specifically drawn to the fact that in terms of Section 50 (2) of the Act an objection must be in relation to a specific individual property and not against the valuation roll as such. The form for lodging of an objection is obtainable at Magareng Municipal Civic Centre, Magrietha Prinsloo Street, Warrenton. The completed form must be returned to the following address by not later than **12:00** on **28 May 2010**.

All enquiries must be directed to Mr HS Oberholzer at (053) 497-3111.

Municipal Manager
Magareng Municipality
PO Box 10
Warrenton
8530

DFAGRETHE16/04CL

INSOLVENTE BOEDEL VEILING VOERTUIE, GROOT VOORRAAD ELEKTRIESE WARE, VERTOONRAKKE EN KANTOOR TOERUSTING TE KURUMAN OP WOENSDAG, 28 APRIL 2010 om 11:00

hta HUGO & TERBLANCHE AUCTIONEERS | AFSLAERS

Behoorlik daartoe gelas deur die Likwidateur van WOODROW ENGINEERING AND SALES CC, sal ons per openbare veiling te die hoek van Bind- en Industrialstrate, Kurdustria, Kuruman, die onderstaande bates te koop aanbeid.

Voertuie:
2007 GWM Bakkie, 2005 Ford Ranger 2.5 Bakkie.

Elektriese Voorraad:
Groot hoeveelheid elektriese voorraad bestaande uit: gloeilampe, verdelers, ligte, pype, termostate, kabel, laste ensovoorts, ensovoorts.

Rakke en Kantoor Toerusting:
Hoeveelheid staal rakke, telefoonstelsel, drukker/faksmasjien, kasregisters, rekenaars, liasseerkabinette, stoele en tafels.

Verkoopswaardes:
Los goedere: Kontant, bankgewaarborgde tjek of Internet betalings plus 10% koperskommissie plus BTW op dag van veiling. Alle finansiëring moet vooraf klaar gereël wees. Vooraf registrasie is 'n vereiste en sal daar by registrasie bewys van betaalvermoë geverg word. Geen uitsondering sal gemaak word nie. Die Afslaers behou die reg voor om sonder kennisgewing items te voeg of geadverteerde items te ontrek voor die veiling. BTW nommer moet beskikbaar wees.

Navra skakel: Kantoor-ure: (053) 574-0002
Dawie: 082-570-5774 Eddie: 073-326-7777 Jan: 082-555-9084

DFAGRETHE16/04CL

ASSMANG LTD - BLACK ROCK MANGANESE MINE PROPOSED 132 KV POWERLINE PROJECT

ENVIRONMENTAL IMPACT ASSESSMENT FOR POWERLINE
DEAT REF NO: 12/12/20/1616

Notice is given in terms of Chapter 5 of Act No 107 of 1998: National Environmental Management Act, and the corresponding regulations.

It is the intention of Eskom Holdings Limited (Eskom), through Assmang Limited (Assmang) Black Rock Manganese Mine, to construct an overhead powerline with a capacity of 132 kiloVolts (kV) between the Klipkop Substation and the Umtu Substation, located in the Kgalagadi District within the Northern Cape Province.

The purpose of the construction of the 132 kV overhead powerline is to provide the Assmang Black Rock Manganese Mine with sufficient electricity which the mine will require for their proposed expansion projects in the near future. As part of the construction of the 132 kV overhead powerline, the existing Klipkop Substation (located on portion 3 of the farm Nchwaning 267) will be upgraded. The upgrade of the Klipkop Substation will be beneficial to the local Black Rock Village and farms in the surrounding areas, whose power supply is provided by the mine. The final route of the proposed powerline still needs to be finalised.

The construction of a powerline falls within the ambit of the Environmental Impact Assessment (EIA) Regulations promulgated in terms of Section 24 of the National Environmental Management Act (NEMA) (Act 107 of 1998).

In terms of Chapter 5 of NEMA and the GNR 386 and 387 in Government Gazette No. 28753 of 21 April 2006, Eskom is required to conduct an Environmental Assessment and submit a Basic Assessment and/or an Environmental Impact Assessment Report (EIA) and an Environmental Management Programme (EMP) to the National Department of Environmental Affairs and Tourism (DEAT), in respect of the listed activities in GNR 386 and 387. The following listed activities will be applied for, under GNR 386, No 12, 14, 15, 16 and under GNR 387, No 1(i), 2. All activities will be encompassed in a holistic full EIA 7 EMP Report, as recommended by DEAT.

Ivuzi (Pty) Ltd has been appointed as the independent environmental consultants to undertake the necessary environmental investigations required for the proposed powerline project, and to guide through the mandatory environmental processes.

