Reg. 2003/089035/23

AMMENDED DRAFT ENVIRONMENTAL IMPACT REPORT

SOWETO INTEGRATION

PROPOSED CONSTRUCTION OF A NEW 2X400kV POWER LINE FROM TO ETNA SUBSTATION TO A NEW PROPOSED QUATTRO SUBSTATION - SOWETO, GAUTENG PROVINCE, SA

DEAT Ref: 12/12/20/984

PREPARED FOR:

ESKOM HOLDINGS LIMITED P.O. Box 1091 Johannesburg 2000 South Africa

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VOLUME 1: MAIN REPORT

MAY 2010

REVIEW PERIOD: 27 May 2010 to 28 July 2010

VOLUME 1: MAIN REPORT

This volume contains the following appendices:

Appendix 1: Scoping Report Acceptance from DEAT
Appendix 2: Locality Map with corridors
Appendix 3: Application Form Acknowledgement Letter
Appendix 4: DEA Comment letter on the submitted FEIR (05 June 2010)

VOLUME 2: PUBLIC PARTICIPATION REPORT

VOLUME 3: SPECIALIST REPORTS

VOLUME 4: DRAFT ENVIRONMENTAL MANAGEMENT PLAN

PROJECT INFORMATION

TITLE	Proposed Construction of a new 2x400kV Power Lines from Etna substation to a new proposed Quattro substation in the Gauteng Province of South Africa
APPLICANT	Eskom Holdings Limited
ENVIRONMENTAL CONSULTANTS	Naledzi Environmental Consultants
REPORT DATE	May, 2010

REPORT COMPILED BY: Khangwelo Desmond Musetsho

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Khangwelo Desmond Musetsho (CEAPSA, SAIEES)
Senior Environmental Scientist and Managing Member

EXPERTISE AND QUALIFICATIONS

Desmond Musetsho is a Senior Environmental Scientist and currently the Managing Director of Naledzi Environmental Consultants. He has over 6 years of experience in the field of Integrated Environmental Management, both on a project and management level. Mr. Musetsho holds a Professional Bachelor of Environmental Management (Hons) Degree from the University of Venda and is currently completing his Masters in Environmental Sciences. He has extensive experience in Environmental Impact Assessments, development of management plans, development and implementation of Environmental Management Programmes for construction, and facilitation of public processes and workshops. Desmond is a Certified Environmental Assessment Practitioner (ICB-EAPSA) and an Environmental Scientist (SAIEES).

INTRODUCTION

Naledzi Environmental Consultants (NEC) has been appointed by Eskom Holdings Limited to conduct an Environmental Impact Assessment (EIA) for the proposed 2x400kV Power Lines from Etna Substation to the new proposed Quattro Substation. The said EIA is being carried out as per the requirements of Regulations 27 to 36 of the Regulations compiled in terms of Chapter 5 of the National Environmental Management Act, 1998 (Act 107 of 1998).

This Draft Environmental Impact Report (DEIR) details the findings of the second stage of the EIA study, which entails a number of specialist studies aimed at assessing the potential impacts identified during the scoping phase. This stage also recommends the alternatives that were found to be preferred after taking into consideration the entire specialist inputs and the views of the public.

BACKGROUND AND THE NEED FOR THE PROJECT

The future presents ever more complex energy challenges to support the societies we live in. Eskom Transmission has established that there is a need to increase the electricity load to the Vaal South area as part of Vaal/West Rand Strengthening Phase 2 and these increases need to be addressed as soon as possible. The analysis done by Eskom shows that since 1995 there has been a marked increase in load demand at Taunus Substation, which primarily supplies Soweto and surrounding areas with electricity.

A request was received by Eskom from City Power to construct a 275kV Substation site in the Soweto area either near Orlando s/s or Mondeor s/s. Both Orlando and Mondeor Substations are City Power Substations.

Transmission Grid would entail the following:

- Establish new Orlando S/S (to be known as Quattro) built at 400kV but operated at 275kV;
- Establish two Transmission Lines from Etna to Orlando (Quattro) s/s;
- 2x275kV feeder bays at Etna s/s;
- Distribution 132kV yard comprising of 3x400/132kV transformers and 12 x 132kV bays;
- 1 x Radio Microwave tower;
- Distribution 88kV indoor substation comprising of 4x275/88kV transformers and 22x88kV line bays;
- An 88/11kV substation equipped with 3x88/11kV transformers;
- Re-alignment of existing 88kV lines adjacent to the Quattro s/s

The length of the Transmission lines is expected to be 14km.The construction period for the proposed Power Lines is estimated to be 12 months in total. This includes the clearing of the servitude, construction of the towers and the stringing of the conductors. The standard servitude width is 55m. Construction is limited to the width of the servitude in which the line will be constructed. The servitude required for a single 400kV Transmission Power line would be 55m, while the separation distance between 400kV and any other line would be 55m.

Therefore 110m will be required. In cases where there are constraints related to space, the separation distance can be limited to 35m (towers opposite) The proposed Quattro Substation at Orlando will be owned by both Eskom and City Power. The double circuit 400kV Transmission power lines leading from the proposed Quattro Substation to Etna Substation will be the property of Eskom – therefore it will be constructed and maintained by Eskom and the electricity supply will be the responsibility of City Power.

By increasing the supply into the Soweto area, the foreseen load growth can be addressed in a suitable and economical way. Optimization of the current system is currently underway, and would alleviate some problems in the system. The short to medium term load requirements can be addressed by the increased supply due to the new Transmission power lines.

The upgrading and new Orlando (Quattro) substation/ will improve the electricity supply to the area. To accommodate the proposed new line, some work is required at the two substations at the start and end of the line.

THE ENVIRONMENTAL IMPACT ASSESSMENT PROCESS

Building the above mentioned power lines falls within 'listed activities', as defined by the National Environmental Management Act (NEMA), 1998 (Act No. 107 of 1998), as amended, and the Environmental Impact Assessment Regulations of 2006. Listed activities are activities, which may have potentially detrimental impacts on the environment and therefore require environmental authorization from the competent authority.

In this case, the primary listed activity is the transmission and distribution of above ground electricity with a capacity in excess of 120kV. Since the applicant is Eskom (a Parastatal), the National Department of Environmental Affairs and Tourism (DEAT) was identified as the competent regulatory authority. Environmental Impact Assessment is a two phased process (Scoping Phase and Environmental Impact Reporting Phase). This report is the result of the second phase, although it considers the inputs from the scoping phase as well.

In the Scoping Phase, information was gathered, and together with specialist and technical input, used to identify potential impacts associated with the proposed project, and to highlight areas, which should be avoided in order to minimize these biophysical and social impacts.

PUBLIC PARTICIPATION PROCESS

A public participation process was undertaken to identify issues and concerns of key stakeholders and interested and affected parties. The results were documented in the Scoping Report. The public participation process included consultation with the municipalities, government departments, non-governmental organizations and environmental groups as well as an extensive effort to identify potentially affected individuals and the general public. This included the distribution of documents by mail, e-mail, use of printed media, telephonic conversations, one-on-one meetings, focus group meetings and public meetings.

The public participation process for the EIA does not include the final servitude negotiation with the landowners who will be directly affected by the proposed development. The servitude negotiation process will be done by an Eskom negotiator once an authorization has been received from the Department of Environmental Affairs and Tourism. The Eskom negotiator however has been involved in discussions and meetings which were aimed at identifying different options or routes. Issues raised by stakeholders and an indication of how they were addressed have been recorded in an Issues and Response Report.

DESCRIPTION OF THE STUDY AREA AND ANTICIPATED IMPACTS

The scoping process identified a large number of potential environmental impacts anticipated during the implementation of the new proposed Quattro Substation and 2x 400kV Power line from Etna-Quattro. It is important to highlight that the significant impacts are chosen from a pool of this vast number of identified impacts. It is also vital to point out that the impacts were identified through site visits, internal workshops by the project team and the public participation process.

The following key issues and/or potential impacts were identified for further investigations:

- Impact on ecological processes
- Impact on soils and geology (including agricultural potential)

- ❖ Impacts on heritage and archaeological resources
- ❖ Impacts on visual conditions and aesthetics (visual impacts)
- ❖ Impacts on current and future developments (social environment)
- ❖ Impacts on birds (avi-fauna)
- ❖ Impacts on regional planning (development node)

ALTERNATIVES CONSIDERED FOR THE LINE

Three alternative corridors (500m wide) were identified during the scoping phase. The three alternative routes are coloured (Red-Alternative 1, Green-Alternative 2 and Blue-Alternative 3). The alternatives are discussed in detail in the report.

ALTERNATIVE SUBSTATION SITES CONSIDERED

Originally there had only been one substation site which was selected by both Eskom and the City Power, but after the Environmental Impact study was conducted, it was found that the City of Johannesburg together with the community had already planned developments which were to be constructed at the proposed substation site, this including the Orlando Ekhaya Development. This then led to Eskom, together with the City of Johannesburg councillors having to go back to their drawing boards and coming up with other substation sites at different locations. Eskom then communicated with the City of Johannesburg and the City Power to assist them with finding suitable sites that did not have any planned developments on them, for the construction of the proposed Quattro substation site.

In addition, Eskom, in collaboration with City Power and City of Johannesburg Planning Department have identified three additional sites and altogether four proposed sites are investigated sufficiently as per DEA's letter (dated 05 June 2009). The addition of these sites requires community participation (which is of utmost importance) where the public is required to comment on the proposed development sites. All the necessary EIA process are being conducted on the four proposed substation sites.

The four sites are located in the areas described;

- *Site A: Situated at the decommissioned sewage disposal works in Pimville on Johannesburg Water's Property.*
- *Site B: Situated at the existing sewage disposal works opposite Devland Industrial, on Johannesburg Water's Property.*
- *Site C: Situated to the east of Motsoaledi residential area.*
- *Site D: Original Quattro substation site*

KEY FINDINGS OF THE EIA (LINE)

A recommended corridor, that is technically feasible and which avoids most of the significant environmental issues has been identified based on the key outcomes of the specialist studies and a rating of the preferred corridor for key environmental issues. The involvement of the public, with a number of issues raised also influenced the final decision.

Considering the avifauna, ecological sensitivity, aquatic ecosystems, Agricultural Potential, visual impact, social environment and urban development node for the area Alternative 1 is considered to be environmentally suitable. Alternative 1 also falls outside the urban development area, mostly traversing agricultural land; therefore encounters least possible encumbrances.

The following particular aspects should receive attention in the implementation of the Transmission power line project:

- ❖ The final route of the transmission power line should:
    - o Be within the recommended corridor
    - o Be aligned through the lower lying landforms

- Cross existing roads as close to 90 degrees as possible
- Position the towers on a midslope of a landform that rises to a plateau so that the plateau will form a background to the line

- ❖ No tower or access roads should be placed in wetlands.
- ❖ Power line should be visible to birds
- ❖ Existing and future developments along the selected alternative corridors should be taken into consideration. The elements of the proposal should not hamper such developments.
- ❖ Safety measures must be implemented to avoid pedestrian accidents due to close proximity of schools in the entire study area.

The selection of the optimum route in terms of specialist studies is as follows:

Organization	**Name of Specialist**	**Specialist Study**	**Alternative**
Axis Landscape Architects (cc)	Gerhard Griesel	Visual Impact Assessment	2
Africa Geo-Environmental Services	Kingsley Ayisi	Agricultural Impact Assessment	2
Archaeologist & Heritage Management Consultant	Julius Pistorius CC	Heritage Impact Assessment	Heritage Resources are present in study area however will not be affected by either of the alternatives.
Bushveld Ecological Services	Fritz Von Oudshoorn	Vegetation Impact Assessment	1
Ingrid Snyman Development Cons	Ingrid Snyman	Social Impact Assessment	1
Taka Echo and Land Rehab CC	Vhangani Silima	Wetland and Stream Crossing Study	1
Eduard van der Linde and Associates	Eduard van der Linde	Development Assessment	1
Endangered Wildlife Trust	Jon Smallie	Avi-faunal Impact Assessment	2

Considering the Impact Assessments compiled by the appointed specialist and consideration of the holistic environmental impact; Alternative 1 is considered the optimum route for the power line corridor.

KEY FINDINGS OF THE EIA (SUBSTATION SITE)

A recommended substation site (site B), that is technically feasible and which avoids most of the significant environmental issues has been identified based on the key outcomes of the specialist studies and a rating of the preferred site for key environmental issues. The involvement of the public, with a number of issues raised also influenced the final decision.

Considering the avifauna, ecological sensitivity, aquatic ecosystems, Agricultural Potential, visual impact, social environment and urban development node for the area substation site B is considered to be environmentally suitable.

The selection of the optimum Quattro substation site in terms of specialist studies is as follows:

Organization	***Name of Specialist***	***Specialist Study***	***Preferred Site***
Axis Landscape Architects (cc)	*Gerhard Griesel*	*Visual Impact Assessment*	*B*
Africa Geo-Environmental Services	*Kingsley Ayisi*	*Agricultural Impact Assessment*	*A & B*
Archaeologist & Heritage Management Consultant	*Julius Pistorius CC and Mr. E Mathoho*	*Heritage Impact Assessment*	*B*
Ecological	*Mr. Koos Steyn*	*Vegetation Impact Assessment*	*B*
Ingrid Snyman Development Cons	*Ingrid Snyman*	*Social Impact Assessment*	*B*
Taka Echo and Land Rehab CC	*Vhangani Silima*	*Wetland and Stream Crossing Study*	*A & B*
Eduard van der Linde and Associates	*Eduard van der Linde*	*Development Assessment*	
Endangered Wildlife Trust	*Jon Smallie*	*Avi-faunal Impact Assessment*	*A, C & D*

Considering the Impact Assessments compiled by the appointed specialist and consideration of the holistic environmental impact; Alternative B is considered the optimum site for the substation construction.

CONCLUSION

The EIA team believes that the EIA for the development of the proposed new Quattro Substation to be situated in Soweto and 2x400kV double circuit power line between Etna and Quattro Substation fulfils the process requirements of current environmental legislation. Issues and associated impacts have been investigated by a team of qualified specialists who have reported on their findings without reservations. Extensive efforts were made to identify and involve potentially affected parties during the public participation process. The public has been afforded opportunities to participate in the EIA. The recommendations set out in the findings section of the EIA are therefore presented for project implementation and the DEIR will be presented to the relevant authorities (DEA) for decision making.

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LIST OF ABREVIATIONS

CLF:	Community Liaison Officer
DEAT:	Department of Environmental Affairs and Tourism
DSR:	Draft Scoping Report
DWAF:	Department of Water Affairs and Forestry
ECO:	Environmental Control Officer
EAP:	Environmental Assessment Practitioner
EIA:	Environmental Impact Assessment
EIR:	Environmental Impact Report
EMP:	Environmental Management Plan
FEIAR;	Final Environmental Impact Assessment Report
I&APs:	Interested and Affected Parties
IEM:	Integrated Environmental Management
kV:	Kilovolts
NEC:	Naledzi Environmental Consultants
NEMA:	National Environmental Management Act, 1998 (Act No.107 of 1998)
NHRA:	National Heritage Resources Act, 1999 (Act No. 25 of 1999)
NWA:	National Water Act, 1998 (Act No.36 of 1998)

PS: Plan of Study

RSA: Republic of South Africa

SAHRA: South African Heritage Resources Agency

SR: Scoping Report

DEFINITIONS

Affected Environment: Those parts of the socio-economic and biophysical environment impacted on by the development.

Affected public: Groups, organizations, and/or individuals who believe that an action might affect them

Alien species: Plant taxa in a given area, whose presence there, is due to the intentional or accidental introduction as a result of human activity

Alternative alignment / corridors: the identified power line alignments within the study area

Alternative proposal: A possible course of action, in place of another, that would meet the same purpose and need. Alternative proposals can refer to any of the following but are not necessarily limited thereto:

* Alternative sites for development

* Alternative projects for a particular site

* Alternative site layouts

* Alternative designs

* Alternative processes

* Alternative materials

Applicant: Any person who applies for an authorization to undertake a listed activity or to cause such activity in terms of the relevant environmental legislation. In this case, Eskom is the applicant

Authorities: The national, provincial or local authorities, which have a decision-making role or interest in the proposal or activity, in this project, the competent authority is the National Department of Environmental Affairs and Tourism. The term includes the competent authority as well as other authorities.

Biodiversity: the variability among living organisms from all sources including *inter alia* terrestrial, marine and other aquatic ecosystems and ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems.

Biome: A major biotic unit, consisting of plant and animal communities, having similarities in form and environmental conditions, but not including the abiotic portion of the environment

Decision-making: The sequence of steps, actions or procedures that result in decisions, at any stage of a proposal.

Ecology: the study of the inter relationships between organisms and their environments.

Ecosystem: organisms together with their abiotic environment, forming an interacting system, inhabiting an identifiable space.

Endangered: a taxon is endangered when it is not Critically Endangered but is facing a very high risk of extinction in the wild in the near future

Environment: NEMA defines “environment” as “the surroundings within which humans exist and that are made up of the land, water and atmosphere of the earth; micro organisms, plant and animal life; any interrelationships among and between them and the physical, chemical aesthetic and cultural properties and conditions that influence human health and well-being’’.

