MULALO/ SOL B 400/132KV MAIN TRANSMISSION SUBSTATION (MTS) AND ASSOCIATED INTEGRATION OF TRANSMISSION AND DISTRIBUTION POWER LINES

JULY 2018

Prepared by:

SENKOSI ENVIRONMENTAL SINCE 2007

FINAL ENVIRONMENTAL IMPACT ASSESSMENT REPORT (EIAR)

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EXECUTIVE SUMMARY

1. Introduction and Background

Eskom Holdings SOC Limited (Land Development) is the sole supplier of electricity to the Secunda area. One of the largest industries in the areas is Sasol Ltd, a petrochemical company producing fuel and chemicals. With the growth of Sasol's asset base and the resultant increase in power needs, Sasol applied to Eskom Holdings for the integration of their new Open Cycle Gas Turbine (OCGT) plant to the North East transmission and distribution electricity network as well as requiring that their notified maximum demand (NMD) be increased from 1100MVA to 1600MVA.

Eskom Distribution Northern Region has also indicated the need of an alternative 132kV source to the distribution network around the Secunda area. The need has been identified and motivated by the applications received for new supply points from the mining industry. The existing Sol Main Transmission Substation (MTS) is operating at full capacity will not be capable of sustaining future load growth, hence a proposal of establishing a new MTS is proposed.

Sasol also raised concerns about the quality of supply from the existing Sol MTS because of voltage dips experienced and it was established that the existing substation would run out of firm capacity in 2011.

Eskom decided that in order to address the above requirements, a new 400/132kV MTS would have to be built that would be integrated with the existing power network through turn-in-turn-out connections on existing transmission and distribution power lines.

Therefore, this EIA deals with:

- Construction of a new 400/132kV MTS
- Equipping the MTS with 8x 132kV feeder bays for Sasol and Eskom Distribution
- Construction of two 400kV turn-in-turn-out transmission power lines on the Kriel-Tutuka 400kV line to the proposed Mulalo MTS
- Construction of two 400kV turn-in-out transmission power lines from the Kriel-Zeus 400kV line to the proposed Mulalo MTS.
- Construction of two 400kV distribution power lines from the proposed Mulalo MTS to the existing Sasol 2 power lines. It should be noted that these lines will be designed at 400kV and operated at 132kV. The use of 400kV power lines is to accommodate future demand.
- Construction of two 400kV distribution power lines from the proposed Mulalo MTS to the existing Sasol 3 power lines. It should be noted that these lines will be designed at 400kV and operated at 132kV. The use of 400kV power lines is to accommodate future demand.
- Decommissioning the existing 132kV power lines between the existing Sol substation and Sasol 2 substation at the point where the new lines from the Mulalo substation will connect with the existing lines.
- Construction of two 132kV lines to join the Open Cycle Gas Turbine with the existing Sasol 3 substation.

The study area is situated within the Govan Mbeki Local Municipality (GMLM) which forms part of the Gert Sibande District Municipality (GSDM) and the study area is situated south of the town of Secunda in the Mpumalanga province.

2. Legal Framework:

Eskom appointed Senkosi Environmental cc, to manage and undertake the required environmental authorisation process for the proposed development.

The National Environmental Management Act, Act No. 107 of 1998 has, in terms of sections 24(2) and 24D of the Act, established regulations to govern the conducting of EIA processes. The regulations, amended in 2014, refer to listed activities that require either a Basic Assessment process or a Scoping and Environmental Impact Assessment process to be undertaken before such activities can be authorised. Based on the project activities, the Environmental Assessment Practitioner (EAP) made application for environmental authorisation to the Department of Environmental Affairs (DEA) subject to a scoping and environmental impact assessment process.

3. Description of Study Area

Parts of the study area are characterised by ecological systems such as water courses and wetlands, and dams and grasslands. These characteristics contribute to the biodiversity of the region as well as indicating potential impacts by the proposed development. However, parts of the study area are also highly disturbed by existing power lines as well as by mining, farming and industrial activities.

4. Substation Sites and Power Line Routes

The size required for the proposed substation is 800m x 800m (or 64 ha). Identification of potential sites was extensively discussed and with technical considerations and requirements in mind, two substation sites were identified for investigation, namely substation sites B and C.

The integration of the substation with the existing transmission network will be through the construction of four (4) 400kV transmission loop-in-out power lines from existing power lines. The servitude requirements for 400kV power lines is 55m per 1x 400kV power line. This will also apply to the 400kV power lines that will integrate the substations with the existing distribution network.

5. Public participation

As part of the process to review the DEIAR and EMPr, registered I&APs was given 30 days to comment on the DEIAR and EMPr. The commenting period commenced on 19 March to 19 April 2018. Registered I&APs will be notified of the decision, Environmental Authorisation (EA), of the DEA. The EA will be advertised in the Citizen Newspaper, and the Ridge Times Newspaper. The details for appeals will also be included in the newspaper advertisements.

The Final EIAR and EMPr will be submitted on 9 July 2018. The report will also be made available with all its associated appendices will be made available on the Eskom website at:

http://www.eskom.co.za/OurCompany/SustainableDevelopment/EnvironmentalImpactAssessments/Pages/Environment_Impact_Assessments.aspx

All the registered parties will be informed of the availability of the Final EIA report. They will be encouraged to send their comments to the Competent Authority should they have any issues that they want to raise.

6. Summary of specialist findings

Avifaunal Assessment

Vegetation is one of the primary factors determining bird species distribution and abundance in an area. The study area is situated in the grassland biome and consists entirely of the Soweto Highveld Grassland vegetation which has been largely transformed. Grasslands represent a significant feeding area for many bird species in densely populated areas. Although the study area does not contain any major rivers, it does contain several tributaries that provide water for drinking and bathing and corridors of microhabitat for water birds. Several dams of varying sizes and water permanency in the study area could also attract birds to the area. In addition, there are several localized wetlands occurring throughout the study area. Agricultural lands, old lands and pasture feature prominently within the study area that also represent a significant feeding area for many bird species.

Potential impacts identified included displacement of bird species as a result of habitat loss, transformation and/or disturbance during construction of the substation and power lines and mortality due to collisions with power line infrastructure during the operational lifespan of the project.

Substation site B and site C occur approx. 2km apart and are therefore likely to be identical in terms of species diversity and density. One key characteristic that sets the two sites apart is the avifaunal habitat that is present on each site. Substation site B is wholly transformed by maize cultivation and is located much closer to the Sasol Synfuels facility. In contrast, substation site C is comprised of natural grassland. In addition, a fairly large wetland area is located in the south-east corner of the proposed site. Every effort must be made to secure these habitats, to ensure the density and diversity of the bird species that are supported by these key habitats. Although the proposed transmission power lines will be longer in length if substation site B is selected, the collision impact associated with the longer power lines would be less significant compared to the loss of grassland habitat at substation site C hence on this basis substation site B is recommended as the preferred Mulalo MTS alternative.

Biodiversity Assessment

The study area falls within the Soweto Highveld grassland vegetation unit. This vegetation unit is classified as endangered due to the high transformation from activities such as cultivation and urban sprawl. Where possible the remaining intact grassland needs to be assessed before any development can occur.

There are no threatened species of plants identified to occur in the site quarter degree square: 2629CA in which the project falls. There are two plant species identified as Near Threatened but neither were observed during the site survey. There is one identified endemic species which is the Cape Genet. It is identified as Least Concern in the Red List category. No threatened reptile species was identified to

potentially occur in 2629CA and there are no threatened amphibian species identified to potentially occur in 2629CA; there is, however, one identified endemic species, namely the Delalande's River Frog.

During construction, identified impacts include loss of natural habitat due to construction activities; during the operational phase of the project, fires and pollution from the substation malfunctioning were identified as potential impacts.

It was found during the site survey that no significant species were found to occur on Site B or Site C. Both sites, C and B, have low impact on biodiversity, however, because site B is located in the middle of cultivation it is therefore preferred because it has less biodiversity than site C.

Geotechnical assessment

In terms of geological setting, both substation sites are underlain by intrusive dolerite of the Jurassic Era, in the form of a large sill. The geology map indicates that sandstone of the Vryheid Formation occurs in the general area. Both sandstone and dolerite bedrock were encountered in the test pits excavated beneath both sites.

The preliminary geotechnical investigation indicates that potential geotechnical constraints are present at both site B and site C. Both site B and site C are underlain by a mantle of highly expansive hillwash clay soils. The thickness of the hillwash clays is marginally thinner at site C than site B. However, the hillwash clays at site C are underlain by moderately expansive residual soils which are also poor founding and subgrade materials.

The quantity of available materials within the cutting sections of the proposed cut-to-fill platforms, suitable for use as construction material, is limited at both site B and site C. However, a large quantity of suitable materials is available at site B, should the footprint and design of the cut-to-fill be amended. Large quantities of weathered dolerite rock are available at site B whilst comparatively, limited quantities of weathered dolerite are available at site C. Amendments to the footprint and design of the cut-to-fill platform at site C is hampered by the presence of graves to the south of the site and by the occurrence of hard rock at shallow depth.

Shallow groundwater conditions are expected beneath north-western section and the south-western section of site C. It is recommended that subsoil drainage is implemented in these areas, in addition to surface drainage measures. Provision of a subsoil drainage system beneath the platform at Site B is not considered necessary, provided that adequate surface drainage measures are implemented.

Site B is considered the preferred option from a geotechnical perspective; while both sites are suitable for development of a substation, the additional mitigation measures required at site C should result in a potential increased cost of construction at site C compared to site B.

Heritage assessment

The planned development triggers several sub-sections of section 38 of the National Heritage Resources Act (NHRA), 1999 (Act No 25 of 1999) that refers to developments that require a heritage impact assessment (HIA). The project could also impact on graves, structures, archaeological and palaeontological resources that are protected in terms of sections 34, 35, and 36 of the NHRA.

No heritage resources were found on substation site B because the site is highly disturbed by the cultivation of maize. In the footprint of substation site C, graves and structures that are over 60 years of age were found. Both the structures and graves are protected by sections 34 (1) and 36 (3)(a) and (b) of the NHRA and cannot be altered, damaged, demolished or moved without the permission of the relevant heritage authority.

Several grave sites and structures older than 60 years were found along the power line routes to the existing Kriel-Tutuka and Kriel-Zeus power lines. These sites are all protected by the NHRA and the specialist has recommended that these resources are left intact and the position of the pylons are adjusted to avoid impacting directly on them.

No protected heritage sites were found along the power line routes from the substation sites to the existing Sasol 2 and Sasol 3 power lines. It was recommended that the foundations of the accommodation provided to workers who built the Sasol Refinery be avoided where possible as the foundations are a reminder of the development of the Refinery.

The fossil sensitivity map indicated that the project area falls in an area that is mainly insignificant fossil sensitivity interspersed with small areas of very high sensitivity. The areas of high sensitivity close to the Sasol Refinery are situated in areas of high disturbance created by the Sasol Refinery and associated activities. The second area is the last section (< 3 km) of the power lines looping into the existing Kriel-Tutuka and Kriel-Zeus power lines.

Impacts identified were the destruction or removal of graves older than 60 years; damage or destruction of structures older than 60 years and the destruction of fossils. From a heritage perspective, substation site B is the preferred site.

Socio-Economic Assessment

The project footprint is located south southwest of the town of Secunda which is located within the GMLM local municipality. Secunda covers a geographical area of 173.71 km² which incorporates Sasol Secunda. The area has a population of 40 198 people living in 10 292 households resulting in a population density of 231.41/km² and household density of 59.25/km². The official unemployment rate in 2011 in the municipality was 26.2% with the official youth unemployment over the same period at 34.4%.

The following social impacts were considered in respect of the project:

- Health and social well-being impacts such as dust and noise, increase in crime, etc.
- Quality of the living environment impacts including disruption of daily living activities

- Economic and material well-being impacts such as an increase in employment opportunities and increased opportunities for SMMEs.
- Cultural impacts
- Family and community impacts
- Institutional, legal, political and equity impacts including the effect of the project on existing infrastructure facilities and social services, possible decreased levels of community participation in decision making, loss of empowerment, etc., and
- Gender relations impacts such as cultural resistance towards women in the workplace and the division of labour

The social preference is for substation site C as site B is located on agricultural land currently under the cultivation. Apart from this the site is owned by two landowners with one landowner being very opposed to the substation due to the impact on his area of maize cultivation. Although Site C is situated on agricultural land, with evidence of cattle grazing, the site is not currently under cultivation and is owned by one landowner who seems more amenable to the construction of a substation on his land.

In terms of the power line routes, no obvious social preference emerges but this could change as further public engagement unfolds. The corridors of the routes may also be minimally adjusted to avoid any structures and/or properties.

Soils and Land Capability Assessment

Only two soil forms were encountered in the project, namely the Arcadia and Rensburg soil forms. Both soil forms have a vertic topsoil which is a very clayey, active soil horizon that swells upon wetting and shrinks upon drying. Establishing infrastructure on vertic horizons is a challenge due to its activity. Both soil forms have a moderate dryland cultivation potential and a high potential for grazing. The soil is very fertile due to its high clay content, which also complicates the water management of these soils.

When assessing the options for the various infrastructure types, the land use and soil type was considered. With land use, homesteads are firstly avoided, and secondly grazing areas are preferred to cultivated areas. For soil forms, the Arcadia is preferred to the Rensburg soil form, due to the possibility of the Rensburg indicating a wetland.

Potential impacts identified were:

- Construction of substation that would lead to loss of agricultural land and soil erosion;
- Construction of access roads leading to loss of agricultural land and soil erosion
- Erection of transmission and distribution power lines leading to loss of agricultural land
- Increased vehicular activity leading to potential destruction of soil structure

The main issue is the loss of agricultural land. Approximately 64 ha will be lost due to the construction of the substation. More agricultural land will be lost at the pylons of the overhead power lines. Substation site C is preferred, based on land use and soil form, as it does not cover any cultivated fields and only a

small area of Rensburg soils. Based on land use, the routes crossing the smallest length of cultivated land is the preferred option.

Undermining Survey Assessment

The implications of the construction of the proposed substation and power lines on ground that had been subjected to mining was assessed. The mined areas were investigated in order to establish the future stability of mined ground to provide reasonable assurance that there will not be surface expressions of subsidence that could risk the integrity of the power lines.

Subsidence in coal mining by virtue of mining being carried out at relatively shallow depth, often results in surface damage. The assessment determined that mining using bord and pillar mining that utilised large pillars is effective to protect the surface. It was assessed that if a surface mining restriction of suitable dimension is declared over the undermined sections, it can be reasonably expected that the surface will be protected far beyond the lifespan of the pylons. However, where stooping has taken place, the surface must be considered suspect and no surface mining restriction will alter the fact that pylons should not be built over stooped sections.

The original route options to the existing Kriel-Tutuka and Kriel-Zeus power lines kept each of the two pairs of power lines together. However, it was identified that part of the original route required pylons to be erected over fully extracted stooped ground that could be prone to future surface subsidence. The undermining was found to be over 600m wide which makes it difficult to span without using very large towers. Therefore, some route diversion was suggested where three lines are kept parallel and a single line is routed slightly to the south. Only a single line was re-routed due to the shortwall mining over which construction is not recommended.

Most of the lines to Sasol 2 and Sasol 3 were rejected as significant sections crossed stooped ground or proposed ash dumps. A route that circumvented most of the mining and that utilised mine boundaries was proposed. Security concerns were raised by Sasol that access for maintenance would be inconvenient around the Nitro Plant structures, and in the event of an explosion in the Nitro Plant, the integrity of the power lines would be brought into question. Thus, a compromise route traversing to the north of the magazines, and mostly outside of the security fence was recommended with part of the route traversing close to some of the Nitro Plant complex and the coal stockyard. This route was later altered slightly to accommodate a safe distance away from these sensitive facilities. A newly conceptualised drawing is attached to illustrate this.

In terms of the MTS, it was assessed that both sites are not undermined. This means that from an undermining perspective, either of the two sites can be used to for the substation.

Visual Impact Assessment

Visual character is based on human perception and the observer's response to the visible project components. The substation, transmission and distribution power lines are the most visible components of the project. Landscape character assessment is concerned with the observable elements, components

or features within a landscape that define the landscape such as topography – the study area is characterised by a rolling, undulating landscape with relatively little topographic variation; land use - the study area is dominated by agricultural activities and mining activities which are scattered through the area and built development such as the existing power stations and mining infrastructure.

Visual quality is a qualitative evaluation of the composition of landscape components and their excellence in scenic attractiveness. The dominance of the existing power stations, agricultural practices and mining activity impact the regional visual quality, which is classified as low.

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 and is founded on the characteristics of the physical environment such as degree of visual screening, terrain variability and land cover. The VAC of the study area is considered low and provides very limited screening capacity for this project relating to the unvaried topography and predominantly low vegetation.

The following impacts were identified and assessed:

- Landscape impacts are alterations to the fabric, character, visual quality and/or visual value which will either positively or negatively affect the landscape character.
- Impact on viewer sensitivity. Specific viewers (visual receptors) experience different views of the visual resource and value it differently. The visual receptors for this study are residents, tourists and motorists.

Substation site B is the preferred alternative. Its position further away major routes and closer to the existing mining and infrastructure is considered to cause the least impact on the landscape character due to the reduced sensitivity of the landscape. The site's great advantage lies in the less significant visual impact on tourists and residents as compared to site C.

Wetlands Assessment

The project area falls within the Upper Vaal Catchments (Primary Catchment C), within quaternary catchment C12D drained by Waterval River. Grootspruit, Trichardtspruit, Groot-Bossiespruit form major tributaries of the Waterval.

A number of wetland systems were identified within the study area. Valley bottom wetlands form the dominate wetland systems on site. Most of these systems are channelled and all are considered to be seasonal systems, though the presence of dams along these wetlands does provide areas of permanent surface water. A pan occurs on the south-eastern section of substation site C. A number of small hillslope seepage wetlands were also identified on the site.

The Present Ecological Status (PES) was used to establish the integrity of the wetlands in the study area. The PES of all the units were categorised as C – moderately modified but with some loss of natural habitats.

The Ecological Importance and Sensitivity (EIS) assessment was undertaken to rank water resources in terms of provision of goods and service or valuable ecosystem functions which benefit people; biodiversity support and ecological value; and reliance of subsistence users. The relatively low EIS assigned to the wetlands units can be attributed to their disturbed nature.

Impacts identified were the loss of wetland habitat and bed/bank modification, water quality impairment, flow modification and loss of terrestrial and wetland biodiversity.

A pan occurs on the south-eastern perimeter of proposed the Mulalo MTS Substation Site C. A riparian area again occurs within 200m of the western border of Site C. On the other hand, Substation Site B is under cultivation and transformed. Its proximity to Sasol Synfuels facility make it ideal for further development and transformation. Substation Site B is therefore recommended as the preferred substation alternative.

7. **Selection of substation site and power line routes**

The predominant choice in terms of the specialist studies was the use of substation site B. This was largely due to the existing disturbance of the site by the cultivation of maize that will have impacted on the biodiversity of the site as well as on heritage resources. The location of the site well away from major routes made it a preferred site in terms of the visual impact assessment.
As substation site C is comprised of natural grassland together with a fairly large wetland area located in the south-east corner of the proposed site, it is not preferred from an avifaunal (and wetland) perspective because birds will be attracted to the undisturbed nature of the site and every effort must be made to secure these habitats to ensure the density and diversity of the bird species that are attracted to and supported by these key habitats.

Both the social impact specialist and soil and land capability specialist indicated a preference for substation site C because the site does not cover any cultivated fields. The use of substation site B would have a large impact on arable land that is currently used for the cultivation of maize.

The Applicant prefers substation site C because Site B is encompassed by underground mining which makes it difficult to terminate and perform tower spotting for 132kV lines (in the direction opposite the 400kV lines) for the evacuation of the power. Consequently, Site B dictates that both 400kV lines and 132kV lines (designed to 400kV standard) enter and exit the substation in the same direction. This line entry requirement results in a complex substation layout design where the 400kV and 132kV busbars will be positioned next to each other or resulting in a layout with many feeder crossing over busbars (overpasses). In both instances the length of the busbar will be excessively long and result in a sizeable portion of the substation platform being on top of undermined ground. The result is a situation that compromises the integrity and reliability of the substation, which is undesirable. Site B is restrictive from the substation expandability point of view due to it being encompassed by underground mining areas.

Site C is the preferred site for the location of Mulalo MTS because it will be technically viable to terminate entering/emanating lines. Also, the substation orientation on Site C will accommodate design

requirements in terms of line termination, standard busbar configuration and substation layout. Moreover, Site C is not entirely encompassed by underground mining areas, thus from that point of view the substation's expansion may be possible (provided there are not additional factors hampering expansion). Even though Site C has graves in a corner of its location, only when an expansion is considered that suitable and relevant permits shall be sought from the relevant authority.

In terms of the power lines routes, the selection of routes was mainly determined by the undermining element. A route for the power lines to the existing Sasol power lines was found that avoided the underground geotechnical risk and this was forwarded to Sasol for their comment and approval. Part of the route around the surface explosive magazines and nitro plant was considered safe from geotechnical risk and remained unaltered. However, security concerns were raised that access for maintenance would be inconvenient around the Nitro Plant and in the event of an explosion in the Nitro Plant, the integrity of the power lines would be brought into question.

A compromise route traversing to the north of the magazines, and mostly outside of the security fence was recommended with part of the route traversing close to some of the Nitro Plant complex and the coal stockyard.

In terms of the routes to the existing Kriel-Tutuka and Kriel-Zeus power lines, both corridors are suitable; however, the southern corridor is preferred as the southern corridor crosses undermined areas that have a lower possibility of failure than the northern corridor which is situated much closer to stooped sections where the chance of failure/subsidence is higher.

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LIST OF ACRONYMS AND ABBREVIATIONS

CA – Competent Authority
CWAC – Coordinated Waterbird Count
DEA – Department of Environmental Affairs
DEIAR – Draft Environmental Impact Assessment Report
DSR – Draft Scoping Report
DWA – Department of Water Affairs
Dx - Distribution
EAP – Environmental Assessment Practitioner
ECA – Environmental Conservation Act
EIA - Environmental Impact Assessment
EIAR – Environmental Impact Assessment Report
EIS – Ecological Importance and Sensitivity
EMF – Electro-Magnetic Fields
EMPr – Environmental Management Programme
EWT – Endangered Wildlife Trust
FEIAR – Final Environmental Impact Assessment Report
FSR – Final Scoping Report
GDP – Gross Domestic Production
GMLM – Govan Mbeki Local Municipality
GPS – Global Positioning System
GSDM – Gert Sibande District Municipality
I&APs – Interested and Affected Parties
IA – Impact Assessment Phase
IBA – Important Bird Area
IDP – Integrated Development Plan
LAC – Landscape Character Assessment
LED – Local Economic Development (plans)
LSDF – Local Spatial Development Framework
kV – Kilovolt
kV/m – Kilovolt per meter: the unit of measurement of electric field levels
MBCP – Mpumalanga Biodiversity Conservation Plan
DARDLEA – Mpumalanga Department of Agriculture, Rural Development, Land and Environmental Affairs
MHI – Major Hazardous Installations
MPRDA: Mineral and Petroleum Resources Development Act
MTPA – Mpumalanga Tourism and Parks Agency
MTS - Main Transmission Substation
MVA – Million Volt Amps
NEMA – National Environmental Management Act
NEMBA: National Environmental Management: Biodiversity Act
NEMWA: National Environmental Management: Waste Act

NMD – Notified Maximum Demand
OCGT – Open Cycle Gas Turbine
PES – Present Ecological Status
PoS for EIA – Plan of Study for EIA
PPP – Public Participation Process
SABAP – South African Bird Atlas Project
SAHRA – South African Heritage Resources Agency
SANBI – South African National Biodiversity Institute
SDF – Spatial Development Framework
SMME – Small, Medium and Micro Enterprises
SOC – Stated Owned Company
Tx – Transmission
VAC – Visual Absorption Capacity

1. INTRODUCTION AND BACKGROUND

1.1 INTRODUCTION

Eskom Holdings SOC Limited (Transmission Services) (Eskom) appointed Senkosi Environmental cc, an independent environmental consultancy, to manage and undertake an environmental authorisation process for the proposed construction of a Main Transmission Substation (MTS) and associated turn-in-out 400kV transmission power lines and 132kV power lines near Secunda in Mpumalanga province.

Senkosi Environmental has no vested interest in the proposed project and hereby declare Senkosi Environmental's independence as required by the EIA regulations and requirements.

1.2 BACKGROUND

Eskom was established in 1923 in terms of the Electricity Act (1922) with the mandate to provide electrical power supply to the country. The utility generates approximately 95% of South Africa's electrical power.

Eskom is the sole supplier of electricity to major industries in the Secunda area. One of the largest industries in the study area is Sasol Ltd, a petrochemical company producing fuel and chemicals. With the growth of Sasol's asset base and the resultant increase in power needs, Sasol applied to Eskom Holdings for the integration of its new Open Cycle Gas Turbine (OCGT) plant to the North East Transmission and Distribution electricity network as well as requesting that their notified maximum demand (NMD) be increased from 1100MVA to 1600MVA.[1] However, to date, Sasol has not approved the quotation supplied by Eskom hence Eskom is proceeding with the project as the existing Sol Main Transmission Substation (MTS) is running at maximum capacity and additional capacity is needed in the area as a matter of urgency.

Eskom Distribution Northern Region has also indicated the need for an alternative 132kV source to the distribution network around the Secunda area. The need has been identified and motivated by the applications received for new supply points from the mining industry. Sol MTS will not be capable of sustaining future load growth therefore Eskom decided that in order to address the above requirements, a new 400/132kV MTS would have to be built that would be integrated with the existing transmission and distribution power network through turn-in-out connections on the existing Kriel – Tutuka 400kV transmission power line and on the existing Kriel – Zeus 400kV transmission power line.[2]

In addition, in order to strengthen the power supply to the Sasol Refinery, two 132kV power lines will connect the proposed Mulalo MTS with the existing Sasol 2 power line and two 132kV power lines will connect the Mulalo MTS to the existing Sasol 3 power line. The new MTS will address Eskom Distribution's 20 year master plan.

[1] Sasol OCGT Integration and Highveld South Strengthening Project: Feasibility Report compiled by DD Matshidza, March 2010, p 6

[2] Ditto, p 30

This EIA deals with the proposed construction of the new MTS substation, to be called Mulalo MTS, as well as the proposed integration of the substation with the existing power network as described above. The scope of work is as follows:

- Construction of a new 400/132kV MTS
- Equipping the MTS with 8x 132kV feeder bays for Sasol and Eskom Distribution
- Construction of two 400kV turn-in-turn-out transmission power lines on the Kriel-Tutuka 400kV line to the proposed Mulalo MTS
- Construction of two 400kV turn-in-out transmission power lines from the Kriel-Zeus 400kV line to the proposed Mulalo MTS.
- Construction of two 400kV distribution power lines from the proposed Mulalo MTS to the existing Sasol 2 power lines. It should be noted that these lines will be designed at 400kV and operated at 132kV. The use of 400kV power lines is to accommodate future demand.
- Construction of two 400kV distribution power lines from the proposed Mulalo MTS to the existing Sasol 3 power lines. It should be noted that these lines will be designed at 400kV and operated at 132kV. The use of 400kV power lines is to accommodate future demand
- Decommissioning of the existing 132kV power lines between the existing Sol substation and Sasol 2 substation at the point where the new lines from the Mulalo substation will connect with the existing lines.
- Construction of two 132kV lines to join the Open Cycle Gas Turbine in the Sasol Refinery with the existing Sasol 3 substation.

The sector classification for this project in terms of the DEA's application form is: infrastructure – electricity (generation, transmission and distribution). The project is classified as a Strategic Infrastructure Project (SIP) namely, SIP 10 which refers to Electricity transmission and distribution for all: expansion of the transmission and distribution network to address historical imbalances, provide access to electricity for all and support economic development. It also refers to the alignment of the 10-year transmission plan, the services backlog, the national broadband roll-out and the freight rail line development to leverage off regulatory approvals, supply chain and project development capacity

The National Environmental Management Act, Act No. 107 of 1998, has, in terms of section 24(2) and 24D of the Act, established regulations under section 24 (5) of the Act and published in Government Notice R33306 of 2010, to govern the conducting of EIA processes. In 2014, these regulations were updated in terms of GNR 38282 of 4 December 2014 and again in terms of GNR 40772 of 7 April 2017. This EIA was undertaken in terms of the 2014 regulations as it commenced prior to the 2017 amendments. The regulations refer to listed activities that require either a Basic Assessment process or a Scoping and Environmental Impact Assessment process to be undertaken before the activities can be authorised. Such activities include the construction of facilities or infrastructure including associated structures for the generation and transmission of above-ground electricity.

Listing Notices 983, 984 and 985 were applied to this project and, based on the project activities, the Environmental Assessment Practitioner (EAP) made application for environmental authorisation to the Department of Environmental Affairs (DEA) subject to a Scoping and Environmental Impact Assessment process. The list of activities applied for are described in Table 1 below.

Table 1: List of activities triggered by the project in terms of 2014 EIA Regulations

Relevant Notice	Activity No	Description of each listed activity	Applicability to project
GNR 983	19 (i)	The infilling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 5 cubic metres from- (i) a watercourse	The footprint of the proposed substation is 64 hectares and a number of substation sites are situated close to watercourses therefore it is anticipated that more than 5 cubic metres of soil and sand could be removed from these watercourses
	24 (ii)	The development of- (ii) a road with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres;	The project will involve the construction of access roads that can accommodate large vehicles transporting transformers and other electrical equipment to the proposed substation sites. These roads could be between 1 and 3 km in length.
	28 (ii)	Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture or afforestation on or after 01 April 1998, and where such development: (ii) will occur outside an urban area where total land to be developed is bigger than 1 hectare	The substation sites are situated on land currently used for agriculture and the footprint of the substation is larger than 1 hectare. The footprint of the substation site will be 64 hectares
	31 (v) (a) (b)	The decommissioning of existing facilities, structures or infrastructure for- (v) any activity regardless the time the activity was commenced with, where such activity: (a)is similarly listed to an activity in (i), (ii), (iii), or (iv) above; and (b)is still in operation or development is still in progress	Decommissioning of existing 132kV power lines between the existing Sol substation and Sasol 2 substation. The length of power lines to be decommissioned is approx. 4 km.
	56 (ii)	The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre- (i)where the existing reserve is wider than 13,5 meters; or	Existing access roads could be expanded to accommodate large vehicles that will transport transformers and other electrical equipment to the proposed substation sites

Relevant Notice	Activity No	Description of each listed activity	Applicability to project
		(ii)where no reserve exists, where the existing road is wider than 8 metres	
GNR 984	9	The development of facilities or infrastructure for the transmission and distribution of electricity with a capacity of 275 kilovolts or more, outside an urban area or industrial complex.	The proposed loop-in-loop-out power lines will have a capacity of 400 kilovolts. The power lines are between 5 and 13 km in length.
	15	The clearance of an area of 20 hectares or more of indigenous vegetation	The footprint of the substation is 64 hectares
GNR 985	3 (a) (b) (a) (ii) (cc)	The construction of masts or towers of any material or typed used for telecommunication broadcasting or radio transmission purposes in the Free State, Mpumalanga, Limpopo and Northern Cape Provinces, outside urban areas (cc) in sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority; where the mast: (a) is to be placed on a site not previously used for this purpose; and (b) will exceed 15 metres in height but excluding attachments to existing buildings and masts on rooftops.	The construction of a 60m high telecommunication mast on the new substation which could be situated close to wetlands
	4 (a) (cc)	The construction of a road wider than 4 meters with a reserve less than 13.5 meters -In the Free State, Mpumalanga, Limpopo and Northern Cape - outside urban areas in: (cc)Sensitive area as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority.	Construction of access roads between 1 and 3 km in length to the substation site that could be situated close to wetlands in the area
	13 (xii) (a) (c) (a) (dd)	The development of-	Footprint of substation is 64 hectares and some of the substation sites are

Relevant Notice	Activity No	Description of each listed activity	Applicability to project
		(xii) infrastructure or structures with a physical footprint of 10 square metres or more; including associated structures and infrastructure, (a) within a watercourse; or (c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse; -In the Free State, Mpumalanga, Limpopo and Northern Cape-outside urban edges in: (dd) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority	situated within close proximity to watercourses
	16 (a) (ii) (cc)	The widening of a road by more than 4 meters or lengthening of a road by more than 1 kilometre (a) In the Free State, Limpopo, Mpumalanga and Northern Cape - (ii) outside an urban area, in (cc) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority	The widening of existing roads by more than 4 meters, to create access to the substation site located in or close to ecologically sensitive areas and wetlands

1.3 GOAL AND OBJECTIVES OF THE EIA STUDY

The goal of this EIA study is to identify a preferred site for the proposed substation and power line corridors for the associated turn-in-out power lines based on the principles of integrated environmental management, sustainable development, and duty of care.

1.3.1 Environmental Impact Assessment Phase

The objective of the impact assessment phase, that takes place once the final scoping report has been accepted by the Competent Authority (CA), is to identify and assess all the significant impacts identified during the scoping phase that may arise from the undertaking of an activity. It includes various specialist studies as informed by the

scoping phase. This phase will identify the most suitable location for the activity within the development footprint as contemplated in the accepted scoping report. The proposed footprint will be based on an impact assessment of all alternatives focusing on the geographical, biological, social, economic, heritage and cultural aspects of the environment. It also identifies suitable measures to avoid, manage or mitigate identified impacts.

It is the findings of impact assessments that are used to inform the CA's decision-making with regard to the authorisation of the activity. The CA for this project is the National Department of Environmental Affairs (DEA) as the DEA is responsible for assessing and authorising EIAs for state owned enterprises such as Eskom. The product of the impact assessment phase is a draft Environmental Impact Assessment Report (DEIAR), including specialist studies and a draft Environmental Management Programme (EMPr).

1.3.2 Decision-making Phase

The decision-making phase provides the CA with an opportunity to consider the EIAR and then determine whether to: accept the report, request amendments to be made to the report, refer the report for specialist review or reject the EIAR if it is deemed to be lacking the information required by the regulations. On approval of the EIAR, the CA will make a decision to: grant all or part of the application or refuse all or part of the application.

The EIA processes currently undertaken for this project comprises two main phases, i.e. Scoping Phase and EIA Phase. The EIA process culminates in the submission of an EIA report and an EMPr to the DEA for decision making. A simplified diagram of the EIA is depicted in Figure 1 below.