The EIA & EMP Report is available for public review and comments from 13 April 2010 until 13 May 2010. The report is available at the following venues:

- **The public library at the Black Rock Village; and**
- **The Assmang Black Rock Manganese Mine.**

If you wish to receive an electronic copy of this EIA & EMP Report on CD in PFD format contact Ivuzi at the following contact details:

Contact person:	**Cecile Vosloo**	*or*	Contact person:	**Trudy Goliath**
E-mail:	cecile@gcs-sa.biz		E-mail:	trudyg@gcs-sa.biz
Fax:	(053) 832-2152		Fax:	(011) 803-5745
Postal address:	PO Box 3386 Diamond 8305		Postal address:	PO Box 2597 Rivonia 2128

The EIA & EMP Report review period is 30 days, all comments, suggestions and issues must be given to Ivuzi in writing at details above and must be received on or before **13 May 2010**.

A **public meeting** will also be held to discuss the outcomes of the EIA & EMP Report and Specialists Reports.

Date: 21 April 2010
Time: 15:00
Venue: Black Rock Recreational Club, Black Rock Village
Should you wish to attend this meeting, please RSVP to the above contact details.

DFAANEL16/04CL

AUCTIONS

AUCTION ADVERTISEMENTS
Contact us on
053 832 6261

Aucor AFRICA'S AUCTION AUTHORITY — BANK REPO VEHICLE AUCTION

THURSDAY, 22 APRIL @ 10:30
1 KRUGER AVENUE, ESTOIRE, BFN

Per Instruction by the Executors, The Repo Managers & Vendors concerned, Aucor will supplement and sell the following:

ABSA — MFC — debis Fleet Management
Mercedes-Benz Financial Services

BANK REPO & LIQUIDATION CARS, SUPER BAKKIES, SUV's, MPV's, QUAD BIKES, etc.

09 HONDA TRX 450 ER QUAD
09 SUZUKI LTZ 400
08 TOYOTA HILUX 2.5D-4D LDV
08 HONDA JAZZ 1.4I
08 VOLKSWAGEN CRAFTER 50 HR80 PANEL VAN
08 FIAT STRADA 1.2 EL
08 MAZDA 2 1.3 DYNAMIC
07 TOYOTA COROLLA 140I
2 X 07 VOLKSWAGEN CITI 1.4I
2 X 07 TATA INDICA 1.4 LE
07 VOLKSWAGEN POLO GTI 1.8
07 ISUZU KB 300 TDI LX DOUBLE CAB
07 FORD KA
06 NISSAN Z350 COUPE
06 MITSUBISHI COLT 2.8 TDI CLUB CAB
06 HYUNDAI BAKKIE 2.6I D
06 FORD FIESTA 1.4I
06 DAIHATSU SIRION 1.3I
05 TOYOTA TAZZ 130
05 VOLKSWAGEN VELOCITI 1.6
05 VOLKSWAGEN VELOCITI 1.4
05 VOLKSWAGEN GOLF 1.9 TDI
05 AUDI A4 2.0 EXECUTIVE
05 MITSUBISHI COLT 2000 LWB LDV
3 X 05 ISUZU KB 300 TDI LX LWB LDV
05 RENAULT CLIO 1.4
05 MAZDA 3 1.6 DYNAMIC
04 TOYOTA HILUX 2700I RAIDER LDV
04 HYUNDAI BAKKIE 2.6I D
04 FORD BANTAM 1.6I
03 MERCEDES BENZ C220 CDI
03 MITSUBISHI COLT CLUB CAB
03 OPEL CORSA UTILITY 1.4I LDV
03 NISSAN ALMERA 1.6 LUXURY
03 BMW 320D
01 VOLVO S60 2.4
01 MAZDA ETUDE 160IE
00 VOLKSWAGEN JETTA 1.6
00 VOLKSWAGEN POLO CLASSIC
00 OPEL ASTRA 1.6
99 BMW 323I
98 TOYOTA COROLLA 160I GLE
98 MERCEDES BENZ C200
98 FORD FAIRMONT
98 FORD FALCON XR6 (FACELIFT)
97 TOYOTA HILUX 2400D LDV
97 VOLKSWAGEN CARAVELLE 2.0
97 MITSUBISHI COLT 2000 DOUBLE CAB
96 VOLKSWAGEN JETTA CLX 1
96 OPEL CORSA 130I