Environmental Control Officer: Independent officer employed by the applicant to ensure the implementation of the Environmental Management Plan (EMP) and manage any further environmental issues that may arise.

Environmental Impact Assessment: An assessment of the positive and negative environmental consequences of the development of the proposed project. The primary objective of the EIA is to aid decision-making by providing factual information on the assessment of the impacts and determining their significance and on which to base valued judgments in choosing one alternative over another.

Hillslope Units: Configuration of the landform consisting of crest, scarp, midslope, footslope and valley bottom

Horizon contour: A line that encircles a development site and that follows ridgelines where the sky forms the backdrop and no landform is visible as a background. This is essentially the skyline that when followed through the full 360-degree arc as viewed from a representative point on the site defines the visual envelope of the development. This defines the boundary outside which the development would not be visible.

Impact: The positive or negative effects on human well-being and/or on the environment

Interested and affected parties (I&APs): Individuals, communities or groups, other than the proponent or the authorities, whose interests may be positively or negatively affected by a proposal or activity and/or who are concerned with a proposal or activity and its consequences. These may include local communities, investors, business associations, trade unions, customers, consumers and environmental interest groups. The principle that environmental consultants and stakeholder engagement practitioners should be independent and unbiased excludes these groups from being considered stakeholders.

Landscape condition: Refers to the state of the landscape of the area making up the site and that of the study area in general. Factors affecting the condition of the landscape can include the level maintenance and management of individual landscape elements such as buildings, woodlands etc and the degree of disturbance of landscape elements by non-characteristics elements.

Landscape impact: Changes to the physical landscape resulting from the development that include; the removal of existing landscape elements and features, the addition of new elements associated with the development and altering of existing landscape elements or features in such as way as to have a detrimental affect on the value of the landscape.

Lead authority: The environmental authority at the national, provincial or local level entrusted in terms of legislation, with the responsibility for granting approval to a proposal or allocating resources and for directing or coordinating the assessment of a proposal that affects a number of authorities. In this project, the lead authority is the Department of Environmental Affairs and Tourism

Magnitude of Impact: the combination of the intensity, duration and extent of an impact occurring.

Mitigate: The implementation of practical measures to reduce adverse impacts.

Monitoring: The repetitive and continued observation, measurement and evaluation of environmental data to follow changes over a period of time to assess the efficiency of control measures.

Preferred (option): The preferred option, whether in terms of camp siting, road alignment, service alternative e.t.c., refers to the concessionaire's preferred alternative and/or the alternative proposed in the concessionaire's environmental proposal which formed part of the bid process. It does not necessarily refer to the recommended alternative discussed in the Scoping Report.

Proponent: Any individual, government department, authority, industry or association proposing an activity (e.g. project, programme or policy). In this project, Eskom is the proponent

Proposed servitude: Refers to the proposed final alignment that the transmission line should follow.

Public: Ordinary citizens who have diverse cultural, educational, political and socio-economic characteristics. The public is not a homogeneous and unified group of people with a set of agreed common interests and aims. There is no single public. There are a number of publics, some of whom may emerge at any time during the process depending on their particular concerns and the issues involved.

Role-players: The stakeholders who play a role in the environmental decision-making process. This role is determined by the level of engagement and the objectives set at the outset of the process.

Red Data: A list of species, fauna and flora that require environmental protection, based on the IUCN definitions

Scoping: The process of determining the spatial and temporal boundaries (i.e. extent) and key issues to be addressed in an environmental assessment process. The main purpose of scoping is to focus the environmental assessment on a manageable number of important questions. Scoping should also ensure that only significant issues and reasonable alternatives are examined.

Sensitive area: a sensitive area or environment can be described as an area or environment where a unique ecosystem, habitat for plant and animal life, wetlands or conservation activity exists or where there is a high potential for ecotourism.

Significant/significance: Significance can be differentiated into impact magnitude and impact significance. Impact magnitude is the measurable change (i.e. intensity, duration and likelihood). Impact significance is the value placed on the change by different affected parties (i.e. level of significance and acceptability). It is an anthropocentric concept, which makes use of value judgments and science-based criteria (i.e. biophysical, social and economic). Such judgment reflects the political reality of impact assessment in which significance is translated into public acceptability of impacts.

Species diversity: a measure of the number and relative abundance of species (see biodiversity).

Stakeholders: A sub-group of the public whose interests may be positively or negatively affected by a proposal or activity and/or who are concerned with a proposal or activity and its consequences. The term therefore includes the proponent, authorities (both the lead authority and other authorities) and all interested and affected parties (I&APs). The principle that environmental consultants and stakeholder engagement practitioners should be independent and unbiased excludes these groups from being considered stakeholders.

Stakeholder engagement: The process of engagement between stakeholders (the proponent, authorities and I&APs) during the planning, assessment, implementation and/or management of proposals or activities. The level of stakeholder engagement varies depending on the nature of the proposal or activity as well as the level of commitment by stakeholders to the process. Stakeholder engagement can therefore be described by a spectrum or continuum of increasing levels of engagement in the decision making process. The term is considered to be more appropriate than the term “public participation

Study area: Refers to the entire study area encompassing all the alternative alignments as indicated on the study area map.

Sub-station: a distribution point within the local and national network from which electrical current is rerouted along different power lines as well as distributed to local and municipal networks.

Threatened species: Species, which have naturally small populations, and those, which have been reduced to small (often unstable) populations by man's activities

Transmission line: Pylons support the 400kV transmission line consisting of steel support structures (supported by guy wires). Transmission lines are suspended between the supports.

Viewer exposure: the extent to which viewers are exposed to views of the landscape in the affected area. Viewer exposure considers the visibility of the site, the viewing conditions, the viewing distance, the number of viewers affected the activity of the viewers (tourists or workers) and the duration of the views.

Viewer sensitivity: the assessment of the receptivity of viewer groups to the visible landscape elements, visual character and their perception of visual quality and value. The sensitivity of viewer groups depends on their activity and awareness within the affected landscape, their preferences, preconceptions and their opinions.

Visual absorption capacity (VAC): the inherent ability of a landscape to accept change or modification to the landscape character and/or visual character without diminishment of the visual quality or value, or the loss of visual amenity. A high VAC rating implies a high ability to absorb visual impacts while a low VAC implies a low ability to absorb or conceal visual impacts.

Visual amenity: the notable features such as hills or mountains or distinctive vegetation cover such as forests and fields of colour that can be identified in the landscape and described. Also included are recognised views and viewpoints, vistas, areas of scenic beauty and areas that are protected in part for their visual value.

Visual character: this addresses the viewer response to the landscape elements and the relationship between these elements that can be interpreted in terms of aesthetic characteristics such as pattern, scale, diversity, continuity and dominance.

Visual contour: the outer perimeter of the visual envelope determined from the site of the development. The two dimensional representation on plan of the horizon contour

Visual contrast: the degree to which the physical characteristics of the proposed development differ from that of the landscape elements and the visual character.

Visual impact assessment: a specialist study to determine the visual effects of a proposed development on the surrounding environment. The primary goal of this specialist study is to identify potential risk sources resulting from the project that may impact on the visual environment of the study area, and to assess their significance. These impacts include landscape impacts and visual impacts.

Visual impact: Changes to the visual character of available views resulting from the development that include: obstruction of existing views; removal of screening elements thereby exposing viewers to unsightly views; the introduction of new elements into the view shed experienced by visual receptors and intrusion of foreign elements into the view shed of landscape features thereby detracting from the visual amenity of the area.

Visual magnitude: Product of the vertical and horizontal angles of an object to describe quantitatively the visual dimension of an object (Iverson, 1985). The visual magnitude is best described in terms of visual arcs with a one minute arc usually considered as being the minimum resolution detectable by the human eye (equivalent to observing a 29 mm ball at a distance of one hundred metres).

Visual quality: an assessment of the aesthetic excellence of the visual resources of an area. This should not be confused with the value of these resources where an area of low visual quality may still be accorded a high value. Typical indicators used to assess visual quality are vividness, intactness and unity. For more descriptive assessments of visual quality, attributes such as variety, coherence, uniqueness, harmony, and pattern can be referred to.

Zone of visual influence: the extent of the area from which the most elevated structures of the proposed development could be seen and may be considered to be of interest.

1. INTRODUCTION

Naledzi Environmental Consultants (NEC) has been appointed by Eskom Transmission to conduct an Environmental Impact Assessment (EIA) for the proposed 2 x 400kV Power Lines from Etna substation to a new proposed substation (Quattro). The study area stretches from the southern outskirts to the northern part of Soweto which comprises Lenasia to Orlando. The project area falls within the jurisdiction of Johannesburg City Council. NEC would serve as independent environmental consultants in this project while Eskom Transmission would be referred to as the project proponents. NEC would provide information for decision making to the proponent and Competent Authority. DEAT is responsible for granting approval to the proposal, allocating resources and directing and coordinating an assessment that affects other authorities.

This Amended Draft Environmental Impact Report (Amended DEIR) documents the EIA process. The report has been prepared on the strengths of the information available to the investigation team at the time of the assessment, and in accordance with the principles of Integrated Environmental Management (IEM), inputs from specialists and the public participation process. Care has been taken to provide an objective document, which will ensure that DEA will be in a position to make an informed decision. The Amended DEIR is initially made available for public review providing Interested & Affected Parties (I&APs) the final opportunity to meaningfully participate in the process.

The scoping phase was completed with the submission of the Scoping Report, detailing the potential impacts and issues around the construction of the 2x400 kV transmission line and associated new substation. This marked the end of the first phase of the EIA process; the application procedure then required the project to proceed into the second phase namely, the EIA phase.

The Final Environmental Impact Report (FEIR) would take account of the entire EIA process and public input. The FEIR is then submitted to the Department of Environmental Affairs (DEA), as the competent decision making authority, for review and possible authorization.

1.1 SCOPE OF WORKS

In light of the above, Naledzi Environmental Consultants committed itself to implement the project as per the requirements of the new environmental impact assessment regulations. The following Scope of Work or Terms of Reference, as extracted from the regulations was applicable to the environmental impact assessment process and related reports:

"***If a competent authority accepts a scoping report and advises the EAP in terms of regulation 31 (1) (a) to proceed with the tasks contemplated in the plan of study for environmental impact assessment, the EAP must proceed with those tasks, including the public participation process for environmental impact assessment referred to in regulation 29 (1) (i) (iv) and prepare an environmental impact assessment report in respect of the proposed activity***"

The competent authority (Department of Environmental Affairs) gave the EAPs a go ahead (**Appendix 1: Scoping Report Approval Letter**) with the tasks contemplated in the plan of study for environmental impact assessment, which formed part of the Final Scoping Report.

1.2 ASSUMPTIONS AND LIMITATIONS

1.2.1 STAGE OF PROJECT AND AVAILABILITY OF INFORMATION

It is important to note that this DEIR was compiled during the conceptual stages of the proposed development, with the primary aim of assisting Eskom to plan and possibly secure the proposed new substation site and the servitude for the proposed 2x400kV transmission

line. Alternative locations for the new substation were considered and the optimum site selected prior to the Scoping phase. The report has considered a number of alternative corridors (500m each) that were proposed for the transmission line. Site selection was based on a careful examination of the pros and cons of each corridor. The precise positions of the towers along the preferred corridor have however not been decided during the course of this study and thus, references to positions of these towers are only made.

Alternative sites for the proposed new substation were considered. However one site was selected for the impact phase.

1.2.2 CONFIDENTIALITY

Naledzi Environmental Consultants has prepared this Amended Draft Environmental Impact Assessment Report (Amended DEIR) for the sole use of Eskom Transmission and the appointed development consultants/contractors to this project, in accordance with generally accepted consulting practices and for the intended purposes, as stated in the agreement under which this work was prepared. The report is also intended for review by the relevant competent authorities. Interested & Affected Parties are also privy to the review of the report to provide input to the EIA process. This report may not be relied upon by any other party without the explicit written agreement of Eskom Transmission and Naledzi Environmental Consultants. No other warranty, expressed or implied, is made as to the professional advice included in this report. The EIA was conducted in as transparent a manner as possible, with emphasis on making the EIA understandable enough for the affected communities to participate.

2. ENVIRONMENTAL ASSESSMENT PRACTITIONERS

2.1 BACKGROUND

The Environmental Regulations specifically calls for practitioners involved in Environmental Assessment Work to list their qualifications and expertise in the report. The Regulations also indicates that the role of the Environmental Consultant or Environmental Assessment Practitioner (EAP) is to conduct the environmental impact assessment process in an independent fashion. Independence was at the core of the EIA process.

An Environmental Assessment Practitioner appointed in terms of regulation 17(1) is required to –

(a) be independent;

(b) have expertise in conducting environmental impact assessments, including knowledge of the Act, the Regulations and any guidelines that have relevance to the proposed activity;

(c) perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant.

Naledzi Environmental Consultants on its own is an independent Environmental Consulting Company which performs environmental assessment objectively. The team outlined below abide by the company's best practices in the consulting industry.

2.2 THE STUDY TEAM

A team of qualified and experienced consultants was assembled for this project. The following consultants are involved in this project:

Name	Qualifications	Roles and Responsibility
Mr. Musetsho K.D	B.EnvM (Hons)	Project Supervisor
Ms. Botha M.I	Environmental Training, 5 years	Project Manager

	practical experience in Environmental Management and public participation processes.	
Mr. Mutshatshi T.N	B.EnvM (Hons), Msc (pending)	Acting Project Manager
Ms. Nemalili K.	N Dip Environmental Sciences	Assistant Project Manager
Ms. Venter N.	Extensive experience in identification and consultation with possibly affected landowners for mainly large-scale Environmental Impact Assessments (EIAs).	Public Participation Officer

Table 1: Naledzi Environmental Consultant's Team

All these individuals are permanent employees of Naledzi Environmental Consultants. Other individuals from other companies were roped in to serve as specialists, their names and the organisations they represented are highlighted throughout the Environmental Impact Assessment Report and reference would be made to their findings and conclusions.

The Environmental Assessment Practitioner responsible for the overall management of the environmental assessment process is as reflected below.

Environmental Consultants	Naledzi Environmental Consultants	
Contact Person	Mr. Desmond Musetsho	
Postal Address	P O Box 6943, Rustenburg , 0300	
Tel, Fax and Cell	Tel	(015) 296 3988
	Fax	(015) 296 4021
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E-mail addresses	dmusetsho@naledzi.co.za	
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Table 2: Environmental Impact Assessment Practitioner's Contact Details

3. NATURE OF THE DEVELOPMENT

3.1 BACKGROUND

Eskom Transmission Group's objectives are, providing the necessary network strengthening to support future load growth, which results in increased sales and revenue. The provision of improved quality of supply to the customers in the Soweto area results in additional sales, revenue and a reduction in electricity cost per unit.

Electricity is not a luxury item and hence as an Energy source the reduction in cost per unit will allow the vast majority of the South African population to access it. Like other developed countries Eskom seeks to embark on a delivery process that allows the immense number of South Africans and other Africans in the Southern Region to access basic electricity needs freely. This can only be achieved if production and transmission costs are streamlined to accommodate this portion of the population.

The main objective of the Land and Rights department is to legally acquire, secure and maintain property rights on behalf of Eskom Transmission. All Eskom transmission activities are listed according to existing environmental Law hence approval is required from the National Authority which is DEA. It is also the mandate of the department to acquire legal rights before a project is started and the rights of land must be legally secured to ensure the rights in perpetuity.

Land and rights is divided into four sections;

- The Environmental section acquires the national government approval to commence projects and produce maps and drawings required for transmission power lines.
- The Acquisition section negotiates with the land owners and statutory bodies to acquire all the necessary land and rights at market value for transmission.
- The Registration section legally registers all land and rights in the relevant government deeds offices and to adjudicate third party applications to encroach on Eskom rights
- Stakeholder and liaison ensures that stakeholders are kept informed about the expansion plans of Eskom and have a communication link for all problem solving requirements.

Transmission projects are linear projects and thus cut across provinces, hence they affect a number of communities.

3.2 THE NEED AND DESIRABILITY OF THE PROJECT

There are few competitors to match electricity's uses in terms of an energy source. Substitution is possible in some cases, but not all. With all these considerations it is the mandate of Eskom group of Holdings to make electricity available to all, at the lowest price per unit to meet sheer market demands. The proposed area to be integrated may in this case only access its electricity from a power station within close proximity. Energy Options such as Solar power and Wind power become obsolete as a result of the high population density in which the electricity is to be supplied and the poor wind speed in the Soweto Area.

The surrounding informal and formal settlements in the Eldorado park area still use coal as their principal source of energy for heat and lighting requirements. Although the electricity from the power stations to supply Orlando substation (Quattro) is thermal based, the Cooling towers of these Power stations have mechanisms to reduce the amount of air pollutants released into the sky as per energy generated when compared to the Domestic methods implemented by the inhabitants of Eldorado park.

Hundreds of kilometres of Transmission power lines feed electricity from Matla and Lethabo Power Station to Transmission Substations in Gauteng.