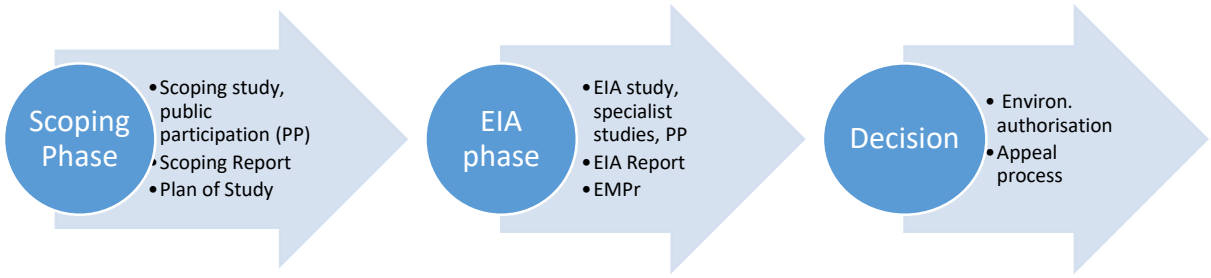

Figure 1: Simplified diagram of EIA process

The Scoping Phase was completed with the acceptance of the FSR (see **Appendix 4**) and the EIA phase commenced. The EIA phase is undertaken in accordance with the Plan of Study for EIA as well as the requirements of the 2014 EIA Regulation, namely Part 3 of GNR. 982 of 4 December 2014 and in compliance with recommendations contained in the acceptance of the FSR. This report is compiled in terms of requirements of Appendix 3 of GNR 982 that refer to the contents of the environmental impact assessment report. The public participation process that was followed in this phase is described in Chapter 6 of this report.

With the results of the specialist studies, recommendations and inputs from the I&APs and stakeholders, an EMPr was prepared for the management and mitigation of potential impacts during the construction, operation and decommissioning of the Mulalo MTS and power lines. The EMPr was compiled in accordance with Appendix 4 of the EIA Regulations (GNR 982) as well as complying with section 24 of NEMA. The draft EMPr is attached as **Appendix 5** to this report.

2. GAPS IN INFORMATION

The assessment was undertaken during the conceptual stage of the project and is based on information available at the time.

- It is unclear at this stage which substation design will be used for the project and what type of overhead power lines will be utilised for the proposed transmission and distribution power lines. Sub-section 6.4.3 of this report provides some examples of towers that could be utilised.
- An exact commencement date for the construction phase is unknown. The planning and construction process is expected to commence as soon as authorisation is received from the relevant authorities;
- The exact location, size and number of construction camps and material lay-down yards are not yet specified at this stage of the project.

3. OVERVIEW OF THE STRUCTURE OF THE DEIAR

The FEIAR consists of 15 chapters.

- Chapter 1 provides an introduction and covers briefly the appointment of the EAP and an explanation of the EIA process and it concludes with an overview of the structure of the project.
- Chapter 2 provides refers to gaps in information relating to the project and study.
- Chapter 3 (this chapter) provides an overview of the structure of the FEIAR.
- Chapter 4 provides the details of the project team. The details of the EAP are included as well as the details of the public participation consultant and relevant details regarding the Applicant.
- Chapter 5 lists the relevant legislative requirements that relate to the proposed project.
- Chapter 6 describes the public participation process that was undertaken for the project.
- Chapter 7 includes a statement regarding the need and desirability of the project, a description of the location of the project and a description of the various components of the project.
- Chapter 8 provides a detailed description of the substation sites and power line routes
- Chapter 9 gives a summary of the specialist studies undertaken
- Chapter 10 provides the impact assessment methodology used in determining the significance of identified impacts.
- Chapter 11 lists the assessment of impacts as per specialist study and the overall outcome of the assessments.
- Chapter 12 provides substation site and power line route selection.
- Chapter 13 contains the required undertaking of the EAP.
- Chapter 14 contains recommendations and conclusions.
- The report is closed out with Chapter 15 which provides the references consulted in the compilation of the FEIAR.

4. DETAILS OF THE ENVIRONMENTAL ASSESSMENT PRACTITIONER

The details of the EAP and public participation consultant are provided below. Their *curricula vitae* are included in **Appendix 1** of this report.

4.1 DETAILS OF THE EAP

Name: Senkosi Environmental cc
Physical & Postal Details: 45B Annie Botha Avenue, Riviera; P.O. Box 100130, Moreleta Plaza, 0167
Contact details Tel: +27 (0)12 329 7569 +27 (0) 72 1452 514
Email details info@senkosi.com/sipho@senkosi.com

4.1.1 EXPERIENCE OF THE EAP

Siphosenkosi Zulu (Project Manager and Leader)
Mr. Zulu has 17 years project management experience and is an experienced public participation professional. Part of his 17 years project management experience was gained while under the employ of different organisations before establishing Senkosi Environmental in 2007. Since 2007, Mr Zulu has managed all project work carried out by Senkosi Environmental.

He has a BSc degree in Environmental Management from the University of the Western Cape and a Diploma in Project Management obtained with distinction from Varsity College (Pretoria). He further completed various courses relevant to environmental management including *"A* Practical Approach to EIA" as well as the "Environmental Law" course from the Potchefstroom campus of the University of the North West. He has dealt with several Eskom projects including:

- Basic Assessment for the construction of a substation in Soweto
- Specialist walk down and EMPr for 120km of the Masa Ngwedi 765kV and 400kV power lines in the Limpopo Province
- A full EIA for the proposed Cooling Water Treatment Plant for the Lethabo Power Station, Free State Province.
- Several Water Use License applications for Eskom Distribution Unit in the Gauteng and the Northern Cape Provinces.

4.1.2 Experience of the PP Consultant

Mr Gembe Moses Mahlangu (Leader of the PP team)

Mr. Gembe Moses Mahlangu, Director of Margen Industrial Services is the public participation project leader. The company has, since 2002, undertaken the PPP for a large number of EIAs including many power lines. His company also undertakes oil spill clean-ups and bio-remediation of hydro-carbon contaminated sites. Mr Calvin Netshisaulu assists Mr. Mahlangu in conducting PPP during this project. He has several years of experience in the field of public participation.

The Public Participation team has extensive experience in conducting and managing EIA PPPs across the country and beyond, including parts of the Southern African Development Community (SADEC) region. These include:

- EIA for Eskom Zeus-Mercury-Perseus 765kV transmission power line project between Standerton and Vierfontein and Standerton and Dealesville.
- EIA for Eskom Delta–Epsilon 6x 765kV transmission power line project between Lephalale and Potchefstroom.
- EIA for Eskom Epsilon substation & Associated turn-ins project near Potchefstroom; and
- EIA for Eskom Transmission Ngwedi substation and associated turn-ins power lines project.

4.2 DETAILS OF THE APPLICANT

The project proponent who commissioned this EIA is Eskom Transmission, a Division of Eskom Holdings Limited. The contact details are as follows:

Proponent	:	Eskom Holdings SOC Limited: Transmission Division
		Mrs Annah Kawadza
Contact Person		Mrs Annah Kawadza (Program Manager-Acting)
Physical Address	:	Megawatt Park, Maxwell Drive, Sunninghill, Sandton
Postal address	:	P.O. Box 1091, Johannesburg 2000
Telephone	:	011 800 4057
Fax	:	086 602 9207
Email	:	KawadzA@eskom.co.za

5 LEGISLATIVE ENVIRONMENT

In South Africa there are many legal requirements to which proponents of development projects must comply in order to ensure adherence with the principles of integrated environmental management. This project is no exception and set out below are some of the key legislation that the Applicant will need to comply with in terms of the project.

5.1 CONSTITUTION OF THE REPUBLIC OF SOUTH AFRICA (ACT NO. 108 OF 1996)

Section 24 of the Constitution of South Africa states that everyone has the right
(a) to an environment that is not harmful to their health or well-being; and to have the environment protected for the benefit of present and future generations, through reasonable legislation and other measures that:

- prevent pollution and ecological degradation,
- promote conservation, and
- secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.

This is interpreted to mean that all developments, including this project, should not infringe on or undermine the constitutional right to a safe and healthy environment of all citizens, as well as the ability of future generations to enjoy the same right and that developments must be undertaken in a sustainable manner.

5.2 NATIONAL ENVIRONMENTAL MANAGEMENT ACT (ACT NO. 107 OF 1998)

The National Environmental Management Act (NEMA) provides for the right to an environment that is not harmful to the well-being of South African citizens; the equitable distribution of natural resources, sustainable development and environmental protection.

NEMA has, in terms of section 24(2) and 24D of the Act, established regulations made under section 24 (5) of the Act and published in Government Notice Regulation (GNR) 33306 of 2010 to govern the conduct of EIA processes. These regulations published lists of activities that require various levels of applications of the EIA process. These regulations were amended in December 2014 in Government Notice 38282 in terms of Regulations 982, 983, 984 and 985, which are applicable to this project.

The proposed development triggers a range of listed activities in terms in terms of the EIA Regulations of 2014. In terms of GNR 984, Activities 9 and 15, a full Scoping and Environmental Impact Assessment (S&EIA) is required for the proposed project and is subject to environmental authorisation as detailed in Section 24 of NEMA.

Additional activities are triggered in accordance with Regulations GNR 983 and GNR 985 of the 2014 EIA Regulations. These activities are described in Table 1 of Chapter 2 of this report.

The NEMA can be regarded as the most important piece of general environmental legislation. The law is based on the concept of sustainable development and the objective of the NEMA is to provide for co-operative environmental governance through a series of principles that serve as:

- A general framework for environmental planning
- Guidelines according to which the State must exercise its environmental functions; and
- A guide to the interpretation of NEMA itself and of any other law relating to the environment

Some of the most important principles contained in the NEMA include:

- Environmental management must put people and their needs first. The improved supply of electricity to the area should address some of the needs of the surrounding communities such as reliable power supply.
- Development must be socially, environmentally and economically sustainable. The EIA for this project will assess all aspects of the environment (physical, biological, and social aspects) to ensure the sustainability of the project.
- There should be equal access to environmental resources, benefits and services to meet basic human needs. The improved power supply should assist the municipality to meet historical electricity and housing shortages in the area so that basic human needs are met.
- Government should promote public participation when making decisions about the environment. This means that this project must undergo a thorough and transparent public participation process to ensure that all elements of the project are made know to interested and affected parties (IAPs). This will include the holding of meetings with I&APs during the scoping and EIA phases of the project.
- Communities must be given environmental education. Documents supplied to I&APs / communities regarding the project will be written in a way that makes them accessible and understandable to all I&APs.
- Decisions must be taken in an open and transparent manner and there must be access to information. Decisions taken in terms of the project will be conveyed to I&APs through the supply of documentation, direct communication (e.g. letters and emails), etc.

5.3 Department of Environmental Affairs Integrated Environmental Management Information Series

The above Information Series of 2002 and 2006 comprise 23 information documents that were drafted as sources of information about concepts and approaches to Integrated Environmental Management (IEM). The IEM is a key instrument of the NEMA and provides an overarching framework for the integration of environmental assessment and management principles into environmental decision-making. The aim of the information series is to provide general guidance on techniques, tools and processes for environmental assessment and management.

5.4 Occupational Health and Safety Act (Act No. 85 of 1993)

This Act makes provisions for the health and safety of persons working at the proposed substation and power lines. The Act addresses, amongst others, the:

- Safety requirements for the operation of plant machinery

- Protection of persons other than persons at work against hazards to safety and health arising out of or in connection with the activities of persons at work
- Establishment of an advisory council for occupational health and safety

Sub-section 10(2) of the Act states that any person who erects or installs any article for use at work on or in any premises shall ensure, as far as is reasonably practicable, that nothing about the manner in which it is erected or installed makes it unsafe or creates a risk to health when properly used.

Other requirements under this Act that are relevant to the proposed project are the regulations on Major Hazardous Installations (MHI) and their potential health and safety impacts particularly on individuals and communities. Section 9 of the MHI regulation, which came into force in 1999, requires that where practicable, the Applicant shall prevent the establishment of an MHI adjacent to sites or areas where the MHI would potentially pose a hazard. In terms of this Act, development of an MHI requires public participation which forms part of the EIA process.

The dominant land use in the project area is industry, with Sasol being the main industry in the area. However, there are also other receptors such as private landowners, workers and their residences within and not far from the project area. This project would involve erection of buildings and electrical structures and equipment that could pose dangers or hazards to individuals and nearby communities. For this reason, Section 9 of this Act has to be taken into consideration so as to ensure the health and safety of individuals and communities in and around the project area.

5.5 CONSERVATION OF AGRICULTURAL RESOURCES ACT (ACT NO. 43 OF 1983)

The objective of this Act is to provide for the conservation of the natural agricultural resources of the country by the maintenance of the production potential of land through the conservation of soil, water sources and vegetation, and the combating of invader plants and weeds.

Section 5(1) of this Act prescribes a list of measures for combating the spread of weeds and invader plants. Therefore, in undertaking rehabilitative work, Eskom or its contractors or sub-contractors should not use plants that are categorised as either a weed or an invasive plant.

In order to achieve the objectives of the Act, control measures are prescribed to specific activities including the utilisation and protection of land which is cultivated; the utilisation and protection of vleis, marshes, water courses and water sources; and the prevention and control of veld fires. Should the planning and construction of the proposed project impinge on the activities listed in Section 6(2) of the Act, then the provisions of this Act could be applicable and necessary control measures need to be implemented to prevent such impacts.

5.6 NATIONAL WATER ACT (ACT NO. 36 OF 1998)

The National Water Act guides the management of water in South Africa and aims to regulate the use of water and activities which will impact on water resources through the categorisation of 'listed water uses' encompassing

water extraction, flow attenuation with catchments as well as the potential contamination of water resources where the Department of Water and Sanitation (DWS) is the administering body in this regard.

Section 21 describes the water uses that the applicant would need to apply for. According to this section, water use includes

(a) Taking water from a water resource;
(b) Storing water;
(c) Impeding or diverting the flow of water in a watercourse;
(d) Engaging in a stream flow reduction activity contemplated in section 36;
(e) Engaging in a controlled activity identified as such in section 37(1) or declared under section 38(1);
(f) Discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea outfall or other conduit;
(g) Disposing of waste in a manner which may detrimentally impact on a water resource;
(h) Disposing in any manner of water which contains waste from which or which has been heated in any industrial or power generation process;
(i) Altering the bed, banks, course or characteristics of a watercourse;
(j) Removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people; and
(k) Using water for recreational purposes

Depending on the final location of the substation and associated power lines, water resources could be impacted where, for example, the construction of power lines takes place close to, over or within wetlands or on river banks where the flow of water could be diverted or the bed or bank altered. This would require that the Applicant apply for a Water Use Licence (WUL) from the DWS.

In addition, should the construction activities involve use of water and generation of runoff; the provisions of the Water Act will need to be taken into account.

5.7 NATIONAL ENVIRONMENTAL MANAGEMENT: BIODIVERSITY ACT (ACT NO. 10 OF 2004) (NEMBA)

NEMBA provides for:

(i) the management and conservation of biological diversity within the Republic and of the components of such biological diversity;
(ii) the use of indigenous biological resources in a sustainable manner; and
(iii) the fair and equitable sharing among stakeholders of benefits arising from bio-prospecting involving indigenous biological resources.

Chapter 4 of NEMBA aims to ensure sustainable use of biodiversity, by providing for the protection of threatened ecosystems and species, through national (and/or provincial) lists of ecosystems and species in need of protection and regulations that require permits to carry out certain threatening processes or activities. Should protected species and ecosystems be impacted on by the proposed project, this Act will be applicable and necessary measures be taken for implementation.

Sections 51 – 58 of the Act provide for the protection and listing of ecosystems and species that are threatened or in need of protection nationally and provincially. Ecosystems and species are listed in the categories critically endangered, endangered, vulnerable and protected

The Mpumalanga Biodiversity Conservation Plan (MBCP), compiled to guide conservation and land use planning in the province, categorises areas accordingly: Irreplaceable, Highly Significant, Important and Necessary, Least Concern and No Natural Habitat Remaining. The project could impact several of these categories.

Other provisions of the Act that could apply to this development include Sections 65 - 69 that deal with restricted activities involving alien species and Sections 71 – 73 that deal with restricted activities involving listed invasive species and duty of care relating to invasive species.

Hence, construction processes such as clearing of vegetation for the proposed substation site and access roads that could allow the spread of invasive species will have to be closely monitored and necessary measures taken to prevent this.

5.8 NATIONAL HERITAGE RESOURCES ACT (ACT NO. 25 OF 1999)

The objective of this Act is to introduce an integrated and interactive system for the management of heritage resources to promote good government at all levels, and empower civil society to nurture and conserve their heritage resources in order to bequeath these resources to future generations.

In terms of Section 38(1) of the Act, any person who intends to undertake a development categorised below must notify the responsible heritage authority of the proposed development and undertake a heritage impact assessment. The categories are-

(a) the construction of a road, wall, power line, pipeline, canal and other similar form of linear development or barrier exceeding 300m in length;

(b) the construction of a bridge or similar structure exceeding 50m in length;

(c) any development or other activity which will change the character of a site-

(i) exceeding 5000m² in extent; or

(ii) involving three or more existing erven or subdivisions thereof, or

(iii) involving three or more erven or divisions thereof which have been consolidated within the past five years; or

(iv) the costs of 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 000m² in extent; or

(e) any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority.

As the proposed construction of the substation and power line falls within the above categories, namely, subsections (a) and (c) (i), the requirements of this Act are therefore applicable to this project.

Other provisions of this Act that relate to this project are Sections 34, 35, and 36 that respectively refer to the protection of structures older than 60 years; archaeological and paleontological sites and meteorites; burial grounds and graves.

Since the proposed development is located on large expanse of land, the potential exists that the project could impact on heritage resources hence the need to be aware of the provisions of this Act.

5.9 SUBDIVISION OF AGRICULTURAL LAND ACT (ACT NO. 70 OF 1970)

The aim of this Act is to prevent the subdivision of agricultural land to the extent where the new portions created are so small that farming will no longer be economically viable. Due to the size of the proposed substation and possible impacts on the agricultural viability of the study area, cognizance needs to be taken of the provisions of this Act.

5.10 NATIONAL ENVIRONMENTAL MANAGEMENT: AIR QUALITY ACT (ACT NO. 39 OF 2004)

The Act provides for the management of air quality in South Africa. The construction activities associated with the proposed development could impact on air quality in and around the development area through the creation of dust. The Applicant would therefore have to ensure compliance with this Act during the construction process (if necessary).

5.11 NATIONAL ENVIRONMENTAL MANAGEMENT: WASTE ACT (ACT NO. 59 OF 2008) (NEMWA)

The objective of NEMWA is to protect health, well-being and the environment. Where waste is generated the Act seeks to ensure that the waste is reused, recycled and recovered in an environmentally sound manner before being safely treated and disposed of. The Act provides reasonable measures for the prevention of pollution and ecological degradation and securing ecologically sustainable development.

Provisions were made in the form of legislative and regulatory tools to facilitate and ensure implementation of the Act by all spheres of government. To this end, a list of waste management activities was published in July 2009 (amended in 2013) that has thresholds on waste activities that require authorisation prior to commencement. The List of Waste Management Activities replaced Schedule 1 of the NEMA and all waste related activities listed in terms of Section 24(2) of the NEMA were repealed at the same time in order to align the NEMWA and EIA regulations and to avoid the necessity of submitting two applications for the same activity.

Due to the decommissioning and possible dismantling of a section of existing 132kV power lines, a waste management licence could have been required for the disposal of the infrastructure in terms of the list of waste management activities as stipulated in Government Notice 921 of November 2013. However, it was determined that a waste management licence was not required for this project.

5.12 MINERAL AND PETROLEUM RESOURCES DEVELOPMENT ACT (ACT NO. 28 OF 2002) (MPRDA)

The objectives of this Act include the promotion of equitable access to the nation's mineral and petroleum resources to all the people of South Africa; to provide security of tenure in respect of prospecting, exploration, mining and production operations and to give effect to section 24 of the Constitution by ensuring that the nation's mineral and petroleum resources are developed in an orderly and ecologically sustainable manner while promoting justifiable social and economic development.

The Act also controls the use of land surface rights on mining and prospecting areas in terms of Section 53(1) and as the proposed development will impact on such rights in the study area, the requirements of the Act in this regard will need to be implemented.

Provisions of the Act could also apply in the event that borrow pits and quarries are required to source building material from for the construction phase of the project.

5.13 HAZARDOUS SUBSTANCES ACT (ACT NO. 15 OF 1973)

This Act controls the use and handling of hazardous substances that could have negative impacts on the environment, including public health. It lists all substances controlled in terms of this legislation. Therefore, in terms of this Act, the contractors involved in the project would have to ensure that the use and handling of any hazardous materials is consistent with the provisions of this Act and does not cause any form of pollution.

5.14 ESKOM LEGISLATION

5.14.1 Eskom Act (Act No 40 of 1987)

The Act sets out the objectives of Eskom, being the provision of a system by which the electricity needs of the consumers are satisfied in the most cost-effective manner, subject to resource constraints and the national interest. The National Energy Regulator of South Africa exercises control over the performance of Eskom's functions and the execution of its powers and duties. Section 12 of the Act sets out the functions, powers, and duties of Eskom. The administrative authority is the Department of Energy.

5.14.2 Eskom Conversion Act (Act No 13 of 2001)

The objective of the Eskom Conversion Act is to convert Eskom into a public company in terms of the Companies Act, and to provide for powers and duties of Eskom. The administrative authority is the Department of Energy.

5.14.3 Electricity Regulation Act (Act No 4 of 2006)

The Act governs the control of the generation and supply of electricity in South Africa, and the existence and functions of the National Energy Regulator of South Africa

5.14.4 White Paper on the Energy Policy of the Republic of South Africa (1998)

Policy objectives identified include increasing access to affordable energy services, improving energy governance, stimulating economic development, and managing energy-related environmental and health impacts. The administrative authority is the Department of Energy.

5.15 GOVAN MBEKI SPATIAL DEVELOPMENT FRAMEWORK, 2014-2034

As far as the current electricity system is concerned, the SDF (p 253) identified the following issues:

- The existing bulk supply to eMbalenhle is fully utilized and needs to be extended to accommodate new development.
- Any future development in eMzinoni will require additional bulk supply.
- The network in the Bethal industrial area is degraded due to age and needs urgent upgrading.
- Overhead power lines in Trichardt cause many power failures and need to be replaced.
- The total network in Evander is old and outdated and should be reviewed and upgraded.

The SDF identified that the lack of electricity supply for new residential developments and expansion was hampering development in Secunda and other areas making up the GMLM. The additional MTS is in line with the need for additional power supply in order to eradicate backlogs and improve power supply to all areas

The SDF (p 143) stated that it was probable that the greater Secunda complex's future is relatively secure, given the projected 30-year supply of underground coal. Also, given the increase in demand for electricity on a national level and the recent recommissioning of Eskom power plants, the demand for coal is expected to increase. The construction of the Mulalo substation and power lines would need to avoid, where possible, areas that are currently mined and those areas to be mined not only from a safety factor but also to allow mining to continue.

According to the SDF (p 281), the future growth of GMLM is dependent on the level of diversification and growth of the economy within GMLM. The diversification of the economy needs to be a priority to ensure long term sustainable development. The provision of additional power in the GMLM should support efficient supply of electricity to sustain additional industry growth. The land south of SASOL (p 331) is proposed as an area where noxious industries can develop in future. This area is relatively far removed from residential areas. The location of the substation and power lines should therefore fit in with the proposed industrial nature of the area and will not impact on residential developments.

6. PUBLIC PARTICIPATION

6.1. INTRODUCTION AND BACKGROUND

Senkosi Environmental submitted the Final Scoping Report (FSR) to Department of Environmental Affairs (DEA) on the 04th November 2016. The DEA accepted the FSR on the 09th December 2016 (See Appendix 5-1). All registered stakeholders were informed about the acceptance of FSR via email (See Appendix 5-2).

According to NEMA EIA Regulations 2014 it is required that all registered Interested and Affected Parties should be informed about the EIA process followed after submitting the FSR to DEA. Stakeholders were informed about this submission by means of a letter dated 08 November 2016 (See Appendix 5-3).

Due to some delays when conducting thorough site investigations, the initial application for the project lapsed. In terms of Environmental Impact Assessment Regulation 21 (2) it is required that a new application for Environmental Authorisation must be submitted. Senkosi Environmental resubmitted a new application together with the Draft Environmental Impact Assessment Report (DEIAR) to the DEA on 16 February 2018 (See Appendix 5-4).

The purpose of public participation during the Impact Assessment Phase was to present the findings of the EIA phase and to make available the DEIAR and Draft Environmental Management Programme report (EMPr) to the public for comment. Once the review period was completed and the report updated with comments received, the Final EAIR and EMPr was submitted to DEA for a decision. The Authority will authorise the application with certain conditions to be compiled with by the Applicant or reject the report. A decision of the Authority reflecting the outcome of the application will be issued to the Applicant and all registered I&APs will be notified about the decision.

6.2. METHODOLOGY /WAY- FOWARD

Registered I&APs were advised about the availability of DEIAR and EMPr and the duration of comment period. Details of how to access the reports to comment and the venues where the reports were placed were made known to the public by a letter and advertisement. The public participation process for the EIA Phase followed involved the following activities:

6.2.1. ANNOUNCEMENT OF THE AVAILABILITY AND PUBLIC REVIEW OF THE DRAFT EIR AND EMPR

A letter was circulated to all registered I&APs, informing them about the progress made with the study and that the DEIAR and EMPr were available for public comment (See Appendix 5-5). The reports were distributed to public places (Secunda Public Library and Embalenhle Public Library) as well as different sections in the Govan Mbeki Local Municipality and Gert Sibande District Municipality. These are the two commenting local government. Advertisements were placed in the national newspaper (The Citizen) on 13 March 2018 and in the local newspaper (The Echo-ridge) on 13 March 2018 (see Appendix 5-6). Executive summary of the DEIAR was sent via email to all registered I&APs on 20 March 2018. (See Appendix 5-6).

6.2.2. PUBLIC REVIEW OF DEIAR AND EMPR

As part of the process to review the DEIAR and EMPr, registered I&APs were given 30 days to comment on the DEIAR and EMPr. The initial commenting period was from the 16th March 2018 to 16th April 2018 and was later extended to end on the 26th April 2018 (See Appendix 5-5).

6.3. MEETINGS

The focus Group Meeting that was planned for 28 March 2018 was not successful as the attendance was poor. All stakeholders who were expected during focus group meeting were again invited to attend the general public meetings which were scheduled for eMbalenhle (See Appendix 5-7 for proof of invitation). The Public Meetings to discuss the DEIAR and EMPr were held on the 07 April 2018 at Zamokuhle Primary School and Maphala-Gulube Primary School respectively. The meeting held at Maphala-Gulube Primary School was disrupted during the proceedings by some members of the community who were in attendance. Attendance register and Minutes of the meeting are attached in this report (Appendix 5-8 for attendance register and Appendix 5-9 for minutes and affidavit for a meeting held at Maphala-Gulube Primary School). All issues raised during the meeting were captured and addressed in the Comments and Responses Report (see Appendix 5-10).

6.2.4. PROGRESS FEEDBACK

All comments from I&APs have been addressed and incorporated into the final EIAR.

6.2.5. SUBMISSION OF FINAL EIAR AND EMPR FOR DECISION MAKING

Registered I&APs will be informed by a letter about the submission of the final EIAR and EMPr to DEA. The final EIAR and EMPr will be placed at Secunda Public Library and Embalenhle Public Library. Registered I&APs will also be advised that the final EIAR and EMPr are available on request.

6.2.6. ANNOUNCING THE DECISION OF THE AUTHORITY

Registered I&APs will be notified of the decision of the DEA. The Environmental Authorisation (EA) will be advertised in The Citizen Newspaper and the Echo-ridge Newspaper. The details for appeals will also be included in the advertisements.

6.2.7. COMMENTS RECEIVED

No comments were received from the general public which can be recorded as resulting from the placement of the reports in public places (Libraries). Comments received at the public meeting were addressed during the meeting and are captured in the comments and response report.

6.3. CONCLUSION

The Public Participation Team believes that I&APs were afforded adequate opportunity to participate in the study process. The input from stakeholders and issues raised have been considered and responded to by the study team. The PP Team is of the opinion that the participants mainly those from the municipalities in the study area made valuable contributions which assisted the Environmental Assessment Practitioner (EAP) to make recommendation

on the preferred sites for routes and substation .The EIA process will be concluded with the announcement of the decision of the authority and allowing 20 days appeal period. Registered I&APs will be advise

7 DESCRIPTION OF THE PROJECT

7.1 NEED AND DESIRABILITY OF THE PROPOSED PROJECT[3]

Eskom is the sole supplier of electricity to the major industries in the Secunda area. Given the growth of Sasol's asset base and the resultant increase in power needs, Sasol approached Eskom in 2011 to address the following needs of Sasol:

- Re-obtaining Sol MTS N-2 (N-2 is the ability of the existing Sol MTS to continue supplying the load demand after the loss of two transformers) firm supply,
- Integrating the Sasol OCGT into the Eskom 132kV network,
- Securing a supply to Sasol Synfuels' future maximum demand, and
- Improving the poor quality of supply to Sasol Synfuels by relocating the non-Sasol Synfuels load to a new substation.

One of Sasol's requirements is to separate their synfuel load from the non-synfuel loads (mining loads and Distribution loads), so that synfuels be supplied from a different substation as the non-synfuels. This requirement is also aligned with Eskom's plan of load growth and strengthening the Highveld South CLN. Constructing a new substation was the most-cost effective and holistic solution to address all the demands.

Eskom is undertaking this project due to additional reasons including the determination that the existing Sol MTS was severely overloaded and no longer N-1 compliant (N-1 is the ability of the existing Sol MTS to continue supplying the load demand after the loss of a single transformer), as required by the Grid Code of South Africa. This situation is likely to be exacerbated by the increased demand for power hence the decision that a new MTS substation, named Mulalo MTS, was required.

In addition, Eskom is also required to support the Govan Mbeki Local Municipality (GMLM) with additional bulk electricity reserves to meet the GMLM's service provision responsibilities towards local businesses and households within its administrative jurisdiction. The Secunda, Evander, eMbalenhle and surrounding areas have a steadily growing population and the need for electricity to support development opportunities and services is growing.

The existing network in the area is operating at full capacity and as a result has no surplus power to cater for additional supplies. The Mulalo MTS 400/132kV project is thus needed to support industrial growth and development of the industrial hub of Secunda, and also meet the power demands of the GMLM and Sasol.

The location of the required electrical infrastructure needed to be strategically considered in order to optimise supply. The study area that was selected by the Applicant was considered to be the best option because of the following reasons:

- The location is near the load centre in order that the new substation can be easily integrated with the existing 132kV network;

[3] Sasol OCGT Integration and Highveld South Strengthening Project: Feasibility Report compiled by DD Matshidza, March 2010, p 12

- The identified study area is the most cost effective after taking into account the required transmission and distribution infrastructure; and
- The location takes into account planned strengthening projects in terms of the Eskom Distribution 20-year Master Plan.

7.2 NO GO OPTION

If the project does not take place, then the environment of the proposed substation and power line will be unaffected and no impacts are expected.

If the project does not go ahead, then the existing Sol MTS will remain overloaded and unable to meet N-1 compliance. The existing network, which is operating at full capacity, will not be able to provide additional power thus hampering economic growth. The lack of development will also result that Sasol's additional power requirements will not be met and the poor quality of supply to Sasol will remain unaddressed.

The 'no-go' option is not a reasonable option in light of the power requirements of both Secunda and Sasol and power constraints of existing electrical infrastructure.

7.3 BRIEF OVERVIEW OF THE STUDY AREA

The study area is located within the Gert Sibande District Municipality (GSDM) which comprises the GMLM and other local municipalities. **Figure 2** below shows the study area within a regional context and **Figure 3** below shows the substation sites and power line routes. The GMLM will be primarily affected by the proposed development of the substation and associated activities.

The study area is situated south of the town of Secunda with the potential substation sites situated south east of eMbalenhle and south of the Sasol refinery. The study area also includes the existing Kriel-Tutuka 400kV transmission line and the Kriel-Zeus 400kV transmission lines and existing Sasol 2 and Sasol 3 distribution lines. The study area is characterised by mining and industrial operations related to the Sasol Refinery, and farming activities. The R546 road, a major arterial road between Secunda and Standerton south runs through the western side of the study area.