MISCELLANEOUS

07 SANDSTONE CUTTING MACHINE
04 LINDE H25 FORKLIFT
05 RUPES 402 DRY FLATTING SYSTEM

VIEWING: WEDNESDAY, 21 APRIL (09:00 - 16:00)

CONDITIONS: A Refundable deposit of R10 000 is payable by bank guaranteed cheque or EFT. NO CASH WILL BE ACCEPTED. A Documentation Fee of R950 + VAT will be payable on each lot sold. All offers exclude VAT. All goods are sold voetstoots.

af AUCTION FINANCE — For financing contact: Celeste: 082 374 5078

Visit: www.aucor.com or phone (051) 433 2872

Black Rock 132kV Powerline Project

Public Feedback Meeting – EIA & EMP

28/04/2010

Welcome

Meeting Agenda

- Meeting Objectives
- Project Background
- EIA Process and Objectives
- Specialist Investigations
- Specialist Findings
- Questions
- Contact Details

2

Meeting Objectives

Objective of the Feedback Meeting:

- Provide the public with feedback on the current status of the proposed powerline project and environmental processes;
- Discuss the outcomes of the Environmental Impact Assessment:
  - possible impacts the proposed powerline project may have on the environment, according to findings of the various specialist studies;
  - mitigation measures that will be applied to these impacts in order to minimise the effects on the environment;
- Provide the public with an opportunity to raise any concerns/issues they may have in terms of the proposed project and EIA/EMP Report.

3

Project Background

It is the intention of ESKOM, through the Assmang Black Rock Manganese Mine, to construct an overhead powerline with a capacity of 132 kiloVolts (kV) between the Klipkop Substation and the Umtu Substation, Kgalagadi District (Northern Cape Province).

The Klipkop Substation is located on Portion 3 of the Farm Nchwaning 267 and the Umtu Substation is located on the Remaining Portion of the Farm Olive Pan 282.

The purpose for the 132kV overhead powerline is to provide Assmang Black Rock Manganese Mine with sufficient electricity, which the mine will require for their proposed expansion projects in the near future.

Project Background continue

As part of the powerline project, the existing Klipkop Substation will be extended by approximately 40m.

The extension will be beneficial to the local Black Rock Village and farms in the surrounding areas, whose power supply is provided by the mine.

The proposed powerline construction will entail a linear development with a 31m wide servitude (15.5m either side of the centreline) between the Klipkop and Umtu Substations.

Project Background continue

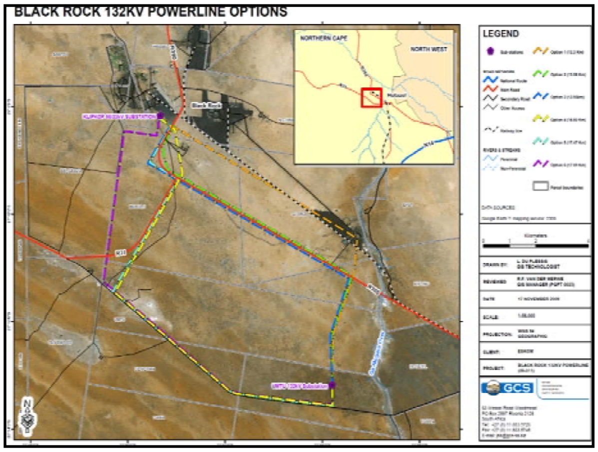
Originally ESKOM considered six possible corridor alignments to be investigated. Only one corridor will be required to be selected as the best possible route for the construction of the 132kV powerline.

Three corridors (Options 1, 2 & 3) were eliminated from further investigation due to the main reason that they would have crossed an area earmarked for mining by the Kalahari Resource Umtu Mine.

Therefore further environmental investigation was conducted on Options 4, 5 and 6.

Ivuzi (now known as GCS) was appointed to conduct the environmental impact assessment to determine the potential impacts associated with the proposed powerline and recommend the best suitable corridor option for construction.

BLACK ROCK 132KV POWERLINE OPTIONS



Environmental Process & Requirements

Authorisation for the construction of the powerline and related infrastructure is required in terms of the Environmental Impact Assessment (EIA) Regulations promulgated in the National Environmental Management Act (Act 107 of 1998).

In terms of Section 24C (2) of NEMA, if ESKOM is the proponent of the proposed project, the National Department of Water and Environmental Affairs (DWEA) is regarded to be the competent authority for authorisations and all applications and reports need be sent to DWEA.