The existing Transmission power lines are becoming heavily loaded and are predicted to reach their full capacity very soon. These Transmission power lines and substation currently cannot supply the increased demand in the Johannesburg area. It is becoming very difficult to manage with one power line out of service since the other power lines have to carry the entire load. This makes it difficult to carry out routine maintenance, the condition of the operating lines can deteriorate and this will result in poor line performance (faults etc.).

Studies have shown a steady 3% per annum average load growth for the area fed from Prospect and Fordsburg S/S, the main bulk supply substation to the Johannesburg and Soweto area. This is due to industrialisation, commercialisation, urban growth and electrification. It is also a sign of good economic growth in this area. The load forecasters predict that this load growth will continue - which will result in the need for additional power by the year 2008.

It can thus be seen that a fault on any of the lines serving the JOHANNESBURG and SOWETO area could have a detrimental effect on supply to customers once the new customer/s are supplied from the existing network.

Eskom Transmission has taken measures to get the most out of the existing Transmission system so that the construction of the new line will occur only when needed. These measures include:

- Comprehensive checks on the existing lines to ensure that they are within the legal clearance for overhead lines. Lines sag when placed under heavy load conditions, due to heating of the conductors.
- Installation of line monitoring devices that measures the atmospheric conditions prevailing. This allows Eskom Transmission to decide whether the lines can cope with more loading (e.g. on a cold day the line can be loaded to more than usual levels since the lines cool down and they do not sag as much.)
- Installation of new infrastructure;
- Demand side management
- When reinforcement options were looked at, the best option was chosen to ensure that an optimised mix of cost, technical benefit and environmental impact was achieved.
- Energy Efficiency initiatives

It is clear that new Transmission power lines will be needed as all options for optimisation of the existing infrastructure have already been studied and implemented. The new Transmission lines will be brought into operation at the time when the load growth and demand exceeds the supply, sometime in 2010. Connecting to another source of supply, i. e. Etna S/S will also ensure a firm supply into the area at all times. It is therefore necessary to secure the necessary servitudes promptly, to ensure this will be possible.

A definite twofold need has been identified:

- to optimise the existing system and
- the need for additional capacity in the Johannesburg and Soweto area.

By increasing the supply into the Soweto area, the foreseen load growth can be addressed in a suitable and economical way. Optimisation of the current system is currently underway, and would alleviate some problems in the system. The short to medium term load requirements can be addressed by the increased supply due to the new Transmission power lines.

In addition the upgrading and new Orlando (Quattro) substation/ will improve the supply to the area. To accommodate the proposed new line, some work is required at the two substations at the start and end of the line.

Eskom and gearing up for ASGISA

ASGISA is an accelerated growth initiative which is a high level priority programme driven from the top by deputy president Phumzile Mlambo-Ngcuka.

The ultimate objective of this initiative is to have unemployment and poverty halved by 2014.It aims to address critical skills shortage and create economic growth of 6% during the same period. Eskom recognizes the need and role played by electricity in this initiative as a basic requirement for these objectives to be achieved hence all its major programmes are shaped and determined by this combined goal.

The optimal utilization and operation of assets and resources enable Eskom to support ASGISA by creating jobs and allowing takeover of other aspects of Electricity distribution by other smaller players in the industry.

ASGISA is intended to overcome a wide range of constraints, not only skills shortage but also other challenges facing small, medium and micro-sized enterprises. It emphasizes partnerships with business, labour and civil society. Selected interventions have been identified to address the challenges of inadequate infrastructure, sector strategies, education and skills.

The economic growth the country is facing at the moment has not been spread to the grass roots level where it is needed the most. The polarization of the economy still provides challenges in terms of priority developments that can be funded by government.

A growth of 6% of the GDP as highlighted by ASGISA will have serious implications and a strong impact on the transmission network, because of not only the increase in load demand but also strain the ageing infrastructure. The Eskom supply plan hence has to be aligned with focus directed on load growth and demand.

An economic growth of 6% will require a larger skills base, especially in core and critical skills areas.

Electricity Transmission in South Africa

Eskom Transmission has a national role and responsibility to provide open access to the transmission system to all participants in the electricity market, and will retain this role when a competitive market develops. Eskom Transmission is in a central position to provide an indicative IRP (statement of opportunities) to participants in the electricity supply industry.

The National Transmission Operator is required to provide an annual “Statement of Opportunities” to guide potential investors in generation and energy intensive industries on the best location for their undertakings; to indicate where transmission constraints are likely to occur; and to identify opportunities for energy imports and demand-side management. Explicit environmental considerations are included into IRP studies as required by the Energy Policies of Government and results are integrated through Integrated Energy Planning of Government. [EPWP Clause 8.4.3].

Additional generation capacity will have to be in operation within 6 years to provide a reliable electricity service to South Africa. Bearing in mind that a lead time of several years is required to conduct environmental impact assessments and to carry out engineering, procurement, construction and commissioning activities, a decision on such new capacity are made as earliest time possible.

Eskom Transmission encourages the entry of multiple players into the generation market as required in the EPWP [EPWP Clause 7.1.5.8] Eskom Transmission is obliged by the national transmission system to publish approved tariffs for the purchase of co-generated and independently generated electricity on the basis of full avoided cost.

A transparent process will be used by the NER to identify suitable demand and supply side options to be included in the plan to meet the energy (electricity) needs of South Africa.

Electricity requirements of South Africa

SEEN from space (Figure1), Africa at night is unlit—as dark as all-but empty Siberia. With nearly 1 billion people, Africa accounts for over a sixth of the world's population, but generates only 4% of global electricity. Three-quarters of that is used by South Africa, Egypt and the other countries along the North African littoral.

Figure 1 - Satellite images of the African continent against Europe (Night View)

The need for more power stations in the rest of the continent has long been recognized, but most of the attempts at electrification in the 1970s and the 1980s failed. In some countries, dictators pillaged power stations for parts and fuel. In others, power stations were built but not maintained. Turbines were run at full capacity until they broke, then were abandoned. By some counts, only 17 of Nigeria's 79 power stations, many dating from this period, are still working; the country's demand for power is an estimated 7,600 megawatts, against an actual operating capacity of 3,500MW.

The situation is bound to get worse as the demand for power continues to grow affecting Africa's relatively healthy economic growth of recent years. Whenever demand outstrips supply, the pressure is not just limited to the demand but affects the equipment required and its maintenance. For now, the continent remains largely dependent on hydropower: 13 countries use it for 60% or more of their energy.

Many African governments are looking at alternative sources of energy to make up their projected shortfalls. Hydropower is clean, from the point of view of greenhouse-gas emissions, but most of the easy alternatives, notably coal, are dirty. Donors committed to cutting global carbon emissions are unlikely to favour more dirty coal-fired power stations of the sort that predominate in South Africa. Some fossil fuels, however, are less damaging than coal. A pipeline planned for West Africa, which will carry gas that is now flared off in oilfields, could stabilize electricity supply in coastal cities.

Few Africans in rural areas have access to electricity. Connecting them to national grids will be slow and expensive. Yet Lilliputian windmills, water mills, solar panels and biomass furnaces could have a big collective impact. The cost of lighting a shack takes 10% of income

in the poorest households and the kerosene lamps are highly polluting. In response, the World Bank has rolled out “Lighting Africa”, an ambitious effort to get 250m of the poorest Africans on clean-energy lighting by 2030.

Other remedies for Africa's power shortages are more familiar but just as urgent: more efficient appliances, such as LED lighting, more deregulation, better use of existing resources by, for instance, improving the quality of power lines, and pooling power into regional grids. Otherwise Africa will remain in the dark.

3.3 STRATEGIC ALTERNATIVES CONSIDERED

In terms of this Amended DEIR, reasonable alternatives to each aspect of the development have been investigated and compared in order to ensure that the development of Orlando (Quattro) substation has the least negative impact on the biophysical and socio-economic receiving environment The identification of alternatives is a key aspect of the success of the impact assessment process and was determined based on information obtained from project proponent and her clients.

Electrical supply constitutes a complex system of Generation facilities, Substations, Transmission and Distribution power lines. The system operates on a demand-supply structure. The power is generated and transmitted at the moment it is needed. Spare generation capacity is currently available in the system supplied by Eskom Generation in South Africa as well as via international interconnecting lines. It is therefore not necessary to increase generating capacity to cater for the forecast load growth.

The forecast growth in demand over the next few years, however, urgently requires Eskom Transmission to take prompt action to ensure supply reach the end users. It is therefore necessary to ensure extra supply capacity into the Johannesburg and Soweto area. There is a definite need to overcome the future overloading problems on the existing Transmission lines.

The ideal solution should be to:

- meet the projected demand
- optimise existing infrastructure
- minimise costs
- minimise any adverse environmental impact.

The following alternatives for satisfying the twofold need for additional electrical supply to the region and optimising the existing infrastructure were investigated by Eskom Transmission:

3.3.1 STATUS QUO ALTERNATIVE

Electricity is an important commodity, and as the world's population grows, the need for electricity will grow. World consumption of electricity is actually expected to double over the next 30 years! Electricity is used in industry, commerce, public transport and of course, in homes. Although many countries around the world are using nuclear energy to generate electricity, there are still about 2 billion people living in under-developed countries who have no electricity at all!

3.3.2 DEMAND SIDE ALTERNATIVE

Demand side management (DSM) can generally be defined as the activities performed by the electricity supply utility, which are designed to produce the desired changes in the load shape through influencing customer usage of electricity and to reduce overall demand by more efficient use. These efforts are intended to produce a flat load duration curve to ensure the most efficient use of installed network capacity.
By reducing peak demand and shifting load from high load to low load periods, reductions in capital expenditure (for network capacity expansion) and operating costs can be achieved. Some of the basic tools are the price signals (such as time of use tariffs) given by the utility and direct load management. This option is practised to a certain extent, but is currently not

considered feasible for expansion in this particular region.Eskom transmission is currently looking at various means to achieve a flatter load profile in this area. However, the large concentration of industrial and commercial users in this area makes this a very difficult option to pursue.

3.3.3 NEW GENERATION SYSTEMS

A new coal fired, gas, re-newable or nuclear generation plant could be commissioned near to the load centre. This might have a more negative overall impact on the environment and would take at least five years to implement; therefore this option was not investigated, this option would also not supply the foreseen demand increase in the short term. The cost of such an option will be extremely high compared to the cost of transmission power lines. Transmitting power through transmission power lines is currently the most economical way to supply bulk electricity.
The use of other types of generation such as wind and solar energy were suggested by some I&APs, but the high cost and low output of such systems does not make them economically feasible for the supply of bulk electricity as is required by large industrial users.

3.3.4 UPGRADING EXISTING TRANSMISSION POWER LINES BY USING BIGGER CONDUCTORS

The physical load on the existing towers would increase substantially and the towers would be inadequate. Furthermore, it would not be possible to remove one Transmission power line from service to perform the upgrading work, as the remaining supply lines would not be able to supply the electrical loads in the region. This option would also not optimise the existing infrastructure.

3.3.5 NO-GO ALTERNATIVE / NO PROJECT

The “no-go” alternative is sometimes referred to as the “no-action” alternative, which assumes that the proposed activity does not go ahead and in turn implying a continuation of the current situation or the status quo. The “no-go, no-project, no-action” alternative was identified to try and highlight those positive environmental issues that could be seen if the project does not continue. It has always been the impression of both the environmental assessment practitioners, the authorities and the proponents that the “no-go” alternative is there merely for the purposes of showing the positive impacts of the project, but over time, people are starting to realize that even if the project does not go ahead, there are positive outcomes at the end of the day.

To maintain the status quo is the easy way out. By not taking any action, Eskom Transmission and City Power are currently in a situation of not being able to ensure firm supply into the region. This would eventually lead to load shedding which can cause major disruptions of power supply to different areas at different times. This can have a major impact on the economics of the region, as no real economic growth can take place. New township and industrial developments in the region in the near future will cause overloading of the existing Transmission system, with resultant power failures. This option is therefore ruled out because it would neither supply the projected demand for electricity nor optimise the existing infrastructure.

Eskom Transmission has taken all measures to date to ensure that the existing Transmission system will be utilised to its full capacity.

3.4 THE ROUTE/CORRIDOR INVESTIGATION PROCESS

The scoping exercise undertaken for this project was aimed at gathering baseline environmental information, which will assist during the selection of an alignment or route or corridor with minimal environmental impacts. For the identification of an alternative with minimal environmental impacts, different role players had to play different roles. The following (not exhaustive) are some of the roles that the various stakeholders played.

3.4.1 ROLE OF ENVIRONMENTAL PRACTITIONERS

The environmental practitioners were required to:

- Encourage the proponent to consider all feasible alternatives
- Provide opportunities for stakeholder input to the identification and evaluation of alternatives
- Document the process of identification and selection of alternatives
- Provide a comprehensive consideration of impacts of each alternatives
- Document the process of evaluation of alternatives

The public participation process carried out for the scoping process tried to achieve the above, by giving stakeholders a chance to have inputs into the whole process.

3.4.2 ROLE OF THE PROPONENT

The proponent came into the picture by:

- Assisting in the identification of alternatives, particularly where these may be of technical nature
- Disclosing all information relevant to the identification and evaluation of the alternatives
- Being open to the consideration of all reasonable alternatives, and
- Being prepared for possible modifications to the project proposal before setting on a preferred option.

3.4.3 ROLE OF THE PUBLIC

The role of the public was to:

- Assist in the identification of alternatives, particularly where local knowledge is required
- Be open to the consideration of all reasonable alternatives
- Recognize that there is rarely one favored alternative that suits all stakeholders and that alternatives were to be evaluated across a broad range of criteria, including environmental, social and economic aspects.

The combination of the three role players culminated into the identification of required substation site and three possible corridors for the proposed 2x400kV power line from Etna substation to the newly proposed Quattro Substation.

Alternative corridors/routes were discussed further in the EIR, subsequent to the specialist findings and input from the affected landowners along the proposed alternative routes. The preferred alternative was one that was found to minimize the environmental impact of the proposed development.

The preferred alignment was determined based on:

- The opinion of the public, ascertained through the public consultation process;
- Specialists' recommendations;
- Environmental constraints

At the stage of the scoping exercise, which was based on a preliminary identification of physical, biological and social constraints (captured through the public participation process) there was no indication of what the preferred corridor would be. It was however noted that the comprehensive impact assessment phase specifically assessed the likely impacts of the alternative routes of the line.

Only at the end of this phase, it started to emerge that most specialist had their own preferred route while the public also had their preferences. This not withstanding, three alternative

routes were identified. Specialist studies were carried out to determine the most preferred corridor from the three identified. The said corridors are explained in detail below. The aim was for the public and key stakeholders to further comment and make inputs into the specialist studies and their recommendations, in order to come up with the final most preferred route/corridor.

3.5 ALTERNATIVE SITES IDENTIFIED

Alternative sites considered for the new substation was as follows*:*

- *Old Soweto Power Station also to be referred to as next to the old Orlando s/s and;*
- *Next to the old Diepkloof s/s;*
- *Orlando (Quattro) Substation opposite Bara Mall.*

The old Soweto Power Station site with its 2 famous cooling towers is to be declared of Heritage significance. The towers are covered with local art and have become a tourist attraction. Often Bungee Jumping is performed from the top of the towers. The site is not considered suitable from a heritage point of view.

The site next to the old Diepkloof s/s is inadequate due to its limited space. This site is not considered suitable from a technical point of view.

The site considered for the proposed new Orlando (Quattro) Substation is situated opposite Bara Mall in Soweto, south west of Diepkloof and North West of Baragwanath Hospital, along the Old Potchefstroom Road. This site is considered suitable as it is technically well positioned and provides adequate space to implement a GIS design substation.
The existing Etna Substation is situated south east of Lenasia & northeast of Ennerdale, along Road 553 (Golden Highway) to Sebokeng/Evaton.

Four new proposed sites for the Quattro substation site

Originally the sites listed above had been considered as alternatives for the proposed Quattro Substation Construction. After all the environmental studies were conducted and specialists introduced to assess the site, it was found that the two alternative sites for the Quattro substation site were not environmentally suitable for the construction of a substation. This then led to Eskom submitting the FEIR with just one site to rely on for the substation construction. The public participation meetings together with consultations with the councilors, led us to discovering that the site had already been earmarked for another development and this again ruled out the possibility of the proposed site close to the Bara mall being the one that the substation(Quattro) to be assessed.

However, during the EIA processes that we have gone through, the authorizing department, Department of Environmental Affairs reviewed the Final Environmental Impact Report, and realized that the study had been conducted, but much concentration had been paid to the lines and not the substation site, and much was written about the lines and not the proposed substation site, this then led to new sites being selected for the proposed Quattro substation site (***see Appendix 2 for the map of the new proposed substation sites****).*

The following are the new proposed Quattro substation sites:

Substation site A

- *Situated south west of Baragwanath Hospital*
- *3 kilometeres from the main turn off from the Main Old Potchefstroom Road*
- *North of PICK-IT-UP waste recycle management area*
- *Further east of site is Old Goudkoppies sewage-water treatment plant*

View of the abandoned waste water treatment works concrete structure noted on the proposed site.