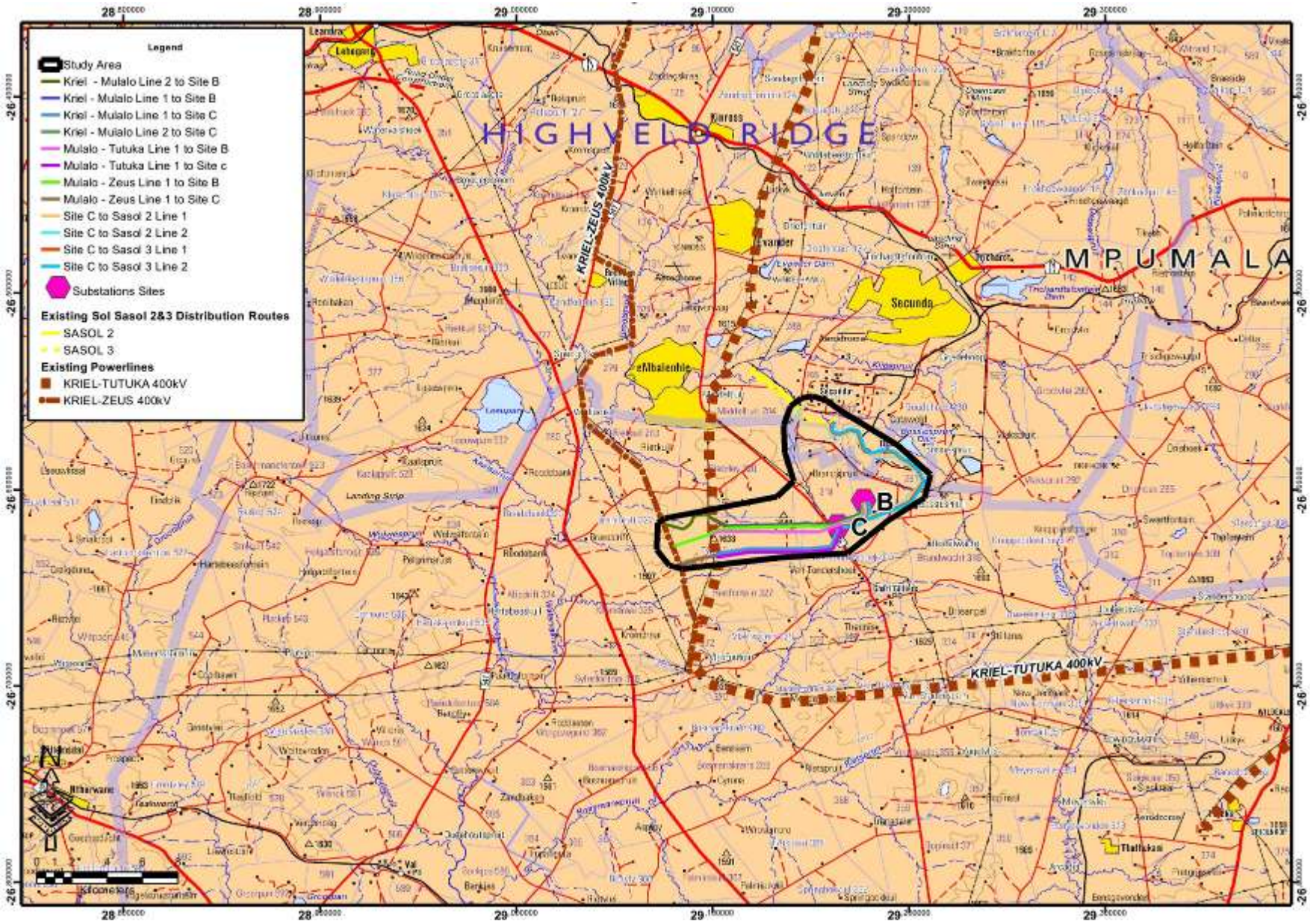

Figure 2: Project area within regional context

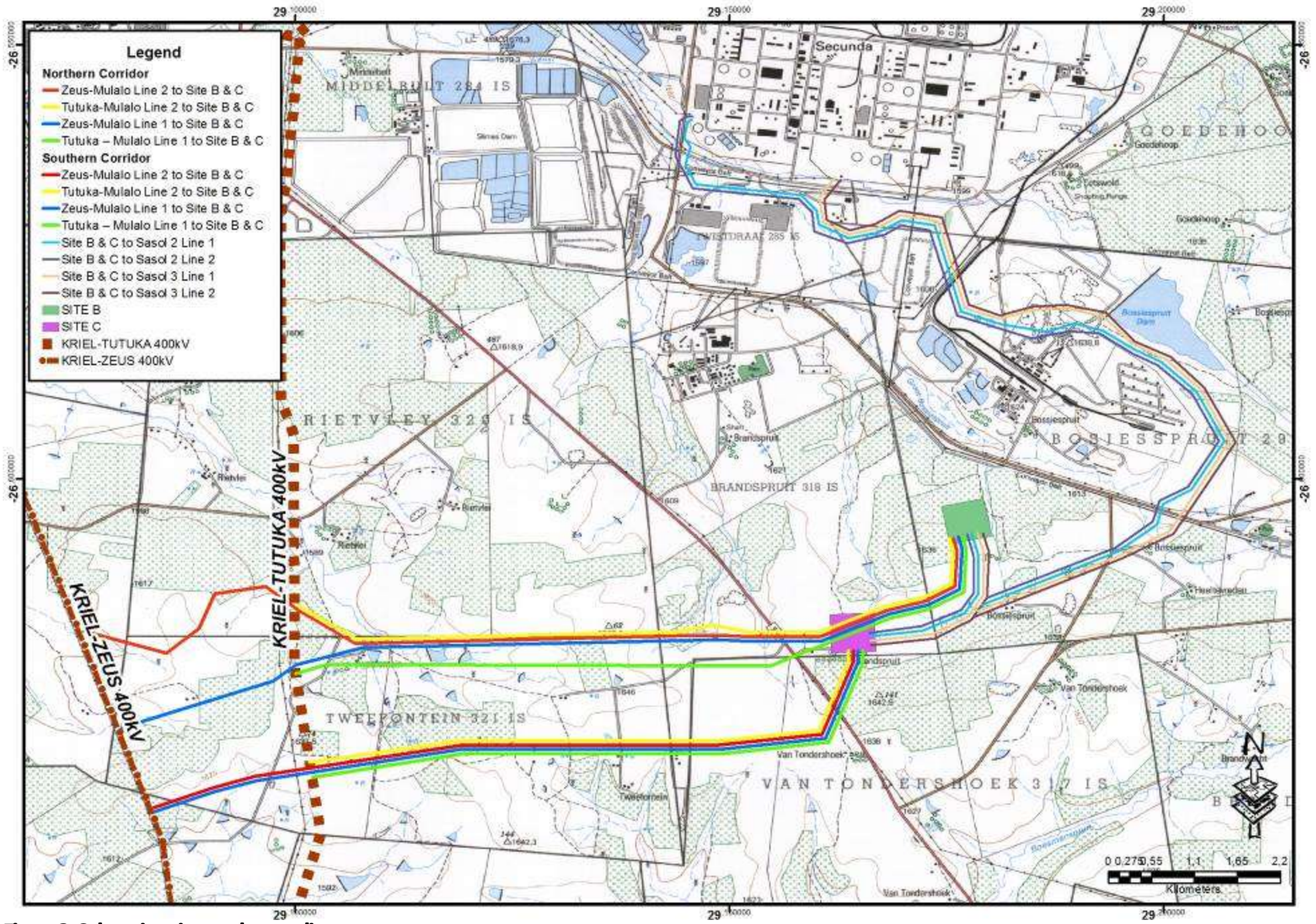

Figure 3: Substation sites and power line routes

7.4 Description and Construction Process for Transmission Substations and Power Lines

7.4.1 Physical Elements of Project Components

Substation Precinct:
Optimal Size = 800m x 800m (for future expansion requirements)
Telecommunications tower of 60m high

400kV Transmission Power Lines:
Servitude: 55m per 1x 400kV power line
Tower-to-Tower span: 300m – 350m
Length of Power lines between substation and existing lines: over 15 km
Height of Tower: between 30m-35m
Minimum conductor ground clearance: 8.1m

132kV Distribution power lines (built as 400kV power lines)
Servitude: 55m per 1x 400kV power line
Tower-to-Tower span: 300m – 350m
Length of Power lines: between 5 and 11 km (depending on location of the new MTS site)
Height of Tower: between 30m-35m
Minimum conductor ground clearance: 8.1m

7.4.2 Main Transmission Substation

In order to allow for items such as oil traps and pylon configuration of incoming power lines, as well as the possibility of future expansion in response to an increased demand for electrical power, and the integration of lines into the MTS, Eskom's optimum substation site size is 800m X 800m (or 64 ha).

Construction of the substation will involve a land survey, clearing of vegetation at the site for the substation, erection of a camp site, upgrading of access road/s, transportation of equipment, materials and personnel, establishment of foundation by casting concrete, installation of transformers, steel tower assembling and erection of substation, fencing the substation area, and rehabilitation of disturbed land.

A typical substation comprises various electrical devices and equipment which include busbars, feeder bays, transformers, etc. As illustrated in Figure 2 below, electricity is transmitted from power stations to transmission substations via overhead transmission power lines. Electricity delivered to these substations is then stepped down to voltages that are suitable for use in, for example, industrial, commercial and residential areas.

Figure 4: Illustration of transmission substation

In addition, in order to transform power from one voltage level to another, substations also perform the following functions:

- Interconnect adjacent power systems for mutual assistance in case of emergency,
- Interconnect alternative sources of power,
- Connect generation, transmission or distribution lines and loads to each other, and
- Provide switching for alternative connections and isolation of failed or overloaded lines and equipment.

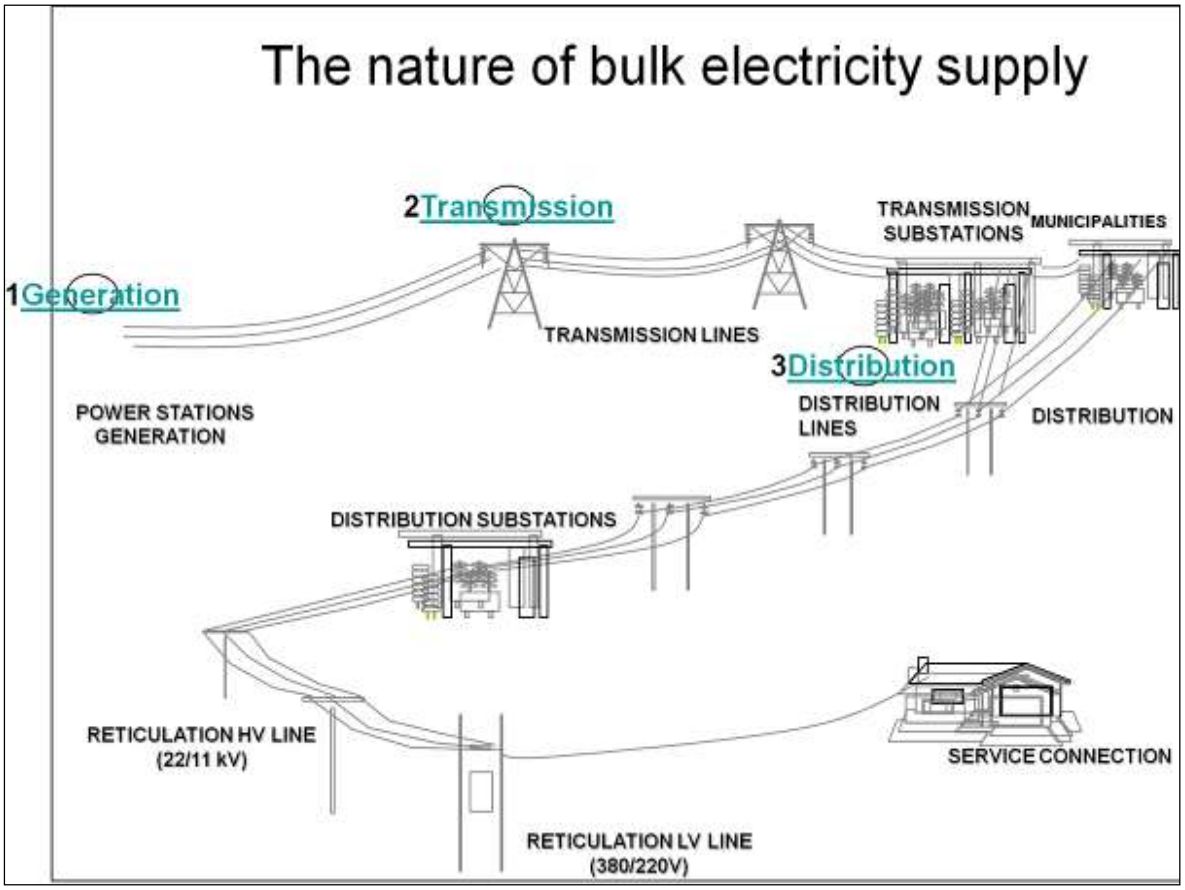

Figure 5: Bulk electricity supply from generation to transmission to distribution[4]

7.4.3 400kV transmission power lines

The standard servitude width requirement for a 400kV transmission power line is 55m. However, because of the developed nature of the study area, a servitude of 100m for each 400kV power line may be considered. The type of power line tower that will be used has not been determined yet.

The construction of the 400kV turn-in power lines will involve the following activities:

- *Survey and Pegging of Tower Locations:* A 400kV transmission line has a tower to tower span of between 350m – 500m. The number of towers required would be determined by the length of the line, and the number of bends on the line.
- *Foundation Excavation:* This will involve clearing of vegetation in areas where towers are to be located and digging of tower foundations. The footprint of each tower construction would vary depending on the type of tower that is being used. Similarly, the depth of excavation would also depend on the type of tower being used.
- *Casting of Foundations:* This involves delivery and casting of concrete into foundation holes, movement of concrete trucks to and from the project area, backfilling of foundation holes, compaction of soil and rehabilitation of the site.

[4] This diagram was obtained from a PowerPoint presentation prepared by Eskom Transmission and presented to a public participation meeting held on 02 November 2010.

- *Tower Erection:* This involves delivery of steelworks to the site, assembly and erection of the tower, and movement of steelworks delivery trucks.
- *Tower Dressing and Stringing of Conductors:* This involves transport and delivery of insulator sets and assembly of insulator sets. Special precautions would have to be taken during the stringing of conductors across roads and precautions would have to be taken when stringing conductors across environmentally sensitive areas including rivers and wetlands. These precautionary measures include undertaking stringing by hand and not mechanically to avoid vehicles driving into wetlands and on to river banks. These details will be provided in the EMPr which would be implemented during at the start of the project.
- *Line Inspection and Routine Maintenance:* This will involve initial inspection and commissioning of power lines, routine inspection at suitable intervals, refurbishment or replacement of parts of towers as required.

The design of the 400kV towers to be used for this project has not been determined as yet. In addition to the Guyed V type tower design; there is also the Cross-Rope suspension design, both of which are illustrated below. The advantages of the Cross-Rope suspension is that there is less steel used in the towers than with the Guyed V, hence the visual impact of the power line is slightly reduced. The use of double circuit power lines may also be considered. A representation of the compact cross-rope suspension tower is indicated in **Figure 6** below.

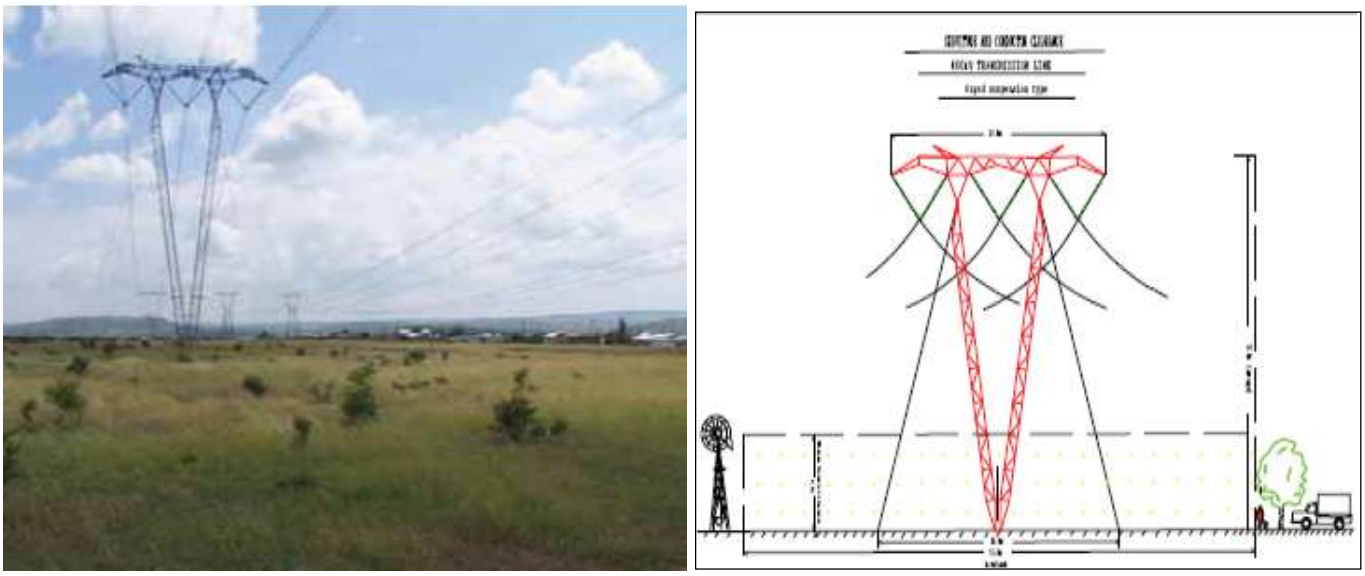

Figure 6: (Left) Photograph of Guyed V Tower; (Right) Representation of Guyed V Tower[5]

[5] Picture and diagram obtained from the DSR for the Proposed Venus-Sigma 765kV Transmission Power Line and Sigma-Hector 400kV Transmission Power Line and New Feeder Bays at Hector Substation project prepared by ACER (Africa) Environmental Management Consultants, March 2010

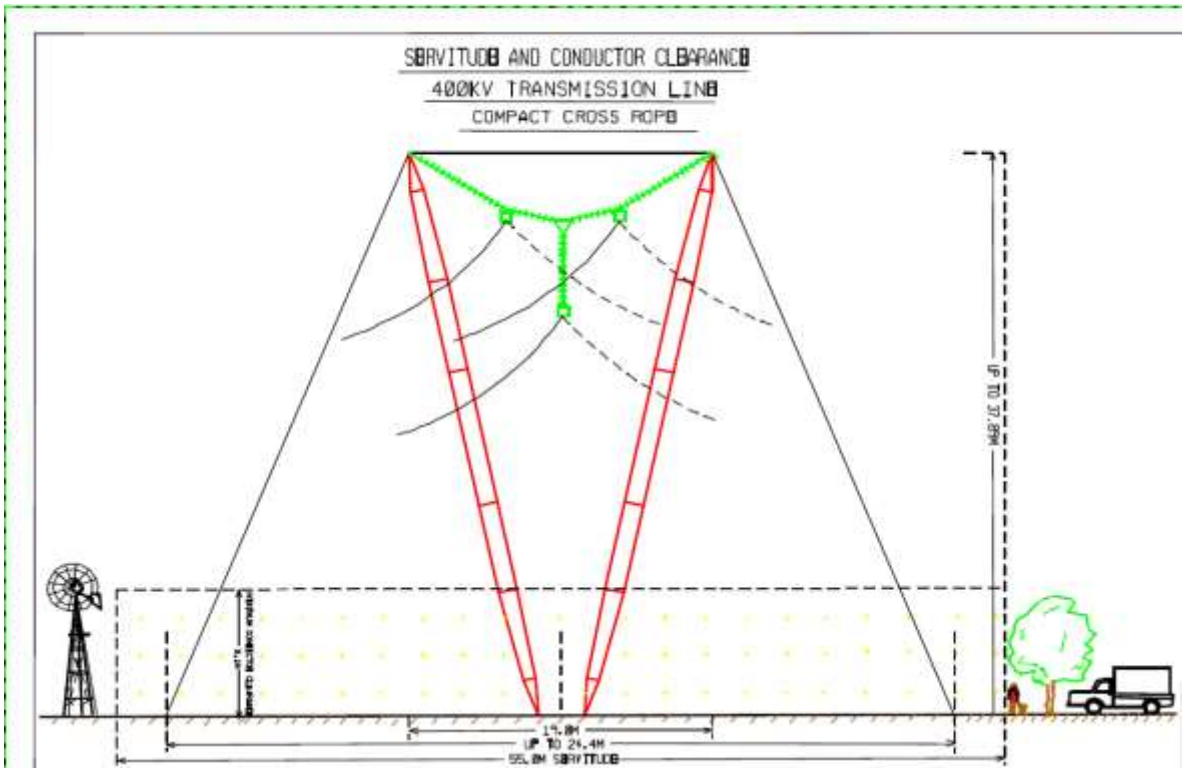

Figure 7: Illustration of the compact cross rope suspension tower

A representation of the compact cross-rope suspension tower is indicated below.

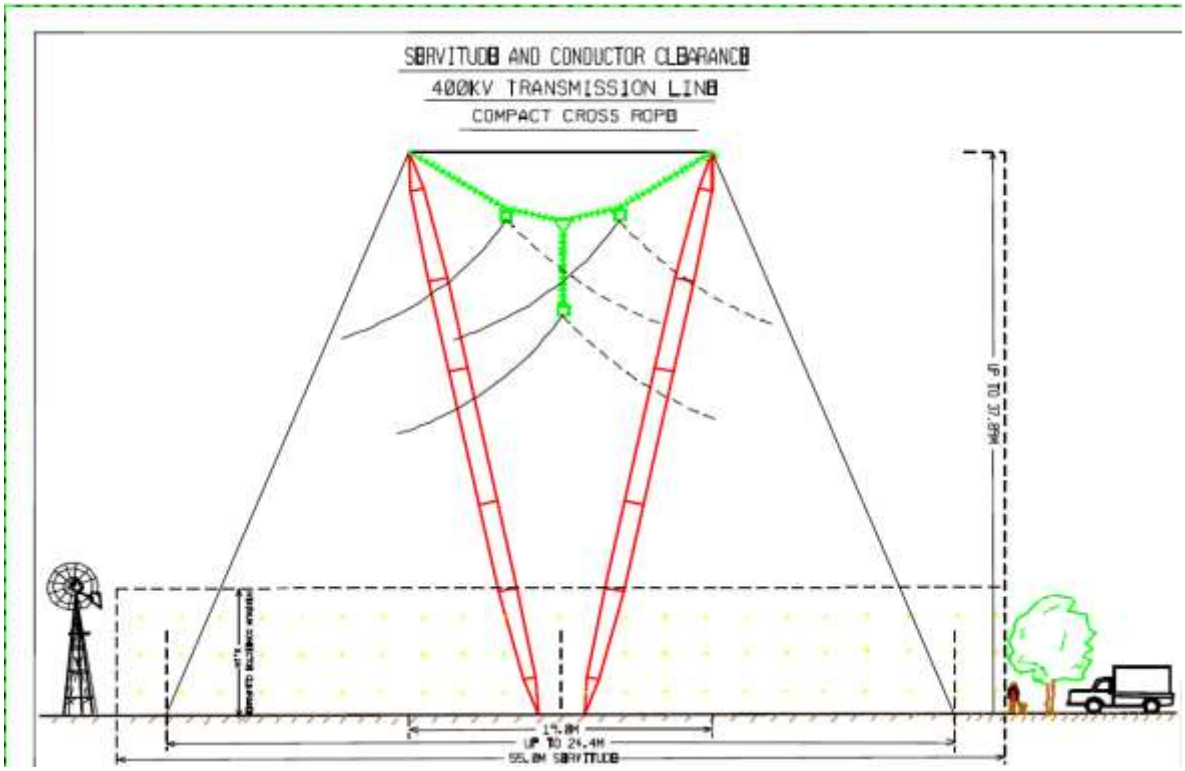

Figure 8: Illustration of the compact cross rope suspension tower

The use of self-supporting Strain Towers is particularly important for bends in the power line route that are greater than 3˚ and/or when power lines cross uneven and difficult terrain.

Figure 10 indicates the clearances below the proposed power lines. Some farming activities can still continue below power lines provided there is conformance to safe working clearances, building restrictions and restriction on crop types such as large trees.

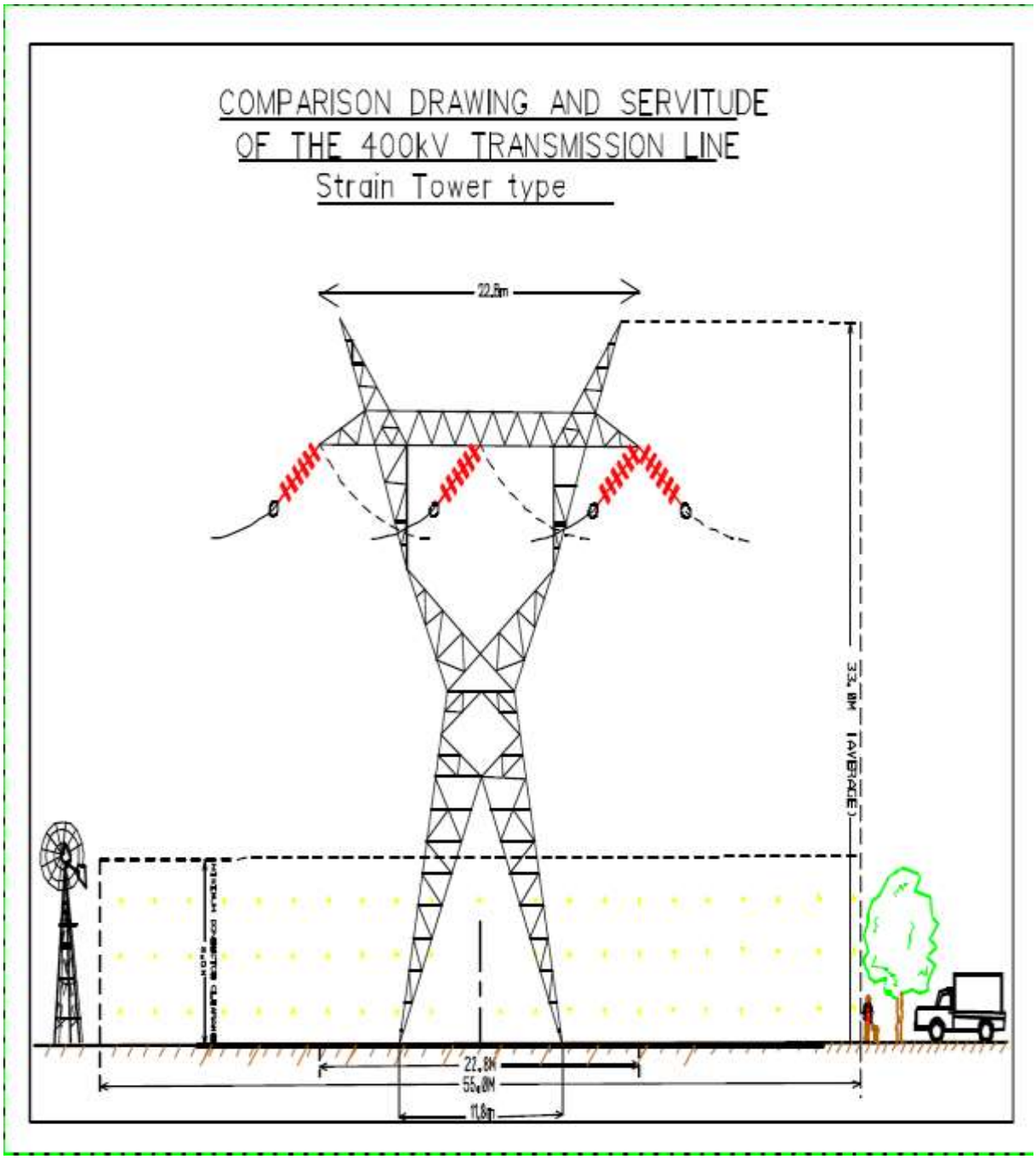

Figure 9: Representation of a self-supporting strain tower

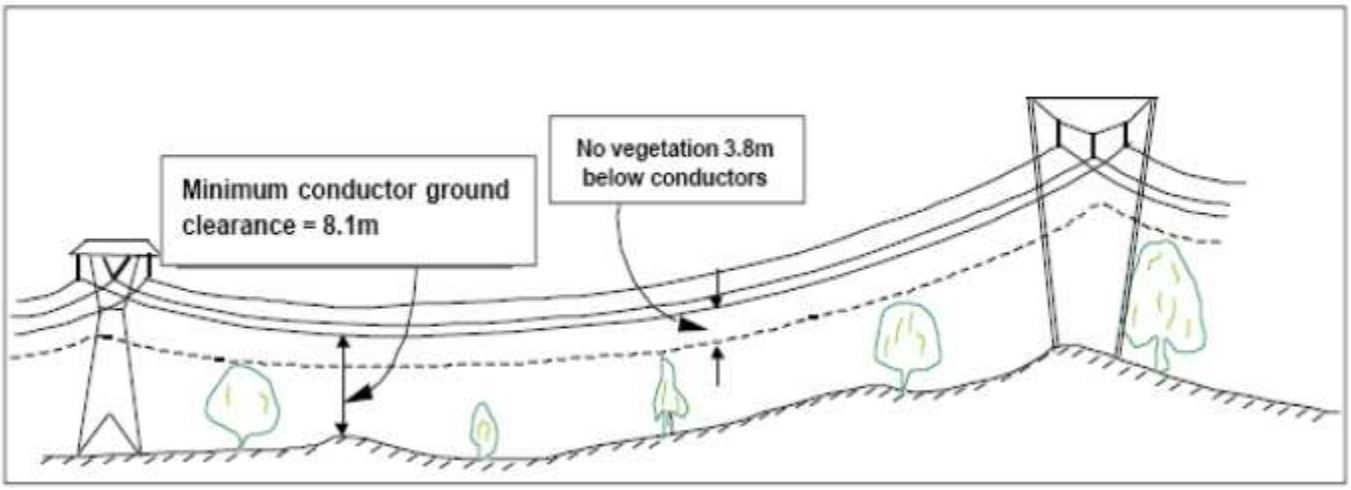

Figure 10: Diagram indicating conductor ground clearance

7.4.4 132kV distribution power lines

Due to the 132kV power lines being built as 400kV power lines, the design and detail as listed in section 3.4.3 above is applicable to the proposed four power lines.

7.5 DESCRIPTION OF DECOMMISSIONING PROCESS OF DISTRIBUTION POWER LINES

A section of the 132kV power line between existing Sol MTS and Sasol 2 substation will be decommissioned and dismantled once the new lines from the proposed Mulalo MTS are integrated into the existing Sasol 2 network.

8 DESCRIPTION OF SUBSTATION SITES AND ASSOCIATED POWER LINES CORRIDORS

8.1 DESCRIPTION OF SUBSTATION SITES

8.1.1 Substation Site B (S26˚36´19.95˝, E29˚10´37.00˝)

Site B is located on portion 8 of the farm Bosjespruit 291IS (T0IS00000000029100008)
The site is currently used for farming including the cultivation of maize and soya beans. The proposed site straddles two farms.

The site is located on land that slopes at gentle gradients in a general north easterly direction. The site occupies a mid-slope location, between the crest of a gentle hill (located to the south west) and a gentle valley (located to the east/northeast). Two small drainage lines originate in the northern section and the eastern section of the site. The drainage lines are only expected to contain water for short periods after heavy rainfall (Jeffares & Green 2015:5).

In terms of geological setting, the site is underlain by intrusive dolerite of the Jurassic Era (commonly referred to as 'Karoo Dolerite'), in the form of a large sill. The geology map indicates that sandstone of the Vryheid Formation occurs in the general area of the site (Jeffares & Green: 3).

8.1.2 Substation Site C (S26˚37´05.97˝, E29˚09´49.43˝)

Site C is situated portion 3 of the farm Brandspruit 318IS (T0IS00000000031800003). The site is currently used for farming, more specifically, for grazing for animals.

Site C is located over the crest of a very gently northerly trending spur which forms a gentle hill located to the south of the site. The site slopes at gentle to very gentle gradients towards the north to north east. A flat section to gentle depression is located in the south western section and surface seepage occurs on the site (Jeffares & Green: 5).

In terms of geological setting, the site is underlain by intrusive dolerite of the Jurassic Era (commonly referred to as 'Karoo Dolerite'), in the form of a large sill. The geology map indicates that sandstone of the Vryheid Formation occurs in the area of the site (Jeffares & Green: 3).

8.2 AMENDED ROUTE ALIGNMENTS FOR POWER LINES

An undermining assessment of the study area, substation sites and power line corridors was completed in early 2017. The assessment found that some of the power line routes were crossing areas that could be subjected to unacceptably high levels of surface subsidence (due to undermining) and therefore these were regarded as terminal flaws to that proposed route, but not to the overall project. Past experiences with existing power lines that are situated on undermined ground can lead to massive costs associated with potential issues such as pylon collapse or line failure resulting from undermining.

The areas of high levels of subsidence were found directly south of the Sasol Refinery affecting the potential distribution power lines between the two substation sites and the existing Sasol 2 and 3 power lines. The affected power line routes are: Routes 1 and 2 (indicated in luminescent green on

Figure 11 below) between substation site B and the existing Sasol 2 power line and routes 1 and 2 (indicated in mustard yellow on **Figure 11**) between substation site C and existing Sasol 3 power line. As a result of the high risk of subsidence, these routes no longer form part of the project.

Route 3 (indicated in turquoise on **Figure 11**), which has always been an option, avoids the underground geotechnical risk and is now the proposed route for the distribution power lines between substation sites B and C and Sasol 2 and 3 power lines. See **Figure 12** indicating the amended map for this project. It should be noted that the colours depicting the routes has been amended from what was presented in the scoping phase.

A section of this route is situated close to and north of Sasol's surface explosive magazines and nitro plant. Security concerns have been raised by Sasol that access for maintenance of the power lines would be inconvenient around the nitro plant and in the event of an explosion at the nitro plant, the integrity of the power lines could be brought into question. At this stage Sasol has accepted the alignment of the route with reservations.

In addition, the routes between substation sites B and C to the existing Kriel-Tutuka and Kriel-Zeus power lines have also been affected. The original route options kept each of the two pairs of proposed power lines (north option and south option) together. The undermining study found that the some of the routes crossed over fully extracted stooped ground that could be prone to future surface subsidence. Therefore, some route diversion was suggested that has resulted in three lines being kept parallel along the original north option and a single line routed slightly to the south to avoid the undermined ground. The undermined area is over 600m wide and will be difficult to span without using very large towers. This explains why a single line has been routed around the mining to the south. Only a single line was re-routed due to the shortwall mining directly to the south over which construction is not recommended.

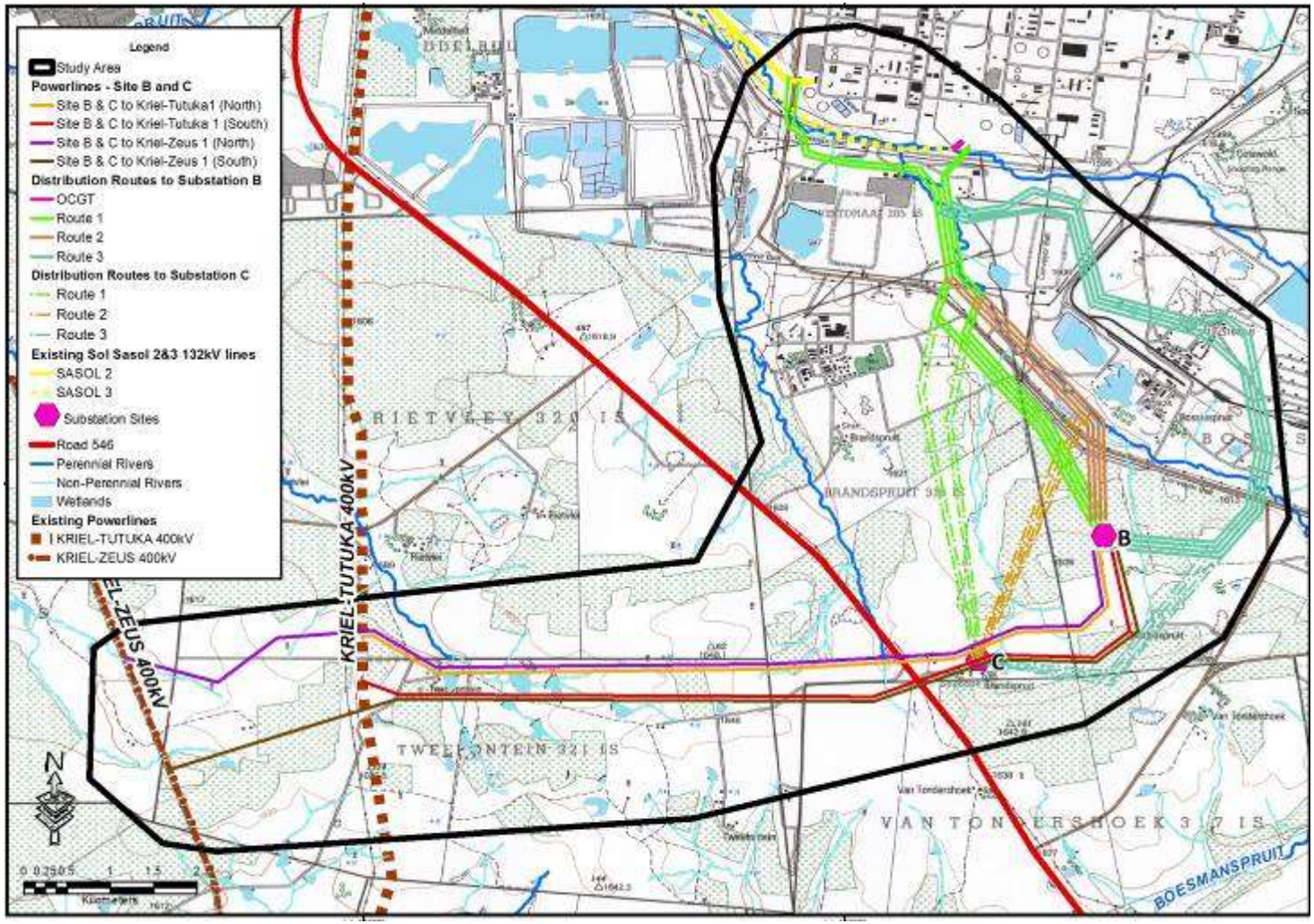

Figure 11: Map indicating 'old' power line routes

In addition, due to the constraints mentioned along the northern route, a southern route/corridor, consisting of all four power lines running parallel has been included. This southern corridor crosses undermined areas that have a higher safety factor than the northern corridor which is located closer to stooped sections which have a higher chance of failure.