Environmental Process & Requirements

Therefore an Application for Environmental Authorisation in terms of NEMA was lodged with DWEA for the approval of the following listed activities:

Number of the relevant notice:	Activity	Description of activity:
GN R. 386	12	The transformation or removal of indigenous vegetation of 3 hectares or more.
	14	The construction of masts of any material or type of any height, including those used for telecommunication broadcasting and radio.
	15	The construction of a road that is wider than 4 meters or that has a reserve wider than 6 metres, excluding roads that falls within the ambit of another listed activity or which area access roads of less than 30 metres long.
	16	The transformation of undeveloped, vacant or derelict land to – (b) Residential, mixed, retail, commercial, industrial or institutional use where such development does not constitute infill and where the total area to be transformed is bigger than 1 hectare.

Environmental Process & Requirements

Therefore an Application for Environmental Authorisation in terms of NEMA was lodged with DWEA for the approval of the following listed activities:

Number of the relevant notice:	Activity	Description of activity:
GN R. 387	1(l)	The construction of facilities or infrastructure, including associated structures or infrastructure for the transmission and distribution of electricity above the ground with a capacity of 120 kilovolts or more.
	2	Any development activity, including associated structures and infrastructure, where the total area of the developed area is, or is intended to be, 20 hectares or more.

Black Rock Powerlinne EIA Process

Environmental Authorisation Process	Date of Importance
Submit application form to the DWEA (National)	7 August 2009
Compilation of draft Scoping Report	*(No timeframe)*
I&AP review of draft Scoping Report (30 days)	From 13 January 2010 Until 15 February 2010
Submit final Scoping Report to DWEA (30 days review)	30 March 2010
Compilation of draft EIA/EMP	*(No timeframe)*
I&AP review of draft EIA/EMP (30 days)	From 13 April 2010 Until 13 May 2010
Compilation of final EIA/EMP	*(No timeframe)*
Submit final EIA/EMP to authorities (60 days review)	18 May 2010
DEAT Accept or Reject EIA/EMP Grant/refuse project – issue Record of Decision (ROD) (45 days)	02 July 2010
The ROD is sent to all registered I&APs and they have 10 days to lodge an appeal with the relevant authority	

EIA & EMP Objectives

Objectives of the EIA (Environmental Impact Assessment)

- Assess all possible environmental impacts associated with the proposed powerline project during the construction and operational phases.
- Assess environmental impacts in terms of the following aspects:
  - Archaeology;
  - Avifauna;
  - Ecology (fauna and flora);
  - Soils, land use and land capability;
  - Surface water; and
  - Visual.

Objectives of the EMP (Environmental Management Plan)

- Provide mitigation measures that will be applied to the impacts in order to minimise the effects of the project on the environment.

Specialist Investigations

As the proposed project will take place within an area with minimal to very little environmental disturbances, the following specialist investigations were conducted to determine the impacts of the proposed powerline on the environment:

- Archaeological and Heritage Impact Assessments;
- Avifauna Impact Assessments;
- Ecological Impact Assessments (fauna and flora);
- Soils, land use and land capability Impact Assessments;
- Surface water Impact Assessments; and
- Visual Impact Assessments.

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Specialist Findings

- The following slides will focus on the main findings of the specialists studies in terms of the environmental impacts associated with the proposed project.
- We will look at:
  - Archaeology;
  - Avifauna;
  - Ecology (fauna and flora);
  - Soils, land use and land capability;
  - Surface water; and
  - Visual
- After discussing the main impacts, the Environmental Management Measure for each individual environmental aspect investigated will be discussed.

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Archaeological Impacts & Mitigation Measures

Key Findings:
No archaeological or cultural heritage resources were identified during the archaeological assessment.

Mitigation Measures:
Should any archaeological or cultural heritage resources be identified during the course of construction the developer should immediately cease the construction operation in the vicinity of the find and report the site to SAHRA. A qualified archaeologist will be appointed to assess the findings and propose the correct mitigation measures if possible.

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Avifauna Key Findings

Key Findings:

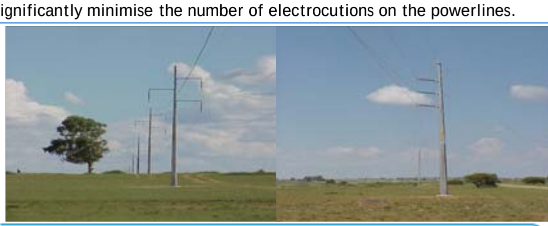
- A total of 54 species were detected within the study area.
- Most abundant Species: White-browed Sparrow Weaver (*Plocepasser mahali*) and Southern Masked Weaver (*Ploceus velatus*).
- Species richness was fairly low due to homogenous nature of the study area.
- Although no threatened bird species were detected during the avifaunal assessment, they may occur within the study area. This does not mean that they would not occur within the area.
  - E.g. Martial Eagle (*Polemaetus bellicosus)* have extremely large home ranges and might be found on occasion within the study area.