Substation Site B

- *Industrial area south of Chris Hani Baragwaneth Hospital*
- *Characterized by dense blackjack and morning glory plant and grass*
- *Existing sewage disposal works, Johannesburg Water*

View of the proposed site B towards the western section, showing the existing waste water treatment works at the photo background

Substation Site C

- *1 kilometre south of Chris Hani Baragwanath Hospital*
- *The area is situated within the industrial area*
- *Immediate south of Motsoaledi residential area*

View of the proposed site C towards the northern section the tall building at the photo background is Chris Hani Baragwaneth hospital

Substation Site D (original substation site)

- *North of Chris Hani Baragwanath Hospital*
- *North of Old Potchefstroom Road and the Bara Mall*
- *Adjacent to the well known Orlando cooling towers and a perennial stream that feeds the Orlando Power dam*

View of the proposed site D located adjacent to Orlando cooling tower, the area is located north of the Bara Mall.

The following alternative routes are highlighted on the Locality Map attached as ***Appendix 2*** *in this report.*

From Etna Substation 2 x 400kV **transmission** power line will link to the new substation. Three alternative corridors are considered for the power line. All three alternative corridors take the north western direction parallel to an existing power line on the farm Roodepoort 302IQ, west of Golden Highway (R553). The three corridors from there takes an eastern direction (not parallel to existing power line) towards Golden Highway, just north of Zakariyya Park. The Three corridors split up south of Lehae (between the farms Vlakfontein 303IQ and Roodepoort 302IQ)

These routes will be individually assessed within 500m corridors. The NETGroup South Africa prepared an evaluation report of Quattro substation site locality alternatives of the proposed Soweto Integration Project (Appendix 4) to assess the proposed alternative sites. Their evaluation of the existing and alternative sites indicates that none of the alternative sites are better than the present site in terms of access and implementation. The Quattro Substation is recommended for the proceeding of the project.

3.5.1 ALTERNATIVE ROUTE 1

From Etna substation, the route takes the north western direction parallel to an existing power line onto the farm Roodepoort 302IQ west of an informal settlement, the route deviates in an eastern direction crossing the Golden Highway (R553) (west to east) south of Lehae and north of Zakariyya Park residential townships. The route takes an north eastern direction towards the N1 route (over the farm Olifantsvlei 316IQ), deviating north away from the N1 route crossing the Klipspruit and the N12 route. The route passes west of Devland crossing the Golden Highway and Old Potchefstroom Road east of Eldorado Park into to the new proposed Orland substation. For ease of reference, the route traverses and/or is located in and close to the following Farms:

- Vlakfontein 303 IQ
- Roodepoort 302 IQ
- Olifantsvlei 316 IQ
- Misgund 322 IQ (on western boundary of farm)

This alternative mostly follows an existing dismantled City Power servitude.

3.5.2 ALTERNATIVE ROUTE 2

The route starts the same way as route 1 up to just south of Lehae to the northern section of the farm Vlakfontein 303IQ. The route then could be on either side (west/east) of the Golden Highway (R553) taking a northern direction, crossing the Kliprivier south of the Sewage Disposal Works (south of Nancefield industrial). From the Golden Highway the route takes a north western direction towards Eldorado Park, crossing the N12, up north towards the eastern side of Soweto Golf Course. From there the route takes a eastern direction linking with alternative 1, north of Goudkoppie.

For ease of reference, the route traverses and/or is located in and close to the following Farms:

- Vlakfontein 303IQ,
- Roodepoort 302IQ,
- Olifantsvlei 316IQ

3.5.3 ALTERNATIVE ROUTE 3

This route starts the same way as route 1 and route 2. The route splits to the north in the north section of the farm Vlakfontein 303IQ passing east of Lenasia, following an existing power line which crosses the Kliprivier subsequent to road R554. Once across the Kliprivier the route deviates from the existing power line and takes a North West direction to cross the N12 route, passing east of Klipspruit West and west of Eldorado Park. Space becomes limited from there. The route cuts east into the western section of Eldorado Park to link with route 2 and route 1 enroute to Orlando Substation.

For ease of reference, the route traverses and/or is located in and close to the following Farms:

- Vlakfontein 303 IQ
- Roodepoort 302IQ,
- Rietfontein 301IQ,
- Olifantsvlei 316IQ,

The three routes were identified at a broad scale, and as indicated above, they should not be considered final routes for the proposed power lines. At the same time, not all of the identified routes would be used; a preferred route/corridor is the one that will be used. At this point in time, inputs are required from different role players as described above. These inputs, together with specialist recommendations and the proponent's views would be used together with the methodology outlined below to assess the impacts related to the three routes and to finalize the preferred route selection. All these will form part of the EIR phase of the project.

3.6 THE TECHNICAL DETAILS OF THE PROJECT

3.6.1 TRANSMISSION GRID

Transmission Grid would entail the following:

- Establish new Orlando S/S (to be known as Quattro) built at 400kV but operated at 275kV;
- Establish two Transmission Lines from Etna to Orlando (Quattro) s/s;
- 2x275kV feeder bays at Etna s/s;
- Distribution 132kV yard comprising of 3x400/132kV transformers and 12 x 132kV bays;
- 1 x Radio Microwave tower;
- Distribution 88kV indoor substation comprising of 4x275/88kV transformers and 22x88kV line bays;
- An 88/11kV substation equipped with 3x88/11kV transformers;
- Re-alignment of existing 88kV lines adjacent to the Quattro s/s

The length of the Transmission lines is expected to be 14km.The construction period for the proposed Power Lines is estimated to be 12 months in total. This includes the clearing of the servitude, construction of the towers and the stringing of the conductors. The standard servitude width is 55m. Construction is limited to the width of the servitude in which the line will be constructed. The servitude required for a single 400kV Transmission Power line would be 55m, while the separation distance between 400kV and any other line would be 55m.

Therefore 110m will be required. In cases where there are constraints related to space, the separation distance can be limited to 35m (towers opposite) The proposed Quattro Substation at Orlando will be owned by both Eskom and City Power. The double circuit 400kV Transmission power lines leading from the proposed Quattro Substation to Etna Substation will be the property of Eskom – therefore it will be constructed and maintained by Eskom and the electricity supply will be the responsibility of City Power.

3.6.2 TYPES OF TOWERS/PYLONS

The environmental impact assessment process being carried out is part and parcel of Eskom Transmission planning process, and as such, specific details regarding certain components of the proposed development could only be finalized once it is clear that the development could proceed. As a result, there is no final decision made yet as to the exact type of towers/pylons to be used in this project. That notwithstanding, the following are the common types of towers or pylons that may be used on this project:

- Cross rope suspension tower;

- Guyed suspension tower; and
- Self-supporting suspension tower; and

There is a high possibility of using multi circuit structures because of the nature of the area (buildup area) such as the Monopoles.

Refer to figures below for visual impression of pylons alternatives proposed from cross rope suspension towers to Monopoles.

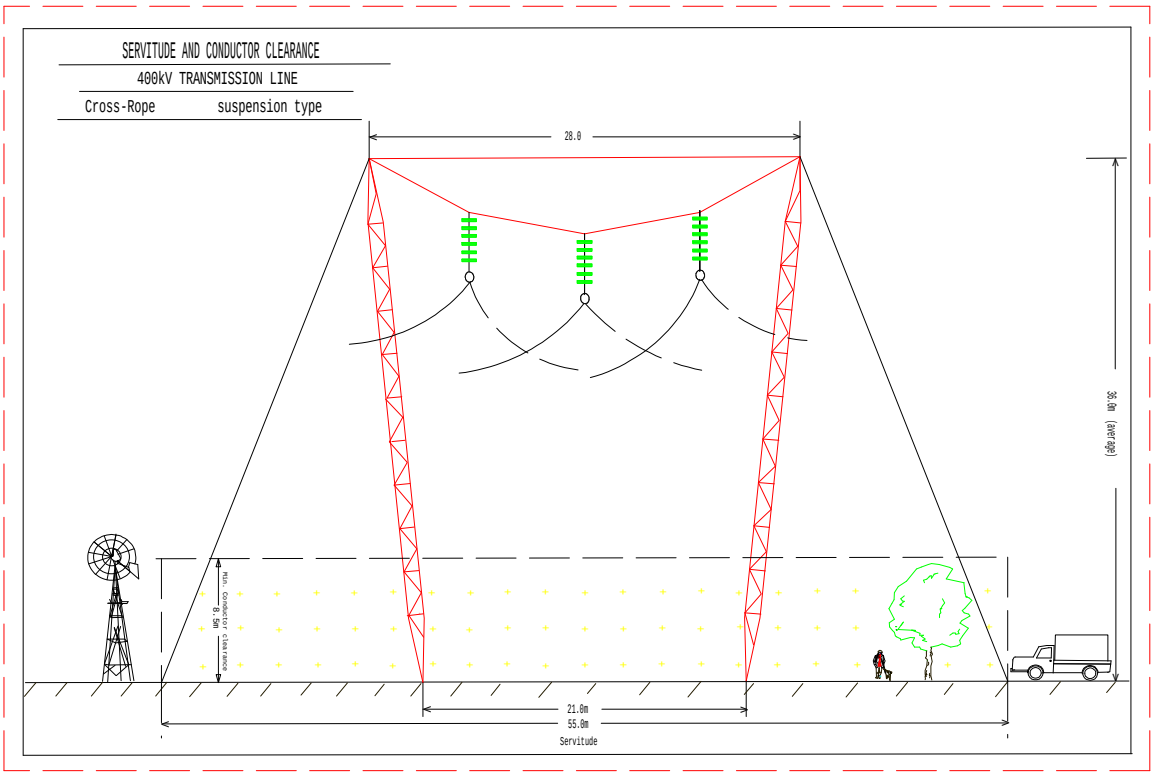


Figure 2: Cross Rope Suspension Tower

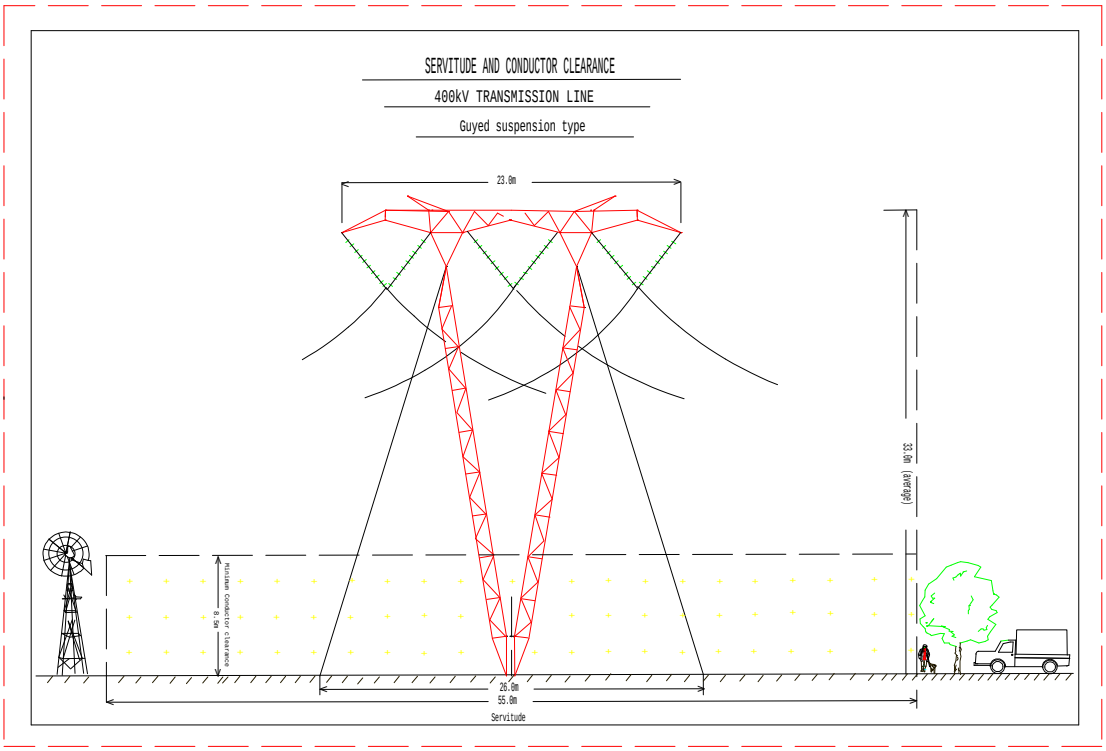


Figure 3: Guyed Suspension Tower

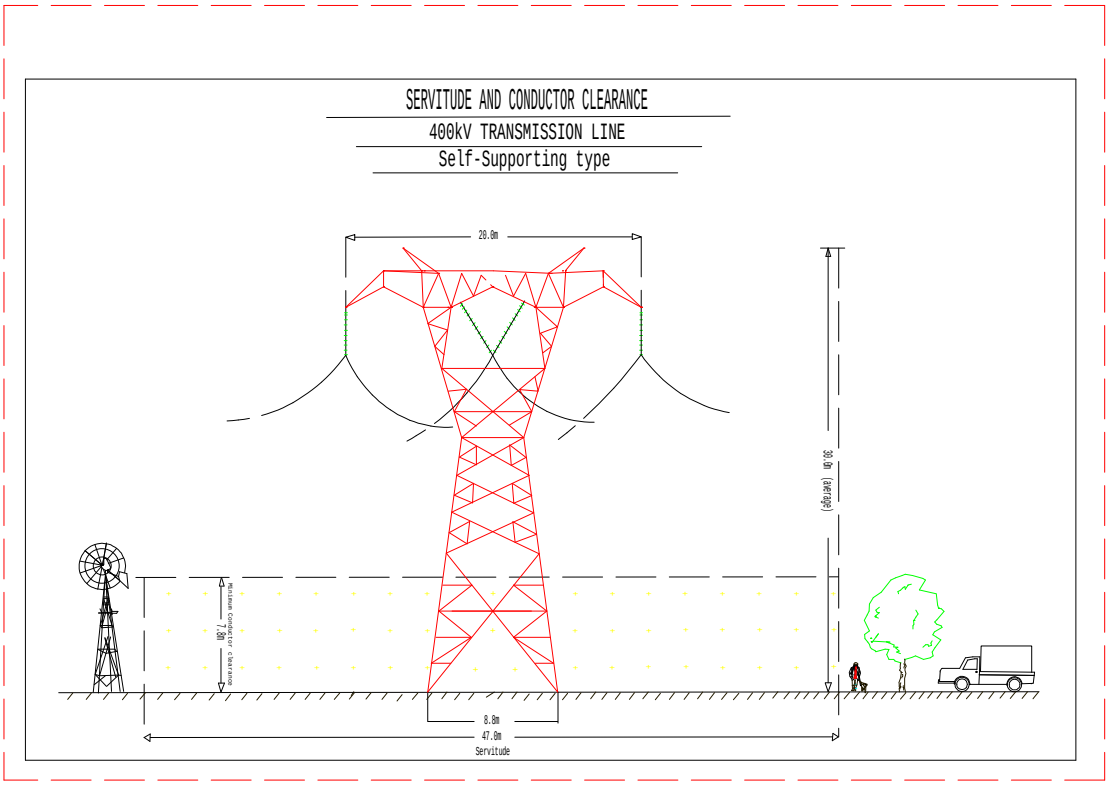


Figure 4: Self-Supporting Tower

Figure 5: Monopole Option A

Figure 6: Monopole Option B

Figure 7: Monopole Option C

It is important to highlight at this point that the final tower type chosen will depend on both technical and environmental constraints. Landowner requirements also play a pivotal role in the tower selection process. Where necessary a different tower type could be used if it enables Eskom to address a site-specific challenge.

3.6.3 SERVITUDE REQUIRED FOR THE PROPOSED POWER LINES

Throughout this report, any reference to servitude should be interpreted as the piece of land demarcated for the proposed Transmission line, including areas required for routine maintenance that are carried out once the power line is in operation.

The servitude required for a single 400kV Transmission Power line would be 55m, while the separation distance between 400kV and any other line would be 55m. This will be a 110m to cater for two lines. In cases where there are constraints related to space, the separation distance can be limited to 35m (towers opposite) Power line servitudes are usually secured along existing servitudes such as roads and pipelines.

In cases where the servitude is required next to a road reserve, a distance of 95m from the centre of road to edge of power line servitude is required.

3.6.4 PHASES OF THE DEVELOPMENT

Establishment of a substation and power lines is a long process that starts with the identification of a need, power system planning, environmental impact assessment, route selection, negotiation, surveying, the actual construction, operation and maintenance and end with the decommissioning of the power lines as well as associated works of the Etna substation. The whole process completes the life cycle of the power line. Other things being equal, the environmental impact assessment, although related to most of the listed aspects of the planning process, focuses more or identifies environmental issues related to the construction phase, operation and maintenance and the subsequent decommissioning.

3.6.4.1 Construction phase

This phase basically entails the establishment of construction camp sites, equipment yards and lay-down areas, access routes establishment, installation of gates (at points where power line intersects fence lines), clearance of servitude to facilitate access, construction of over head power lines (excavation of pits for tower foundations, casting of foundation for towers, assembly and erection of towers, stringing of pilot wire, stringing of conductors including winching and tensioning), associated substation works, movement of construction workforce, equipment and materials.