Figure 12 below provides the new route alignments. As stated previously, the scope of work requires that two new transmission power lines are required to connect the proposed Mulalo MTS with the existing Kriel-Tutuka 400kV transmission power lines and two new transmission power lines are required connect the proposed Mulalo substation with the existing Kriel-Zeus 400kV transmission power lines. In addition, two new distribution power lines are required to integrate the proposed Mulalo substation with the existing Sasol 2 substation; two new distribution power lines are required to connect the proposed Mulalo substation with the existing Sasol 3 substation, both of which are located in the Sasol Refinery complex. The distribution lines will be built as 400kV power lines to accommodate future demand. Two 132kV lines will connect the OCGT located in the Sasol Refinery with the existing Sasol 3 substation.

8.2.1 Description of northern corridor from Substation Site B

The northern corridor consists of three power lines that run parallel to one another and a fourth line that is situated some distance south of the three power lines. The two lines that connect to the Kriel-Zeus power lines are depicted in red and in blue in **Figure 12** below. The two lines that connect to the Kriel-Tutuka power lines are depicted in yellow and green.

The coordinates are provided in **Table 2** with the start point being the substation site coordinates, an approximate middle point along the power line and the end point is where the power line loops into the existing power lines.

Table 2: Coordinates for northern corridor from site B

START POINT	MID-POINT	END POINT
KRIEL ZEUS – red		
S26˚36´19.95˝, E29˚10´37.00˝	S26˚37´07.66˝, E29˚07´50.80˝	S26˚37´10.39˝, E29˚04´33.10˝
KRIEL ZEUS - blue		
S26˚36´19.95˝, E29˚10´37.00˝	S26˚37´15.95˝, E29˚07´56.11˝	S26˚37´49.17˝, E29˚04´48.70˝
KRIEL-TUTUKA – yellow		
S26˚36´19.95˝, E29˚10´37.00˝	S26˚37´05.15˝, E29˚08´21.92˝	S26˚36´53.57˝, E29˚05´59.26˝
KRIEL-TUTUKA - green		
S26˚36´19.95˝, E29˚10´37.00˝	S26˚37´24.71˝, E29˚08´18.00˝	S26˚37´22.65˝, E29˚05´59.22˝

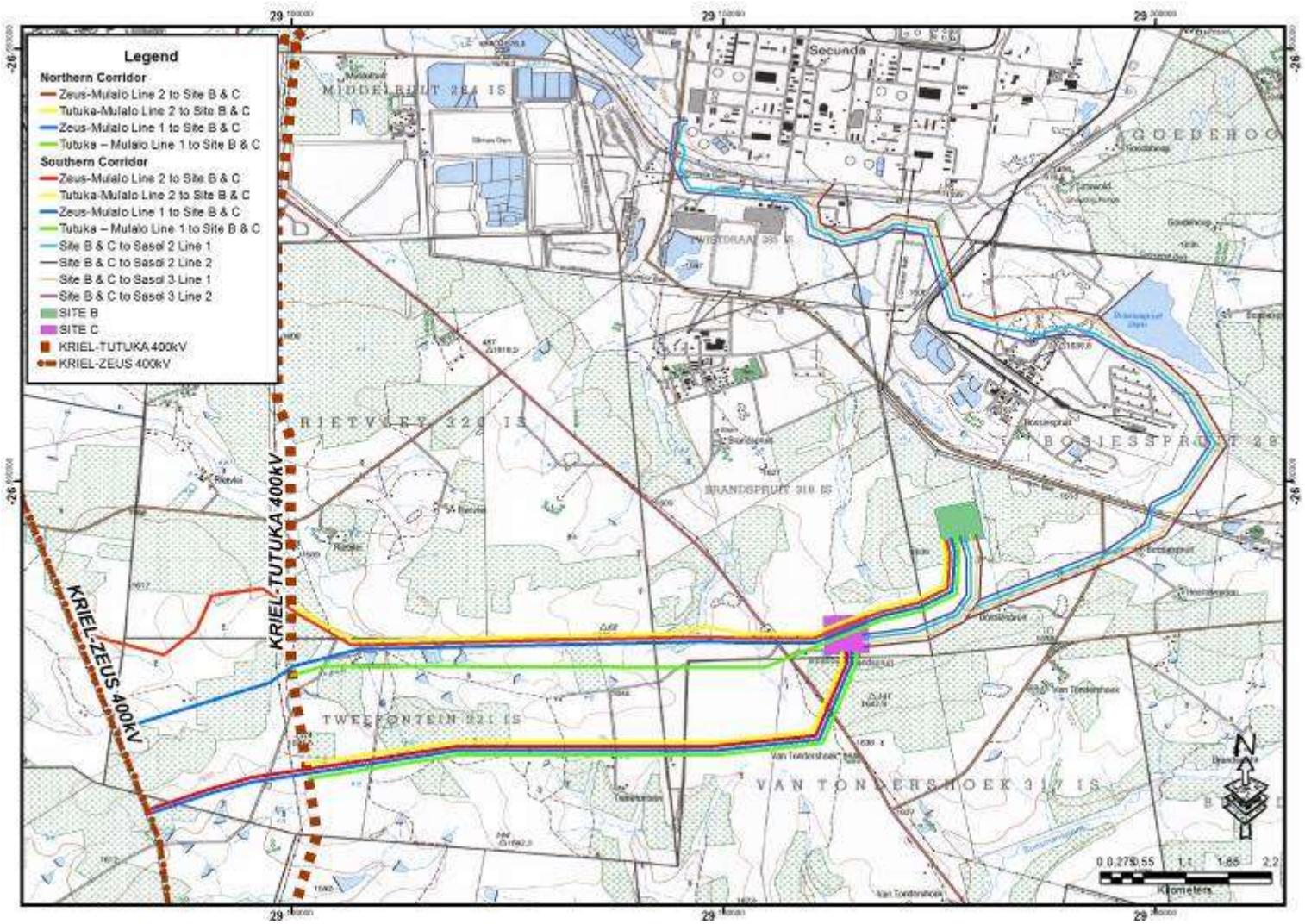

Figure 12: Location of substation sites and amended power line routes

8.2.2 Description of northern corridor from substation site C

The power lines from Site C follow exactly the same alignment and are depicted in the same colours as those described for Site B except the lines from Site C are shorter due to the closer proximity of Site C to the existing Kriel-Tutuka and Kriel-Zeus power lines. The coordinates for the routes are provided below.

Table 3: Coordinates for northern corridor from site C

START POINT	MID-POINT	END POINT
KRIEL ZEUS: red		
S26˚37´05.97˝, E29˚09´49.43˝	S26˚37´08.16˝, E29˚06´56.65˝	S26˚37´10.39˝, E29˚04´33.10˝
KRIEL ZEUS: blue		
S26˚37´05.97˝, E29˚09´49.43˝	S26˚37´11.43˝, E29˚07´09.08˝	S26˚37´49.17˝, E29˚04´48.70˝
KRIEL-TUTUKA: yellow		
S26˚37´05.97˝, E29˚09´49.43˝	S26˚37´05.63˝, E29˚07´50.21˝	S26˚36´53.57˝, E29˚05´59.26˝
KRIEL-TUTUKA: green		
S26˚37´05.97˝, E29˚09´49.43˝	S26˚37´18.60˝, E29˚07´59.08˝	S26˚37´22.65˝, E29˚05´59.22˝

8.2.3 Description of southern corridor from substation site B

The southern corridor consists of four lines that run parallel to one another. The two lines that connect to the Kriel-Zeus power lines are depicted in red and blue in **Figure 12**. The two lines that connect to the Kriel-Tutuka power lines are depicted in yellow and green.

Table 4: Coordinates for southern corridor from site B

START POINT	MID-POINT	END POINT
KRIEL ZEUS – red		
S26˚36´19.95˝, E29˚10´37.00˝	S26˚36´29.70˝, E29˚07´55.44˝	S26˚38´17.80˝, E29˚05´00.08˝
KRIEL ZEUS – blue		
S26˚36´19.95˝, E29˚10´37.00˝	S26˚37´54.35˝, E29˚08´18.52˝	S26˚38´19.76˝, E29˚05´00.79˝
KRIEL-TUTUKA – yellow		
S26˚36´19.95˝, E29˚10´37.00˝	S26˚37´49.53˝, E29˚08´55.19˝	S26˚36´53.57˝, E29˚05´59.26˝
KRIEL-TUTUKA - green		
S26˚36´19.95˝, E29˚10´37.00˝	S26˚37´56.16˝, E29˚08´54.41˝	S26˚37´22.65˝, E29˚05´59.22˝

8.2.4 Description of southern corridor from substation site C

The southern corridor consists of four lines that run parallel to one another. The two lines that connect to the Kriel-Zeus power lines are depicted in red and blue (**Figure 12)**. The two lines that connect to the Kriel-Tutuka power lines are depicted in yellow and green.

Table 5: Coordinates for southern corridor from site C

START POINT	MID-POINT	END POINT
KRIEL ZEUS: northern		
S26˚37′05.97″, E29˚09′49.43″	S26˚37′52.23″, E29˚07′41.96″	S26˚38′17.80″, E29˚05′00.08″
KRIEL ZEUS: southern		
S26˚37′05.97″, E29˚09′49.43″	S26˚37′53.98″, E29˚07′42.03″	S26˚38′19.76″, E29˚05′00.79″
KRIEL-TUTUKA: northern		
S26˚37′05.97″, E29˚09′49.43″	S26˚37′49.98″, E29˚08′13.50″	S26˚36′53.57″, E29˚05′59.26″
KRIEL-TUTUKA: southern		
S26˚37′05.97″, E29˚09′49.43″	S26˚37′55.66″, E29˚08′13.36″	S26˚37′22.65″, E29˚05′59.22″

8.2.5 Description of distribution power line corridors from substation site B

Sasol 2_Line 1:

From substation site B, the line depicted in turquoise on **Figure 12**, exits the substation site in a southerly direction before turning north-eastwards and northwards to circle around and above the Sasol nitro plant and explosive magazines. The route then turns in a north westerly direction to skirt the bottom of the Sasol Refinery before looping into the existing Sasol 2 power line.

Sasol 2_Line 2

This route (depicted in purple on **Figure 12**) runs parallel to Line1 duplicating the alignment of Line 1

Sasol 3_Line 1

From substation site B, the line indicated in mustard yellow in **Figure 12**, exits the site in a southerly direction before turning north east and then north-west to loop around the Sasol nitro plant and explosive magazines. This line almost copies the same route as Sasol 2 Line 1 and Line 2 but is situated east of these lines.

Sasol 3_Line 2

This route follows the same alignment as Line 1 and is depicted in brown on **Figure 12**.

The coordinates for these routes are provided below. The start coordinate is the substation site, an approximate midpoint and the end point is where the lines loop into the existing Sasol 2 and 3 lines.

Table 6: Coordinates for distribution power lines from site B

START POINT	MID-POINT	END POINT
SASOL 2_LINE 1		
S26˚36´19.95˝, E29˚10´37.00˝	S26˚35´01.29˝, E29˚11´35.69˝	S26˚33´32.56˝, E29˚08´43.38˝
SASOL 2_LINE 2		
S26˚36´19.95˝, E29˚10´37.00˝	S26˚35´03.73˝, E29˚11´35.14˝	S26˚33´31.58˝, E29˚08´43.46˝
SASOL 3_LINE 1		
S26˚36´19.95˝, E29˚10´37.00˝	S26˚35´16.22˝, E29˚12´05.58˝	S26˚33´56.36˝, E29˚09´41.64˝
SASOL 3_LINE 2		
S26˚36´19.95˝, E29˚10´37.00˝	S26˚35´15.01˝, E29˚12´06.91˝	S26˚33´56.41˝, E29˚09´44.75˝

8.2.6 Description of distribution power line corridors to substation site C

Sasol 2_Line 1:

From the substation site, the line depicted in turquoise exits to the north-east to follow the same alignment described for the lines from substation site B to the existing Sasol 2 power line.

Sasol 2_Line 2:

This route (depicted in purple) runs parallel to and east of Line 1.

Sasol 3_Line 1:

From substation site C, this route (depicted in mustard yellow on **Figure 12)** exits in a north easterly direction following much the same alignment as that described for substation site B.

Sasol 3_Line 2:

This route (depicted in brown on **Figure 12**) follows the same alignment as Line 1. Coordinates for these routes are provided below with the start point at substation site C and end point at the Sasol 3 existing power lines.

Table 7: Coordinates for distribution power line corridors from site C

START POINT	MID-POINT	END POINT
SASOL 2_LINE 1		

S26˚37´05.97˝, E29˚09´49.43˝	S26˚34´59.32˝, E29˚10´54.74˝	S26˚33´30.06˝, E29˚08´42.29˝
SASOL 2_LINE 2		
S26˚37´05.97˝, E29˚09´49.43˝	S26˚34´59.32˝, E29˚10´54.74˝	S26˚33´28.72˝, E29˚08´38.79˝
SASOL 3_LINE 1		
S26˚37´05.97˝, E29˚09´49.43˝	S26˚35´34.39˝, E29˚12´19.66˝	S26˚33´55.96˝, E29˚09´42.10˝
SASOL 3_LINE 2		
S26˚37´05.97˝, E29˚09´49.43˝	S26˚35´33.27˝, E29˚12´21.23˝	S26˚33´55.64˝, E29˚09´44.15˝

8.3 Description of distribution power line route between OCGT and Sasol 3 power lines

From the existing Sasol 3 power lines (lines 1 and 2), the proposed distribution power lines will run in a north easterly direction to the OGCT. The length of the power lines is approximately 140 m. These lines fall within the grounds of the Sasol Refinery. The coordinates are as follows:

Table 8: Coordinates for power lines to OCGT

SASOL 3_LINE 1	**OCGT**
S26˚33´54.73˝, E29˚09´40.24˝	S26˚33´51.85˝, E29˚09´43.89˝
SASOL 3_LINE 2	**OCGT**
S26˚33´55.83˝, E29˚09´40.85˝	S26˚33´51.85˝, E29˚09´43.89˝

9 SPECIALIST STUDIES

The proposed project will cause impacts to the biophysical and socio-economic environment. Specific environmental and socio-economic impacts will occur at different phases of the proposed project. These phases are:

- Construction of the Mulalo Main MTS) and power lines.
- Operation and maintenance of the MTS and power lines.
- Decommissioning / closure of the MTS and power lines

The scoping phase of the EIA resulted in a Plan of Study (PoS) for the next phase of EIA and based on the scoping exercise of the biophysical, socio-economic and cultural environment of the project, the following specialist studies were recommended because of the potential issues and impacts identified during the scoping phase:

- Avifauna
- Biodiversity
- Geotechnical
- Heritage
- Socio-economic
- Soils and land capability
- Undermining and surface subsidence risk assessment
- Visual Impact
- Wetland

The section below will summarise the findings of the various specialist assessments as well as providing information regarding the physical, biological, social, and economic and heritage environment of the proposed activity and alternatives.

9.1 AVIFAUNAL ASSESSMENT

The complete report is appended to this report as **Appendix 6**. Vegetation is one of the primary factors determining bird species distribution and abundance in an area. The study area is situated in the grassland biome and consists entirely of the Soweto Highveld Grassland vegetation which has been largely transformed by mining, agricultural and to a lesser extent other land use practices (e.g. game farming). Of South Africa's 841 bird species, 350 occur in the grassland biome. Grasslands represent a significant feeding area for many bird species in densely populated areas.

Rivers are extremely important sources of water for most bird species and will be regularly utilised as a source of drinking water and food and for bathing. Although the study area does not contain any major rivers, it does contain several tributaries that provide water for drinking and bathing and may act as corridors of microhabitat for water birds. Several dams of varying sizes and water permanency were observed along the route alignments that could also attract birds to the area. In addition, there are several localized wetlands occurring throughout the study area and these are likely to represent attractive areas for certain species year-round.

Agricultural lands (rain fed), old lands and pasture feature prominently within the study area that also represent a significant feeding area for many bird species. There are no Important Bird Areas (IBA's) within the delineated study area. However, the study area is located between two IBAs (SA130 – Devon Grasslands and SA018 – Amersfoort-Bethal-Carolina District) that are located approx. 20km west and 30km east of the study area respectively.

The Coordinated Avifaunal Roadcounts (CAR) project monitors the populations of 36 species of large terrestrial birds in agricultural habitats along 350 fixed routes covering over 19 000km. CAR route GD05 has relevance to the study area. The route has recorded fairly significant numbers of Helmeted Guineafowl, Black-headed Heron, Blue Korhaan, Spur-winged Goose, Blue Crane, Secretarybird, Steppe Buzzard and Black-shouldered Kite from 2010 to 2015. Although the study area is somewhat transformed and subject to significant industrial disturbance, the presence of these species in the open grassland areas in the broader study area cannot be ruled out.

There are no Coordinated Waterbird Count (CWAC) sites within the delineated study area. The closest site (approx. 12km to the west) is Leeuwpan, a large privately owned dam. Although the Leeuwpan site will not have a significant impact on the selection of the preferred substation site alternative and for the routing of the power line alignments, because of its relatively close proximity, the site does provide an indication of the species that are likely to occur in similar wetland habitats found within the study area.

A combined total of at least 190 bird species have been recorded within the relevant South African Bird Atlas Project 1 & 2 (SABAP 2) pentads. The presence of these species in the broader area provides an indication of the diversity of species that could potentially occur in the study area. Of these species, 14 species are considered to be of conservation concern (see Table 9 below). The majority of the Red List species that have been recorded in the broader study area are physically large species, meaning that they are capable of interacting directly with electrical infrastructure through collision.

EN = Endangered; VU = Vulnerable; NT = Near-threatened; LC = Least Concern

Table 9: Red list species that could occur in study area

Name	Regional conservation status (Taylor *et al.* 2015)	Global conservation status (IUCN 2016)	Av. reporting rate across the relevant pentads (%)	Grassland	Agriculture Lands	Wetlands, Dams & Surface Water	Exotic tree stands (*Eucalyptus*)	Collisions	Displacement through disturbance	Displacement through habitat destruction
Crane, Blue	NT	VU	1.39	x	x	x	-	x	x	x
Duck, Maccoa	NT	NT	2.78	-	-	x	-	x	-	-
Falcon, Red-footed	NT	NT	1.39	x	old lands & pasture	-	x	x	x	-
Flamingo, Greater	NT	LC	16.67	-	-	dams and pans	-	x	-	-
Flamingo, Lesser	NT	NT	2.78	-	-	dams and pans	-	x	-	-
Ibis, Southern Bald	VU	VU	1.39	x	x	-	-	x	x	-
Korhaan, Blue	LC	NT	6.94	x	old lands & pasture	-	-	x	x	x
Marsh-harrier, African	EN	LC	1.39	-	-	wetlands	-	x	-	-
Painted-snipe, Greater	NT	LC	1.39	-	-	dams, pans & flood plains	-	-	-	-
Plover, Chestnut-banded	NT	NT	2.78	-	-	salt pans	-	-	-	-

Pratincole, Black-winged	NT	NT	2.78	x	x	x	-	-	x	-
Sandpiper, Curlew	LC	NT	6.94	-	-	wetlands	-	-	-	-
Secretarybird	VU	VU	1.39	x	old lands & pasture	-	-	x	x	x
Tern, Caspian	VU	LC	2.78	-	-	dams	-	x	-	-

The principal areas of concern for Red List species related to the proposed MTS and associated 400kV and 132kV power line infrastructure are:

- Displacement due to habitat loss in the physical infrastructure footprint;
- Displacement due to disturbance associated with construction and maintenance; and
- Mortality due to collision with earthwires and/or conductors of the transmission lines.

9.1.1 Potential impacts:

- Construction phase
  - Displacement as a result of habitat loss or transformation
  - Displacement as a result of disturbance
- Operational phase
  - Mortality due to collision with the earth wire of the power lines
  - Mortality due to electrocution on the power line infrastructure and within the substation yard
  - Displacement due to habitat transformation and disturbance
- Decommissioning phase
  - Displacement associated with decommissioning process

The Mulalo MTS Site B and Site C occur within the same quarter degree square and within adjoining pentads, approximately 2km apart and are therefore likely to be identical in terms of species diversity and density. One key characteristic that sets the two proposed sites apart is the avifaunal habitat that is present on each site. Substation Site B is wholly transformed by maize cultivation and is likely to be subject to significant existing disturbance both in terms of agricultural practices and the disturbances associated with the operation of the Sasol Synfuels facility. Substation Site B is located much closer to the Sasol Synfuels facility and is likely to be within the impact zone for this facility.

In contrast, Substation Site C is comprised of natural grassland. In addition, a fairly large wetland area is located in the south-east corner of the proposed site. Every effort must be made to secure these habitats, no matter how small in extent, to ensure the density and diversity of the bird species that are attracted to and supported by these key habitats. Although the proposed Kriel-Mulalo, Mulalo-Zues and Mulalo-Tutuka 400kV loop-in-loop-out power lines will be approximately 2km longer in length if Substation Site B is selected, the collision impact associated with the longer power lines would be less significant compared to the loss of grassland habitat at Substation Site C.

9.2 BIODIVERSITY ASSESSMENT

The biodiversity assessment (see **Appendix 7**) was comprised of various floristic and faunal information that was collected both on site and from various databases.

The climate of the study area / Secunda is characterised by summer rainfall with a mean annual rainfall of 662mm. The area is characterised by cool temperate climate with thermic continental extremes with high summer temperatures and cold winters with high occurrence of frost. These conditions

influence the biodiversity of the area. The study area is located in the Soweto Highveld Grassland vegetation unit (GM8). The vegetation unit is found in gently to moderately undulating landscape with the altitude ranging between 1 420–1 760 m. The unit supports short to medium-high, dense, tufted grassland dominated almost entirely by *Themeda triandra* and accompanied by a variety of other grasses such as *Elionurus muticus, Eragrostis racemosa, and Heteropogon contortus*. The Soweto Highveld Grassland vegetation unit is listed as Endangered and has a conservation target of 24 %.

Flora Species

There are no threatened species of plants identified to occur in the site quarter degree square: 2629CA. There are two plant species identified as Near Threatened, namely, *Stenostelma umbelluliferum and Trachyandra erythrorrhiza.* Neither of these plant species was observed during the site survey.

Family	Genus	Species	Subspecies	Common name	Red list category
Bufonidae	*Sclerophrys*	*capensis*		Raucous Toad	Least Concern
Bufonidae	*Sclerophrys*	*gutturalis*		Guttural Toad	Least Concern
Hyperoliidae	*Kassina*	*senegalensis*		Bubbling Kassina	Least Concern
Hyperoliidae	*Semnodactylus*	*wealii*		Rattling Frog	Least Concern
Phrynobatrachidae	*Phrynobatrachus*	*natalensis*		Snoring Puddle Frog	Least Concern
Pipidae	*Xenopus*	*laevis*		Common Platanna	Least Concern
Pyxicephalidae	*Amietia*	*delalandii*		Delalande's River Frog	Least Concern
Pyxicephalidae	*Amietia*	*fuscigula*		Cape River Frog	Least Concern
Pyxicephalidae	*Cacosternum*	*boettgeri*		Common Caco	Least Concern
Pyxicephalidae	*Tomopterna*	*cryptotis*		Tremelo Sand Frog	Least Concern
Pyxicephalidae	*Tomopterna*	*natalensis*		Natal Sand Frog	Least Concern

Mammal Species

There was one identified endemic species which is the Cape Genet. It is identified as Least Concern in the Red List category.

Reptile Species

There are no threatened reptile species identified to potentially occur in 2629CA.

Amphibian species

Family	Genus	Species	Subspecies	Common name	Red list category
LYCAENIDAE	*Lycaena*	*clarki*		Eastern sorrel copper	Least Concern (SABCA 2013)
NYMPHALIDAE	*Catacroptera*	*cloanthe*	*Cloanthe*	Pirate	Least Concern (SABCA 2013)
NYMPHALIDAE	*Danaus*	*chrysippus*	*Orientis*	African monarch, Plain tiger	Least Concern (SABCA 2013)
NYMPHALIDAE	*Junonia*	*Hierta*	*Cebrene*	Yellow pansy	Least Concern (SABCA 2013)
NYMPHALIDAE	*Telchinia*	*Rahira*	*Rahira*	Marsh acraea	Least Concern (SABCA 2013)
NYMPHALIDAE	*Vanessa*	*Cardui*		Painted lady	Least Concern (SABCA 2013)
PIERIDAE	*Pontia*	*Helice*	*Helice*	Common meadow white	Least Concern (SABCA 2013)
Coenagrionidae	*Africallagma*	*glaucum*		Swamp Bluet	Not listed
Coenagrionidae	*Ischnura*	*senegalensis*		Tropical Bluetail	Not listed
Libellulidae	*Sympetrum*	*fonscolombii*		Red-veined Darter or Nomad	Not listed

BUTHIDAE	*Uroplectes*	*triangulifer*			Not listed

There are no threatened amphibian species identified to potentially occur in 2629CA. There is one identified endemic species this being the Delalande's River Frog.

Table 10: Identified amphibian species occurring in 2629CA

Insect species

There are no threatened insect species identified to potentially occur in 2629CA. There is one identified endemic species: Eastern Sorrel Copper.

Table 11: Identified insect species occurring in 2629CA

Figure 13 below shows that substation Site B is located within a habitat that is classified as having no natural habitat remaining. Site B is situated within a cultivated land use and therefore, development within this site will have a low impact on the biodiversity of the area but may have a significant impact on the livelihood of the local agriculture.

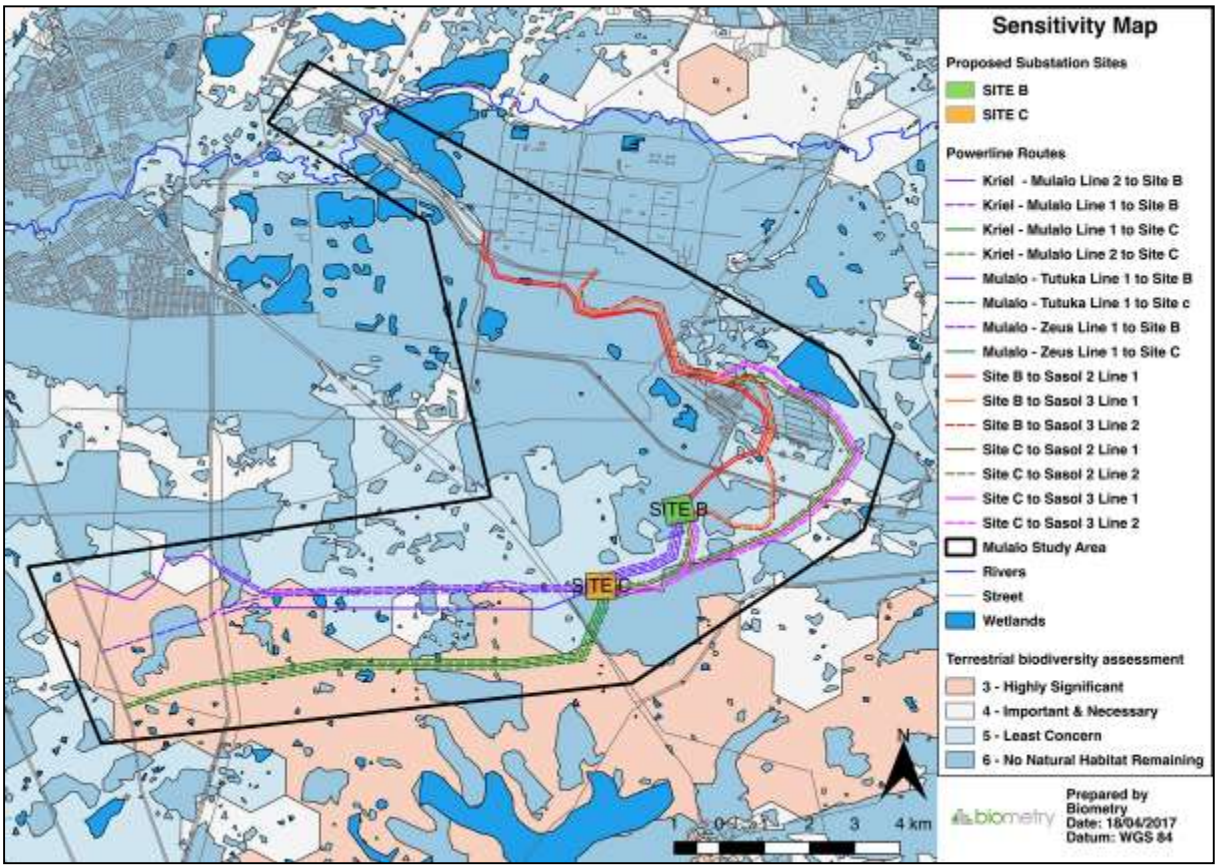

Figure 13: Habitat sensitivity

Site C is situated within the Soweto Highveld Grassland habitat. The site is covered by natural grasses and is close to a climax state. Site C has previously been farmed and has since regenerated to the existing grassland. Site C is situated in a habitat that is classified as least concern with patches of no

natural habitat remaining. Both Sites B and C have a low impacts on the biodiversity in the area, however Site B has the lower impact of the two sites as it is situated on cultivated land and is therefore the preferred site from a biodiversity perspective.

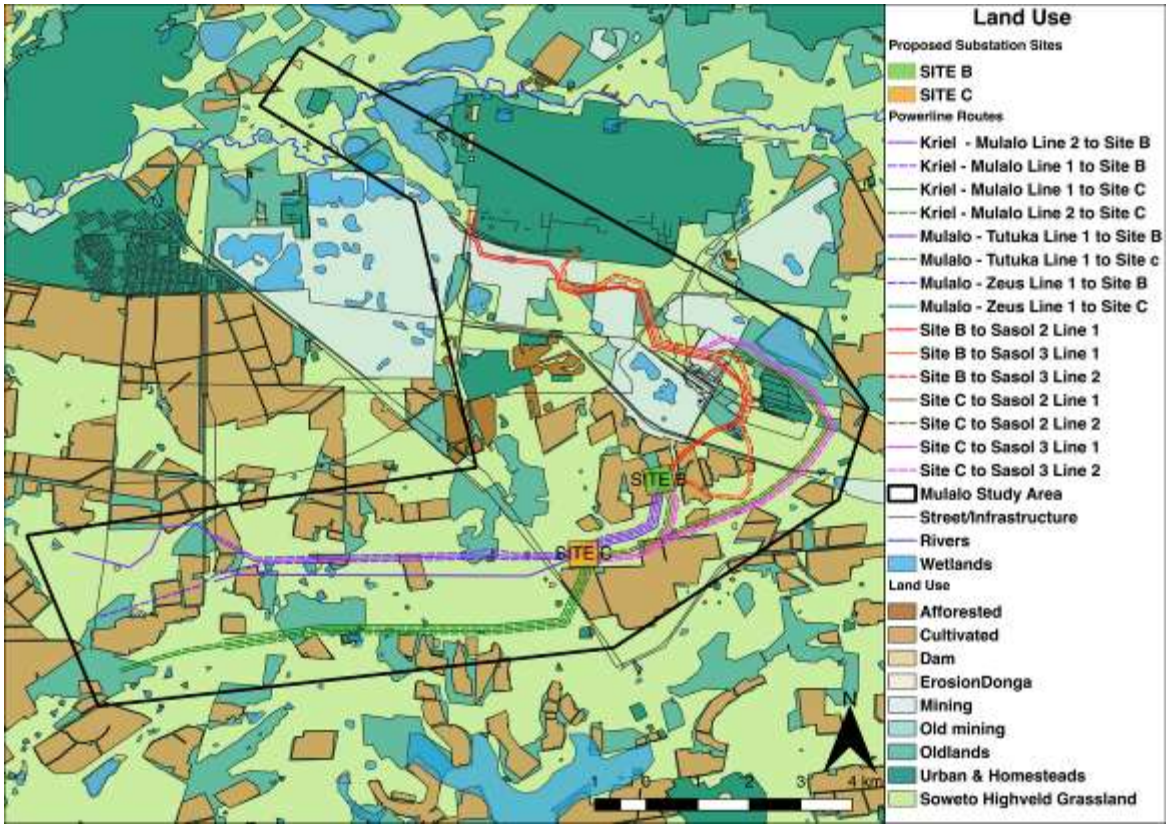

Figure 14: Land use

The proposed power line routes (light green) from the Kriel-Zeus and Kriel-Tutuka 400kV power line that travel to Site C, pass through a habitat type that is classified as **Highly Significant**. The proposed power line routes (purple) from the Kriel-Zeus and Kriel-Tutuka 400kV lines that travel to Site B, pass through some **Highly Significant** habitat areas, however the majority passes through **No Natural Habitat Remaining** and **Least Concern Habitat**. It is recommended that the preferred power line route to Site B is Kriel-Mulalo Line 2 to Site B; and Kriel-Mulalo Line 1 to Site B. According to the routes seen in the scoping report. The preferred routes going to Site B will be the Northern routes. The Southern routes pass though mostly highly significant habitat areas.

The routes going from Site B to Sasol all have low impacts on biodiversity (Figure 13). The routes with the least impact is that of Site B to Sasol 2 Line 1; Site B to Sasol 3 Line 1; Site B to Sasol 3 Line 2. The routes from Site C to Sasol are the least preferred as they cross habitats classified as **Important and Necessary** as well as **Least Concern**, whereas the routes from Site B mostly cross habitat from **No Natural Habitat Remaining** and some **Least Concern** patches.

During construction, identified impacts include loss of natural habitat due to construction activities; during the operational phase of the project, fires and pollution from the substation malfunctioning were identified as potential impacts.