Avifauna Key Impacts & Mitigation Measures

Key Impacts
Collision of birds with overhead cables – Death/injury to bird species.
Mitigation Measures
Two mitigation measures are proposed: •alignment of the powerline away from topographical features to limit/prevent collisions; and •fitting appropriate marking devices (such as bird flappers) to make the line more visible.

Avifauna Key Impacts & Mitigation Measures

Key Impacts
Electrocution of birds on the tower structure.
Mitigation Measures
Eskom plans to utilise the mono pole bird friendly structure which will significantly minimise the number of electrocutions on the powerlines.



Avifauna Key Impacts & Mitigation Measures…

Key Impacts

Impact on local bird community due to disturbance during construction.

Mitigation Measures

- Habitat clearance must remain at an absolute minimum and restricted to site specific area.
- Construction workers must remain within the designated work areas.
- If any breeding birds are found within the servitude the Environmental Control Officer (ECO) will need to notify the ornithologist within the Northern Cape Department of Environment, Tourism and Conservation.

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Avifauna Key Impacts & Mitigation Measures…

Key Impacts

Impact on local bird community due to loss of habitat.

Mitigation Measures

- If possible the servitude should follow existing roads where possible and should not cut across undisturbed natural habitat.
- All construction and maintenance activities must be undertaken in accordance with Eskom environmental best practise standards.
- All construction and access roads should be restricted in size as much as possible.

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Avifauna Key Impacts & Mitigation Measures…

Key Impacts

Impacts of bird species upon the powerline:

- Bird Pollution (Streamers and faeces build up) – faulty insulators

Mitigation Measures

- Eskom has indicated that it intends to utilise the mono pole bird-friendly structure. The design of the tower needs to incorporate perch deterrents in the area directly above the insulator strings to ensure that bird species are not given the opportunity to defecate on the string.

Key Impacts

Impacts of bird species upon the powerline:

- Bird Nesting on the tower structures (fire hazard)

Mitigation Measures

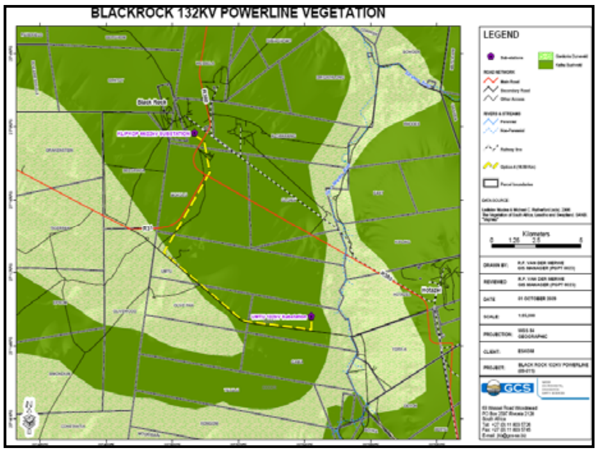
- Eskom has indicated that it intends to utilise the mono pole bird-friendly structure. The design of the tower needs to incorporate perch deterrents in the area directly above the insulator strings to ensure that bird species are not given the opportunity to nest above these strings.

WATER
ENVIRONMENTAL
ENGINEERING
EARTH SCIENCES
GIS

Ecological Key Findings

Key Flora Findings:

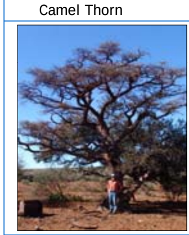
- The study area falls within the boundaries of two vegetation types, namely the Kathu Bushveld and the Gordonia Duneveld.



Ecological Key Findings

Key Flora Findings continue:

•Three of the tree species found in the study area are protected in terms of Section 12 of the National Forests Act namely:

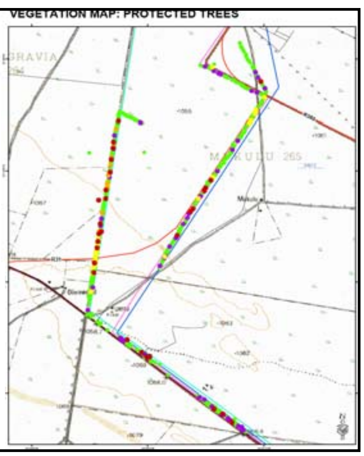
Camel Thorn	Shepherd's Tree	Grey Camel Thorn
		

Ecological Key Findings

Key Flora Findings continue:

- A total of 956 individuals and/or clusters of these protected species were recorded within the study area.