3.6.4.2 Operation and Maintenance Phase

The phase mainly involves the transmission/distribution of electricity/power from one substation to the other, including the use of electricity from the substation by beneficiaries. It also includes the inspections and maintenance substation equipment and of power line infrastructure, all areas disturbed during construction, servitude/right of way vegetation pruning/cutting, ongoing monitoring and management of erosion and lastly eradication and control of invasive species if any.

Some of the activities that characterize this phase include replacements of hardware on the line such as insulators, improvement of earthing cables, maintenance of bird patches/platforms, aviation markers and bird flappers.

3.6.4.3 Decommissioning Phase

Decommissioning phase mainly entails the dismantling of the power lines. Environmental rehabilitation is carried out during this phase of the development. Breaking up and removal of foundations also characterize the decommissioning phase of the power line development. This includes creation of access routes to facilitate demolition and transport of waste materials, disposal of waste materials and monitoring of the success of rehabilitation measures.

4. DESCRIPTION OF THE AFFECTED ENVIRONMENT

4.1 BACKGROUND (LOCATION)

The study area is a strip of land from the existing Etna Substation (near Ennerdale) to the new proposed Orlando (Quattro) Substation located in the Diepkloof area (south west of Diepkloof/south east of Soweto Cooling Towers).

The proposal will take place within the jurisdiction of Johannesburg City Council.

The southern section of the study area (area where Etna Substation is located) comprises Lenasia, Lehae, Zakariyya Park, Vlakfontein and Sunrise Farm along Golden Highway. The northern section of the study area comprises Eldorado Park, Pimville, Devland, Nancefield, Diepkloof, Klipspruit Wes. (Refer to **Appendix 2 – Locality Map**)

Etna substation is located (**26˚23´ 7.61˝s and 27˚52´ 31.33˝e**) some 26km southwest of Johannesburg. Most locally it is situated south of Zakariyya Park and Lehae residential establishments on the farm Vlakfontein 303IQ.

New Substation Sites

New substation sites have been selected for the location of the proposed Quattro substation site, the proposed substation sites are listed below.

Site A: ***27˚ 55' 10, 74" E, 26˚ 16' 16, 87" S,***

- *Situated south west of Baragwanath Hospital*
- *3 kilometeres from the main turn off from the Main Old Potchefstroom Road*
- *North of PICK-IT-UP waste recycle management area*

- *Further east of site is Old Goudkoppies sewage-water treatment plant*

Site B: ***27˚ 55' 50, 13" E, 26˚ 16' 27, 19" S***
- *Industrial area south of Chris Hani Baragwaneth Hospital*
- *Characterized by dense blackjack and morning glory plant and grass*
- *Existing sewage disposal works, Johannesburg Water*

Site C: ***27˚ 56' 10, 2" E, 26˚ 16' 7, 03" S***
- *1 kilometre south of Chris Hani Baragwanath Hospital*
- *The area is situated within the industrial area*
- *Immediate south of Motsoaledi residential area*

Site D: ***27˚ 55' 48, 7" E, 26˚ 15' 20, 25" S***
- *North of Chris Hani Baragwanath Hospital*
- *North of Old Potchefstroom Road and the Bara Mall*
- *Adjacent to the well known Orlando cooling towers and a perennial stream that feeds the Orlando Power dam*

4.2 BIOPHYSICAL ENVIRONMENT

4.2.1 CLIMATE

The climate in the area understudy is characteristic of the highveld. It has warm summers with showers and thunderstorms commonly occurring in the late afternoon with rainfalls that vary between 700mm and 800mm. The winters are cool and dry. The area is located in the southern portions of the Gauteng Province, where air pollution occurs. This is attributed to the fact that the area is situated south of the mining belt in Johannesburg, which results in dust being blown over the area from the mining activities. Further causes of air pollution are the industries situated in Johannesburg.

4.2.2 TOPOGRAPHY AND MAJOR LAND FEATURES

The topography of the area covering the southern tip of the City of Johannesburg is characterized as gentle to moderately undulating.

The study area includes three terrain types, namely
1. Level plains with some relief
2. Plains with open low hills or ridges
3. Rolling or irregular plains with high hills or ridges

The Kliprivier traverses the mid section of the study area forming the Olifantsvlei Municipal Nature Reserve. Areas not consisting of urban environment are covered with short to medium-high, dense tufted grass (mostly agricultural land).

4.2.3 FAUNA AND FLORA

The four proposed sites for the Quattro substation sites occur within the following Vegetation zones:

Mr. Koos Steyn from the University of Venda compiled a Vegetation Assessment dated May 2010 to assess the sensitivity of the vegetation and the impact of the proposed substation sites development on the vegetation. (Refer to ***Volume 3 Specialist Reports****). Information contained in this report was abstracted from the specialist report.*

Considering the proposed alternatives, alternative no B will have the least coincidence with sensitive biological features as indicated by this report and is therefore the recommended

option. (A first inspection created the impression that this site is also located within a wetland, but the presence of water seems to rather be as a result of man-made dams relating to sewage works.

4.2.4 AVIFAUNA

Endangered Wildlife Trust performed a Bird Impact Assessment on the four proposed substation sites dated April 2010. The aim of the study was to assess the avifaunal sensitivity of the area and the impact of the four proposed developments on birds within the substation site. (Refer to ***Volume 3 Specialist Reports****)*

Avifaunal inputs found within the four proposed substation sites

Due to the general degradation and disturbance in the area three of the four substation sites have been rated as equal in impact. These three are sites A, C and D. All three occur in very degraded areas and all three are feasible for use. Site B should however be discarded as it occurs very close to some dams and there was a great deal of non sensitive bird life in this area during the site visit. Thus site B must be discarded, the proposed Quattro substation site is degraded and disturbed, significant impacts on avifauna are unlikely irrespective of the substation footprint size. Although the substation will be situated close to a small stream (the Bailey Spruit), this stream is unlikely to be frequented by any sensitive bird species.

4.2.5 CONSERVATION AREAS

The area under study is characteristic of the Gauteng Urban environment, where most portions have already been developed and where there are no major mountains and forests such as the ones found in the Limpopo, Mpumalanga and Kwazulu Natal Provinces.

The Kliprivier feeds the Olifantsvlei Municipal Nature Reserve south of Eldorado Park which is the centre of the study area. The route alternatives would need to traverse the Municipal Nature Reserve from south to north in order to reach the newly proposed Orlando (Quattro) Substation.

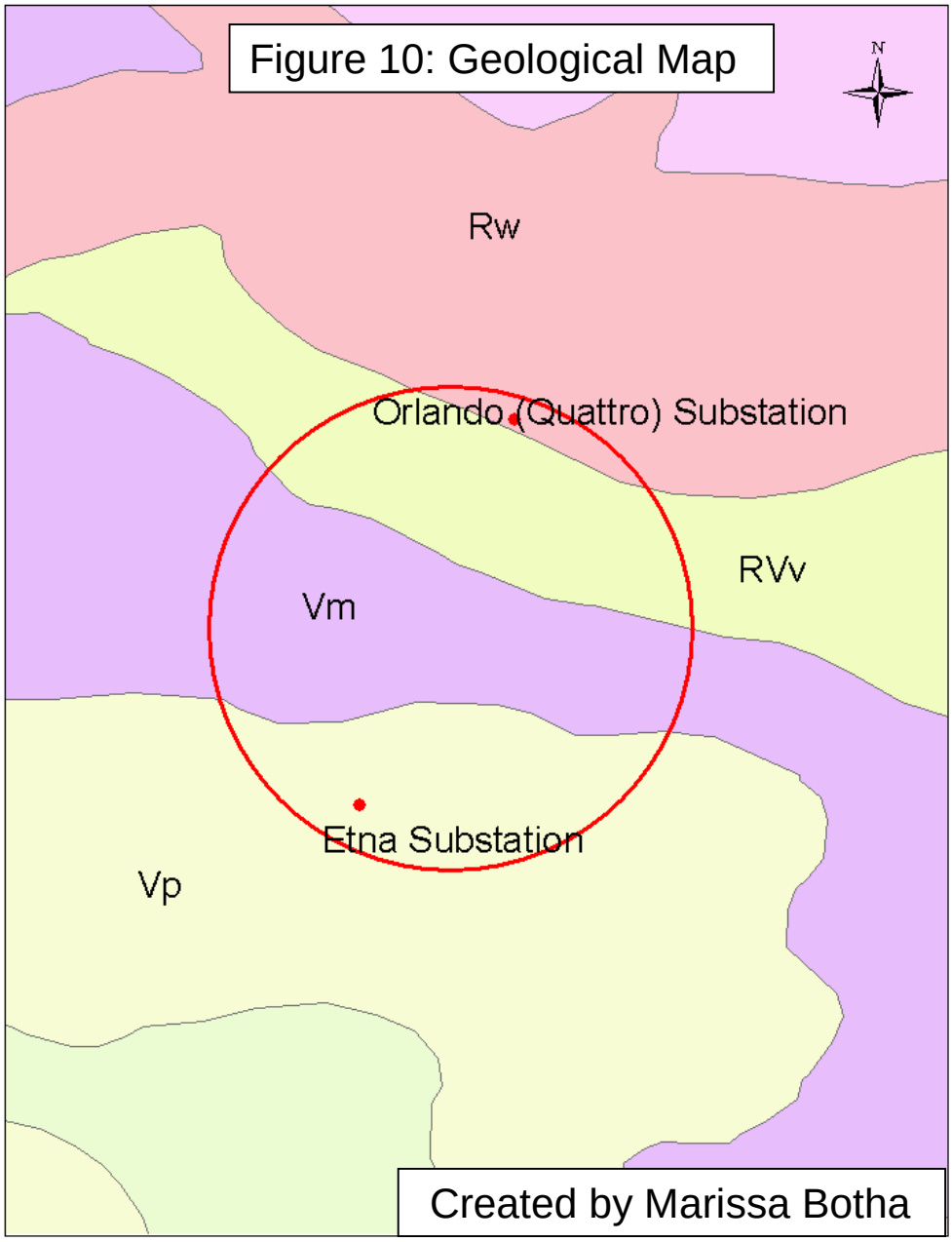
4.2.6 SOILS

Deep, red (Hutton) and yellow (Clovelly) soils, mostly on Karoo Sequence sediments but also on shale (Witwatersrand Supergroup), andesitic lava (Ventersdorp Supergroup) and some other substrates, predominate.

4.2.7 GEOLOGY AND GEOMORPHOLOGY

The area between Etna substation and the new proposed Orlando (Quattro) Substation is characterized by four different geological strata. For ease of reference, all of these are labelled as
Rw, RVv, Vm, and Vp. (**Figure 10**: Geological Map).

Refer to figure 10 below.



4.2.7.1 Rw

Lithology: Quartzite, shale, comglomerate, lava

Formation: Witwatersrand Supergroup

Rock Type: Compact sedimentary strata

4.2.7.2 RVv

Lithology: Andesite, quartz porphyry, dacite, ryolite, trachyte, tuff, agglomerate, olcaniclastics,

conglomerate, sandstone, arkose, quartzite shale and chert

Formation: Ventersdorp SuperGroup' Klipriviersber, Zoetlief, Amalia, Hartswater and Sodium Groups' Hereford

Rock type: Assemblage of compact sedimentary and extrusive rocks

4.2.7.3 Vm

Lithology: Dolomite, chert, subordinate quartzite, conglomerate, shale; diabase and syenite dykes and sills

Formation: Malmani Sungroup, Assen and Black Reef Formations (except where the latter is included with Godwan Formation).

Rock type: Dolomite, chert and subordinate limestone

4.2.7.4 Vp

Lithology: Quartzite, shale, conglomerate, iron formation, breccia, diamictite, limestone, dolomite and where not shown separately as Vh, andesite; also includes Malmani dolomite.

Formation: Part of the Pretoria Group, Duitschland, Penge and Langrant Formations.

Rock type: Compact sedimentary strata

4.2.8 HYDROLOGY AND DRAINAGE

Taka Echo & Land Rehabilitation CC performed a Wetland and River Crossing Study dated September 2008 to present the locations and extent of wetland and stream crossing. (Refer to **Volume 3 Specialist Reports**)

The project area is situated within the upper Klip River catchment. Rivers covered by the area include Bailey Spruit, Diepkloofspruit, Kliprivier, Olifantsvlei. The Klip River is the river with the most important flow to be taken into consideration during the installation of the power line in the study area. Other rivers are tributaries to the Klip River, some are small and seasonal. The investigation identified 17 wetlands and river crossing areas that have a relationship with the proposed power stations and power line corridors within the study area. The wetlands identified are illustrated in figure. Of the 17 wetlands identified within the study area only one is occurring adjacent to the proposed Quarto Power Station. The study found it necessary to delineate this wetland.

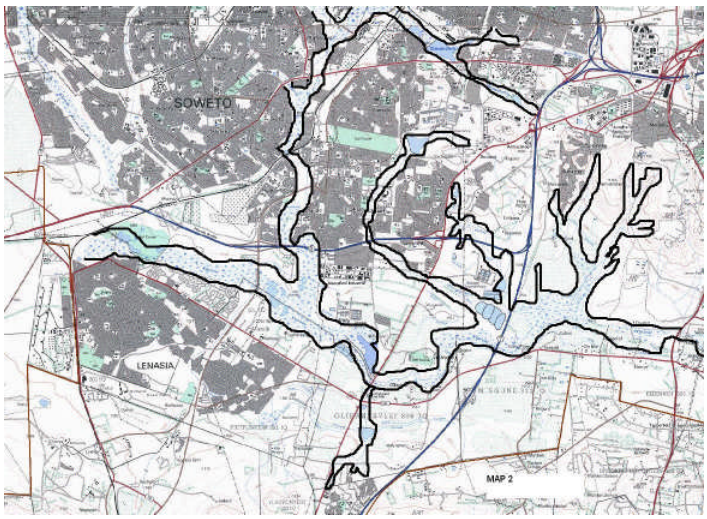


Figure 11: Study area drainage basin 1: 50 000 Map

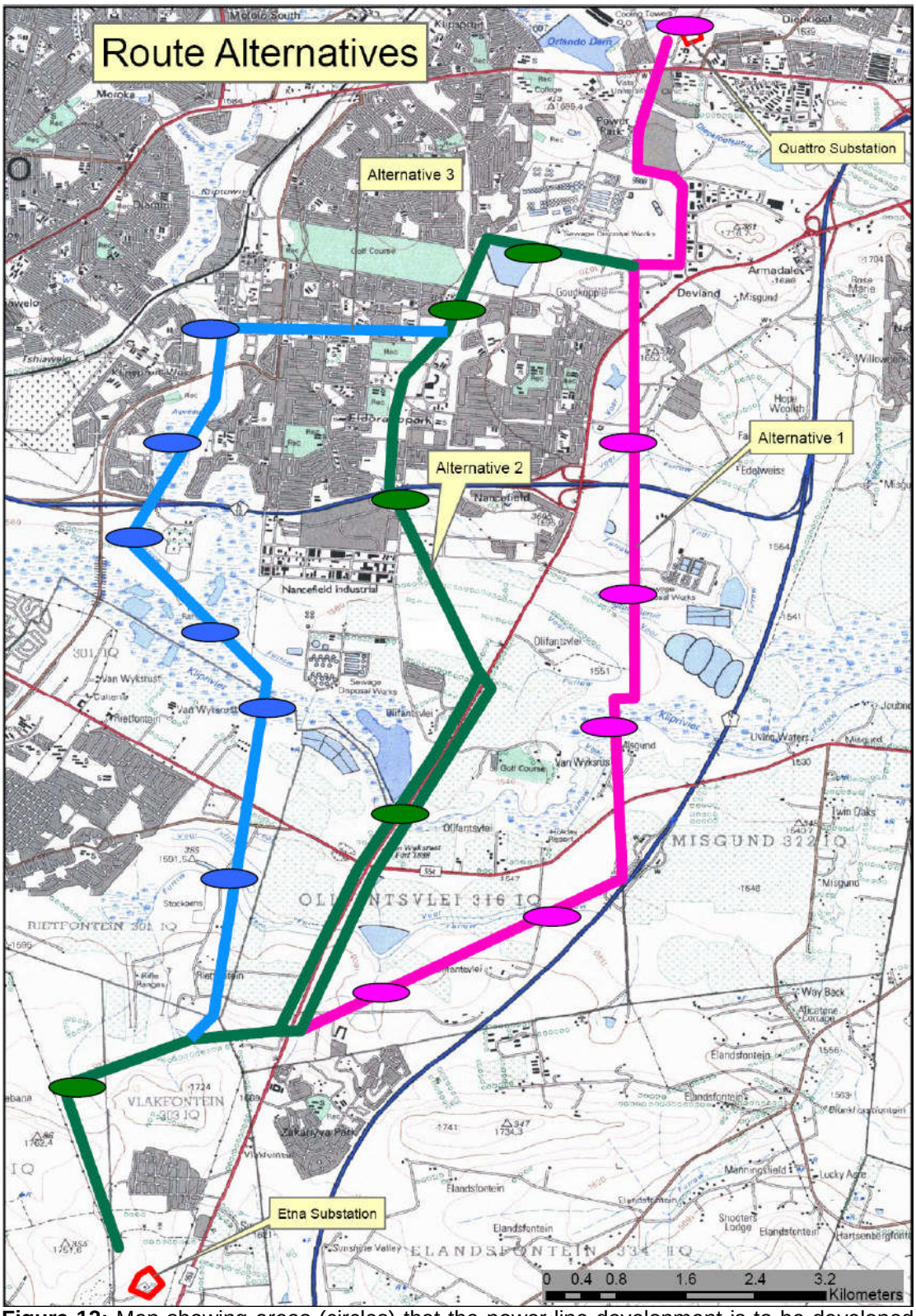


Figure 12: Map showing areas (circles) that the power-line development is to be developed near, along and across the aquatic system (stream and wetland).