9.3 PRELIMINARY GEOTECHNICAL INVESTIGATION

The geotechnical investigation (see **Appendix 8**) was undertaken in order to provide a comparative assessment of the proposed two substation sites. Field investigations were carried out in 2015, and entailed:

- The excavation of 36 test pits
- Recovery of selected disturbed samples for laboratory testing.

In terms of geological setting, both substation sites are underlain by intrusive dolerite of the Jurassic Era (commonly referred to as "Karoo Dolerite"), in the form of a large sill, as can be seen in **Figure 15**, and set out in **Table 12** below. The geology map indicates that sandstone of the Vryheid Formation occurs in the general area. Both sandstone and dolerite bedrock were encountered in the test pits excavated beneath both sites.

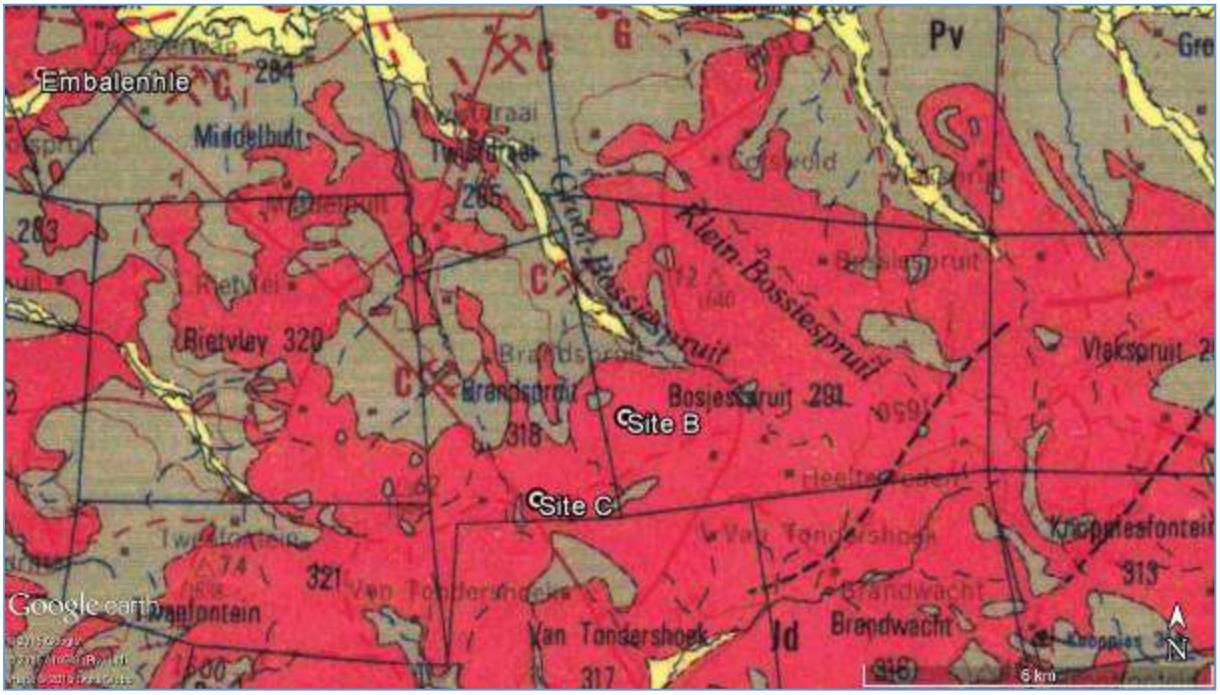

Figure 15: Geology of substation sites

Table 12: Stratigraphy and rock types

MAP SYMBOL	STRATIGRAPHY	LITHOLOGY
Jd	Jurassic Era	Intrusive dolerite
Pv	Vryheid Formation, Ecca Group, Karoo Supergroup	Sandstone, shale and coal beds

Nineteen (19) test pits were excavated at substation site B and seventeen (17) test pits were excavated at substation site C.

Site B was found to be underlain by a mantle of highly expansive hillwash soils that extended from surface to depths of between 0.50 and 0.90 m (average depth of 0.70 m). This mantle of highly expansive clays is not considered suitable founding or platform construction materials. It is recommended that all expansive clays are removed from beneath the platform footprint and spoiled or used for landscaping purposes only.

Difficult access and working conditions are expected in wet weather due to the high clay content of the surface soils beneath and surrounding the site. These soils are expected to soften considerably with increasing soil moisture conditions, resulting in problematic vehicle and plant movement.

Site C: the investigation also indicated that the site is underlain by a mantle of highly expansive hillwash clays which are not considered suitable founding or platform construction materials. The hillwash clays are underlain by potentially expansive residual soils in some areas. As with site B, it is recommended that all expansive clays are removed from beneath the platform footprint and spoiled or used for landscaping purposes only.

Site C is easily accessible in dry conditions and working conditions should not be problematic in dry conditions. However, difficult access and working conditions are expected in wet weather due to the high clay content of the surface soils beneath and surrounding the site. These soils are expected to soften considerably with increasing soil moisture conditions, resulting in problematic vehicle and plant movement.

9.3.1 Comparative assessment of geotechnical conditions of substation sites

The preliminary geotechnical investigation indicates that potential geotechnical constraints are present at both site B and site C. However, these constraints may be mitigated and both sites are considered suitable for construction of a substation.

Both site B and site C are underlain by a mantle of highly expansive hillwash clay soils. The thickness of the hillwash clays is marginally thinner at site C than site B. However, the hillwash clays at site C are underlain by moderately expansive residual soils which are also poor founding and subgrade materials. It is recommended that both the highly expansive hillwash clays and moderately expansive residual soils are removed beneath the footprint at site C. The total volume of material recommended to be removed is similar at both sites (estimated at approximately 70 000 m3 for the proposed layouts).
The quantity of available materials within the cutting sections of the proposed cut-to-fill platforms, suitable for use as construction material, is limited at both site B and site C. However, a large quantity of suitable materials is available at site B, should the footprint and design of the cut-to-fill be amended. Large quantities of weathered dolerite rock are available beneath the south western section of the platform and to the south west (upslope) of the proposed footprint at site B. Comparatively, limited quantities of weathered dolerite are available at site C. Amendments to the footprint and design of the cut-to-fill platform at site C is hampered by the presence of graves to the south of the site and by the occurrence of hard rock at shallow depth.

Intermediate to hard excavation conditions will be encountered at shallow depths below the proposed platform level over large portions of site C. This will be problematic for the excavation of foundations

and trenches at site C. Significantly less intermediate or hard excavation will be required for the excavation of foundations and trenches at site B.

Shallow groundwater conditions are expected beneath north western section and the south western section of site C. It is recommended that subsoil drainage is implemented in these areas, in addition to surface drainage measures. Provision of a subsoil drainage system beneath the platform at Site B is not considered necessary, provided that adequate surface drainage measures are implemented.

Site B is considered the preferred option from a geotechnical perspective. It is however recommended that the platform footprint is shifted approximately 80 m south and 80 m west of the current position (i.e. approximately 113 m to the south-west of the current position). The cutting section should also be deepened to allow for the increased utilisation of the weathered dolerite as platform construction material and to reduce the required volume of fill material.

While both sites are suitable for development of a substation, the additional mitigation measures required at site C should result in a potential increased cost of construction at Site C compared to site B.

9.4 HERITAGE IMPACT ASSESSMENT

The complete report can be found as **Appendix 9** of this report.

The planned development triggers several sub-sections of section 38 of the National Heritage Resources Act (NHRA), 1999 (Act No 25 of 1999) that refers to developments that require a heritage impact assessment (HIA). The relevant sub-sections that are triggered by the project are:
38 (1) (a) - the construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length. The proposed loop-in-loop out power lines are longer than 300m in length thus triggering this section;
38 (1) (c) - any development or other activity which will change the character of a site—
(i) exceeding 5 000 m² in extent – the proposed substation is 64 hectares in size
38 (1) (d) - the re-zoning of a site exceeding 10 000 m² in extent. The location of the substation may be rezoned by Eskom.

The project may also impact on graves, structures, archaeological and palaeontological resources that are protected in terms of sections 34, 35, and 36 of the NHRA. A site inspection, undertaken on 28 and 29 November 2016, found that several heritage resources will be affected by the proposed substation and power line development:

- Substation site B: the site is highly disturbed by the cultivation of maize and no heritage sites were found on the site;
- Substation site C: the footprint of the substation impacts on graves and structures/ buildings that are over 60 years of age. Both the structures and graves are protected by sections 34 (1) and 36 (3)(a) and (b) of the NHRA and cannot be altered, damaged, demolished or moved without the permission of the Mpumalanga Provincial Heritage Resources Authority (MPHRA). The specialist

has recommended that if Site C is selected as the substation site, then the location should be altered/moved to avoid impacting on the graves and structures.

- Several other grave sites and structures that were older than 60 years were found along the power line routes to the existing Kriel-Tutuka and Kriel-Zeus power lines. These sites are all protected by sections 34 and 36 of the NHRA and the specialist has recommended that they are left intact and the positions of the pylons are adjusted to avoid impacting directly on these heritage sites. It was also recommended that during the construction phase, construction activities could damage them hence it was recommended that a buffer of 20 m be placed around them to avoid any damage.
- No protected heritage sites were found along the power line routes from the substation sites to the existing Sasol 2 and Sasol 3 power lines. It was however recommended that the foundations of the accommodation that was provided to workers who built the Sasol Refinery be avoided where possible as the foundations are a reminder of the development of the Refinery.
- The fossil sensitivity map of South Africa indicated that the project area falls in an area that is mainly insignificant fossil sensitivity interspersed with small areas of very high sensitivity. The areas of high sensitivity close to the Sasol Refinery are situated in areas of high disturbance created by the Sasol Refinery and associated activities. The possibility of find intact fossils in this disturbed area is very low.
- The second area of very high fossil sensitivity is the last section (< 3 km) of the power lines looping into the existing Kriel-Tutuka and Kriel-Zeus power lines. It is recommended that a palaeontologist is appointed as part of the specialist walk down team and that he/she inspect the 3km to see if any fossils will be impacted by the power lines.

Impacts identified were:

- Destruction / removal of graves older than 60 years
- Damage or destruction of structures older than 60 years
- Destruction of fossils

The assessment of impacts indicated that with the implementation of mitigation measures, most impacts could be reduced generally to a low-medium rating. The impact that remains high is the removal of the graves if the location of substation site C cannot be altered to avoid the graves found within its current footprint.

From a heritage perspective, **substation site B** is the preferred site as it is highly disturbed by maize cultivation and no heritage sites were found. Substation site C is located on graves and structures that are over 60 years which means that they are protected by the NHRA and are of heritage significance.

9.5 SOCIAL IMPACT ASSESSMENT

9.5.1 Social environment

See **Appendix 10** for the complete report.

The Govan Mbeki Local Municipality (GMLM) covers a geographical area of 2 954.69 km² and, with a population of 294 538 people living within 83 874 households, has a population and household density

of 99.7/km² and 28.4/km². At 80.5% black African people form the largest part of the population followed by white people at 16% and coloured and Indian or Asian people both at 1.5%.

In the GMLM, 26.9% of the population are under 15 year of age, 69.4% are between 15 and 64 years and 3.7% are 65 and above while the municipality has a sex ratio of 106.9 which indicates that the municipality has a higher proportion of males to females. This data is graphically presented below in **Figure 16**. The dependency ratio of the GMLM is 44.0 and population growth rate, measured between 2001 and 2011, is 2.84%.

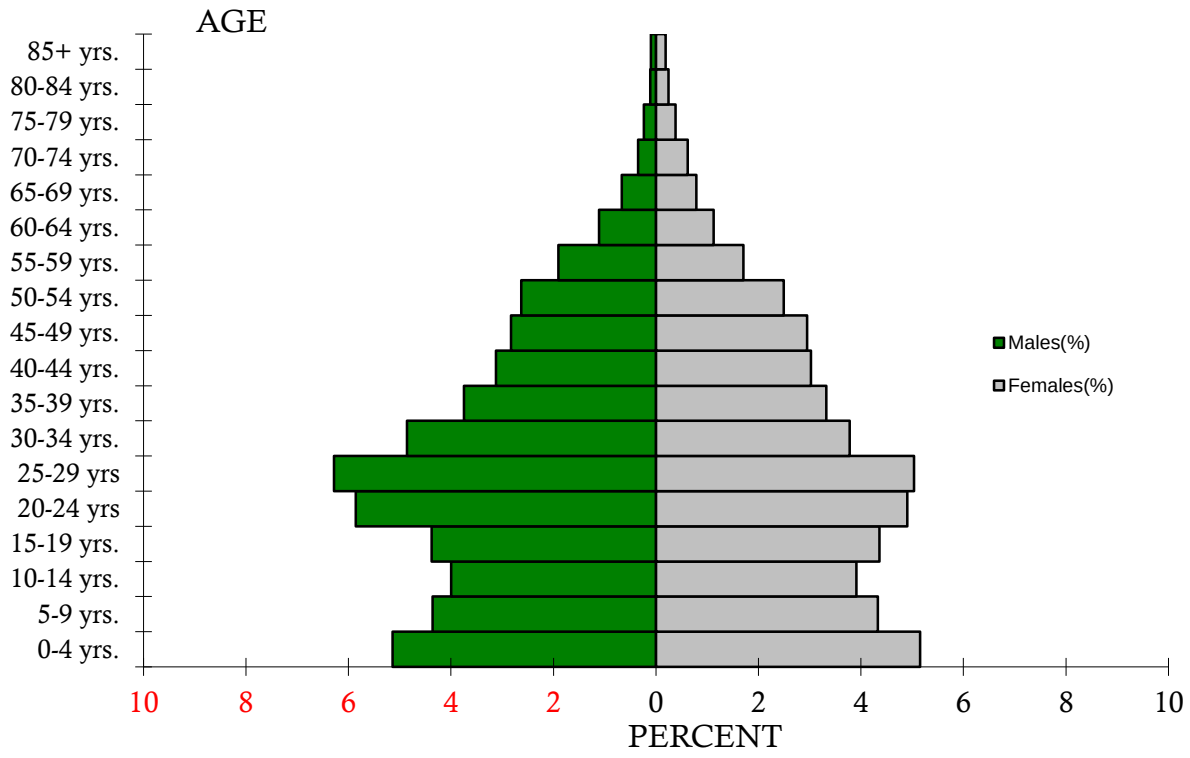

Figure 16: Population pyramid Govern Mbeki LM (MP307) (Data source: Statistics South Africa, 2012)

The project footprint is located south southwest of the town of Secunda which is within the boundary of Secunda and east southeast of eMbalenhle. Secunda covers a geographical area of 173.71 km² which incorporates Sasol Secunda. The area has a population of 40 198 people living in 10 292 households resulting in a population density of 231.41/km² and household density of 59.25/km².

With regard to the labour market the official unemployment rate in 2011 in the municipality was 26.2% with the official youth unemployment over the same period at 34.4%. In terms of education levels in the municipality 7.9% of people over 20 had no schooling in 2011 while 32.2% had a matric and 11.8% had a level of education higher than that of matric.

Regarding household services delivery in the GMLM, 88.9% of households had flush toilets connected to the sewerage system, 91.7% had their refuse removed on a weekly basis, 56.5% had piped water delivered inside the dwelling and 90.3% used electricity for lighting purposes.

9.5.2 Potential Impacts

With regard to similar infrastructure as the Mulalo project, most social impacts are experienced during the construction phase, as this is when construction related activities, resulting in the influx of labour and use of heavy machinery and explosives, occur. The various social impacts are listed below. The assessment of impacts is provided in Chapter 10 of this report.

Health and social wellbeing impacts

- Annoyance, dust and noise
- Increase in crime
- Increased risk of HIV and AIDS
- Personal safety, increased hazard exposure

Quality of living environment impacts

- Disruption of daily living activities
- Perceived quality of live

Economic and material well-being impacts

- Increase in employment opportunities
- Increased opportunities for SMMEs

Cultural impacts

Family and community impacts

Institutional, legal, political and equity impacts

- Effect on existing infrastructure facilities and social services
- Attitude formation towards project
- Decreased level of community participation in decision-making, loss of empowerment
- Compliance with municipal by-laws

Gender relations impact

- Cultural resistance towards women working
- Division of labour

Of these impacts the more significant relate to.

Construction phase:

1. Personal safety and hazard exposure in respect of construction activities and vehicles.
2. Disruption of daily living activities particularly within the vicinity of the substation site.
3. Effect on existing infrastructure facilities and social services.

Operational phase:

1. Loss of 64 ha of agricultural land that is needed for the substation site.
2. Public perceptions regarding the effect of electromagnetic fields associated with both the substation and power lines. This issue was not assessed in this report at a technical level as it is not within the scope of expertise of the specialist.
3. Visual impact associated with the power lines traversing agricultural/rural areas.
4. Increase in employment opportunities and opportunities for SMMEs due to the security of electricity supplied to the area in particular to the Sasol 2 and 3 facilities.

The preferred substation site is Site C because it is situated on agricultural land with evidence of cattle grazing but currently not under cultivation. In addition, the land is owned by one land owner who seem more amenable to the construction of a substation on his land than one of the owners of substation site B who is very opposed to losing arable land to the substation. Site B will see a substantial loss of available agricultural land.

9.6 Soil and Land Capability Assessment

9.6.1 Soil and agricultural potential

The complete report is appended to this report as **Appendix 11**.

A soil map for the potential substation and power lines was created using a digital soil mapping (DSM) approach. The theory behind the DSM approach is that soils form due to five factors: soil formation, parent material (geology/lithology), climate, relief or topography, organism (including anthropological effects) and time.

Thirty-seven soil observations were made by soil auger or noting interesting occurrences when moving in the field. Soils were classified per the South African soil classification system. Only two soil forms were encountered, the Arcadia and Rensburg soil forms. Both soil forms have a vertic topsoil which is a very clayey, active soil horizon. The definitive characteristic of vertic horizons are that they swell upon wetting and shrink upon drying. Establishing infrastructure on vertic horizons is a challenge due to its activity. The difference between the Arcadia and Rensburg soil forms is that the Rensburg soil form has a G horizon under the vertic horizon that implies that the subsoil is waterlogged for large parts of the year. When the G horizon is within 500 mm of the soil surface, this soil is regarded as a wetland indicator. The G horizon was observed to start within 500 mm of the soil surface at three Rensburg observations.

Both soil forms have a moderate dryland cultivation potential and a high potential for grazing. The soil is very fertile due to its high clay content, which also complicates the water management of these soils. As all the cultivated fields observed were dryland fields, the farmers are all reliant on rain for their water management. Although vertic horizons are not regarded as being conducive to soil erosion, clear signs of soil erosion and surface sealing were observed, especially when soil was exposed to the surface in cultivated fields.

When assessing the options for the various infrastructure types, the land use and soil type was considered. With land use, homesteads are firstly avoided, and secondly grazing areas are preferred to cultivated areas. For soil forms, the Arcadia is preferred to the Rensburg soil form, due to the possibility of the Rensburg indicating a wetland.

The percentage of area which each substation site covers for each land use and soil form is shown in **Table 13**.

Table 13: Percentage of land use and soil forms covered by substation sites

Substation	Land Use %	Soil Form %

Option	Cultivation	Grazing	Arcadia	Rensburg
B	86	14	45	55
C	0	100	97	3

Table 14: Transmission tables

Transmission	Land Use				Soil From	
Power Line	**Cultivation**	**Grazing**	**Industrial**	**Homestead**	**Arcadia**	**Rensburg**
South	1 974	18 885	0	0	17 510	3 348
North	573	19 551	331	33	13 894	6 594

Table 15: Distribution tables

Distribution	Land Use			Soil From	
Route	**Cultivation**	**Grazing**	**Industrial**	**Arcadia**	**Rensburg**
West	7810	3453	12968	8103	16128
Middle	3416	0	20093	3103	20406
East	3582	7627	26814	20189	17833

9.6.2 Potential impacts

- Construction of substation leading to loss of agricultural land and soil erosion
- Construction of access roads leading to loss of agricultural land and soil erosion
- Erection of transmission and distribution power lines leading to loss of agricultural land
- Increased vehicular activity leading to potential destruction of soil structure

The main issue is the loss of agricultural land. Approximately 64 ha will be lost due to the construction of the substation. More agricultural land will be lost at the pylons of the overhead power lines. This has a slight chance of having a cumulative impact when the loss of such agricultural land will render a farm smaller than an economical unit, which could lead to a whole farm not being utilized. However, agricultural land is in high demand, which makes this scenario unlikely. A more likely issue is that of soil erosion. There is some existing soil erosion and this should be managed to reduce the impact of soil erosion. Sheet erosion leads to rill erosion, leads to gully erosion. The further an erosion cycle have developed, the quicker the process occurs thus it will be important to mitigate potential soil erosion threats, before soil erosion can commence.

Substation site C is preferred, based on land use and soil form, as it does not cover any cultivated fields and only a small area of Rensburg soils due to the possibility of Rensburg soils indicating a wetland.

9.7 Undermining and Surface Subsidence Risk Assessment

See **Appendix 12** for the full report.

The study area contains coal seams, some of which have been mined and other areas that could be mined by underground or open cast mining methods in the future. Sasol Mining has been mining coal in the Secunda area for nearly 40 years using a combination of underground mining methods: bord

and pillar, stooping and short / longwall mining methods, and strip mining methods. Sasol Mining operates the Secunda Complex which is composed of five coal mines, namely Twistdraai, Bosjesspruit, Brandspruit, Middelbult and Syferfontein Mines. The proposed power line pass over the Brandspruit Mine as well as part of the Twistdraai Mine and a small section of the Bosjesspruit Mine.

The implications of the construction of the proposed substation and power lines on ground that had been subjected to considerable mining was assessed. The mined areas were investigated in order to establish the future stability of mined ground and surface structures such as pylons and to provide reasonable assurance that there will not be surface expressions of subsidence that could risk the integrity of the proposed power lines especially. Geological risks were also considered.

Sasol's Secunda plant is underlain by rocks belonging to the Vryheid Formation of the Ecca Group, Karoo Supergroup. These rocks primarily consist of sandstones, shales and coal beds and are extensively intruded by dolerites of Jurassic Age. The dolerites occur both as sills and linear dyke structures that may extend over tens of kilometres. The power lines that cross over the Sasol Mining Complex provides the most potential for mining related geotechnical risk. No indication of dolomites were observed along the proposed power line routes.

9.7.1 Subsidence analysis

Subsidence in coal mining by virtue of mining being carried out at relatively shallow depth, often results in surface damage. A misconception is that it is only high extraction coal mining that is of any concern (long and short-walling and stooping). However, bord and pillar mining has caused surface subsidence in the past, especially from early mining layouts that were under-designed. There are two main forms of subsidence relevant to this investigation:

- Large scale subsidence affecting a wide area leading to a typical trough style depression on surface or;
- Localised sinkholes or "ratholing" that are often the result of an intersection of underground failing and the new roof failing in successive stages, taking days to decades to "rathole" to surface

The assessment determined that the primary mining using bord and pillar mining that used large pillars and a high safety factor is effective to protect the surface. If a surface mining restriction of suitable dimension is retrospectively declared over these sections, it can be reasonably expected that the surface will be protected far beyond the lifespan of the pylons. However, where stooping has taken place at Brandspruit and Bosjesspruit, the surface must be considered suspect and no surface mining restriction, retrospectively declared will alter the fact that pylons should not be built over stooped sections.

The direct effect of subsidence is the strain and tilt caused to surface structures. Power lines and pylons are most affected by tilt, although pylons with wide bases are also affected by strain which could cause deformity in the legs of the pylon. Towers that are exposed to subsidence will be tilted causing parts of the tower to move; this change in motion exerts stresses on the tower structure possibly resulting structural damage. A further aspect to consider lateral movement due to subsidence. Lateral movement will cause horizontal stresses within the power line structures, which could impact on

structural integrity of tower/s. In the event that relative horizontal displacement occurs surface points could move closer, resulting in compressive strain, or move farther apart causing tensile strain.

9.7.2 Pillar analysis

Pillar analysis was undertaken across varying sites between the Brandspruit and Bosjesspruit Mines. Since both collieries use stooping pillar extraction as a mining method, most of the mining panel pillar layouts are designed for the purpose of the secondary pillar extraction.

Throughout the Sasol Mining Complex, the layouts were planned and mined well over the recommended 1.6 safety factor, with a very stable pillar width to height ratio, which is comfortably in excess of the recommended value. With the figures given for the Sasol collieries quoted as around 2.0 for the initial design and as mined, dropping to around 1.9 for pillars that have been affected by normal time dependent scaling, it can be seen that it is highly unlikely that any pillars will fail and therefore it can be concluded that all the bord and pillar mining that has not been stooped are safe.

9.7.3 Critical span analysis

A feature of many coalfields is the presence of igneous intrusions that intersect the coal seams as near-vertical dykes or that form massive sills above or below the coal seams. In the event that a thick dolerite is present within the overburden, the dolerite may act as a sill which may halt subsidence from travelling towards the surface. The effectiveness of a dolerite sill is dependent on the span of the sill should the span extend beyond the panel it will bridge and maintain the surface above regardless of the loss of stability below it. Dolerite sills of 30 or 40m in thickness can span several hundred metres without failing and, by doing so, prevent surface subsidence. An analysis of the mining span required to induce failure of the sill was undertaken.

The average critical span of dolerite sills within the wider study area was calculated at around 83m. The mining panel that spans across the tower positions of the Kendal – Zeus 175 and Kusile – Zeus power lines was measured to be in excess of a 400m width panel. This value is far greater than the critical span of 83m a singular dolerite sill can support. Therefore, the critical span for the singular dolerite sill, averaging at 83m does not provide adequate span to overcome the span of the panel and the resulting surface subsidence.

9.7.4 Bulking factor

Due to the high extraction mining process there is a massive change and transfer of stresses within the overburden strata due to the cavity created by mining. Due to this there will be a large initial amount of rubble. As further failure continues all the fallen material will bulk and fill the cavity. The weight of the waste material will compress bulked material. This could create a void between fallen and bulked material and the main roof which could possibly be the base of a dolerite sill. Fallen material bulks at different rates depending on the type of fallen material. Materials that have a higher bulking factor and bulk more than others will fill a cavity more than those that have lower bulking factors.

After investigations were undertaken, the results clearly indicated that bulking failed to reach the base of the dolerite sills. Therefore, although the combination of the critical span and bulking may hinder

the process of subsidence at surface, it cannot be ruled out that at some point the caving will migrate to surface as the dolerite sills present are not sufficient to bridge the span of the panel in failure and the height of caving is taken as very close to the dolerite sill's present base.

9.7.5 Risk assessment of power lines

Kriel-Tutuka / Kriel-Zeus

The east-west route to the existing Kriel-Tutuka and Kriel-Zeus power lines was fairly simple to align and follows the suggested route over much of the way. A constraining factor was Sasol's proposed Number 6 Ash Dump as initially it was not known how close the power lines could be constructed to an ash dump. Plans now show that the dump will lie far from the power lines and pose no threat to them.

The original route options kept each of the two pairs of power lines together. However, it was identified that part of the original route option for the lines required pylons to be erected over fully extracted stooped ground that could be prone to future surface subsidence. The undermining highlighted was found to be over 600m wide which makes it difficult to span without using very large towers. Therefore, some route diversion was suggested where three lines are kept parallel (northern routes) and a single line is routed slightly to the south (southern routes) (see **Figure 17** below). Only a single line was re-routed to the south due to the shortwall mining over which construction is not recommended.

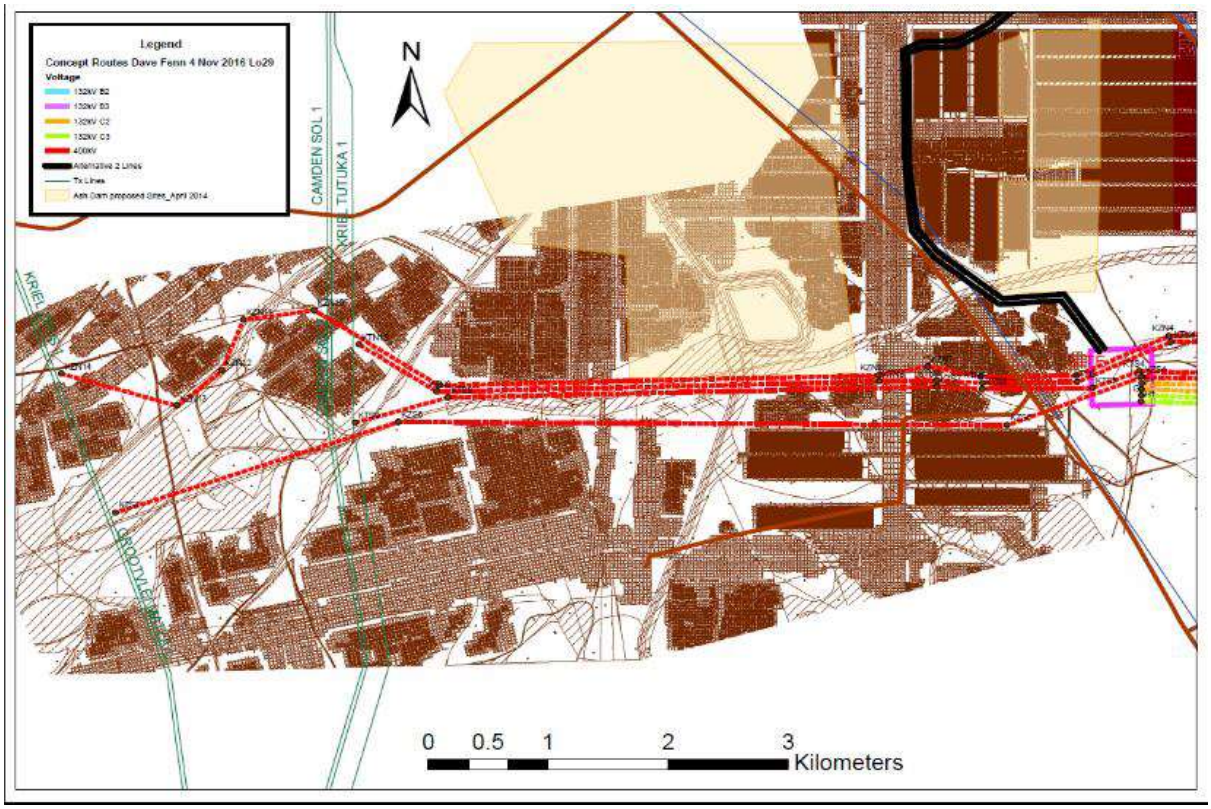

Figure 17: Overall view of current recommended route for the east-west 400kV line

Most of the lines to the north (to Sasol 2 and Sasol 3) were rejected as unsuitable as significant sections crossed stooped ground or other proposed ash dumps. A route that circumvented most of the mining, utilising the mine boundaries between Brandspruit, Twistdraai and Bosjesspruit Mines has been proposed.

A route for the power lines was found that avoided the underground geotechnical risk and part of the route around Sasol's surface explosive magazines and nitro plant was considered safe from geotechnical risk and remained unaltered. Unfortunately, security concerns were raised by Sasol that access for maintenance would be inconvenient around the Nitro Plant structures, and in addition, in the event of an explosion in the Nitro Plant, the integrity of part of the power lines would be brought into question. Thus, a new route was sought that avoided this area, but no route could be found that did not pass over stooped or shortwalled mining and avoided all surface infrastructure. A compromise route traverses to the north of the magazines, mostly outside of the security fence and therefore providing access. However, part of the route with 2 power lines still traverses close to some of the Nitro Plant complex and in addition, the other two lines traverse close to the coal stockyard with its stacker/reclaimers. The lines also pass close to the edge of Twistdraai Dam and dam wall.

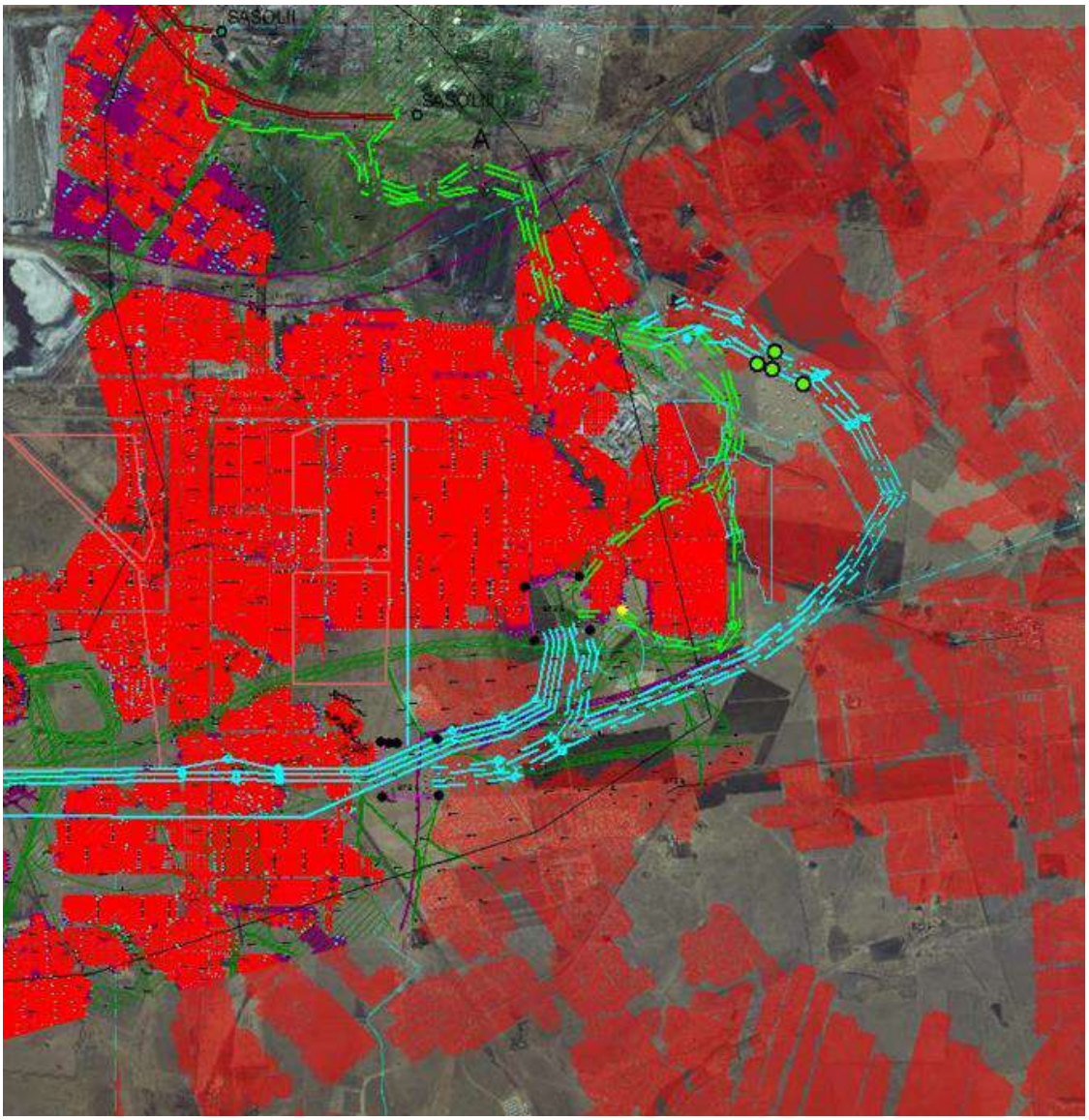

Figure 18: Routes in green are no longer under consideration; dashed blue lines are alternative routes; another route (black solid line) passes over undermined ground

The current design parameters require that the power lines be spaced 55m apart. If this is relaxed, to perhaps as close as 35m apart then most of the proximity issues can be nullified by moving some of the pylons. However, this will still leave two of the lines very close to the nitro plants. It should be borne in mind that no route avoiding this area completely could be found that does not cross already undermined ground.