Protected Trees



HIGHLY PROTECTED

- Rare should not be disturbed

TREE SPECIES

- A. erioloba x A. haematoxylon
- Acacia haematoxylon
- Boscia albitrunca
- Acacia erioloba

Ecological Key Findings

Key Flora Findings continue:

- **Protected Plant Species**:
  - Two of the plant species recorded within the study area are protected in the Northern Cape Province in terms of the Nature and Environmental Conservation Ordinance, 1974, namely vleilelie (*Nerine laticoma)* and (*Pergularia daemia* var*. daemia)*.
- **Weeds and Alien Vegetation**
  - Two alien weeds and invasive plants were recorded within the borders of the study area, i.e. White-flowered Mexican Poppy and Prickly Pear.
  - Both Category 1 Weed → plants are prohibited plants, not tolerated in rural or urban areas. These plants may not be planted or propagated, nor be transported or be allowed to disperse.

Flora Impacts & Mitigation Measures

Key Impacts	
The destruction of protected tree species for site clearing purposes and during routine maintenance visits to the area.	
Mitigation Measures	
Avoid destruction wherever possible and replace with trimming where possible. A permit should be obtained beforehand if destruction or trimming is planned.	
Key Impacts	
The destruction of protected plant species for site clearing purposes and during routine maintenance visits to the area.	
Mitigation Measures	
Avoid destruction wherever possible and where destruction cannot be altogether avoided, appoint suitably qualified specialists to sweep areas to be cleared prior to construction in order to relocate such plants to e.g. botanical gardens or nurseries. A permit should be obtained beforehand if destruction is planned.	

Flora Impacts & Mitigation Measures ...

Key Impacts	
The destruction of protected tree and/or plant species by workers for medicinal use or use as fire wood.	
Mitigation Measures	
Give awareness training to workers regarding the conservation status of protected plants prior to the commencement of construction and implement a fining system where individuals who are caught destructing protected trees or plants for whatever purpose are penalised financially.	
Key Impacts	
An increase in the possibility of veld fires as a result of discarded cigarette stumps or fires made by construction and maintenance workers.	
Mitigation Measures	
Fires should only be made in cleared areas in structures specifically constructed for this purpose. Workers should be given awareness training regarding the fire hazard of the area. Fire extinguishers should be available on site.	

Flora Impacts & Mitigation Measures ...

Key Impacts	
An increase in the number of alien weeds and invasive plants in disturbed areas.	
Mitigation Measures	
Limit vegetation clearing to the absolute minimum and control individuals of alien weeds and invasive plants in disturbed areas according to the requirements of Regulations 15(a) and (e) of the regulations made in terms of Section 29 of the Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983).	

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Ecological Key Findings

Key Fauna Findings:

The following mammals are commonly found within the area:

COMMON NAME	COMMON NAME
Cape Hare	Warthog*
Suricate	Grey Rhebok*
Cape Ground Squirrel	Kudu*
Springbok*	Pangolin
Bat-eared Fox*	Porcupine
Black-backed Jackal	Spring Hare
Caracal	Steenbok*
Common Duiker*	Aardvark*
Gemsbok*	Hedgehog*
Silver Jackal*	Striped Polecat

** Protected species (Nature and Environmental Conservation Ordinance, 1974)*

Fauna Impacts & Mitigation Measures ...

Key Impacts
The setting of snares or traps for the killing of mammals by workers.
Mitigation Measures
Draft and Implement a strict “no poaching” policy. Give awareness training to workers regarding the total prohibition of poaching in the study area and surrounds and implement a fining system where individuals who are caught poaching are penalised financially.
Key Impacts
The destruction of animal habitats that are dependant on protected trees at some stage during their life cycle.
Mitigation Measures
Avoid destruction wherever possible and replace with trimming where possible. A permit should be obtained beforehand if destruction or trimming is planned.

Fauna Impacts & Mitigation Measures ...

Key Impacts
A decrease in the number of food sources available to animals.
Mitigation Measures
Avoid destruction wherever possible and replace with trimming where possible. A permit should be obtained beforehand if destruction or trimming is planned.
Key Impacts
A decrease in the number of shade trees available to animals.
Mitigation Measures
Avoid destruction wherever possible and replace with trimming where possible. A permit should be obtained beforehand if destruction or trimming is planned.

Fauna Impacts & Mitigation Measures ...