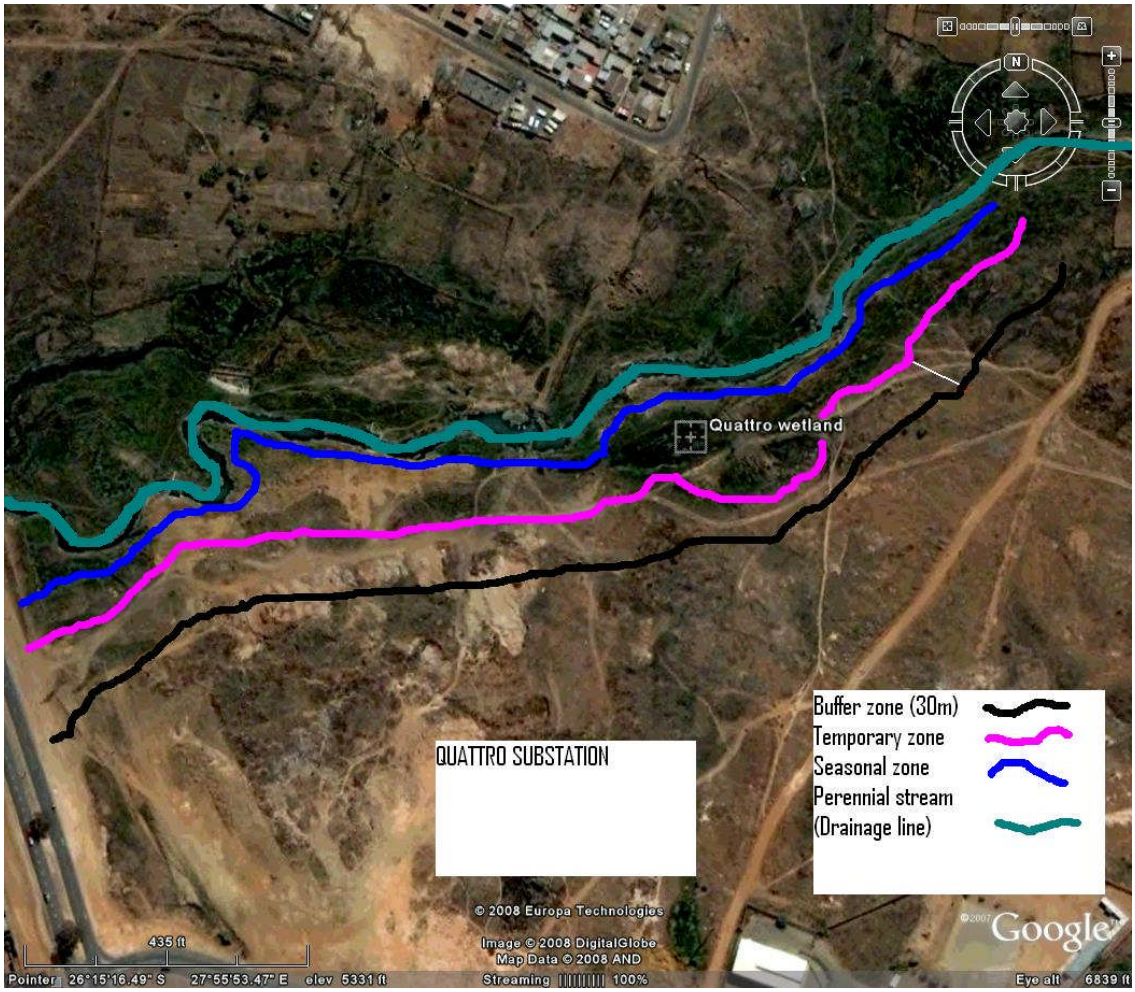


Figure 13: Quattro substation site wetland delineation

This wetland is located in a valley bottom and it is a permanently soaked wetland, i.e. soaked throughout the year as it is characterized by a perennial stream. Its hydrology is dependent to the surface flow from the upstream and immediate catchment. It also gets its water from the adjacent northern subsurface foot slope seepage. Plants that tolerate permanent water logging such as common reeds, Knot weed and bulrush dominate it (refer to figure 14). Map analysis and observation show that this wetland has been influenced by the existence of the catchment dam; the picture below (figure 14) shows the dam wall that is broken and created a donga which has been rehabilitated using a gabion stone packed structure. Filling of impoundments leads to the inundation of the upstream of the dam wall, causing the area to be wet than what it supposes to be. Just like in the study area the outlets of many catchment or farm dams are poorly maintained creating opportunity for erosion gullies and bursting.

Taka Echo & Land Rehabilitation CC performed a Wetland and River Crossing Study dated April 2010 to present the locations and extent of wetland and stream crossing in the four proposed substation sites that were recently proposed for the Quattro substation site construction. (Refer to ***Volume 3 Specialist Reports****)*

The wetland identification in selected areas marked as options for developing Quattro substation sites provided the comparison of four sites marked for substation development.
Option A was found to be the old sewage plant with water at various areas creating wet condition. Option A can be available for development provided the environmental authorization for decommissioning an existing structure is obtained.
Option B has been identified to be an existing sewage sludge dam and chances for development are very low.

Option B is also a possibility if it is moved towards the brown line as indicated on the map. Infact it should be stated that the site should be the area within the brown line as we need to avoid the wetlands.
Option C has a stream on the south boundary. Chances for development are high provided the foot-print does not impact the riverine system and WULA has been obtained.
Option D has been found to be close to the wetland. It has the smallest land available for substation development if riverine encroachment is to be avoided. Chances of development are very low and WULA has to be obtained before development.

Option	***Wetland/ or stream within 500m x 500m***	***Land Use***	***GPS coordinates***	***Wetland state***	***Development requirement (if there is foot print encroaching the buffer zone)***	***Size of the land available for substation development (to avoid buffer zone encroachment)***	***Chances for developmennt***
A	*Yes (source of water need to be identified)*	*Disused sewage system*	*26. 25558 -27. 93243*	*Poor*	*Decommissioning of the old sewage system authorisation*	*665 X 622*	*High*
B	*Yes*	*Veld and sewage water treatments ponds*	*26. 2795 -27.93202*	*Fair*	*Water use licence*	*477 X 40*	*Low*
C	*Yes*	*Veld and farmstead*	*26. 27020 -27.93390*	*Good*	*Water Use licence*	*1200 X 420*	*Medium*
D	*Yes*	*Illegal Rubble dumping area*	*26. 27363 -27. 92204*	*Good*	*Water Use Licence*	*600 X 200*	*Low*

Figure 14: Common reeds growing in Edge of the proposed Substation Site D and the old dam wall rehabilitated with gabion structure.

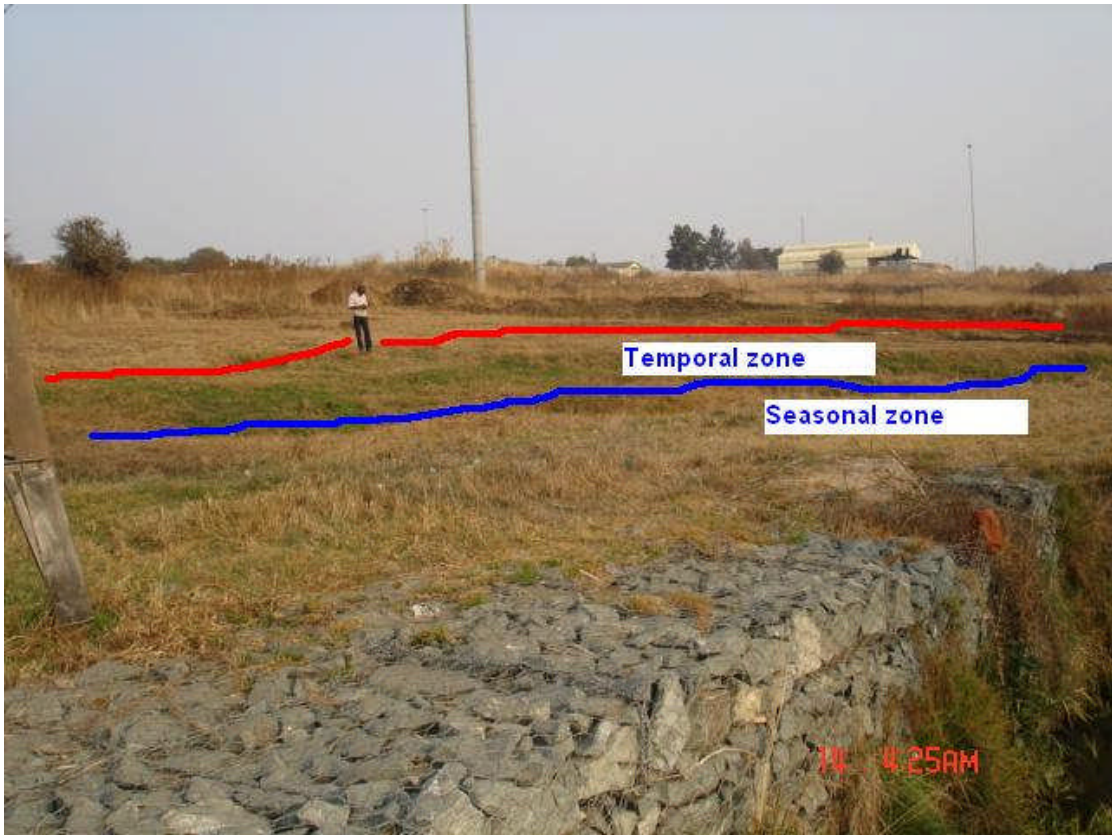


Figure 15: Edge of the proposed Substation Site D

4.3 SOCIO-ECONOMIC ENVIRONMENT

An amendment of the social impact report is also attached to this report which was conducted by Ms. Ingrid Snyman during April 2010 on the four proposed substation sites that have been proposed for the proposed Quattro substation site, indicating the impacts that will be associated with the four new proposed substation sites for the proposed Quattro Substation site. This report will also predict the probable impact of a development (before the development actually takes place) on people's way of life (how they live, work, play and interact with one another on a daily basis), their culture (their shared beliefs, customs and values) and their community (its cohesion, stability, character, services and facilities). (See ***Volume 3 for specialist reports****)*

Site A
The following potential impacts from a social point of view have been noted with regards to Site A: Currently the site poses safety and security risks to nearby residents, and especially children, due to old infrastructure still on site, as well as holes of previous fencing. Thus changing the land use on site would result in an improvement in the safety and security risks. There seems to be plans to develop a golf course on the section of land between Pimville and Goudkoppies (Goudkoppies landfill site and Goudkoppies waste water treatment plant). This section of land overlaps with Site A. Should this proposal continue, careful planning would have to be undertaken to also construct the proposed substation. It is unclear at this stage, however, whether there would be sufficient land available for both the substation and golf course at Site A. The site already has a negative visual impact and is currently in a degraded state due to the defunct infrastructure and littering across the site.Site A is characterised by infrastructural developments in close proximity to the site. It is opposite the Goudkoppies Waste Water Treatment Plant and the Goudkoppies landfill site is situated to the south. The change in the visual environment is thus not expected to have severe negative impacts on the surrounding environment.Should Site A be preferred for the proposed substation, the length of transmission lines would be shorter from the Etna Substation to this substation compared to Site C and Site D. Apart from the economical benefits, this could have some positive secondary impacts due to fewer intrusions and social impacts associated with the longer transmission lines. Site A is fairly easily accessible from an existing road (The extension of Watt Street). Entrances to the site would however, have to be upgraded

SITE B

The following potential impacts with regards to Site B should be noted:

- *Site B is on an open section of land which is currently in a much degraded state due to the invasion of alien vegetation.*
- *The closest areas to the site are Devland Extension 6 and the Goudkoppies landfill site.*
- *Site B is not expected to have severe negative visual impacts on the surrounding environment due to the proximity of the industrial area, as well as the existing Goudkoppies Waste Water Treatment Plant and Goudkoppies landfill site to the site.*
- *Should Site B be preferred for the proposed substation, the length of transmission lines would be shorter from the Etna Substation to this substation compared to Site C and Site D. Apart from the economical benefits, this could have some positive secondary impacts due to fewer intrusions and social impacts associated with the longer transmission lines.*
- *The site is easily accessible from the Houthamer Road turning from East Road. Entrances to the site would however, have to be upgraded.*

SITE C

Site C could result in the following social impacts:

- *The close proximity of Motsoaledi informal settlement to the proposed substation site is a source of concern. During the construction phase, intrusion impacts on these*

residents could negatively impact on their daily living and movement patterns e.g. the increase in vehicular traffic, noise pollution and possible safety and security risks especially for children.

- *According to the Strategic Development Framework (SDF) of Region D and the spatial strategy, this area has been identified as a "Housing Implementation" area. The Motsoaledi informal settlement would thus be formalised and would provide new higher density housing as part of the Baralink Node which would again form part of the "Gateway to Soweto". The feasibility study for the formalisation seems to be under way.*
- *The Baralink Development Framework has been developed by the City of Johannesburg Municipality. This would include the formalisation of the Elias Motsoaledi Informal Settlement and provision of new higher density housing in this area. This issue should thus be adequately addressed to limit any possible negative impacts of Site C on this future development or improvement of the neighbourhood*
- *The site is easily accessible from an existing road (Axle Road). Entrances to the site would however, have to be upgraded.*
- *Noise pollution (construction phase) at Site C is of concern with regards to the close proximity of the medical precinct to the north of the site as patients making use of the facilities would be viewed as sensitive receptors.*

SITE D

The following potential impacts from a social point of view have been noted with regards to Site D:

- *Site D is in close proximity to business facilities such as the Bara Mall, as well as to sensitive receptors such as the Chris Hani Baragwanath Hospital.*
- *There is an existing dirt road (path) on site which is mainly used by pedestrians. This route, would, however stop to function if a substation would be constructed on site. This could negatively impact on the daily living and movement patterns of those making use of this road, even if it can be viewed as an "illegal use". It is possible that this road could be upgraded as part of the project, depending on the final layout of the substation infrastructure.*
- *Site D can be accessed from an existing road, although it is anticipated that the road and the entrance to the site would have to be upgraded.*
- *The proposed site could have some negative impacts on the tourism activities created in the vicinity of the well-known cooling towers and proposed Orlando Ekhaya Development, as well as the overall Baralink Development Framework.*
- *The exact location of the Soweto Empowerment Zone (along Chris Hani Drive near Baragwanath Hospital) has to be taken into consideration to determine the possible impact of this proposed development on Site D.*

PREFERRED SITE

From a social point of view the various sites assessed are ranked as follows (where ranking number one is the most preferred site).

Substation Site	***Ranking***
Site B	*1*
Site A	*2*
Site D	*3*
Site C	*4*

4.3.1 SOCIAL AND POPULATION CHARACTERISTICS

4.3.1.1 Population figures

Herewith a breakdown of the population figures of the regions applicable to the study area:

Table 5: Population figures of the regions applicable to the study area

AREA	POPULATION
CITY OF JOHANNESBURG METROPOLITAN	3 200 000[1]
REGION D (NORTHERN SECTION OF STUDY AREA)	1 058 000[2]
REGION G (SOUTHERN SECTION OF STUDY AREA)[3]	270 000[4]

According to Census 2001, the population of the CJM reached approximately 3,2 million. It has been estimated that 65% of Johannesburg's residents live in Soweto. However, the 2001 statistics puts its population at almost 900 000 (almost one third of the city's population).[5] A large percentage (63%) of the residents in Region G, however, lives in the Greater Orange Farm and Weilers Farm area, which falls outside the study area[6].

Based on the information provided by Census 2001, the population figures of the affected wards in the study area were the following[7]:

Table 6: Population figures of affected wards in the study area

WARD	WARD 8	WARD 10	WARD 11	WARD 17	WARD 18	WARD 24	WARD 25	WARD 26	WARD 28	WARD 31
POPULATION	41 254	34 477	31 121	34 079	41 268	42 880	32 842	34 014	23 709	28 416
TOTAL										344 060

The CJM suggested that due to factors such as, lower fertility rates, a stabilising in-migration of outsiders and the negative growth effects of Aids, that there would be less than one percent growth in the population rate for the city over the next 10 years.