Substation sites: both Site B and Site C are not undermined and both have feasible route options in and out of the sites. The choice of sites is therefore not dependant on undermining considerations and either site can be used.

9.8 VISUAL IMPACT ASSESSMENT

See **Appendix 13** for the complete report.

Visual character is based on human perception and the observer's response to relationships between and composition of the visible project components. The substation, transmission and distribution lines are the most visible and permanent components of the project.

Landscape Character Assessment (LCA) is concerned with the observable elements, components or features within a landscape that individually and collectively define the landscape characteristics:
Topography: The study area is characterised by a rolling, undulating landscape with relatively little topographic variation. There are small drainage lines that meander through the landscape with numerous farm dams situated in the drainage lines. Different sized pans are irregularly spaced on the higher lying areas.
Land use: The study area is dominated by agricultural activities, cultivated fields extending across the plains and isolated farmsteads widely distributed across the landscape. Mining activities are scattered through the area and manifests itself through the presence of open cast mines, large stockpiles and severe scarring of the landscape.
Built development: The existing power stations are highly visible structures in this largely undeveloped and open landscape. Infrastructure from the mining activities are particularly noticeable around the proposed alignments and substations.

Visual quality is a qualitative evaluation of the composition of landscape components and their excellence in scenic attractiveness. Many factors contribute to the visual quality of the landscape and are grouped under the following main categories that are internationally accepted indicators of visual quality.

Table 16: Criteria of Visual Quality (FHWA, 1981)

INDICATOR	CRITERIA
Vividness	Memorability of the visual impression received from contrasting landscape elements as they combine to form a striking and distinctive visual pattern.

Intactness	Integrity of visual order in the natural and man-built landscape, and the extent to which the landscape is free from visual encroachment.
Unity	Degree to which visual resources of the landscape join together to form a coherent, harmonious visual pattern. Unity refers to the compositional harmony of inter-compatibility between landscape elements.

The landscape is allocated a rating from an evaluation scale of 1 to 7 and divided by 3 to get an average. The evaluation scale is as follows: Very Low =1; Low =2; Moderately Low =3; Moderate =4; Moderately High =5; High =6; Very High =7;

The regional landscape is assessed against each indicator separately. The dominance of the existing power stations, agricultural practices and the encroachment of the mining activity are impacting the regional visual quality, which is classified as low.

Table 17: Visual quality of the regional landscape

VIVIDNESS	INTACTNESS	UNITY	VISUAL QUALITY
2	2	2	Low

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, terrain variability and land cover.

A basic rating system is used to evaluate the three VAC parameters. A three value range is used; three (3) being the highest potential to absorb an element in the landscape and one (1) being the lowest potential. The values are counted together and categorised in a high, medium or low VAC rating.

Table 18: Regional Visual Absorption Capacity evaluation

VISUAL SCREENING	TERRAIN VARIABILITY	LAND COVER	VAC
1	1	1	Low

The VAC of the study area is considered low and provides very limited screening capacity for this project. The low VAC relates to the unvaried topography and predominantly low vegetation. The regular forms and associated vertical posture of the proposed power lines are unlike the undulating and horizontal appearance of the topography. The less prominent project components such as access roads, are expected to be visually absorbed to a greater degree in the landscape.

9.8.1 Identified impacts

The following impacts were identified and assessed:

- Landscape impact – altering the landscape character - landscape impacts are alterations to the fabric, character, visual quality and/or visual value which will either positively or negatively affect the landscape character.

- Impact on viewer sensitivity – within the receiving environment, specific viewers (visual receptors) experience different views of the visual resource and value it differently. They will be affected because of alterations to their views due to the project. The visual receptors for this study are: residents, tourists and motorists.

Mulalo substation site B is regarded as the most preferred alternative. Its position further away major routes and closer to the existing mining and infrastructure is considered to cause the least impact on the landscape character due to the reduced sensitivity of the landscape. The site's great advantage lies in the less significant visual impact on tourists and residents as compared to site C.

9.9 WETLAND AND WATER RESOURCES ASSESSMENT

See **Appendix 14** for the complete report.

Wetlands have many distinguishing features, the most notable being the presence of water at or near the surface, distinctive hydromorphic soils, and vegetation adapted to or tolerant of saturated soils. Observing evidence of the presence of each of these features, by means of indicators, has become widely accepted as a valid way to identify wetlands.

The project area falls within the Upper Vaal Catchments (Primary Catchment C), within quaternary catchment C12D drained by Waterval River. Grootspruit, Trichardtspruit, Groot-Bossiespruit form major tributaries of the Waterval. Catchment size, mean annual rainfall and runoff for the quaternary catchment is provided in the table below. Within the context of the Mpumalanga Coalfields, a relatively high percentage of rainfall ends up as run-off out of the catchment (8.9%).

Table 19: mean annual precipitation, run-off and potential evaporation per quaternary catchment

Quaternary Catchment	Catchment Surface Area (ha)	Mean Annual Rainfall (MAP) in mm	Mean Annual Run-off (MAR) in mm	MAR as a %of MAP
C12D	81 343	666.88	59.3	8.9 %

Wetlands were identified and delineated according to the delineation procedure as set out by the "A Practical Field Procedure for the Identification and Delineation of Wetlands and Riparian Areas" document. Using this procedure, wetlands were identified and delineated using the Terrain Unit Indicator, the Soil Form Indicator, the Soil Wetness Indicator and the Vegetation Indicator. For the purposes of delineating the actual wetland boundaries use was made of indirect indicators of prolonged saturation, namely wetland plants (hydrophytes) and wetland soils (hydromorphic soils), with particular emphasis on hydromorphic soils.

A number of wetland systems were identified within the study area including dams. Valley bottom wetlands form the dominate wetland systems on site. Most of these systems are channelled and all are considered to be seasonal systems, though the presence of dams along these wetlands does provide areas of permanent surface water. These wetlands are maintained predominantly by rainfall and surface run-off from the adjacent slopes. The vertic soils that characterise large portions of the

site encourage surface run-off of rainfall. However, it is also speculated that localised perched aquifers play an important role in supporting these wetlands, especially those sections of the valley bottom wetlands characterised by more extended wetness.

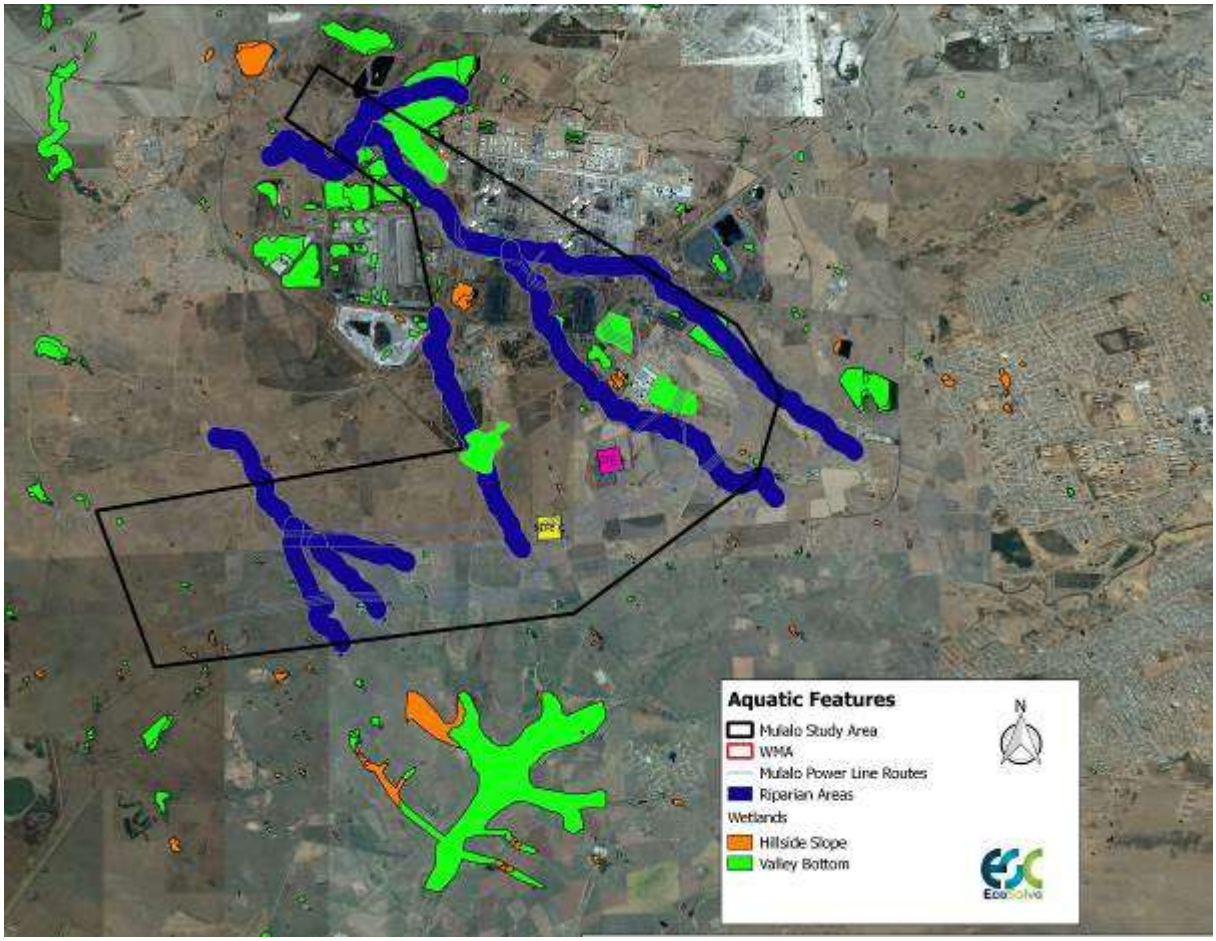

Figure 19: Aquatic features in and close to study area

A pan occurs on the south eastern section of proposed Substation C. A number of small hillslope seepage wetlands were also identified on site. The seepage wetlands in the southern reaches of the site are associated with more sandy soils, while most of the seepage wetlands in the southern half of the site are associated with vertic soils and very clayey soils.

In order to assess the wetlands on site in terms of their functional importance as well as their present ecological state and ecological importance and sensitivity, the wetland units identified on site were divided into distinct functional wetland systems based on a sub-catchment approach (see **Figure 20** below).

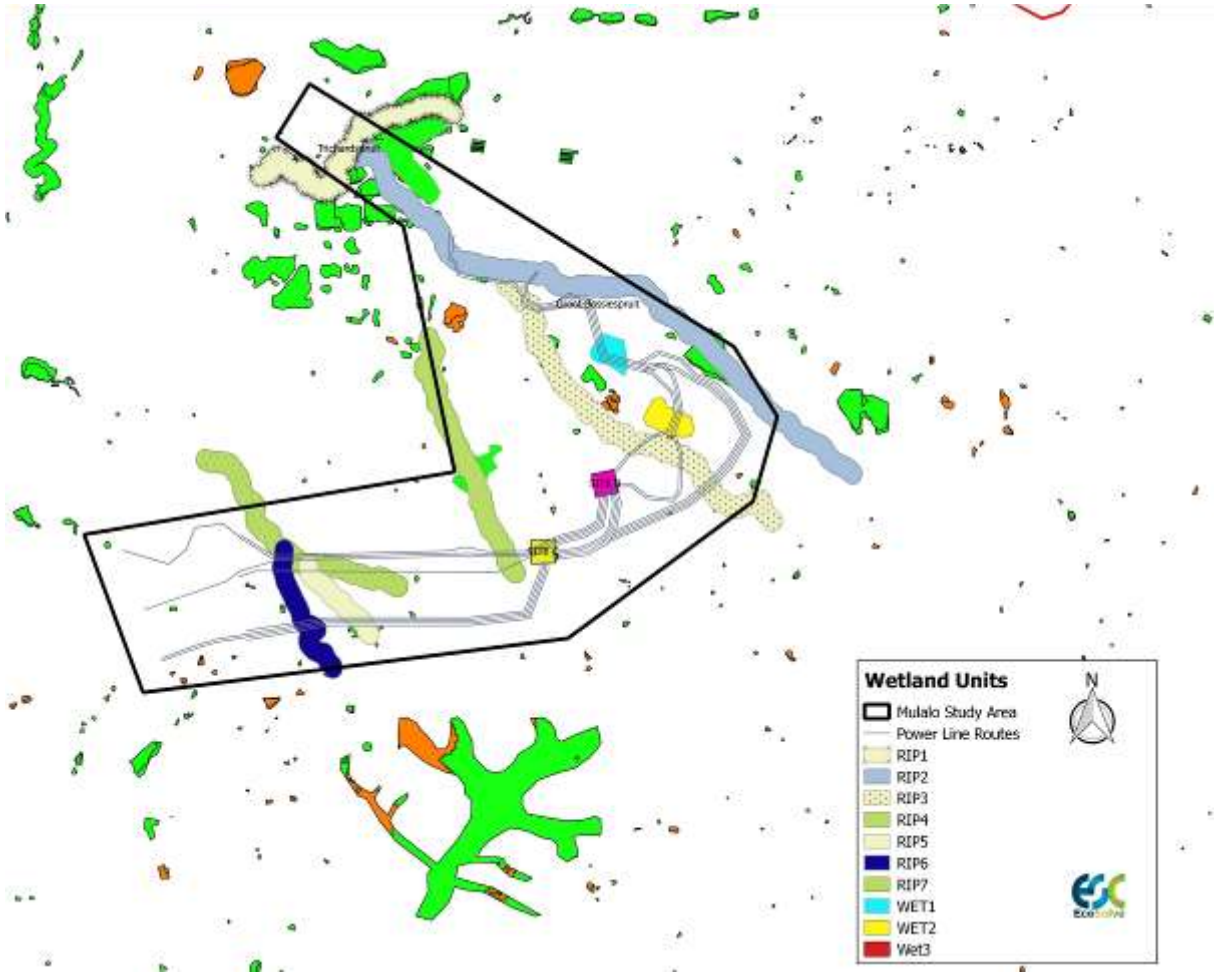

Figure 20: Wetland units in study area

9.9.1 Functional and Present Ecological Status

Wetlands within the study area serve to improve habitat within and potentially downstream through the provision of various ecosystem services. Many of these functional benefits contribute directly or indirectly to increased biodiversity within the study area as well as downstream through provision and maintenance of appropriate habitat and associated ecological processes. The Present Ecological Status (PES) was used to establish the integrity of the wetlands in the study area and was based on the modified Habitat Integrity approach.

Potential wetland services and functions in the study area include water purification, sediment trapping, stream flow regulation and flood attenuation.

The exercise below indicated that all the units were categorised as C – moderately modified but with some loss of natural habitats.

Table 20: Present Ecological Status per unit (score of 0=critically modified to 5=unmodified)

Criteria & Attributes	RIP1	RIP2	RIP3	RIP4	RIP5	RIP6	RIP7	Wet1	Wet2	Wet3
Hydrologic										
Flow Modification	1	1	2	2	2	2	2	2	2	2
Permanent Inundation	4	3	3	3	3	3	3	3	3	3
Water Quality										
Water Quality Modification	3	3	3	3	3	3	3	3	2	2
Sediment Load Modification	2	2	2	2	3	3	3	2	3	2
Hydraulic/Geomorphic										
Canalisation	2	2	2	2	3	3	3	2	3	3
Topographic Alteration	2	2	2	3	2	2	2	2	2	3
Biota										
Terrestrial Encroachment	2	2	3	3	3	3	3	3	3	3
Indigenous Vegetation Removal	2	3	2	3	3	3	3	2	2	3
Invasive Plant Encroachment	3	2	4	3	2	2	2	3	2	2
Alien Fauna	3	3	3	3	3	3	3	3	3	3
Over utilisation of Biota	2	2	2	3	3	3	3	2	2	2
Total Mean	**2.4**	**2.3**	**2.6**	**2.7**	**2.7**	**2.7**	**2.7**	**2.5**	**2.5**	**2.5**
Category	**C**	**C**	**C**	**C**	**C**	**C**	**C**	**C**	**C**	**C**

Category	Mean Score	Category Description
Within generally acceptable range		
A	>4	Unmodified or approximated natural condition.
B	>3 and <=4	Largely natural with few modifications, but with some loss of natural habitats.
C	**>2 and <=3**	**Moderately modified but with some loss of natural habitats.**
D	2	Largely modified. A large loss of natural habitats and basic ecosystem functions has occurred.
Outside generally acceptable range		
E	>0 and <2	Seriously modified. The losses of natural habitats and basic ecosystem functions are extensive.
F	0	Critically modified. Modifications have reached a critical level and the system has been modified completely with an almost complete loss of natural habitat.

9.9.2 Ecosystem services

The assessment of the ecosystem services supplied by the identified wetlands was conducted. The characteristics scored for the wetlands according to the general levels of services provided is notably

important and requires management to the wetlands to ensure that they can continue to provide the valued goods and services

Table 21: Goods and services assessment results for wetlands

Goods &Services	RIP1	RIP2	RIP3	RIPt4	RIP5	RIP6	RIP7	Wet1	Wet2	Wet3
Flood attenuation	3	3	3	2	1	1	1	1	1	1
Stream flow regulation	3	3	3	3	2	2	2	2	2	1
Sediment trapping	3	3	3	2	2	2	2	2	2	0
Phosphate trapping	2	2	2	2	2	2	2	2	2	1
Nitrate removal	2	2	2	2	2	2	2	2	2	1
Toxicant removal	2	2	2	2	2	2	2	2	2	1
Erosion control	3	3	3	3	1	1	1	1	1	0
Carbon storage	2	2	2	2	2	2	2	2	2	0
Maintenance of biodiversity	3	3	3	2	2	2	2	2	2	3
Water supply for human use	2	2	2	2	2	2	2	2	2	1
Natural resources	2	2	2	2	2	2	2	2	2	2
Cultivated foods	2	2	2	2	2	2	2	2	2	2
Cultural significance	2	2	2	2	2	2	2	2	2	2
Tourism and recreation	0	0	0	0	0	0	0	0	0	0
Education and research	0	0	0	0	0	0	0	0	0	0

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

9.9.3 Ecological importance and sensitivity

All wetlands, rivers, their flood zones and their riparian areas are protected by law and no development is allowed to negatively impact on rivers and river vegetation. The vegetation in and around rivers and drainage lines play an important role in water catchments, assimilation of phosphates, nitrates and toxins as well as flood attenuation. Quality, quantity and sustainability of water resources are fully dependent on good land management practices within the catchment. The Ecological Importance and Sensitivity (EIS) assessment was undertaken to rank water resources in terms of:

- Provision of goods and service or valuable ecosystem functions which benefit people;

- Biodiversity support and ecological value; and
- Reliance of subsistence users (especially basic human needs uses).

Table 22: Ecological Importance and Sensitivity scores for wetlands

Wetland	Parameter	Rating (0 -4)
RIP1	**Ecological Importance & Sensitivity**	1.3 (Low)
	Hydrological / Functional Importance	0.4 (Very Low)
	Direct Human Benefits	1.2 (Low)
RIP2	**Ecological Importance & Sensitivity**	1.3 (Low)
	Hydrological / Functional Importance	0.8 (Very Low)
	Direct Human Benefits	1.2 (Low)
RIP3	**Ecological Importance & Sensitivity**	3.2 (High)
	Hydrological / Functional Importance	2.9 (Moderate)
	Direct Human Benefits	1.6 (Low)
RIP4	**Ecological Importance & Sensitivity**	2.0 (Moderate)
	Hydrological / Functional Importance	1.9 (Low)
	Direct Human Benefits	1.2 (Low)
RIP5	**Ecological Importance & Sensitivity**	2.2 (Moderate)
	Hydrological / Functional Importance	1.8 (Low)
	Direct Human Benefits	1.2 (Low)
RIP6	**Ecological Importance & Sensitivity**	0.5 (Very Low)
	Hydrological / Functional Importance	0.3 (Very Low)
	Direct Human Benefits	0.8 (Very Low)
RIP7	**Ecological Importance & Sensitivity**	1.3 (Low)
	Hydrological / Functional Importance	0.5 (Very Low)
	Direct Human Benefits	1.2 (Low)
Wet1	**Ecological Importance & Sensitivity**	1.2 (Low)
	Hydrological / Functional Importance	0.4 (Very Low)
	Direct Human Benefits	1.0 (Low)
Wet2	**Ecological Importance & Sensitivity**	1.2 (Low)
	Hydrological / Functional Importance	0.5 (Very Low)
	Direct Human Benefits	1.0 (Low)
Wet3	**Ecological Importance & Sensitivity**	1.3 (Low)
	Hydrological / Functional Importance	0.4 (Very Low)
	Direct Human Benefits	1.0 (Low)

The relatively low EIS assigned to the wetlands can be attributed to their disturbed nature.

9.9.4 Identified impacts

- Loss of wetland habitat and bed/bank modification
- Water quality impairment
- Flow modification
- Loss of terrestrial and wetland biodiversity

A pan occurs on the south-eastern perimeter of proposed the Mulalo MTS Substation Site C. A riparian area again occurs within 200m of the western border of Site C. On the other hand Substation Site B is under cultivation and transformed. Its proximity to Sasol Synfuels facility make it ideal for further development and transformation. **Substation Site B** is therefore recommended as the preferred MTS alternative.

10 IMPACT ASSESSEMENT METHODOLOGY

The significance of impacts identified was assessed, on the whole, according to the methodology described below. The methodology meets the requirements of section (j) (i) – (vii) of Appendix 3 of the EIA Regulations GNR 982 of 2014).

Extent of the impact: the extent of the impact will be assessed according to the following parameters:
(1) Limited to the site and its immediate surroundings.
(2) Local/ Municipal extending only as far as the local community or urban area.
(3) Provincial/Regional.
(4) National i.e. South Africa.
(5) Across International borders.

Duration of the impact: the lifespan of the impact will be assessed in terms of the duration of the impact, i.e.:
(1) Immediate (less than 1 year).
(2) Short term (1-5 years).
(3) Medium term (6-15 years).
(4) Long term (the impact will cease after the operational life span of the project).
(5) Permanent (no mitigation measures or natural process will reduce impact after construction).

Magnitude of the impact: the magnitude or severity of the impacts will be indicated as either:
(0) None (where the aspect will have no impact on the environment).
(1) Minor (where the impact affects the environment in such a way that natural, cultural and social functions and processes are not affected).
(2) Low (where the impact affects the environment in such a way that natural, cultural and social functions and processes are slightly affected).
(3) Moderate (where the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way).
(4) High (where natural, cultural or social functions or processes are altered to the extent that it will temporarily cease)
(5) Very high / don't know (where natural, cultural or social functions or processes are altered to the extent that it will permanently cease).

Probability of occurrence: likelihood of impact actually occurring will be indicated as either:
(0) None (impact will not occur).
(1) Improbable (the possibility of the impact materializing is very low as a result of design, historic experience or implementation of adequate mitigation measures).
(2) Low probability (there is a possibility that the impact will occur).
(3) Medium probability (the impact may occur).
(4) High probability (it is most likely that the impact will occur).

(5) Definite / do not know (the impact will occur regardless of the implementation of any prevention or corrective actions or if the specialist does not know what the probability will be based on too little published information).

Status of the impact: the impacts will be assessed as either having a:

- Negative effect (i.e. at a cost to the environment).
- Positive effect (i.e. at a benefit to the environment).
- Neutral effect on the environment.

Reversibility

The degree to which the impact can be reversed.

Cumulative impact: the impact of the development is considered together with additional developments of the same or similar nature and magnitude. The combined impacts may be:

- Negligible – i.e. the net effect is the same as the single development
- Marginal – i.e. the impact of two developments of a similar nature is less than twice the impact of a single development. This implies it is better to place the two developments in the same environment rather than in separate environments.
- Compounding – the impact of two developments is more than twice the impact of two single developments therefore it is better to split the two developments into separate environments.

Significance of the impact:

Based on a synthesis of the information contained in the points above, the potential impacts will be assigned a significance weighting (S). The weighting is formulated by adding the sum of the numbers assigned to extent (E), duration (D) and magnitude (M) and multiplying this sum by the probability (P) of the impact hence S=(E+D+M)*P.

Table 23: Significance score and associated description

Significance	Significance Score	Description
Negligible	0	There is no impact
Low	1-15	Impact is of a low order, mitigation measures are easy and simple or not required
Low-Medium	16-30	Impact is higher but with limited effect, mitigation measures are feasible and easily achieved
Medium	31-45	Impact is real but not substantial and mitigation is both feasible and fairly easily possible
Medium-High	46-60	Impact is substantial and mitigation measures are difficult, expensive and time consuming
High/Fatal Flaw	>60	Impact is of the highest order and there are few, if any, mitigation measures to offset impact

11 ASSESSMENT OF IMPACTS

The proposed project will cause impacts to the biophysical and socio-economic environment as identified by the specialist studies. Specific environmental and socio-economic impacts will occur at different phases of the proposed project. These phases are:

- Construction of the Mulalo Main Transmission Substation (MTS) and power lines.
- Operation of the MTS and power lines.
- Decommissioning / closure of the MTS and power lines

11.1 AVIFAUNA IMPACT ASSESSMENT

It was determined that the construction and operation of the proposed Mulalo MTS and associated 400kV and 132kV loop-in-loop-out power lines may result in various threats to the birds occurring in the vicinity of the new infrastructure, with impacts ranging from low to medium in significance. Habitat transformation and disturbance impacts associated with the construction of the Mulalo MTS and the 400kV and 132kV loop-in-loop-out power lines are likely to be **medium** in significance. Similarly, the proposed power lines pose a **medium** collision risk which can be reduced to **low** through the application of mitigation measures.

Table 24: Assessment of the displacement of Red List species due to habitat loss or transformation

CONSTRUCTION PHASE		
Nature: Displacement of Red List species as a result of habitat loss or transformation. Avifaunal habitat is cleared to accommodate the Mulalo MTS and the associated 400kV and 132kV loop-in-loop-out power line infrastructure, reducing the amount of habitat available to birds for foraging, roosting and breeding		
	Without mitigation	With mitigation
Extent	2	2
Duration	4	4
Magnitude	4	3
Probability	4	3
Significance	40 - Medium	27 – Low-Medium
Status (positive or negative)	Negative	Negative
Reversibility	Low - construction of the infrastructure will require the complete eradication of the vegetation in the foot print	Medium
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Partially - a certain amount of land surface will be impacted on.	

Mitigation:

- Construction of the proposed Mulalo MTS at Substation Site B.
- Construction activity should be restricted to the immediate footprint of the infrastructure.
- Access to the remainder of the site should be strictly controlled to prevent unnecessary disturbance of Red List species.
- Maximum use should be made of existing access roads and the construction of new roads should be kept to a minimum.
- The recommendations of the ecological and botanical specialist studies must be strictly implemented, especially as far as limitation of the construction footprint and rehabilitation of disturbed areas is concerned.

Cumulative impacts:

Compounding - the surrounding area is already heavily transformed as a result of mining, industry, agriculture and urbanisation. Any additional infrastructure development will contribute to the absence of Red List species within the study area.

Table 25: Assessment of the displacement of Red List species as a result of disturbance

CONSTRUCTION PHASE		
Nature: Displacement due to disturbance associated with the construction of Mulalo MTS and associated 400kV and 132kV loop-in-loop-out power line infrastructure (i.e. noise and movement of construction and operational equipment and personnel) resulting in a negative direct impact on the resident avifauna.		
	Without mitigation	With mitigation
Physical Extent	2	2
Duration	2	2
Magnitude	4	3
Probability	4	3
Significance	32 - Medium	21 – Low-Medium
Status (positive or negative)	Negative	Negative
Reversibility	Medium	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Partially	

Mitigation:

- Construction activity should be restricted to the immediate footprint of the infrastructure.
- Access to remainder of the site should be strictly controlled to prevent disturbance of Red List species.
- Measures to control noise should be applied according to current best practice in the industry.
- An avifaunal walk-through of the final power line routes must be conducted to identify Red List species that may be breeding within the power line corridor to ensure that the impacts to breeding species (if any) are adequately managed

Cumulative impacts:

Marginal - the surrounding area is already subject to a significant source of existing disturbance (i.e. mining, industry, etc). These activities are a likely cause of the absence of Red List species within the study area. Those species that have persisted have undoubtedly developed a tolerance for the current levels of disturbance and are likely to persist within the broader area despite the development of the Mulalo MTS and the 400kV and 132kV loop-in-loop-out power line infrastructure.

Table 26: Assessment of mortality of Red List species due to collision with power line earth wires/conductors

OPERATIONAL PHASE		
Nature: Collisions of Red List avifauna with the earth wire of the 400kV and 132kV power lines, resulting in a negative direct mortality impact, particularly large terrestrial species.		
	Without mitigation	With mitigation
Physical Extent	2	1
Duration	4	3
Magnitude	4	3
Probability	4	3
Significance	40 - Medium	21 – Low-Medium
Status (positive or negative)	Negative	Negative
Reversibility	Low	High
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	
Mitigation: * Every effort must be made to select a route that poses the least risk to birds, avoiding key avifaunal habitat (i.e. rivers, dams, pans and wetlands) and where possible routing the power lines alongside existing power line infrastructure in an effort to increase conductor visibility. * High risk sections of power line must be identified by a qualified avifaunal specialist during the walk-through phase of the project. If power line marking is required, bird flight diverters must be installed according to Eskom guidelines.		
Cumulative impacts: Compounding – An extensive power line network features prominently both within the study area and within its immediate surrounds. Any additional power lines will increase the collision risk to power line sensitive species that may be present in the broader study area and therefore collisions with the proposed 400kV and 132kV loop-in-loop-out power lines will have a high cumulative impact.		

Table 27: Assessment of displacement of Red List species due to disturbance associated with decommissioning activities

DECOMMISSIONING PHASE

Nature: Displacement of Red List species as a result of disturbance associated with the decommissioning of the existing 132kV power lines between the existing Sol substation and Sasol 2 substation (i.e. noise and movement of equipment and personnel) resulting in a negative direct impact on the resident avifauna. This assessment is also applicable to the decommissioning of the proposed Mulalo MTS and the associated 400kV and 132kV loop-in-loop-out power line infrastructure once the project reaches its operational life span.		
	Without mitigation	With mitigation
Physical Extent	2	2
Duration	1	1
Magnitude	3	2
Probability	3	3
Significance	18 – Low-Medium	15 - Low
Status (positive or negative)	Positive	Positive
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Partially	
Mitigation: * Decommissioning activity should be restricted to the immediate footprint of the infrastructure. * Access to the remainder of the site should be strictly controlled to prevent unnecessary disturbance of Red List species. * Measures to control noise should be applied according to current best practice in the industry.		
Cumulative impacts: Negligible		

11.2 BIODIVERSITY ASSESSMENT

See **Appendix 7** for the impact tables for the biodiversity assessment.

Substation site B has a low impact rating both pre- and post-mitigation because it is already disturbed by agriculture activity. Substation site C is rated as a medium impact pre-mitigation with a low impact rating post-mitigation. The higher ranking is due to the largely natural state of the substation site which will be impacted by the development of the proposed substation if site C is selected.

The preferred power line route between the substation sites and the existing Kriel-Zeus and Kriel-Tutuka power lines is the northern route as it was rated at as low impact rating because the majority of the route passes through No Natural Habitat Remaining and Least Concern Habitat. The southern route passes though mostly highly significant habitat areas hence it is not preferred.

The routes going to Sasol all have low impacts on biodiversity as the majority of the route falls within No Natural Habitat biodiversity.

11.3 HERITAGE IMPACT ASSESSMENT

The impact on heritage resources occurs mainly during the construction phase. Identified heritage sites should be avoided during this phase and then there is the possibility of having chance finds when heritage sites are found during the excavation of soil, clearing of bush, etc. A process is then undertaken to avoid or recover and remove the heritage resources in order to protect them. During operation, sites can still be damaged / destroyed if such sites are not well marked and/or are covered by thick vegetation.

The assessment indicated that with the implementation of mitigation measures, most impacts could be reduced to a low-medium rating. These impacts have a limited effect and mitigation measures are both feasible and easily achieved. The impact that remained higher than the other impacts is the removal of the graves if the location of substation site C cannot be altered to avoid the graves found within its current footprint.

Table 28: Assessment of substation site B impacts

Environmental Feature	**Cultural heritage, fossils, archaeological sites, etc.**
Relevant Alternatives & Activities	**SUBSTATION SITE B**
Potential Impact	**Proposed Management Objectives / Mitigation Measures**
Destruction or damage to heritage sites including fossils, structures older than 60 years as well as graves	1. During construction, if any heritage resources are found, the following protocol must be followed: a All work must stop in the vicinity of the find b The Contractor or ECO must be informed and the find barricaded off to prevent further interference or damage c The MPHRA must be informed and a registered heritage specialist must be appointed to undertake an assessment of the find. d Depending of what is found and the significance thereof, the specialist will advise on the way forward. e If the resource needs to be removed/altered/destroyed then the necessary permit/s must be obtained from the MPHRA/SAHRA. f Only once the specialist gives the go-ahead can work commence in the area g Under no circumstance can heritage material be destroyed or removed from the site h Should any remains be found that could potentially be human remains then the SAPS must be contacted. i If there are chance finds of fossils, a palaeontologist must be called to the site in order to assess the fossils and rescue them if necessary (with a MPHRA/SAHRA permit). The fossils must then be housed in a suitable, recognized institution.