Key Impacts
An increase in instances of littering by workers working in the area, which may lead to animal suffocations and deaths.
Mitigation Measures
Draft and Implement a strict "no littering" policy. Give awareness training to workers regarding the total prohibition of littering in the study area and surrounds and implement a fining system where individuals who are caught littering are penalised financially. Also ensure that an adequate number of covered rubbish receptacles are available during construction.

Soils, Land Use and Capability Findings

Key Findings:

Soils

- The soils in the region are typical of the Kalahari fine-grained sands;
- The major soil forms are of the orthic Hutton phase. These soils are freely drained, deep and sandy.
- The Hutton soils have low dryland agricultural potential due to the sandy and poor water retention capacity characteristics.

Soils, Land Use and Capability Findings...

Key Findings:

Land Use

- The main land use for this area is grassland.

Land Capability

- The main land capability for this area is arable.

Soils, Land Use and Capability
Impacts & Mitigation Measures

Key Impacts
Loss of soil due to exposed surface susceptible to wind and water erosion during construction phase.
Mitigation Measures
Rehabilitate affected areas immediately after mono pole installation. Spray stockpiles with mist (when and if necessary) and irrigate rehabilitated areas to minimise loss of soil to wind erosion.

Key Impacts
During the construction phase some fuels form the construction vehicles may be spilt onto the soils which can lead to soil pollution.
Mitigation Measures
All fuels and waste used should be placed and stored in a controlled manner. When and if spillages occur, immediate remediation actions needs to be undertaken to ensure the affected area is cleaned and rehabilitated.

Soils, Land Use and Capability
Impacts & Mitigation Measures…

Key Impacts
Using access tracks during regular maintenance will cause lose soil particles to become airborne.
Mitigation Measures
Ensure sufficient grass cover in worked areas as well as access tracks. Reduce travelling speed when using the access tracks to limit dust creation.

Surface Water Key Findings

Key Findings:

- The Klipkop Substation is located 9.8Km south-west of the transition between the Kuruman and Ga-Mogara Rivers.
- The Ga-Mogara River then flows in a southerly direction and eventually passes the Umtu Substation.
- The Umtu Substation is located 1.8Km west of the Ga-Mogara River.
- The powerline project will have little if any affect on the stream flow of these rivers
- The powerline infrastructure will take up very little surface area. Water can flow around the tower structures.

Surface Water Impacts & Mitigation Measures

Key Impacts
Sediment displacement and transportation of soils.
Mitigation Measures
Holes must be filled after digging and vegetation must be replaced immediately after construction to minimize the time soils are exposed to natural water erosion processes.

Key Impacts
Surface water pollution caused by potential carbon spillages.
Mitigation Measures
All fuels and waste used should be placed and stored in a controlled manner. When and if spillages occur, immediate remediation actions needs to be undertaken to ensure the affected area is cleaned and rehabilitated.

Surface Water Impacts & Mitigation Measures

Key Impacts
Reduction in the natural stream flow of surface water (very limited impact due to dry conditions of the study area).
Mitigation Measures
All holes and depressions caused by the construction must be back filled and proper rehabilitation of the affected areas should take place after construction. All vegetation will be replaced to ensure less erosion will form and therefore less runoff will be trapped.

Visual Impacts Key Findings

The following photographic simulation represents the viewpoints by residents, tourists, and motorists within the study area:

View from the R31 road in a south-western direction (before).

View from the R31 road in a south-western direction (after).

Visual Impacts Key Findings...

A view from the R380 road in a north eastern direction (before)

A view from the R380 road in a north eastern direction (after)

Visual Impacts Key Findings...

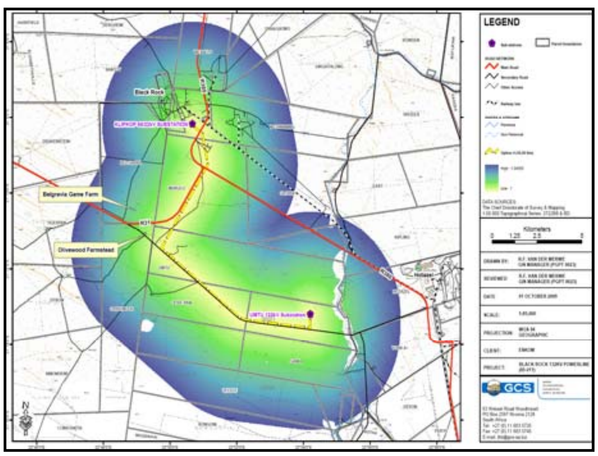
Viewshed:

Viewshed analysis defined observation sites from which the proposed powerline infrastructure would be visible.