4.3.1.2 Age groups and gender

The age structure of the CJM indicates a fairly young population, as 42% of the population is under the age of 25. In Region G, 40% of the population is under the age of 18[8]. Statistics indicate that the population under the age of 25 in the various affected wards are even higher, as the figures for those under the age of 25 vary between 42% to 50%[9].

[1] Census 2001
[2] www.joburg.org.za
[3] A recent study noted on www.joburg.org.za estimated the population of region G at 1 million people.
[4] www.joburg.org.za
[5] One could thus estimate that the population of Soweto is approximately 1 million based on the information sourced from different sources.
[6] www.joburg.org.za
[7] www.demarcation.org.za
[8] www.joburg.org.za
[9] www.demarcation.org.za

There would thus be a definite need for social activities, recreational facilities, sports and educational facilities, youth development, training and employment opportunities in the area. From information sourced[10] it is evident that there are an equal percentage females (50%) and males (50%) in the municipality's jurisdiction. A similar situation is found in the majority of the various affected wards with the exception of Wards 8 and 24.

4.3.1.3 Education levels

The education figures for the CJM are as follows:

Table 7: Education levels

CITY OF JOHANNESBURG METROPOLITAN					
NO SCHOOLING	SOME PRIMARY	COMPLETED PRIMARY	SOME SECONDARY	STD. 10 / GR. 12	HIGHER
7%	10%	5%	35%	29%	14%

From the above it is clear that less than half of the population have completed school or have a higher education level.

4.3.1.4 Employment

The CJM IDP noted that there has been an increase in the unemployment rate from 27% (Census 2001) to 30% over the last couple of years. Estimations are that approximately half of the population in Region G have no income and that unemployment even reaches 70%, which is far higher than the national average of 24%. The City of Johannesburg Regional Spatial Development Framework for Region G (2008/2009) further emphasised the low levels of education and skills development in the area resulting in high unemployment rates and poverty levels in the region[11]. Many parts of Soweto (Region D) also rank amongst Johannesburg's poorest, although some areas have a blend in terms of the wealthy and the poor. There, however, remains high unemployment rates and similar low levels of income. A high demand for informal business thus exists.

In terms of the affected wards, the unemployment rates can be summarised as follows:

Table 8: Unemployment rate in the affected wards[12]

WARD	WARD 8	WARD 10	WARD 11	WARD 17	WARD 18	WARD 24	WARD 25	WARD 26	WARD 28	WARD 31
UNEMPLOYMENT RATE	40%	38%	47%	48%	46%	40%	55%	58%	55%	52%
AVERAGE										48%

The above clearly indicates that based on the overall household income levels of the people residing in the study area, a large part of the population is unemployed and live in poverty. The need for employment is thus critical. A strategy to address this issue has been incorporated in the Johannesburg 2030 vision. In the CJM region, successful employment creation is challenged by the skills mismatch between the industry's needs and the local labour force supply. This aspect needs serious attention and needs to be balanced to ensure economic growth. Further aspects to address unemployment include improved support for

[10] Census 2001
[11] City of Johannesburg Regional Spatial Development Framework for Region G (2008/2009)
[12] The unemployment rate referred to did not include the "economically not active" category

SMMEs, strategic investments in infrastructure projects, and the improvement of the procurement process to involve SMMEs and BEEs.[13]

4.3.2 HOUSING AND BASIC SERVICES

Fifteen percent of the city's residents lived in informal settlements and 14% in backyard shacks[14]. The City of Johannesburg Regional Spatial Development Framework for region G supports this situation as it indicated that the high number of informal settlements in the region implies a definite shortage of housing in the area. One should, however, note that the area, within Region G, with the most desperate need for housing falls outside the study area for the proposed project.
The CJM IDP indicated that the city will aim to develop sustainable neighbourhoods. As part of this objective, affordable housing should focus on the rental market to address the backlogs in terms of the housing delivery process.

The following table provides an outline of the status of the basic services of the CJM[15]:

Table 9: Status of Basic Services

CITY OF JOHANNESBURG METROPOLITAN : ACCESS TO SERVICES			
ELECTRICITY FOR LIGHTING PURPOSES	**REFUSE REMOVAL ONCE A WEEK**	**FLUSHED TOILET SEWER SYSTEM**	**REGIONAL LOCAL WATER SCHEME**
85%	**91%**	**82%**	**48%**

In the Soweto area (Region D) the bulk water is supplied by Rand Water, whereas Johannesburg Water is responsible for providing Soweto with water and sanitation. Soweto is seen as one of the highest water consumers under the CJM[16].

In the northern section of the study area, waste management needs critical attention. Illegal dumping occurs in almost all open spaces, along water sources and vacant sites[17].

4.3.3 LAND USE AND PROPERTIES

On a broader scale, the area under study is used mostly for residential purposes. Suburbs that would be directly affected by the development are as follows:

- Northern section: Soweto - Diepkloof, Pimville, Klipspruit West and Kliptown as well as Devland ;

The largest of these areas is Soweto with emphasis on Klipspruit West, Kliptown, and Pimville. Other major suburbs are Lenasia, Lenasia South and Eldoradopark. Soweto landmarks include:

- The cooling towers, at the defunct Orlando Power Station;
- The Chris Hani Baragwanath Hospital;
- Credo Mutwa Village;
- The Apartheid Museum;
- Freedom Square (also referred to as the Walter Sisulu Square of Dedication);
- Ekhaya Soweto Neighbourhood Museum;
- Hector Pieterson Memorial Museum;
- Mandela Family Museum; and

[13] City of Johannesburg Metropolitan, (2007/8) Integrated Development Planning (IDP) Document
[14] City of Johannesburg Metropolitan, (2007/8) Integrated Development Planning (IDP) Document
[15] Census 2001
[16] City of Johannesburg Regional Spatial Development Framework for Region D: Draft (2008/2009)
[17] City of Johannesburg Regional Spatial Development Framework for Region D: Draft (2008/2009)

- Regina Mundi Catholic Church.

The above also attributes to Soweto being one of the most popular tourist destinations, apart from the Kruger National Park, in South Africa.

- Southern section: Eldorado Park, Lenasia, Klipriviersoog Nancefield Industrial, Zakariyya Park and Lehae.

This section is traversed by the N1 and the Golden Highway, with the N12 roughly forming the region's (D) northern border. The section is characterised by some larger middle-income neighbourhoods, smallholdings or agricultural land and various smaller settlements due to the inmigration of individuals seeking work. Furthermore the area is characterised by many natural features such as ridges, dams, tributaries and grassveld.

Lenasia, which is a large "Indian" township south of Soweto, is the major centre in the "southwestern section" of the study area. This suburb also had its origin due to the former Group Areas Act. Lenasia is now a rapid growing suburb with various shopping centres, churches, mosques, and commercial and industrial centres.

The Olifantsvlei Municipal Nature Reserve is located in the mid section of the study area, south of Eldorado Park.

4.3.4 AGRICULTURE

*Dr. Kingsley Ayisi compiled an Agricultural Impact Assessment Report dated April 2010 to determine the impact of the four proposed substation sites on the agricultural potential of the study area. (See **Volume 3 Specialist Reports**) Information was abstracted from the specialist report for use in the EIA.*

The proposed locations for the substations occur mainly in urban and peri-urban areas and comprise largely urban areas, open areas, as well as fallow lands occurring between and around settlement and industrial areas. The surrounding areas of site D have some smallholder maize production fields.

Table: General characteristics of the proposed substations as inferred from site visit.

Site	***Coordinates***	***General characteristics***
A	*27 55 10, 74 E, 26 16 16, 87 S*	• *This is an old sewage processing site with ruins of the structure visible.* • *The vegetation is highly disturbed* • *Peri-urban site*
B	*27 55 50, 13 E, 26 16 27, 19 S*	• *Fallow land within an industrial area* • *Disturbed vegetation dominated by thatch grass and broadleaf weeds* • *The area is zoned as industrial*
C	*27 56 10, 2 E, 26 16 7, 03 S*	• *Fallow land within an industrial area* • *Disturbed vegetation dominated by thatch grass and broadleaf weeds* • *The area is not yet zoned as industrial*
D	*27 55 48, 7 E, 26 15 20, 25 S*	• *Fallow land boarded by the Bara mall, wetland and settlement areas within an industrial area* • *Urban site* • *Disturbed vegetation dominated by thatch grass and broadleaf weeds* • *Smallholder maize production farms were observed close t the peripheries of the site*

Dr. Kingsley Ayisi compiled an Agricultural Impact Assessment Report dated August 2008 to determine the impact of the proposed development on the agricultural potential of the study area**.** (See **Volume 3 Specialist Reports**) Information was abstracted from the specialist report for use in the EIA.

A sizable proportion of the existing farms are located away from the urban portions which will render them suitable for arable and livestock production. Livestock grazing can occur on portions of the site which contain significant proportions of *Themida triandria*, a medium to high palatable species. The significant proportion of common thatch grass could mask the contribution of the palatable species for effective livestock production. The size of the farm may also be a limitation to economically viable production.

The project site is also located in an area conducive for rainfed arable crop production and there is significant amount of surface water for irrigation development. Based on the result of the assessment the site can support the cultivation of diverse range of field crops, without irrigation such as Dryland Maize and Sugarbean.

By definition (based on Part 1 of the Regulation of Conservation of Agricultural esources Act 43 of 1983), the land occurring at the project site consist of combination of areas classified as high and low potential for agriculture. There are also some areas which may be considered medium potential. The high and medium potential areas are found at the old croplands which cover approximately 1062 ha. The site is considered to cover low, medium and high potential area due to the following reasons:

Low potential
All the three proposed power line routes will traverse significant portion of land areas that are rocky, urbanised with human settlement and industries. These are not suitable for agricultural activities.

Medium potential
1) There are localised pockets of undesirable soil forms such as Mispah, in addition to Rock outcrop on the previously cropped lands.
2) The abundance of *Themida triandria* will not support good livestock grazing.
3) Low pH and sub-optimal concentrations of some minerals and organic matter.

High potential
1) A large proportion of the area under assessment contains Hutton soil forms which is considered high potential at the project site
2) The average topsoil clay content range from 10 to 32 %, which qualifies it to be of high potential.
3) There is presence of perennial surface water which is of good quality for irrigation.
4) The project site is expected to receive moderate rainfall and is classed as 2, which is considered to be conducive to rainfed agriculture.

4.3.5 HERITAGE RESOURCES

Based on the outcome of the assessments done by Mr. Mathoho Eric of Vhufa Hashu Consultants, these are the outcomes of finds and heritage resources we would like to recommends that the proposed substation Site B, C and D be utilized as the most preferred sites since there is no other actions or any further heritage mitigation measures needed as no heritage resource sites or finds of any value or significance which were identified within the proposed substation sites. However, if Site A becomes the preferred sites.

We would like to suggest that due to treatment structures, the substation be positioned further north of the structures within the disturbed Eucalyptus plantation area. There is consequently no reason from a heritage point of view why Eskom should not proceed with the proposed substation project on either of the proposed sites.

No further studies/ Mitigations are recommended for the proposed project and there is no archaeological or place of historical significance that will be impacted by the proposed project. However, should any chance archaeological or any other physical cultural resources be discovered subsurface, heritage authorities should be informed. From an archaeological and cultural heritage resources perspective, there are no objections to the proposed substation development and we recommend to South African Heritage Resources Agency (SAHRA) authorities to approve the project as planned.

Dr Julius Pistorius CC compiled a Phase I Heritage Impact Assessment dated August 2008. The aim of the study to establish whether any of the types and ranges of heritage resources as outlined in Section 3 of the National Heritage Resources Act (Act 25 of 1999) do occur in or near the proposed Eskom Project Area, and, if so, to establish the significance of these heritage resources. To establish whether such heritage resources will be affected by the proposed Soweto Integration Project, and, if so, to determine possible mitigation measures that can be applied to these heritage resources. (See **Volume 3 Specialist Reports**)

The Phase I HIA study for the proposed Soweto Integration Project revealed the following types and ranges of heritage resources as outlined in Section 3 of the National Heritage Resources (No 25 of 1999) near the Project Area, namely:

- A stone walled site which date from the Late Iron Age.
- A farmstead complex and house which are older than sixty years and which qualify as historical structures.
- A large formal cemetery.
- Remains from the recent past

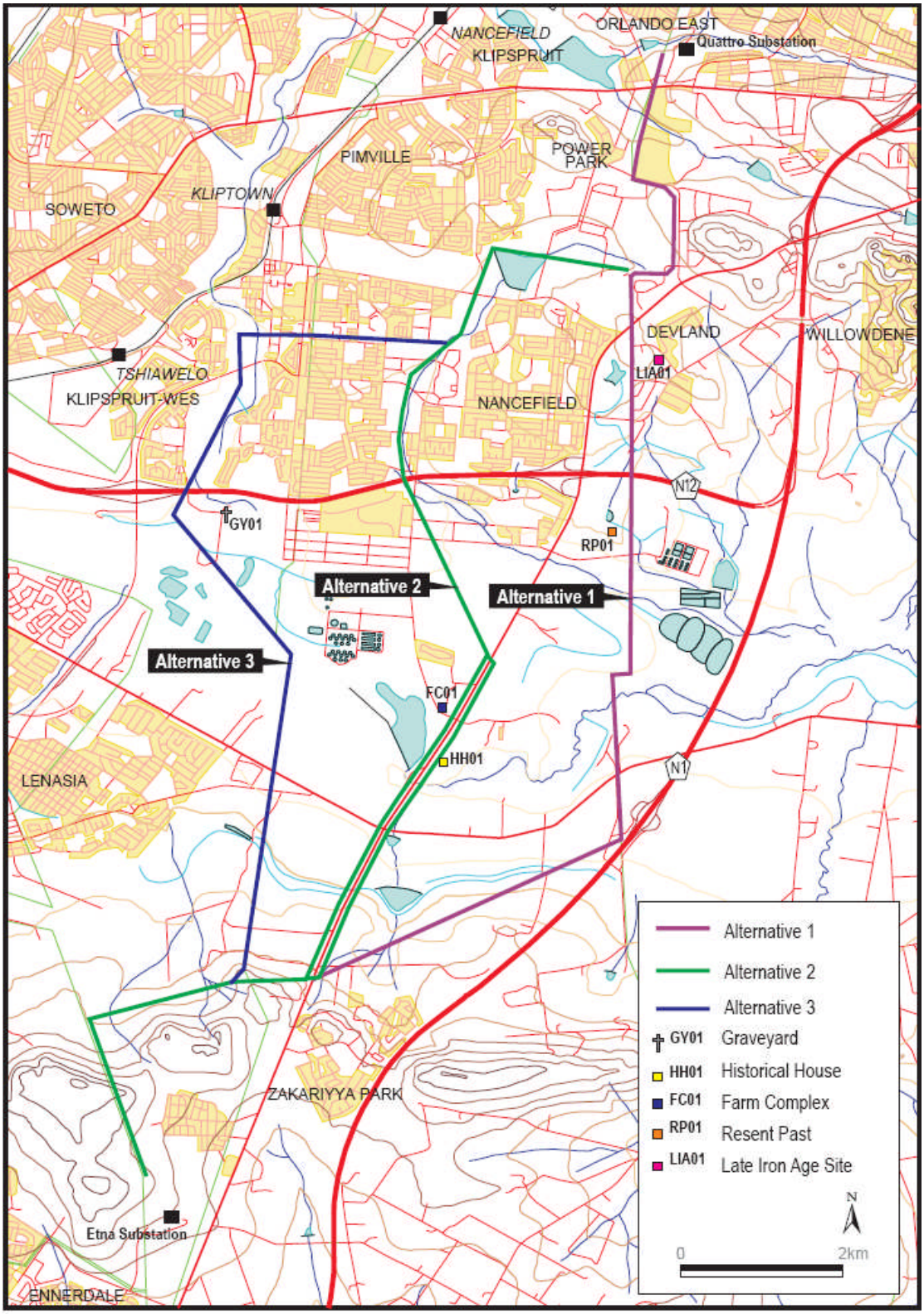


Figure 16 The Soweto Integration Project Area in Soweto in the Gauteng Province of South Africa (above).
Note the presence of a Late Iron Age site, historical structures and a graveyard near the Eskom Project Area.

A stone walled site
The stone walled site (Site LIA01) slightly to the west of Alternative 1 qualifies as an archaeological site which date from the Late Iron Age and possibly the Historical Period as well. Archaeological, historical and paleontological sites are protected by Section 35 of the National Heritage Resources Act (No 25 of 1999). This site may not be affected (demolished, altered, renovated, removed) before the Provincial Heritage Resources Authority (PHRA) has approved such alterations.

Historical structures
The farmstead complex (FC01) as well as the house (HH01) on opposite sides of the Golden Highway (R553) near Alternative 2 are older than sixty years and therefore qualify as historical structures.

All buildings and structures older than sixty years are protected by Section 34 of the National Heritage Resources Act (No 25 of 1999) and may not be affected (demolished, altered, renovated, removed) before the Provincial Heritage Resources Authority (PHRA) has approved such alterations.