	+/- Impact	Reversibility	Cumulative impact	Extent	Magnitude	Duration	Probability	Significance
Before mitigation	-	No	Negligible	Site (1)	Moderate (3)	Permanent (5)	Low (2)	**18 (low-medium)**
After mitigation	-	No		Site (1)	Low (2)	Permanent (5)	Improbable (1)	**8 (low)**

Table 29: Assessment of substation site C impacts

Environmental Feature	**Cultural heritage, fossils, archaeological sites, etc.**
Relevant Alternatives & Activities	**SUBSTATION SITE C**
Potential Impact	**Proposed Management Objectives / Mitigation Measures**
Destruction or damage to heritage sites including graves, buildings older than 60 years, fossils, etc. • Damage / destruction / removal of graves and remains of structures within the footprint of site C	1. During construction, if any heritage resources are found, the following protocol must be followed: a All work must stop in the vicinity of the find b The Contractor or ECO must be informed and the find barricaded off to prevent further interference or damage. c The MPHRA must be informed & a registered heritage specialist must be appointed to undertake an assessment of the find. d Depending of what is found and the significance thereof, the specialist will advise on the way forward e If the resource needs to be removed/altered/destroyed then the necessary permit/s must be obtained from the MPHRA / SAHRA f Once the specialist gives the go-ahead can work commence in the area g Under no circumstance may heritage material be destroyed or removed from the site h Should any remains be found that could potentially be human remains then the SAPS must be contacted i If there are chance finds of fossils, a palaeontologist must be called to site in order to assess the fossils and rescue them if necessary (with the relevant permit). The fossils must be housed in a suitable, recognised institution. 2. If Site C is selected, then the proposed site must be moved at least 300 m north of the current site to avoid impacting on the graves and structures 3. The graves and structures must have a 20 m buffer around them to avoid any impacts by the construction of the substation

	4. The buffer area must be barricaded off with highly visible danger tape or other method so that the buffer area is clearly visible to all construction personnel 5. Permanent fencing around the graves must be considered in order that both construction and operational activities such as maintenance and repair of the substation do not impact on the identified heritage resources 6. If the location of the substation cannot be moved, then the process to have the graves moved must be undertaken. The exhumation and removal of graves is not recommended. Appendix 1 of the HIA must be adhered to as well as any other requirements from the MPHRA. 7. Application to have the structures destroyed must be made to MPHRA / SAHRA.

IF LOCATION OF SITE C CANNOT BE MOVED	**+/- Impact**	**Reversibility**	**Cumulative impact**	**Extent**	**Magnitude**	**Duration**	**Probability**	**Significance**
Before mitigation	-	No	Marginal	Local (2)	High (4)	Permanent (5)	Very High (5)	55 (medium - high)
After mitigation	-	No		Local (2)	Moderate (3)	Permanent (5)	Very High (5)	40 (medium)
IF LOCATION OF SITE C CAN BE MOVED								
Before mitigation			Negligible	Local (2)	Moderate (3)	Permanent (5)	Medium (3)	30 (low-medium)
After mitigation				Local (2)	Moderate (3)	Permanent (5)	Low (2)	20 (low – medium)

Table 30: Assessment of Kriel-Tutuka and Kriel-Zeus impacts

Environmental Feature	**Cultural heritage, fossils, archaeological sites, etc.**
Relevant Alternatives & Activities	**KRIEL-TUTUKA AND KRIEL-ZEUS POWER LINES**
Potential Impact	**Proposed Management Objectives / Mitigation Measures**
Destruction or damage to heritage sites including graves,	1. During construction, if any heritage resources are found (chance finds) the following protocol must be followed:

buildings older than 60 years, fossils, etc.	a All work must stop in the vicinity of the find b The Contractor or ECO must be informed and the find barricaded off to prevent further interference or damage. c MPHRA must be informed & a registered heritage specialist must be appointed to undertake an assessment of the find. d Depending of what is found and the significance thereof, the specialist will advise on the way forward e If the heritage resource needs to be removed /altered /destroyed, the necessary permit/s must be obtained from MPHRA / SAHRA f Once the specialist gives the go-ahead, work commence in the area g Under no circumstance may heritage material be destroyed or removed from the site h Should any remains be found that could potentially be human remains then the SAPS must be contacted.
• Damage/destruction/ removal of graves and remains of structures along the route of the northern options and southern option as well as between substation sites B and C • Potential damage/destruction to fossils situated along the last 2-3 km before the lines loop into the existing power lines	2. It is recommended that all heritage sites identified along the power lines are not destroyed or damaged with the adjustment of the pylon positions to avoid impacting directly on the identified sites 3. The graves and structures must have a 20 m buffer around them to avoid any impacts by the construction of the power lines 4. The buffer area must be barricaded with highly visible danger tape or other method so that buffer area is clearly visible to all construction personnel 5. Permanent fencing around the unfenced graves should be considered by the Applicant so that during construction and operation, such activities do not impact on the graves and structures. 6. A palaeontologist forms part of the specialist walk through to investigate the section of power lines that cross an area of very high fossil sensitivity close to the Kriel-Tutuka-Zeus power lines. 7. If there are fossil finds, a palaeontologist must be called to site in order to assess the fossils and rescue them if necessary (with relevant MPHRA/SAHRA permit). The fossils must be housed in a suitable, recognised institution

	+/- Impact	**Reversibility**	**Cumulative impact**	**Extent**	**Magnitude**	**Duration**	**Probability**	**Significance**
Before mitigation	-	No	Marginal	Local (2)	High (4)	Permanent (5)	Medium (3)	3 (medium)
After mitigation	-	No		Local (2)	Moderate (3)	Permanent (5)	Low (2)	20 (low - medium)

Table 31: Assessment of Sasol 2 and Sasol 3 power line route impacts

Environmental Feature	**Cultural heritage, fossils, archaeological sites, etc**

Relevant Alternatives & Activities	**SASOL 2 AND SASOL 3 POWER LINE ROUTES**
Potential Impact	**Proposed Management Objectives / Mitigation Measures**
Destruction or damage to heritage sites including graves, buildings older than 60 years, etc. • Damage to / destruction of foundations situated close to power line routes	1. During construction, if any heritage resources are found (chance finds) the following protocol must be followed: a All work must stop in the vicinity of the find b The Contractor or ECO must be informed and the find barricaded off to prevent further interference or damage. c The MPHRA must be informed & a registered heritage specialist must be appointed to undertake an assessment of the find. d Depending of what is found and the significance thereof, the specialist will advise on the way forward e If the resource needs to be removed/altered/destroyed then the necessary permit/s must be obtained from the MPHRA / SAHRA f Once the specialist gives the go-ahead work commence in the area g Under no circumstance can heritage material be destroyed or removed from the site h Should any remains be found that could potentially be human remains then the SAPS must be contacted i If there are chance finds of fossils, a palaeontologist must be called to site in order to assess the fossils and rescue them if necessary (with the suitable MPHRA/SAHRA permit). The fossils must then be housed in a suitable, recognised institution. 2. It is recommended that the remains of the accommodation for the workers who built the Sasol refinery are avoided where possible. Some of the foundations will fall within the servitude of the power lines and damage to these is unavoidable. However, those situated outside / beyond the servitude should be avoided.

	+/- Impact	**Reversibility**	**Cumulative impact**	**Extent**	**Magnitude**	**Duration**	**Probability**	**Significance**
Before mitigation	-	No	Marginal	Local (2)	Low (2)	Permanent (5)	High (4)	36 (medium)
After mitigation	-	No		Local (2)	Low (2)	Permanent (5)	Medium (3)	27 (low - medium)

Table 32: Assessment of power lines to OCGT

Environmental Feature	**Cultural heritage, fossils, archaeological sites, etc.**
Relevant Alternatives & Activities	**132KV POWER LINES TO OCGT**
Potential Impact	**Proposed Management Objectives / Mitigation Measures**

Destruction or damage to heritage sites including graves, buildings older than 60 years, fossils, etc.	1. During construction, if any heritage resources are found (chance finds) the following protocol must be followed: a All work must stop in the vicinity of the find b The Contractor or ECO must be informed and the find barricaded off to prevent further interference or damage. c The MPHRA must be informed & a registered heritage specialist must be appointed to undertake an assessment of the find. d Depending of what is found and the significance thereof, the specialist will advise on the way forward e If the resource needs to be removed/altered/destroyed then the necessary permit/s must be obtained from the MPHRA / SAHRA f Only once the specialist gives the go-ahead can work commence in the area g Under no circumstance can heritage material be destroyed or removed from the site h Should any remains be found that could potentially be human remains then the SAPS must be contacted i If there are chance finds of fossils, a palaeontologist must be called to site in order to assess the fossils and rescue them if necessary (with the suitable MPHRA/SAHRA permit). The fossils must then be housed in a suitable, recognised institution.

	+/- Impact	**Reversibility**	**Cumulative impact**	**Extent**	**Magnitude**	**Duration**	**Probability**	**Significance**
Before mitigation	-	No	Negligible	Site (1)	Minor (1)	Permanent (5)	Low (2)	14 (low)
After mitigation	-	No		Site (1)	Minor (1)	Permanent (5)	Improbable (1)	7 (low)

11.4 SOCIAL IMPACT ASSESSMENT

The large percentage of impacts identified have a low – medium impact rating that are reduced to a low – medium rating with mitigation measures. There are a few impacts that are rated at a medium impact rating which are, after mitigation, reduced to a low-medium impact rating. The impacts that remain at a medium impact are the positive impacts such as an increase in employment opportunities and increased opportunities for SMMEs.

At a social level the most severe social impacts are related to the proposed Mulalo Main Transmission substation and those sections of the power line routes, as they leave the Mulalo MTS and cross mainly green field agricultural land to the east to join the existing Sasol 2 and Sasol 3 power lines and to the west to connect with the Kriel-Tutuka and Kriel-Zeus lines. With respect to those routes within the more industrialised, brown field Sasol Secunda area, the social impacts are likely to be proportionally less severe.

Table 33: Assessment of Health and Social Well-being Impacts

Environmental Feature	Health and Social Well-Being
Project life-cycle	Construction & operational phases
Potential Impact	**Proposed Optimisation / Mitigation Measures**
Annoyance, dust and noise	Apply the dust suppression reduction mitigation measures recommended by the air quality specialist.
Increase in crime	Ensure that construction workers are clearly identifiable. All workers should carry identification cards and wear identifiable clothing.
	Fence off all construction sites and control access to these sites.
	Clearly mark any hazardous areas and regularly monitor these areas to ensure that they are avoided by people and animals.
	Liaise with the South African Police Services (SAPS) and Community Policing Forums to ensure that construction sites are monitored.
	Encourage local people to report any suspicious activity associated with the construction sites.
	Prevent loitering within the vicinity of construction camp as well as construction sites.
Increased risk of HIV and AIDS	Ensure that an onsite HIV and AIDS policy is in place and that construction workers have easy access to condoms.
Personal safety and increased hazard exposure	Ensure all construction equipment and vehicles are properly maintained at all times.
	Ensure that operators and drivers are properly trained and make them aware, through regular toolbox talks, of any risk they may pose to the community. Place specific emphasis on the vulnerable sector of the population such as children and the elderly.
	Ensure that fires lit by construction staff are only ignited in designated areas and that safety precautions, such as not lighting fires in strong winds and completely extinguishing fires before leaving them unattended, are strictly adhered to.
	Ensure all construction equipment and vehicles are properly maintained at all times.
	Undertake an independent health assessment in respect of the dangers that may be associated with electromagnetic fields
	Follow mitigation measures recommended in the appropriate specialist report/s

	Put in place a monitoring system to monitor health risks throughout the life of the project
	Ensure that there is broad based representation, capable of serving both community and company interests in respect of the monitoring facility referred to above

400/132kV Mulalo Main Transmission Substation Alternative B

	Status	Extent	Magnitude	Duration	Probability	Significance
Construction Phase						
Before Mitigation	Negative	Site	Moderate	Short term	High	24 Low Medium
After Mitigation	Negative	Site	Low	Short term	High	20 Low Medium
Operational Phase						
Before Mitigation	Negative	Site	Moderate	Long term	High	32 Medium
After Mitigation	Negative	Site	Low	Long term	High	28 Low Medium

400/132kV Mulalo Main Transmission Substation Alternative C

	Status	Extent	Magnitude	Duration	Probability	Significance
Construction Phase						
Before Mitigation	Negative	Site	Moderate	Short term	High	24 Low Medium
After Mitigation	Negative	Site	Low	Short term	High	20 Low Medium
Operational Phase						
Before Mitigation	Negative	Site	Moderate	Long term	High	32 Medium
After Mitigation	Negative	Site	Low	Long term	High	28 Low Medium
Cumulative Impact: The construction of a MTS and power lines in the area will add to the growing industrial nature of the area and will result in an overall degradation of the health and social well-being of the area.						

400kV loop-in-loop-out transmission power lines on the Kriel-Tutuka and Kriel-Zeus 400kV line to the proposed Mulalo MTS

	Status	Extent	Magnitude	Duration	Probability	Significance
Construction Phase						
Before Mitigation	Negative	Site	Moderate	Short term	High	24 Low Medium
After Mitigation	Negative	Site	Low	Short term	High	20 Low Medium
Operational Phase						
Before Mitigation	Negative	Site	Low	Long term	High	28 Low Medium
After Mitigation	Negative	Site	Minor	Long term	High	24 Low Medium

Cumulative Impact: The construction of a MTS and power lines in the area will add to the growing industrial nature of the area and will result in an overall degradation of the health and social well-being of the area as surrounding green field areas are drawn into the brownfield areas.

400kV distribution power lines from the proposed Mulalo MTS to the existing Sasol 2 power lines.

	Status	Extent	Magnitude	Duration	Probability	Significance
Construction Phase						
Before Mitigation	Negative	Site	Moderate	Short term	High	24 Low Medium
After Mitigation	Negative	Site	Low	Short term	High	20 Low Medium
Operational Phase						
Before Mitigation	Negative	Site	Low	Long term	High	28 Low Medium
After Mitigation	Negative	Site	Minor	Long term	High	24 Low Medium

400kV distribution power lines from the proposed Mulalo MTS to the existing Sasol 3 power lines

	Status	Extent	Magnitude	Duration	Probability	Significance
Construction Phase						
Before Mitigation	Negative	Site	Moderate	Short term	High	24 Low Medium
After Mitigation	Negative	Site	Low	Short term	High	20 Low Medium
Operational Phase						
Before Mitigation	Negative	Site	Low	Long term	High	28 Low Medium
After Mitigation	Negative	Site	Minor	Long term	High	24 Low Medium
Cumulative Impact: The route of both the 400kV distribution power lines as they leave the proposed Mulalo MTS towards the existing Sasol 2 and Sasol 3 power lines will cross agricultural land and will change the visual characteristics of this area substantially. However, as they cross into the Sasol Secunda, area which is more industrial in character, the visual impact is likely to be somewhat less intrusive as they will add to the industrialised nature of the area.						

Table 34: Assessment of Quality of the Living Environment Impacts

Environmental Feature	Quality of the living environment (Liveability)
Project life-cycle	Construction & operational phases
Potential Impact	**Proposed Optimisation / Mitigation Measures**
Disruption of daily living activities	Ensure people have access to their properties and facilities such as schools, churches, transport and shops.
	Investigate and consult local communities on need to provide access points around the construction sites for people and animals.
Perceived quality of life	Establish channels of communication between local communities and contractors to ensure that construction workers behave in a manner acceptable to the local communities.

	Put procedures in place to control loitering & construction of informal dwellings near the construction sites.

400/132kV Mulalo Main Transmission Substation Alternative B

	Status	Extent	Magnitude	Duration	Probability	Significance
Construction Phase						
Before Mitigation	Negative	Site	Moderate	Short term	High	24 Low Medium
After Mitigation	Negative	Site	Low	Short term	High	20 Low Medium
Operational Phase						
Before Mitigation	Negative	Site	Moderate	Long term	High	32 Medium
After Mitigation	Negative	Site	Low	Long term	High	28 Low Medium

400/132kV Mulalo Main Transmission Substation Alternative C

	Status	Extent	Magnitude	Duration	Probability	Significance
Construction Phase						
Before Mitigation	Negative	Site	Moderate	Short term	High	24 Low Medium
After Mitigation	Negative	Site	Low	Short term	High	20 Low Medium
Operational Phase						
Before Mitigation	Negative	Site	Moderate	Long term	High	32 Medium
After Mitigation	Negative	Site	Low	Long term	High	28 Low Medium
Cumulative Impact: Both substation alternatives are on agricultural lane and will require an area of 800m x 800m which amounts to 64 ha. In both cases this will reduce the available agricultural land in the area and will change the sense of place introducing a more industrialised characteristic to the area that is already within close proximity of the Secunda Sasol industrialised setting.						

400kV loop-in-loop-out transmission power lines on the Kriel-Tutuka and Kriel-Zeus 400kV line to the proposed Mulalo MTS

	Status	Extent	Magnitude	Duration	Probability	Significance
Construction Phase						
Before Mitigation	Negative	Site	Moderate	Short term	High	24 Low Medium
After Mitigation	Negative	Site	Low	Short term	High	20 Low Medium
Operational Phase						
Before Mitigation	Negative	Site	Moderate	Long term	High	32 Medium
After Mitigation	Negative	Site	Low	Long term	High	28 Low Medium

Cumulative Impact: These power lines cross what is largely agricultural lane and will change the sense of place introducing a more industrialised characteristic to the area.

400kV distribution power lines from the proposed Mulalo MTS to the existing Sasol 2 power lines.

	Status	Extent	Magnitude	Duration	Probability	Significance
Construction Phase						
Before Mitigation	Negative	Site	Moderate	Short term	High	24 Low Medium
After Mitigation	Negative	Site	Low	Short term	High	20 Low Medium
Operational Phase						
Before Mitigation	Negative	Site	Low	Long term	High	28 Low Medium
After Mitigation	Negative	Site	Minor	Long term	High	24 Low Medium

400kV distribution power lines from the proposed Mulalo MTS to the existing Sasol 3 power lines

	Status	Extent	Magnitude	Duration	Probability	Significance
Construction Phase						
Before Mitigation	Negative	Site	Moderate	Short term	High	24 Low Medium
After Mitigation	Negative	Site	Low	Short term	High	20 Low Medium
Operational Phase						
Before Mitigation	Negative	Site	Low	Long term	High	28 Low Medium
After Mitigation	Negative	Site	Minor	Long term	High	24 Low Medium

Table 35: Assessment of Economic and Material Well-being Impacts

Environmental Feature	Economic and material well-being (positive)
Project life-cycle	Construction & operational phases
Potential Impact	**Proposed Optimisation / Mitigation Measures**
Increase in employment opportunities	Local residents should be recruited to fill semi and unskilled jobs.
	Women should be given equal opportunities and encouraged to apply for positions
	A skills transfer plan should be put in place and workers should be given the opportunity to develop skills which they can use to secure jobs post-construction
Increased opportunities for SMMEs	A procurement policy promoting the use of local business should, where possible, be put in place to be applied throughout the construction and operational phases of the project.

400/132kV Mulalo Main Transmission Substation Alternative B

	Status	Extent	Magnitude	Duration	Probability	Significance
Construction Phase						

Before Mitigation	Positive	Local	Minor	Short term	High	16 Low Medium
After Mitigation	Positive	Local	Low	Short term	High	20 Low Medium
Operational Phase						
Before Mitigation	Positive	Local	Low	Long term	High	32 Medium
After Mitigation	Positive	Local	Moderate	Long term	High	36 Medium

400/132kV Mulalo Main Transmission Substation Alternative C

	Status	**Extent**	**Magnitude**	**Duration**	**Probability**	**Significance**
Construction Phase						
Before Mitigation	Positive	Local	Minor	Short term	High	16 Low Medium
After Mitigation	Positive	Local	Low	Short term	High	20 Low Medium
Operational Phase						
Before Mitigation	Positive	Local	Low	Long term	High	32 Medium
After Mitigation	Positive	Local	Moderate	Long term	High	36 Medium
Cumulative Impact: During the operational phase of the project it is likely that jobs will be created due to the multiplier effect of increasing electricity supply to industry in the area.						

400kV loop-in-loop-out transmission power lines on the Kriel-Tutuka and Kriel-Zeus 400kV line to the proposed Mulalo MTS

	Status	**Extent**	**Magnitude**	**Duration**	**Probability**	**Significance**
Construction Phase						
Before Mitigation	Positive	Local	Minor	Short term	High	16 Low Medium
After Mitigation	Positive	Local	Low	Short term	High	20 Low Medium
Operational Phase						
Before Mitigation	Positive	Local	Low	Long term	High	32 Medium
After Mitigation	Positive	Local	Moderate	Long term	High	36 Medium
Cumulative Impact: During the operational phase of the project it is likely that jobs will be created due to the multiplier effect of increasing electricity supply to industry in the area.						

400kV distribution power lines from the proposed Mulalo MTS to the existing Sasol 2 power lines.

	Status	**Extent**	**Magnitude**	**Duration**	**Probability**	**Significance**
Construction Phase						

Before Mitigation	Positive	Local	Minor	Short term	High	16 Low Medium
After Mitigation	Positive	Local	Low	Short term	High	20 Low Medium
Operational Phase						
Before Mitigation	Positive	Local	Low	Long term	High	32 Medium
After Mitigation	Positive	Local	Moderate	Long term	High	36 Medium

400kV distribution power lines from the proposed Mulalo MTS to the existing Sasol 3 power lines

	Status	Extent	Magnitude	Duration	Probability	Significance
Construction Phase						
Before Mitigation	Positive	Local	Minor	Short term	High	16 Low Medium
After Mitigation	Positive	Local	Low	Short term	High	20 Low Medium
Operational Phase						
Before Mitigation	Positive	Local	Low	Long term	High	32 Medium
After Mitigation	Positive	Local	Moderate	Long term	High	36 Medium

Table 36: Assessment of Cultural Impacts

Environmental Feature	Cultural
Project life-cycle	Construction & operational phases
Potential Impact	**Proposed Optimisation / Mitigation Measures**
Heritage	Consult traditional healers, herbalists, traditional doctors and elderly people of the area to ensure that any lost access to natural resources is restored to former levels.
	Follow the mitigation measures suggested by the Heritage Specialist.
	Wherever possible reinstate access to sites of cultural importance.
Apart from noting the heritage impacts here as an important social aspect they fall outside the scope of specialisation of this report and are dealt with in more detail and assessed within the Heritage Impact Report.	

Table 37: Assessment of Institutional, Legal, Political and Equity Impacts

Environmental Feature	Institutional, legal, political and equity
Project life-cycle	Construction & operational phases
Potential Impact	**Proposed Optimisation / Mitigation Measures**
Effect on existing infrastructure facilities and social services	Liaise with all relevant services providers such as the district and local municipalities, South African National Roads Agency Limited (SANRAL) and the water authorities in the area to ensure that any disruption to existing infrastructure is limited.
	Liaise with property owners to ensure that existing infrastructure is recorded and any damage repaired or compensated for.
	Provide a channel through which communities can route grievances or concerns regarding service disruption as a result of the project.
	Swiftly address any grievance raised concerning service disruption as a result of the project in a transparent manner.

	Regularly monitor the effect that the project has had on existing infrastructure facilities and social services within the host community.
Attitude formation towards project	Promptly deal with any raised expectations amongst communities regarding perceived benefits associated with the project, through a process of communication and consultation.
	Promptly address any concerns raised by the public in a transparent manner.
	Where necessary always provide prompt and clear feedback to communities.
	Include all relevant community members in decisions affecting them.
Compliance with municipal by-laws	Ensure that all municipal by-laws are complied with.

400/132kV Mulalo Main Transmission Substation Alternative B

	Status	Extent	Magnitude	Duration	Probability	Significance
Construction Phase						
Before Mitigation	Negative	Site	Moderate	Short term	High	24 Low Medium
After Mitigation	Negative	Site	Low	Short term	High	20 Low Medium
Operational Phase						
Before Mitigation	Negative	Site	Low	Long term	High	28 Low Medium
After Mitigation	Negative	Site	Minor	Long term	High	24 Low Medium

400/132kV Mulalo Main Transmission Substation Alternative C

	Status	Extent	Magnitude	Duration	Probability	Significance
Construction Phase						
Before Mitigation	Negative	Site	Moderate	Short term	High	24 Low Medium
After Mitigation	Negative	Site	Low	Short term	High	20 Low Medium
Operational Phase						
Before Mitigation	Negative	Site	Low	Long term	High	28 Low Medium
After Mitigation	Negative	Site	Minor	Long term	High	24 Low Medium
Cumulative Impact:						

400kV loop-in-loop-out transmission power lines on the Kriel-Tutuka and Kriel-Zeus 400kV line to the proposed Mulalo MTS

	Status	Extent	Magnitude	Duration	Probability	Significance
Construction Phase						
Before Mitigation	Negative	Site	Moderate	Short term	High	24 Low Medium
After Mitigation	Negative	Site	Low	Short term	High	20 Low Medium

Operational Phase						
Before Mitigation	Negative	Site	Low	Long term	High	28 Low Medium
After Mitigation	Negative	Site	Minor	Long term	High	24 Low Medium

400kV distribution power lines from the proposed Mulalo MTS to the existing Sasol 2 power lines.

	Status	**Extent**	**Magnitude**	**Duration**	**Probability**	**Significance**
Construction Phase						
Before Mitigation	Negative	Site	Moderate	Short term	High	24 Low Medium
After Mitigation	Negative	Site	Low	Short term	High	20 Low Medium
Operational Phase						
Before Mitigation	Negative	Site	Low	Long term	High	28 Low Medium
After Mitigation	Negative	Site	Minor	Long term	High	24 Low Medium

400kV distribution power lines from the proposed Mulalo MTS to the existing Sasol 3 power lines

	Status	**Extent**	**Magnitude**	**Duration**	**Probability**	**Significance**
Construction Phase						
Before Mitigation	Negative	Site	Moderate	Short term	High	24 Low Medium
After Mitigation	Negative	Site	Low	Short term	High	20 Low Medium
Operational Phase						
Before Mitigation	Negative	Site	Low	Long term	High	28 Low Medium
After Mitigation	Negative	Site	Minor	Long term	High	24 Low Medium
Cumulative Impact:						

Table 38: Assessment of Gender Relations Impacts

Environmental Feature	Gender relations
Project life-cycle	Construction & operational phases
Potential Impact	**Proposed Optimisation / Mitigation Measures**
Cultural resistance towards women	Sensitise staff in respect of gender sensitive issues that are pertinent to the workplace.
Division of labour	Ensure gender inclusivity and equity with respect to all compensation.
	Prioritise gender inclusivity and equity in access to resources, goods, services and decision making with the aim of empowering women.
	Promote equal job opportunities for women and men during construction and operation
	Prioritise and articulate gender inclusivity and equity in the project documents by including specific strategies and guidelines for implementation.

	The project documents should also include clear mechanisms through which the actual implementation of the activities and the impact on the ground can be monitored and evaluated.
	Develop a grievance procedure to specifically address gender matters.
	Factors such as culture should be considered when planning for gender activities since they play a great role in influencing gender relations.
	Ensure that gender differences are taken into account when hiring staff.

400/132kV Mulalo Main Transmission Substation Alternative B

	Status	Extent	Magnitude	Duration	Probability	Significance
Construction Phase						
Before Mitigation	Negative	Local	Low	Short term	High	24 Low Medium
After Mitigation	Negative	Local	Minor	Short term	High	20 Low Medium
Operational Phase						
Before Mitigation	Negative	Local	Low	Long term	High	32 Medium
After Mitigation	Negative	Local	Minor	Long term	High	28 Low Medium

400/132kV Mulalo Main Transmission Substation Alternative C

	Status	Extent	Magnitude	Duration	Probability	Significance
Construction Phase						
Before Mitigation	Negative	Local	Low	Short term	High	24 Low Medium
After Mitigation	Negative	Local	Minor	Short term	High	20 Low Medium
Operational Phase						
Before Mitigation	Negative	Local	Low	Long term	High	32 Medium
After Mitigation	Negative	Local	Minor	Long term	High	28 Low Medium
Cumulative Impact:						

400kV loop-in-loop-out transmission power lines on the Kriel-Tutuka and Kriel-Zeus 400kV line to the proposed Mulalo MTS

	Status	Extent	Magnitude	Duration	Probability	Significance
Construction Phase						
Before Mitigation	Negative	Local	Low	Short term	High	24 Low Medium
After Mitigation	Negative	Local	Minor	Short term	High	20 Low Medium
Operational Phase						
Before Mitigation	Negative	Local	Low	Long term	High	32 Medium
After Mitigation	Negative	Local	Minor	Long term	High	28 Low Medium

400kV distribution power lines from the proposed Mulalo MTS to the existing Sasol 2 power lines.

	Status	Extent	Magnitude	Duration	Probability	Significance

Construction Phase						
Before Mitigation	Negative	Local	Low	Short term	High	24 Low Medium
After Mitigation	Negative	Local	Minor	Short term	High	20 Low Medium
Operational Phase						
Before Mitigation	Negative	Regional	Medium	Long term	Almost certain	2
After Mitigation	Negative	Regional	Low	Long term	Almost certain	2

400kV distribution power lines from the proposed Mulalo MTS to the existing Sasol 3 power lines

	Impacts	**Extent**	**Magnitude**	**Duration**	**Probability**	**Significance**
Construction Phase						
Before Mitigation	Negative	Local	Low	Short term	High	24 Low Medium
After Mitigation	Negative	Local	Minor	Short term	High	20 Low Medium
Operational Phase						
Before Mitigation	Negative	Local	Low	Long term	High	32 Medium
After Mitigation	Negative	Local	Minor	Long term	High	28 Low Medium
Cumulative Impact:						

11.5 SOIL AND LAND CAPABILITY ASSESSMENT

This specialist used a similar impact assessment methodology as that described in Chapter 9 of this report; however, he used a different scoring system for the categories (e.g. extent, duration, etc.). This system is depicted in **Table 39** below.

Table 39: Impact assessment criteria – soils and land capability

Category	Description of category
Nature	Describes the cause of the effect, what will be affected and how will it be affected
Extent (E)	Indicate the area being affected i.e. geographical extent (scale: 1 = local *up to* 5 = regional)
Duration (D)	Indicate the lifespan of the impact (scale: 1 = short term *up to* 5 = permanent
Magnitude (M)	Indicate the impact of the effect on the environment (scale: 0=no significant impact; 2 = minor impact; 4 = low/slight impact; 6 = moderate; 8 = high i.e. natural processes significantly altered and 10 = very high i.e. complete destruction of biophysical environment
Probability (P)	Describes the likelihood of the impact actually occurring (scale: 1 = very improbable *up to* 5 = definite)
Significance (S)	Summarise the impact by combining the criteria in the following formula: $S = (E + D + M) \times P$

Status	Either positive, negative or neutral
Reversal and mitigation	Indicate the degree to which the impact might be reversed or mitigated

Table 40: Impact of construction of substation on loss of agricultural land

Category	Description of category
Nature	Construction of the substation leading to the loss of agricultural land
Extent (E)	2 – Site (2 dimensional)
Duration (D)	5 – Permanent
Magnitude (M)	10
Probability (P)	5
Significance (S)	85
Status	Negative
Reversal and mitigation	**None; agricultural land will be lost irreversibly when the substation is constructed**

Table 41: Impact of construction of substation on potential soil erosion

Category	Description of category
Nature	Construction of the substation potentially leading to soil erosion
Extent (E)	3 – Site and local surrounds
Duration (D)	1 (Could be 5 if no mitigation done)
Magnitude (M)	2 (Could be 6 if no mitigation done)
Probability (P)	1 (With adequate prevention measures)
Significance (S)	6
Status	Negative
Reversal and mitigation	Ensure that rainwater running off substation is dispersed with a low energy into the adjacent land. Standard urban hydrological controls must be in place to control both rainfall and overland flow generated by the roofs, roads and paving. Controls could include gutters, storm water drains and runoff paths. Erosion should not have an impact if mitigated

Table 42: Impact of the expansion on the road network

Category	**Description of category**
Nature	Constructing of access roads to new buildings leading to loss of agricultural land and potential erosion
Extent (E)	2 – Site (2 dimensional)
Duration (D)	2 – Gravel roads can be rehabilitated
Magnitude (M)	2 (can be 4 if adequate erosion measures are not in place)
Probability (P)	3
Significance (S)	18
Status	Negative

Reversal and mitigation	Use existing roads as far as possible. Construct roads with erosion walls to channel water into adjacent fields. Deep rip unused roads after construction.

Table 43: Impact of erection of overhead power lines

Category	Description of category
Nature	Erection of transmission power line and distribution routes
Extent (E)	1 – Site (1-Dimensional)
Duration (D)	5 - Permanent
Magnitude (M)	4
Probability (P)	5
Significance (S)	50
Status	Negative
Reversal and mitigation	Agricultural land will be lost where the pylons are anchored in the ground. In cultivated fields, a slim pylon will limit the extent of land being lost, while in grazing land a larger pylon can be used where animals could graze under.

Table 44: Impact of increased vehicle activity on soil

Category	Description of category
Nature	Increased vehicle activity and potential destruction of soil structure
Extent (E)	2 – Local
Duration (D)	2 – Short term, generally restricted to construction period
Magnitude (M)	2
Probability (P)	1 (if managed correctly)
Significance (S)	6
Status	Negative
Reversal and mitigation	Limit vehicle movement. Ensure that road surfaces are dry when vehicles operate on them.

The combined mitigatable impact of the proposed development on soil and agricultural resources is presented in **Table 45**. The loss of agricultural land is not assessed as it cannot be mitigated.

Table 45: Summary impact of the development

Nature	**Loss of soil and agricultural resources due to development of Mulalo substation and related infrastructure**	
	Without mitigation	With mitigation
Extent (E)	3 – Site and surrounds	1 - Site
Duration (D)	5 – Permanent	3 – Medium term
Magnitude (M)	6	2
Probability (P)	4 – Very likely	2
Significance (S)	64 – Medium	12 – Medium
Status	Negative	Negative

Reversibility	Low	High
Irreplaceable loss of resources?	Yes	No
Can impacts be mitigated?	Yes	Yes
Mitigation strategies	Reduce increased runoff from buildings and roads. Limit vehicle movement to roads and only when roads are dry.	
Cumulative Impacts	Soil erosion leads to more soil erosion. Sheet erosion becomes rill erosion becomes gully erosion. Water is channelled increasing the erosion. If not mitigated the effect will indefinitely be cumulative.	
Residual Impacts	Soil erosion in one area can potentially initiate soil erosion in adjacent areas.	

11.6 VISUAL IMPACT ASSESSMENT

The VIA assessed the significance of landscape impacts (alterations to the fabric, character, visual quality and/or visual value) and viewer sensitivity. Visual receptors experience different views of the visual resource and value it differently. This will be affected because of alterations to their views due to the proposed project. The visual receptors are: residents; tourists; and motorists.

Table 46 below indicates that both substation sites will have a medium to high impact on the landscape whilst the power lines will have a low to low-medium impact.

Table 47 indicates that substation site C will have a higher impact rating (medium-high) on surrounding residents than substation site B (medium rating). Site B is further away from major routes and closer to existing mining and infrastructure hence is considered to have less impact to residents due to the reduced sensitivity of the surrounding landscape. The impact of the proposed power lines was assessed to have a low to low-medium impact on residents.