Outcome of analysis, the powerline will be visible from the following areas:

- R31 road;
- R380 road;
- Belgravia Game Farm;
- Olivewood farmstead.

Remaining area = remote with no major sensitive viewing points.



Visual Impacts & Mitigation Measures

Key Impacts
Dust generated due to construction activities, earthworks, hauling and site clearance.
Mitigation Measures
During construction, access roads will require an effective dust suppression management programme, such as regular wetting and/or the use of non-polluting chemicals that will retain moisture in the road surface .

Visual Impacts & Mitigation Measures

Key Impacts
Large denude areas as a result of site clearance may cause unpleasant sites for visual receptors.
Mitigation Measures
• Minimise the extent of cleared areas to only those necessary for completion of the works. • Temporarily revegetate open areas whilst construction is underway and fully rehabilitate and revegetate the site once construction has ceased

Visual Impacts & Mitigation Measures

Key Impacts
Visual intrusion of site camp, vehicles and associated infrastructure
Mitigation Measures
• Temporarily revegetate open areas whilst construction is underway and fully rehabilitate and revegetate the site once construction has ceased. • Appropriately site the construction camp as well as other storage areas and consider screening through the erection of shade cloth visual barrier. • Site ablution facilities out of view of road users. • Avoid the unnecessary removal of vegetation for the powerline servitudes and limit access to the servitude.

Visual Impacts & Mitigation Measures

Key Impacts
Visual intrusion of stockpiles and material storage areas.
Mitigation Measures
Decrease the height of material stockpiles and locate these areas away from view of road users.

Visual Impacts & Mitigation Measures

Key Impacts
Visual intrusion due to change in sense of place, increased activity and traffic in the area.
Mitigation Measures

- Temporarily revegetate open areas whilst construction is underway and fully rehabilitate and revegetate the site once construction has ceased. This should be done to restrict extended periods of exposed soil.
- Utilise exiting power line servitudes where possible.
- Avoid the unnecessary removal of vegetation for the power line servitudes and limit access to the servitude (during both construction and operational phases along exiting access roads.

Visual Impacts & Mitigation Measures

Key Impacts
Vegetation clearing is required for the safe mechanical construction and electrical operation of the 132 kV powerline and may result in visual scarring of the affected area.
Mitigation Measures

- Minimise the extent of cleared areas to only those necessary for completion of the works.
- Temporarily revegetate open areas whilst construction is underway and fully rehabilitate and revegetate the site once construction has ceased.
- Avoid the unnecessary removal of vegetation for the power line servitudes and limit access to the servitude

WATER
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Visual Impacts & Mitigation Measures

Key Impacts
The potential scarring of the landscape due to the creation of cleared cut-lines and new tracks
Mitigation Measures
• Temporarily revegetate open areas whilst construction is underway and fully rehabilitate and revegetate the site once construction has ceased. • Avoid the unnecessary removal of vegetation for the power line servitudes and limit access to the servitude.

Recommendation

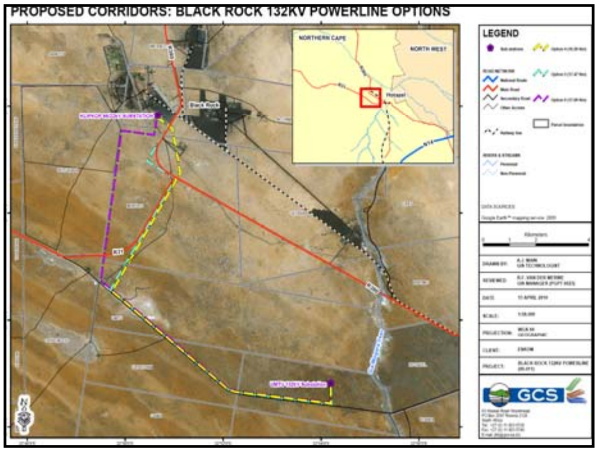
Recommendation:

The recommended corridors to be considered for environmental authorisation in terms of the proposed project are Corridor 4 or Corridor 5.

The two corridors were chosen for the following reasons:

- Alignment with existing servitudes (road); and
- Avoidance of crossing sensitive areas

PROPOSED CORRIDORS: BLACK ROCK 132KV POWERLINE OPTIONS



Conclusion

Conclusion:

The identified impacts and associated mitigation measures as discussed will be implemented as stipulated in the Environmental Management Plan (EMP) during the construction and operation phases of the proposed development.

No environmental fatal flaws were identified during the environmental impact assessment or through the various specialist studies that would prevent the proposed project from proceeding.

Questions

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