Table 46: Landscape impact – altering the landscape character

Activity	Extent of Impact	Duration of Impact	Magnitude of Impact	Probability of Impact	Status of impact	Cumulative	Significance	Reversibility
Mulalo Substation Site B	Regional (3)	Permanent (5)	Moderate (3)	High (4)	Negative	Compounding	Medium-High (44)	Low
Mulalo Substation Site C	Regional (3)	Permanent (5)	Moderate (3)	High (4)	Negative	Compounding	Medium-High (44)	Low
Power line: Site B and C to Kriel-Tutuka 1 North	Local (2)	Long term (4)	Low (2)	Medium (3)	Negative	Marginal	Low-Medium (24)	Moderate
Power line: Site B and C to Kriel-Tutuka 1 South	Local (2)	Long term (4)	Low (2)	Medium (3)	Negative	Marginal	Low-Medium (24)	Moderate
Power line: Site B and C to Kriel-Zeus 1 North	Local (2)	Long term (4)	Low (2)	Medium (3)	Negative	Marginal	Low-Medium (24)	Moderate
Power line: Site B and C to Kriel-Zeus 1 South	Local (2)	Long term (4)	Low (2)	Medium (3)	Negative	Marginal	Low-Medium (24)	Moderate
Distribution line to Substation B: Route 1	Local (2)	Long term (4)	Minor (1)	Low (2)	Negative	Marginal	Low (14)	High
Distribution line to Substation B: Route 2	Local (2)	Long term (4)	Minor (1)	Low (2)	Negative	Marginal	Low (14)	High
Distribution line to Substation B: Route 3	Local (2)	Long term (4)	Low (2)	Low (2)	Negative	Marginal	Low-Medium (16)	High
Distribution line to Substation C: Route 1	Local (2)	Long term (4)	Minor (1)	Low (2)	Negative	Marginal	Low (14)	High
Distribution line to Substation C: Route 2	Local (2)	Long term (4)	Minor (1)	Low (2)	Negative	Marginal	Low (14)	High
Distribution line to Substation C: Route 3	Local (2)	Long term (4)	Low (2)	Low (2)	Negative	Marginal	Low-Medium (16)	High

Table 47: Potential visual impacts on residents

Activity	Extent of Impact	Duration of Impact	Magnitude of Impact	Probability of Impact	Status of impact	Cumulative	Significance	Reversibility
Mulalo Substation Site B	Regional (3)	Permanent (5)	High (4)	Medium (3)	Negative	Compounding	Medium (36)	Low
Mulalo Substation Site C	Regional (3)	Permanent (5)	High (4)	High (4)	Negative	Compounding	Medium-High (48)	Low
Power line: Site B and C to Kriel-Tutuka 1 North	Local (2)	Long term (4)	Low (2)	Medium (3)	Negative	Marginal	Low-Medium (24)	Moderate
Power line: Site B and C to Kriel-Tutuka 1 South	Local (2)	Long term (4)	Low (2)	Medium (3)	Negative	Marginal	Low-Medium (24)	Moderate
Power line: Site B and C to Kriel-Zeus 1 North	Local (2)	Long term (4)	Low (2)	Medium (3)	Negative	Marginal	Low-Medium (24)	Moderate
Power line: Site B and C to Kriel-Zeus 1 South	Local (2)	Long term (4)	Low (2)	Medium (3)	Negative	Marginal	Low-Medium (24)	Moderate
Distribution line to Substation B: Route 1	Site and surroundings (1)	Long term (4)	Minor (1)	Low (2)	Negative	Negligible	Low (12)	High
Distribution line to Substation B: Route 2	Site and surroundings (1)	Long term (4)	Minor (1)	Low (2)	Negative	Negligible	Low (12)	High
Distribution line to Substation B: Route 3	Site and surroundings (1)	Long term (4)	Minor (1)	Low (2)	Negative	Negligible	Low (12)	High
Distribution line to Substation C: Route 1	Site and surroundings (1)	Long term (4)	Minor (1)	Low (2)	Negative	Negligible	Low (12)	High

Distribution line to Substation C: Route 2	Site and surroundings (1)	Long term (4)	Minor (1)	Low (2)	Negative	Negligible	Low (12)	High
Distribution line to Substation C: Route 3	Site and surroundings (1)	Long term (4)	Minor (1)	Low (2)	Negative	Negligible	Low (12)	High

Tables 47 and 48 below indicate that the position of substation site C which is close to major roads (including the R546) has a medium-high impact rating in comparison to site B which as a medium rating. Site B is situated well away from any major roads. The transmission power lines to the existing Kriel-Zeus and Kriel-Tutuka power lines have a higher impact than the distribution lines as the transmission lines cross the R546 road that is used by tourists, residents and motorists alike.

Table 48: Visual impact on tourists

VISUAL IMPACT ON TOURISTS								
Activity	**Extent of Impact**	**Duration of Impact**	**Magnitude of Impact**	**Probability of Impact**	**Status of impact**	**Cumulative**	**Significance**	**Reversibility**
Mulalo Substation Site B	Regional (3)	Permanent (5)	High (4)	Medium (3)	Negative	Compounding	Medium (36)	Low
Mulalo Substation Site C	Regional (3)	Permanent (5)	High (4)	High (4)	Negative	Compounding	Medium-High (48)	Low
Power line: Site B and C to Kriel-Tutuka 1 North	Local (2)	Long term (4)	Low (2)	Medium (3)	Negative	Marginal	Low-Medium (24)	Moderate
Power line: Site B and C to Kriel-Tutuka 1 South	Local (2)	Long term (4)	Low (2)	Medium (3)	Negative	Marginal	Low-Medium (24)	Moderate
Power line: Site B and C to Kriel-Zeus 1 North	Local (2)	Long term (4)	Low (2)	Medium (3)	Negative	Marginal	Low-Medium (24)	Moderate
Power line: Site B and C to Kriel-Zeus 1 South	Local (2)	Long term (4)	Low (2)	Medium (3)	Negative	Marginal	Low-Medium (24)	Moderate
Distribution line to Substation B: Route 1	Site and surroundings (1)	Long term (4)	Minor (1)	Low (2)	Negative	Negligible	Low (12)	High
Distribution line to Substation B: Route 2	Site and surroundings (1)	Long term (4)	Minor (1)	Low (2)	Negative	Negligible	Low (12)	High
Distribution line to Substation B: Route 3	Site and surroundings (1)	Long term (4)	Minor (1)	Low (2)	Negative	Negligible	Low (12)	High
Distribution line to Substation C: Route 1	Site and surroundings (1)	Long term (4)	Minor (1)	Low (2)	Negative	Negligible	Low (12)	High

Distribution line to Substation C: Route 2	Site and surroundings (1)	Long term (4)	Minor (1)	Low (2)	Negative	Negligible	Low (12)	High
Distribution line to Substation C: Route 3	Site and surroundings (1)	Long term (4)	Minor (1)	Low (2)	Negative	Negligible	Low (12)	High

Table 49: Visual impact on motorists

VISUAL IMPACT ON MOTORISTS								
Activity	**Extent of Impact**	**Duration of Impact**	**Magnitude of Impact**	**Probability of Impact**	**Status**	**Cumulative**	**Significance**	**Reversibility**
Mulalo Substation Site B	Regional (3)	Permanent (5)	High (4)	Medium (3)	Negative	Compounding	Medium (36)	Low
Mulalo Substation Site C	Regional (3)	Permanent (5)	High (4)	High (4)	Negative	Compounding	Medium-High (48)	Low
Power line: Site B and C to Kriel-Tutuka 1 North	Local (2)	Long term (4)	Low (2)	Medium (3)	Negative	Marginal	Low-Medium (24)	Moderate
Power line: Site B and C to Kriel-Tutuka 1 South	Local (2)	Long term (4)	Low (2)	Medium (3)	Negative	Marginal	Low-Medium (24)	Moderate
Power line: Site B and C to Kriel-Zeus 1 North	Local (2)	Long term (4)	Low (2)	Medium (3)	Negative	Marginal	Low-Medium (24)	Moderate
Power line: Site B and C to Kriel-Zeus 1 South	Local (2)	Long term (4)	Low (2)	Medium (3)	Negative	Marginal	Low-Medium (24)	Moderate
Distribution line to Substation B: Route 1	Site and surroundings (1)	Long term (4)	Minor (1)	Low (2)	Negative	Negligible	Low (12)	High
Distribution line to Substation B: Route 2	Site and surroundings (1)	Long term (4)	Minor (1)	Low (2)	Negative	Negligible	Low (12)	High

Distribution line to Substation B: Route 3	Site and surroundings (1)	Long term (4)	Minor (1)	Low (2)	Negative	Negligible	Low (12)	High
Distribution line to Substation C: Route 1	Site and surroundings (1)	Long term (4)	Minor (1)	Low (2)	Negative	Negligible	Low (12)	High
Distribution line to Substation C: Route 2	Site and surroundings (1)	Long term (4)	Minor (1)	Low (2)	Negative	Negligible	Low (12)	High
Distribution line to Substation C: Route 3	Site and surroundings (1)	Long term (4)	Minor (1)	Low (2)	Negative	Negligible	Low (12)	High

11.7 WETLAND AND WATER RESOURCES ASSESSMENT

The impact with the highest rating was the loss of wetland habitat and bed/bank modification by both substation sites and power line routes. All were assessed with a low – medium ranking that remained at a low-medium ranking post mitigation. Substation site C had the highest score in terms of this impact. All the other identified impacts were assessed to have a low impact rating both pre- and post-mitigation.

The study site is entirely within wetlands; however, the ecological importance of these ecosystems has greatly been modified. Given that mitigation measures provided are adhered to, no impact to downstream water resources are expected to result from the proposed development.

Table 50: Substation site B - loss of wetland habitat and bed/bank modification (pre- and post-mitigation)

Stage	**Construction & Decommissioning**	**Operation**
Extent of impact	2 (Local)	2 (Local)
Duration of impact	5 (Permanent)	5 (Permanent)
Magnitude	4 (High)	2 (Low)
Probability of occurrence	2 (Low)	2 (Low)
Status of the impact	Negative	Negative
Cumulative Effect	Marginal	Marginal
Level of significance	**22 (Low – Medium)**	**18 (Low – Medium)**

Post-mitigation

Stage	**Construction & Decommissioning**	**Operation**
Extent of impact	2 (Local)	2 (Local)
Duration of impact	3 (Medium term)	1 (Immediate)
Magnitude	2 (Low)	2 (Low)
Probability of occurrence	2 (Low)	2 (Low)
Status of the impact	Negative	Negative
Cumulative Effect	Marginal	Marginal
Level of significance	**14 (Low)**	**16 (Low)**
Mitigation	A buffer refers to an area around an aquatic feature such as a wetland. Buffers serve to reduce the levels of sediment and pollutants directly entering the wetland. A buffer zone of at least 50m should therefore be adopted for all identified rivers and wetlands	

Table 51: Substation site B – water quality impairment (pre- and post-mitigation)

Stage	**Construction & Decommissioning**	**Operation**
Extent of impact	2 (Local)	2 (Local)
Duration of impact	2 (Short term)	1 (Immediate)
Magnitude	2 (Low)	2 (Low)
Probability of occurrence	2 (Low)	2 (Low)
Status of the impact	Negative	Negative
Cumulative Effect	Marginal	Marginal
Level of significance	**12 (Low)**	**10 (Low)**

Post-mitigation

Stage	**Construction & Decommissioning**	**Operation**
Extent of impact	2 (Local)	2 (Local)
Duration of impact	2 (Short term)	1 (Immediate)
Magnitude	2 (Low)	2 (Low)
Probability of occurrence	2 (Low)	2 (Low)
Status of the impact	Negative	Negative
Cumulative Effect	Marginal	Marginal
Level of significance	**12 (Low)**	**10 (Low)**
Mitigation	Runoff from the construction site must be prevented from directly entering wetlands and other water resources. Wetland buffer areas should be maintained to reduce the impact of runoff from the developed site's activities after the construction phase.	

Table 52: Substation Site B - Loss of terrestrial and wetland biodiversity (pre- and post-mitigation)

Stage	**Construction & Decommissioning**	**Operation**
Extent of impact	2 (Local)	2 (Local)
Duration of impact	3 (Medium term)	1 (Immediate)

Magnitude	2 (Low)	2 (Low)
Probability of occurrence	2 (Low)	2 (Low)
Status of the impact	Negative	Negative
Cumulative Effect	Marginal	Marginal
Level of significance	**14 (Low)**	**16 (Low)**

Post-mitigation

Stage	**Construction & Decommissioning**	**Operation**
Extent of impact	2 (Local)	2 (Local)
Duration of impact	3 (Medium term)	1 (Immediate)
Magnitude	2 (Low)	2 (Low)
Probability of occurrence	2 (Low)	2 (Low)
Status of the impact	Negative	Negative
Cumulative Effect	Marginal	Marginal
Level of significance	**14 (Low)**	**16 (Low)**
Mitigation	The loss of terrestrial and wetland biodiversity is expected to occur in localised areas. The natural vegetation around wetland areas impacted by the development is expected to recover in the mid-term as a result of the small development footprint of the proposed development.	

Table 53: Substation site B - flow modification (pre- and post-mitigation)

Stage	**Construction & Decommissioning**	**Operation**
Extent of impact	2 (Local)	2 (Local)
Duration of impact	2 (Short term)	1 (Immediate)
Magnitude	2 (Low)	2 (Low)
Probability of occurrence	2 (Low)	2 (Low)
Status of the impact	Negative	Negative
Cumulative Effect	Marginal	Marginal
Level of significance	**12 (Low)**	**10 (Low)**

Post-mitigation

Stage	**Construction & Decommissioning**	**Operation**
Extent of impact	2 (Local)	2 (Local)
Duration of impact	2 (Short term)	1 (Immediate)
Magnitude	2 (Low)	2 (Low)
Probability of occurrence	2 (Low)	2 (Low)
Status of the impact	Negative	Negative
Cumulative Effect	Marginal	Marginal
Level of significance	**12 (Low)**	**10 (Low)**
Mitigation	The hydrological impacts on the wetland, is negated if construction takes place outside of flood lines.	

Table 54: Substation site C - loss of wetland habitat and bed/bank modification (pre- and post-mitigation)

Stage	**Construction & Decommissioning**	**Operation**
Extent of impact	2 (Local)	2 (Local)
Duration of impact	5 (Permanent)	5 (Permanent)
Magnitude	4 (High)	2 (Low)
Probability of occurrence	3 (Low)	3 (Low)
Status of the impact	Negative	Negative
Cumulative Effect	Marginal	Marginal
Level of significance	**24 (Low – Medium)**	**20 (Low – Medium)**

Post-mitigation

Stage	**Construction & Decommissioning**	**Operation**
Extent of impact	2 (Local)	2 (Local)
Duration of impact	3 (Medium term)	1 (Immediate)
Magnitude	2 (Low)	2 (Low)
Probability of occurrence	2 (Low)	2 (Low)
Status of the impact	Negative	Negative
Cumulative Effect	Marginal	Marginal
Level of significance	**14 (Low)**	**16 (Low)**
Mitigation	A buffer zone of at least 50m should therefore be adopted for all identified rivers and wetlands	

Table 55: Substation site C – water quality impairment (pre- and post-mitigation)

Stage	**Construction & Decommissioning**	**Operation**
Extent of impact	2 (Local)	2 (Local)
Duration of impact	2 (Short term)	1 (Immediate)
Magnitude	2 (Low)	2 (Low)
Probability of occurrence	2 (Low)	2 (Low)
Status of the impact	Negative	Negative
Cumulative Effect	Marginal	Marginal
Level of significance	**12 (Low)**	**10 (Low)**

Post-mitigation

Stage	**Construction & Decommissioning**	**Operation**
Extent of impact	2 (Local)	2 (Local)
Duration of impact	2 (Short term)	1 (Immediate)
Magnitude	2 (Low)	2 (Low)
Probability of occurrence	2 (Low)	2 (Low)
Status of the impact	Negative	Negative
Cumulative Effect	Marginal	Marginal
Level of significance	**12 (Low)**	**10 (Low)**
Mitigation	Runoff from the construction site must be prevented from directly entering wetlands and other water resources.	

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

Table 56: Substation site C - loss of terrestrial and wetland biodiversity

Stage	**Construction & Decommissioning**	**Operation**
Extent of impact	2 (Local)	2 (Local)
Duration of impact	3 (Medium term)	1 (Immediate)
Magnitude	2 (Low)	2 (Low)
Probability of occurrence	2 (Low)	2 (Low)
Status of the impact	Negative	Negative
Cumulative Effect	Marginal	Marginal
Level of significance	**14 (Low)**	**16 (Low)**

Post-mitigation

Stage	**Construction & Decommissioning**	**Operation**
Extent of impact	2 (Local)	2 (Local)
Duration of impact	3 (Medium term)	1 (Immediate)
Magnitude	2 (Low)	2 (Low)
Probability of occurrence	2 (Low)	2 (Low)
Status of the impact	Negative	Negative
Cumulative Effect	Marginal	Marginal
Level of significance	**14 (Low)**	**16 (Low)**
Mitigation	The loss of terrestrial and wetland biodiversity is expected to occur in localised areas. The natural vegetation around wetland areas impacted by the development is expected to recover in the mid-term as a result of the small development footprint of the proposed development.	

Table 57: Substation site C - flow modification

Stage	**Construction & Decommissioning**	**Operation**
Extent of impact	2 (Local)	2 (Local)
Duration of impact	2 (Short term)	1 (Immediate)
Magnitude	2 (Low)	2 (Low)
Probability of occurrence	2 (Low)	2 (Low)
Status of the impact	Negative	Negative
Cumulative Effect	Marginal	Marginal
Level of significance	**12 (Low)**	**10 (Low)**

Post-mitigation

Stage	**Construction & Decommissioning**	**Operation**
Extent of impact	2 (Local)	2 (Local)
Duration of impact	2 (Short term)	1 (Immediate)
Magnitude	2 (Low)	2 (Low)
Probability of occurrence	2 (Low)	2 (Low)

Status of the impact	Negative	Negative
Cumulative Effect	Marginal	Marginal
Level of significance	**12 (Low)**	**10 (Low)**
Mitigation	The hydrological impacts on the wetland, is negated if construction takes place outside of flood lines.	

Table 58: Power line routes: loss of wetland habitat and bed/bank modification (pre- and post-mitigation)

Stage	**Construction & Decommissioning**	**Operation**
Extent of impact	2 (Local)	2 (Local)
Duration of impact	5 (Permanent)	5 (Permanent)
Magnitude	3 (Medium)	2 (Low)
Probability of occurrence	2 (Low)	2 (Low)
Status of the impact	Negative	Negative
Cumulative Effect	Marginal	Marginal
Level of significance	**20 (Low – Medium)**	**18 (Low – Medium)**

Post-mitigation

Stage	**Construction & Decommissioning**	**Operation**
Extent of impact	2 (Local)	2 (Local)
Duration of impact	2 (Short term)	1 (Immediate)
Magnitude	2 (Low)	2 (Low)
Probability of occurrence	2 (Low)	2 (Low)
Status of the impact	Negative	Negative
Cumulative Effect	Marginal	Marginal
Level of significance	**12 (Low)**	**10 (Low)**

Table 59: Power line routes - water quality impairment (pre- and post-mitigation)

Stage	**Construction & Decommissioning**	**Operation**
Extent of impact	2 (Local)	2 (Local)
Duration of impact	2 (Short term)	1 (Immediate)
Magnitude	2 (Low)	2 (Low)
Probability of occurrence	2 (Low)	2 (Low)
Status of the impact	Negative	Negative
Cumulative Effect	Marginal	Marginal
Level of significance	**12 (Low)**	**10 (Low)**

Post-mitigation

Stage	**Construction & Decommissioning**	**Operation**
Extent of impact	2 (Local)	2 (Local)
Duration of impact	2 (Short term)	1 (Immediate)
Magnitude	2 (Low)	2 (Low)
Probability of occurrence	2 (Low)	2 (Low)
Status of the impact	Negative	Negative
Cumulative Effect	Marginal	Marginal

Level of significance	**12 (Low)**	**10 (Low)**

Table 60: Power line routes - loss of terrestrial and wetland biodiversity (pre- and post-mitigation)

Stage	**Construction & Decommissioning**	**Operation**
Extent of impact	2 (Local)	2 (Local)
Duration of impact	3 (Medium term)	1 (Immediate)
Magnitude	2 (Low)	2 (Low)
Probability of occurrence	2 (Low)	2 (Low)
Status of the impact	Negative	Negative
Cumulative Effect	Marginal	Marginal
Level of significance	**14 (Low)**	**16 (Low)**

Post-mitigation

Stage	**Construction & Decommissioning**	**Operation**
Extent of impact	2 (Local)	2 (Local)
Duration of impact	3 (Medium term)	1 (Immediate)
Magnitude	2 (Low)	2 (Low)
Probability of occurrence	2 (Low)	2 (Low)
Status of the impact	Negative	Negative
Cumulative Effect	Marginal	Marginal
Level of significance	**14 (Low)**	**16 (Low)**

Table 61: Power line routes - flow modification (pre and post mitigation)

Stage	**Construction & Decommissioning**	**Operation**
Extent of impact	2 (Local)	2 (Local)
Duration of impact	2 (Short term)	1 (Immediate)
Magnitude	2 (Low)	2 (Low)
Probability of occurrence	2 (Low)	2 (Low)
Status of the impact	Negative	Negative
Cumulative Effect	Marginal	Marginal
Level of significance	**12 (Low)**	**10 (Low)**

Post-mitigation

Stage	**Construction & Decommissioning**	**Operation**
Extent of impact	2 (Local)	2 (Local)
Duration of impact	2 (Short term)	1 (Immediate)
Magnitude	2 (Low)	2 (Low)
Probability of occurrence	2 (Low)	2 (Low)
Status of the impact	Negative	Negative
Cumulative Effect	Marginal	Marginal
Level of significance	**12 (Low)**	**10 (Low)**

Table 62: Water quality impairment

Stage	**Construction & Decommissioning**	**Operation**
Extent of impact	2 (Local)	2 (Local)
Duration of impact	2 (Short term)	1 (Immediate)
Magnitude	2 (Low)	2 (Low)
Probability of occurrence	2 (Low)	2 (Low)
Status of the impact	Negative	Negative
Cumulative Effect	Marginal	Marginal
Level of significance	**12 (Low)**	**10 (Low)**

Table 63: Loss of terrestrial and wetland biodiversity

Stage	**Construction & Decommissioning**	**Operation**
Extent of impact	2 (Local)	2 (Local)
Duration of impact	3 (Medium term)	1 (Immediate)
Magnitude	2 (Low)	2 (Low)
Probability of occurrence	2 (Low)	2 (Low)
Status of the impact	Negative	Negative
Cumulative Effect	Marginal	Marginal
Level of significance	**14 (Low)**	**16 (Low)**

Table 64: Flow modification

Stage	**Construction & Decommissioning**	**Operation**
Extent of impact	2 (Local)	2 (Local)
Duration of impact	2 (Short term)	1 (Immediate)
Magnitude	2 (Low)	2 (Low)
Probability of occurrence	2 (Low)	2 (Low)
Status of the impact	Negative	Negative
Cumulative Effect	Marginal	Marginal
Level of significance	**12 (Low)**	**9 Low)**

12 SUBSTATION SITE AND POWER LINE ROUTE SELECTION

12.1 Substation site selection

The two substation sites, sites B and C that were investigated by the specialists and the specialists' preference in terms of their preferred site are provided below in **Table 65** below. Substation site B was preferred by the majority of the specialists with a number of specialists indicating that that either of the two sites could be used.

Table 65: Specialist preference: substation sites

Specialist Study	Site B	Site C
Avifauna	✓	✓
Biodiversity	✓	
Geotechnical	✓	✓
Heritage	✓	
Social Impact	✓	✓
Soil and Land capacity		✓
Undermining	✓	✓
Visual	✓	
Wetland	✓	

However, substation site C is preferred by the Applicant because Site B is encompassed by underground mining which makes it difficult to terminate and perform tower spotting for 132kV lines (in the direction opposite the 400kV lines) for the evacuation of the power. Consequently, site B dictates that both 400kV lines and 132kV lines (designed to 400kV standard) enter and exit the substation in the same direction. This line entry requirement results in a complex substation layout design where the 400kV and 132kV busbars will be positioned next to each other or resulting in a layout with many feeder crossing over busbars (overpasses). In both instances the length of the busbar will be excessively long and result in a sizeable portion of the substation platform being on top of the undermined area (indicated by pink blocks on **Figure 21** below). The result is situation that compromises the integrity and reliability of the substation which is undesirable. Site B is restrictive from the substation expandability point of view due to it being encompassed by underground mining area.

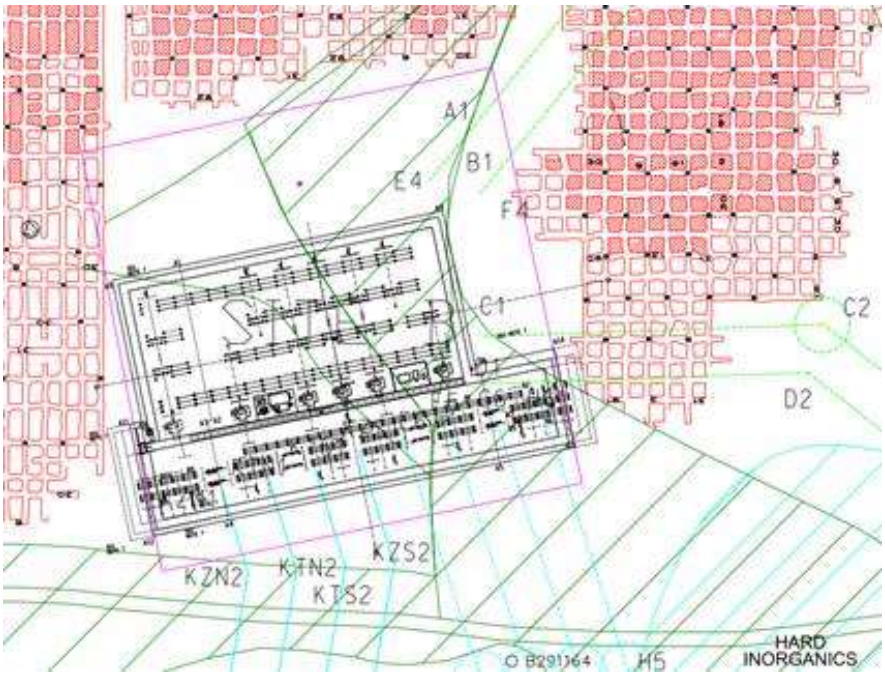

Figure 21: Sketch of substation site B in relation to undermined ground

Site C is the preferred site for location of Mulalo MTS because it will be technically viable to terminate entering/emanating lines. Also the substation orientation on Site C will accommodate design requirements from Lines Engineering Services and Substation Engineering in terms of line termination, standard busbar configuration and substation layout. Moreover Site C is not entirely encompassed by underground mining areas (see **Figure 22** below), thus from that point of view the substation's expansion may be possible (provided there are not additional factors hampering expansion).

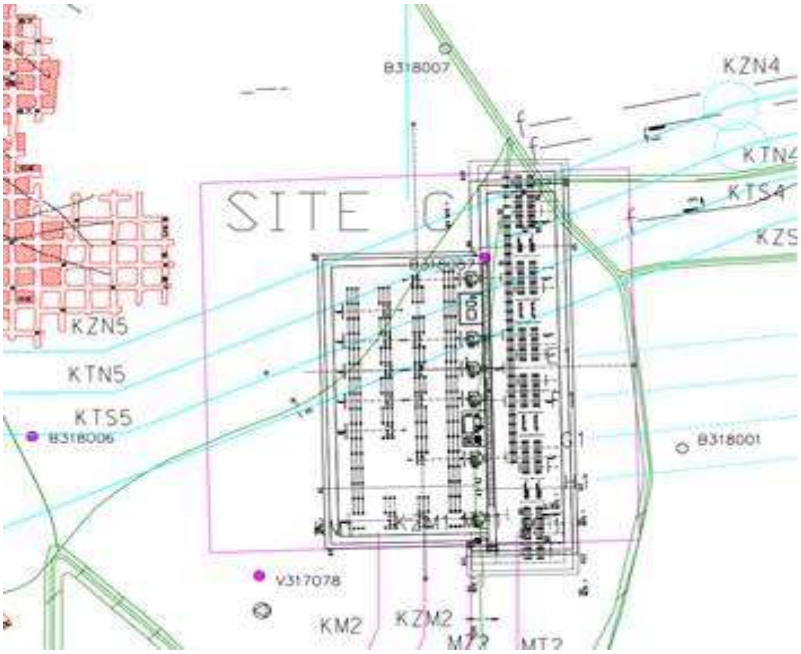

Figure 22: Sketch of substation site C in terms of undermined ground

12.2 Power line route selection

Due to the undermining of much of the project area as well as security and other concerns raised by Sasol, there are no alternatives for the proposed power lines between the substation sites and the existing Sasol 2 and Sasol 3 power lines. A route for the power lines to the existing Sasol power lines was found that avoided the underground geotechnical risk and this was forwarded to Sasol for their comment and approval. Part of the route around the surface explosive magazines and nitro plant was considered safe from geotechnical risk and remained unaltered. However, security concerns were raised that access for maintenance would be inconvenient around the Nitro Plant and in the event of an explosion in the Nitro Plant, the integrity of the power lines would be brought into question.

A compromise route traversing to the north of the magazines, and mostly outside of the security fence was recommended with part of the route traversing close to some of the Nitro Plant complex and the coal stockyard.

In terms of the power lines between the substation sites and the existing Kriel-Tutuka and Kriel-Zeus power lines, two corridors have been proposed to accommodate potential risks relating to undermining in the area. Therefore, both corridors are suitable for the construction of the proposed power lines; however, the southern corridor is preferred as it crosses undermined areas that have a high safety factor than the northern corridor which is located closer to stooped sections which have a higher chance of failure.

A specialist walk down must be undertaken of the corridor that is approved in order to ensure that no sensitive areas are impacted by the construction and operation of the power lines. The walk down must be undertaken by avifauna, biodiversity, heritage and wetland specialists.

13 ENVIRONMENTAL STATEMENT

It is the reasoned opinion of the EAP that the construction of the new Mulalo 400/132kV Main Transmission Substation (MTS) and Power Line Integration should be authorised taking into account the mitigation measures as set out in the attached EMPr. The significance of the identified environmental impacts associated with the project have been evaluated according to their extent, duration, magnitude and probability of the impact. The outcome of this assessment was that the identified impacts would have a predominantly low to low medium significance. Thsis is thus a clear indication that the overall impact of the Mulalo (SolB) 400/132kV MTS is manageable. No fatal flaws were discovered during eh environmental authorisation process.

14 OPINION OF THE EAP ON SITE AND POWER-LINES SELECTION

14.1 SITE SELECTION:

Taking in cognisance the specialist studies and the inforaiotn realting to the project, it is the EAP's determination that the proposed Mulalo (SolB)400/132kV MTS and power lines Integration project be located on site C. the reasons for this decision are:

- It will be technically viable to terminate entering/emanating lines.

- The substation orientation on Site C will accommodate design requirements in terms of line termination, standard busbar configuration and substation layout.
- Site C is not entirely encompassed by underground mining areas, thus from that point of view the substation's expansion may be possible (provided there are not additional factors hampering expansion).
- Even though Site C has graves in a corner of its location, only when an expansion is considered that suitable and relevant permits shall be sought from the relevant authority.

14.2 POWER- LINES SELECTION:

In terms of power-line selection, there were no alternatives for it due to the undermining of much of the project area as well as security and other concerns raised by Sasol.
A route for the power lines to the existing Sasol power lines was found that avoided the underground geotechnical risk and this was forwarded to Sasol for their comment and approval. Only one compromise route traversing to the north of the magazines, and mostly outside of the security fence was recommended with part of the route traversing relatively close to some of the Nitro Plant complex and the coal stockyard.

15 UNDERTAKING

I, **Siphosenkosi Zulu**, hereby confirm that the information provided in this report is correct at the time of compilation. I, hereby, also confirm that the comments received from I&APs are included in the Final EIA Report to be submitted to DEA in the form of a Comments and Response Report.

14 CONCLUSIONS AND RECOMMENDATIONS

The need for additional electrical infrastructure in the Secunda area was identified. The existing Sol MTS is not capable of sustaining future load growth therefore Eskom decided that in order to address this issue, a new 400/132kV MTS would have to be built that would be integrated with the existing transmission and distribution power network through turn-in-out connections on the existing Kriel – Tutuka 400kV transmission power lines and on the existing Kriel – Zeus 400kV transmission power lines.

In addition, in order to strengthen the power supply to the Sasol Refinery, two 132kV distribution power lines will connect the Mulalo MTS with the existing Sasol 2 power line and two 132kV power lines will connect the Mulalo MTS to the existing Sasol 3 power line.

The significance of the identified environmental impacts associated with the project have been evaluated according to their extent, duration, magnitude and probability of the impact. The outcome of this assessment was that the identified impacts would have a predominantly low to low medium significance.

In terms of the environmental assessment, substation site B is the preferred site for the proposed MTS. However, the Applicant prefers substation site C because substation site B is encompassed by undermined ground thereby

restricting the expansion of the substation (if required) as well as impacting on the configuration of the power lines entering and exiting the substation that will compromise the integrity and unreliability of the substation.

In terms of the power lines routes, the selection of routes was mainly determined by the undermining element. A route for the power lines to the existing Sasol power lines was found that avoided the underground geotechnical risk and this was forwarded to Sasol for their comment and approval. Part of the route around the surface explosive magazines and nitro plant was considered safe from geotechnical risk and remained unaltered. However, security concerns were raised that access for maintenance would be inconvenient around the Nitro Plant and in the event of an explosion in the Nitro Plant, the integrity of the power lines would be brought into question. A compromise route traversing to the north of the magazines, and mostly outside of the security fence was recommended with part of the route traversing close to some of the Nitro Plant complex and the coal stockyard.

In terms of the routes to the existing Kriel-Tutuka and Kriel-Zeus power lines, both corridors are suitable; however, the southern corridor is preferred as it crosses undermined areas that have a high safety factor than the northern corridor which is located closer to stooped sections which have a higher chance of failure.

This FEIAR has been structured to comply with the requirements of the 2014 and 2017 EIA regulations as well as the NEMA. The report provides a description of the Mulalo 400/132kV MTS and Power Line Integration Project and the siting alternative as well as a detailed description of the existing environment based on the specialist studies. Stakeholder engagement was undertaken from the onset of the project in a transparent and comprehensive manner.

In summary, the environmental process assessed both biophysical and socio-economic environments and identified appropriate management and mitigation measures. In addition, some of the socio-economic impacts associated with the project are positive such as the creation of job opportunities and contribution to the local and regional economies.

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Internet Sites:

APPENDICES

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APPENDIX 3 – FACILITY ILLUSTRATION

APPENDIX 4 – SPECIALISTS STUDIES

APPENDIX 5 – PUBLIC PARTICIPATION

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