A formal graveyard
All graveyards and graves such as the one to the east of Alternative 3 (GY01) can be considered to be of high significance and are protected by various laws. Legislation with regard to graves includes the National Heritage Resources Act (No 25 of 1999) whenever graves are older than sixty years. The act also distinguishes various categories of graves and burial grounds. Other legislation with regard to graves includes those which apply when graves are exhumed and relocated, namely the Ordinance on Exhumations (No 12 of 1980) and the Human Tissues Act (No 65 of 1983 as amended).

Remains from the recent past
The remains from the recent past (RP01) are not older than sixty years and therefore do not qualify as historical remains. These remains have no historical or cultural significance.

It is unlikely that any of these heritage resources will be affected by the proposed Soweto Integration Project as they do occur some distance from the alignments for Alternatives 1 to 3 for the 400kV power lines.

Another Heritage Impact Assessment was conducted by Mr. Eric Mathoho of Vufa Hashu Consultants on the four new proposed substation sites, and how they would impact the Heritage features in the area proposed.

4.3.6 EXISTING AND FUTURE INFRASTRUCTURE/DEVELOPMENTS

Eduard van der Linde & Associates compiled a Town Planning Input Report to identify the following within the study area:

- Existing land uses and development trends in the three corridors;
- Established land use rights in the affected areas ;
- Existing and planned infrastructure and other major developments;
- Establish official land use policy for the affected areas.

The Town Planning Input Report, 2008 is included in **Volume 3 Specialist Reports**.

Existing Land uses
Substation
The site is located on primarily vacant land.

Alternative 1

From Quattro Substation to Devland and Freedom Park the servitude appears to be largely vacant from the substation site to Devland. However enroute to Freedom Park there is some illegal squatting in certain parts of the corridor.

On the northern side of the N12 Moroka Bypass, there is a well developed formal public park in the most southern section of this route through Freedom Park. South of the N12 Bypass, the proposed power line route seems to follow an existing Rand Water servitude.

The route crosses parts of the farms Misgund 322 IQ and Olifantsvlei 316 IQ. It passes to the west of the Bushkoppie Waste Water Treatment Works (Jo'burg Water), and follows existing farm portion boundaries down to Harrington Spruit. The overflow dams of the Bushkoppie Works lie to the east of the route. The land to the south of the N12 belongs to the City of Johannesburg (RE of Ptn. 2 of the farm Misgund 322 IQ) and is primarily undeveloped. There are some farming activities on the agricultural land to the north of Harrington Spruit.

The area from Harrington Spruit to Engen 1 Stop is characterised by low intensity farming and some commercial uses along the R554.

Enroute Golden Highway the land is vacant and farming activities appear to be very limited. The final part of this route approaching Golden Highway is characterized by ridges very typical of this part of Witwatersrand.

Alternative 2
From Devland to Eldorado Park the land is vacant and the section to the north of the Goudkoppies Landfill site is much undulated - possibly due to either illegal dumping or mini borrow pits.

Along the western side of Pimville Dam, Union Avenue the route follows an open space strip (flood plain of the Harrington Spruit) in the direction of the Eldorado Park CBD. There are also other existing power lines in this area following the same route.

The corridor shift west of the Eldorado Park CBD, crosses both Sirkel and Hoof Road, then turns in a southerly direction and follows the open space strip (flood plain) all the way down to the N12 Moroka Bypass. The existing power lines follow the same route.

After crossing the N12, the route veers off in a south-easterly direction, passing the Slovo Park Informal Settlement. It cuts through Nancefield and the vacant land south of Nancefield (R.E. of Portion 2 of the farm Olifantsvlei 316 IQ) up to the Golden Highway (K45/R553). Limited farming activities occur in this last part of this section of the route.

The route follows the Golden Highway in a south-westerly direction all the way to the southern boundary of Lehae, where it turns to the west. Both sides of the Golden Highway are seen as possible alternative routes. Parts of the Golden Highway are lined with blue gum trees acting as windbreaks for the farming activities in this area.

Cavendish Road extension (Road 399) from Nancefield joins up with the Golden Highway along this section, and the K144/K142/Golden Highway intersection is also along this section. Several small farm portions (parts of Olifantsvlei 316 IQ) are traversed along this section.

The route crosses Harrington Spruit between Road 399 and the K144. A large wetland system – in the floodplain of Harrington Spruit - is located on the western side of and very close to the Golden Highway. The maturation ponds of the Olifantsvlei Waste Water Treatment Works also lie to the west of the route.

South of Lehae the route runs in a westerly direction (page 24) and then, after initially deviating in a south-westerly direction, it turns south-east heading straight for the Etna Substation located to the west of Vlakfontein.

Various portions of the farms Vlakfontein 303 IQ and Roodepoort 302 IQ are traversed in this section. This vacant land to the south of Lehae and to the west of Vlakfontein is also characterised by the ridges typical of this area.

Alternative 3
This route emanates from Alternative 1 in the section north of the Eldorado Park CBD and heads straight west through Eldorado Park Extensions 6 and 7.

Although there are some vacant corridors along this section, the route passes through primarily built-up areas, including two schools.

After crossing Boundary Road (Kliptown), the route turns in a general south-westerly direction and initially follows what appears to be the future road reserve for the planned K122 – K43 link (Union Road - Main Road) before it crosses over Main Road to follow another open space system – the flood plain of a local spruit. The land earmarked for the future road, is occupied by informal settlements.

From Kliptown to Nancefield the route follows the flood plain (open space system) and then crosses the N12 Moroka Bypass before turning in a south-easterly direction. It passes to the south of Avalon Cemetery and heads for the most south-western point of the Nancefield Industrial area, where it turns due south.

Johannesburg Water has a major waste water treatment plant (Olifantsvlei) in this southern part of Nancefield. This section of the route is vacant, but characterised by the flood plain of the local spruit, as well as the major wetlands area to the south of the cemetery. Various portions of the farm Klipriviersoog 299 IQ are traversed to the south of the N12.

From Nancefield to Lehae it is primarily vacant agricultural land with little signs of farming activities. The RE of Portion 2 of the farm Olifantsvlei 316 IQ (Johannesburg Council) as well as parts of the farm Rietfontein 301 IQ are traversed in this section. The maturation ponds of the Olifantsvlei Waste Water Treatment Works lie to the east of the route.

At the most southern extreme of this section, the route crosses the K142 to follow a route running along the western boundary of Lehae. There is a major stormwater channel in this section of the route.

This route to a large extent follows the alignment of existing power lines.

Past Lehae the route traverses primarily vacant land with little signs of farming activities, but also established power lines.

Existing Land Use Rights
The land use rights are under control of City of Johannesburg.

Alternative 1
The proposed new Quattro Substation is on land zoned “Undetermined”. The same zoning applies along the services corridor all the way down to the East Street extension in Devland.

Uses allowed i.t.o the “Undetermined” zoning are agricultural purposes and dwelling houses. Apart from extensive electrical infrastructure, the area and strip south of Old Potchefstroom Road, are primarily vacant.

The route goes through a farm portion (Portion 12 of the farm Misgund 322 IQ) zoned “Agricultural” before entering the Rivasdale township with a zoning of “Sewage farm”. In terms of the “Agricultural” zoning, the primary uses are agricultural purposes and dwelling houses and in terms of the “Sewage farm” zoning, the primary use is sewage works. There are no existing developments along this section of the route.

After exiting Rivasdale, the route turns south on land zoned “Municipal” - allowing for municipal purposes and canteen as primary rights. “Municipal purposes” is not defined in the Johannesburg Town Planning Scheme.

This section of the route passes between the Goudkoppies Landfill Site and the Devland Extension 1 industrial township. After crossing the Golden Highway and along the full length of this section down to the N12, the route seems to follow an existing servitude area, zoned “Municipal” and “Public Open Space”. There are some squatting in parts of the servitude area and a formal park close to the N12 – otherwise open space.

The land to the south of the N12 all the way to the Golden Highway where the Red Route joins up with the Blue Route, is zoned “Agricultural”.

Alternative 2
Where the Blue Route starts to the west of Rivasdale, the land is zoned “Municipal”. From there it crosses land zoned “Public Open Space” in the section north and west of Pimville Dam. Before crossing Union Road, it crosses two erven in Pimville Extension 2 – one zoned “Residential 3” and the other zoned “Business 2”. Both sites are vacant. The “Residential 3” zoning primarily makes provision for dwelling units and residential buildings, and the primary rights in terms of the “Business 2” zoning, are shops, dwelling units, residential buildings, places of instruction, business purposes (offices), car sales lots, canteen, dry cleaners, and laundrettes.

To the south of Union Road the route primarily follows a strip zoned “Public Open Space”. It also crosses sites zoned “Educational” and “Residential 2” before passing the Eldorado Park CBD on the western side. The route remains in the “Public Open Space” strip all the way down to the N12. All of the land in this section is undeveloped.

The Nancefield area south of the N12 is zoned “Residential 1” and the Olifantsvlei farm portions south of Nancefield and along the Golden Highway virtually all the way to the K142 intersection, is zoned “Municipal”. Apart from a section of the Slovo Park informal settlement and the odd house in Nancefield, the entire section of this route is free from any development of any significance.

The farm portions in the vicinity of the K142/Golden Highway intersection are zoned “Undetermined” and “Agricultural”. South of the intersection the zoning is “Public Open Space” on the western side of the Golden Highway and “Agricultural” on the eastern side. The section south of Lehae and all the way to the Etna Substation is zoned “Agricultural”. No existing developments are encountered along the whole length of this last section.

Alternative 3
This route deviates from Alternative 2 in Eldorado Park Extension 6 on a vacant site zoned “Educational”. Along this route, heading west towards Kliptown, the route crosses properties zoned “Educational” and “Residential 1”. Most of these erven are developed. Where the route turns south in Kliptown, it follows a strip of unzoned land earmarked for a future road before it crosses Main Road. This strip is fully occupied by informal housing.

South of main Road and down to the N12, the route again follows a strip of land zoned “Public Open Space”. The rest of the route, south of the N12 and all the way to where it joins the Blue Route again south-west of Lehae, the zoning is either “Undetermined”, “Agricultural” or “Municipal”.

No developments are encountered along the last section of this route.

Planned Developments and infrastructure

Alternative 1:

- Johannesburg Project Company: Orlando Ekhaya Project. This proposal impacts on the s/s site and most northern section of corridor;

- Gauteng Housing: New housing schemes to be known as Elias Motsoaledi Settlement, Golden Triangle south of Golden Highway. This may affect the corridor;
- Gautrans: Proposed PWV- and K-routes have a long history in this Metropolitan area. This corridor crosses the K45 (Golden Highway), the proposed K122 (Union Road extension), the PWV 16 (N12), and the K144, before reaching the K45 again in the vicinity of Lehae. There are no short term plans to upgrade the existing or construct any of the proposed routes.
- Johannesburg Water: Upgrade Goudkoppies and Bushkoppie Waste Treatment Works – No impact on this route. There are plans to install two new main sewer lines (381mm and 160mm) across the servitude corridor just to the south of Old Potchefstroom Road.

Alternative 2

- Golf Estate on the land to the north of the Pimville dam;
- Johannesburg Property Company: Proposed Pimville Extension 2 was approved recently and the re-proclamation conditions of establishment are currently being complied with. Severe impact on corridor;
- Gauteng Housing: Plans for a number of new housing schemes on vacant land in and surrounding the Eldorado Park CBD.
- Gautrans: Routes K122 (Union Road), PWV 16 (N12), K45 (Golden Highway), K142 and then the proposed K154 through Vlakfontein. There are no short term plans to upgrade the existing or to construct any of the proposed routes.
- Johannesburg Water: Planning 2 main water pipelines in vicinity of Pimville Dam-one line running north-south to the east of the dam and the other approaching the dam from the west. Otherwise infrastructure follow existing road reserves. May impact on this corridor.

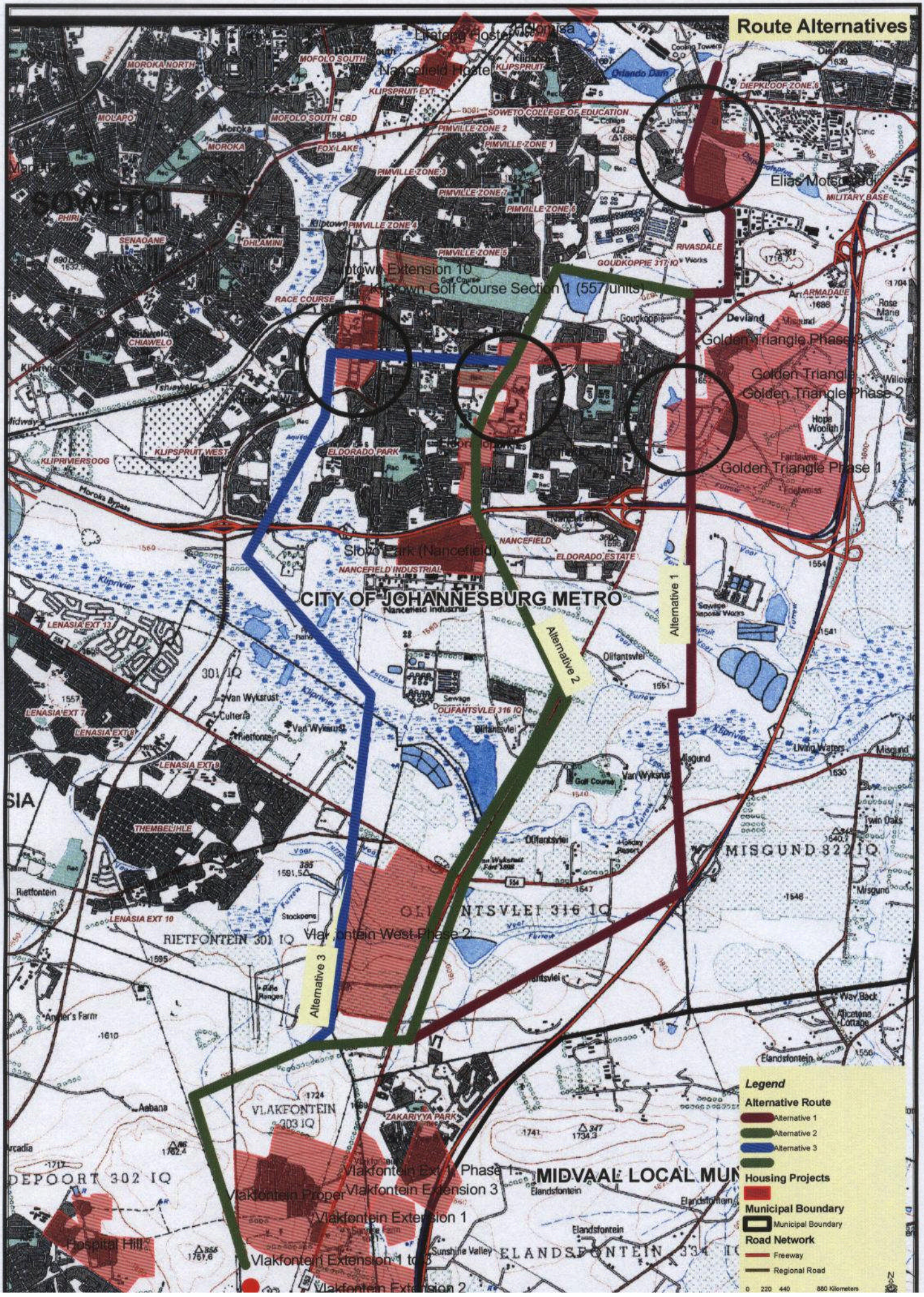
Alternative 3

- City of Johannesburg: Upgrading of Kliptown (investment promotion node);
- Gauteng Housing: New housing schemes in Eldorado Park Ext 6 and Kliptown;
- Gautrans: Routes K122/K43 (proposed Union Road extension into Main Road), PWV 16 (N12) and the K142. Again, there are no short term plans to upgrade the existing or to construct any of the proposed routes;
- Johannesburg Water: Upgrade Olifantsvlei Waste Water Treatment Works. Plans do not impact on alternative.

Refer to figures below as indication of future developments. For maps on future infrastructure refer to Volume 3 Development Assessment pg. 66 and 67.

The land use policies are also discussed in the Development Assessment. For information refer to Volume 3.

Figure 17: Developments planned by Gauteng Department of Housing.


Route Alternatives
Alternative 1
Alternative 2
Alternative 3
CITY OF JOHANNESBURG METRO
MIDVAAL LOCAL MUN
Golden Triangle Phase 1
Golden Triangle Phase 2
Golden Triangle Phase 3
Kliptown Extension 10
Kliptown Golf Course Section 1 (557 units)
Slovo Park (Nancefield)
Vlakfontein West Phase 2
Vlakfontein Ext 1 Phase 1
Vlakfontein Proper
Vlakfontein Extension 3
Vlakfontein Extension 1
Vlakfontein Extension 1 to 3
Vlakfontein Extension 2
Legend
Alternative Route
Alternative 1
Alternative 2
Alternative 3
Housing Projects
Municipal Boundary
Municipal Boundary
Road Network
Freeway
Regional Road
0 220 440 880 Kilometers

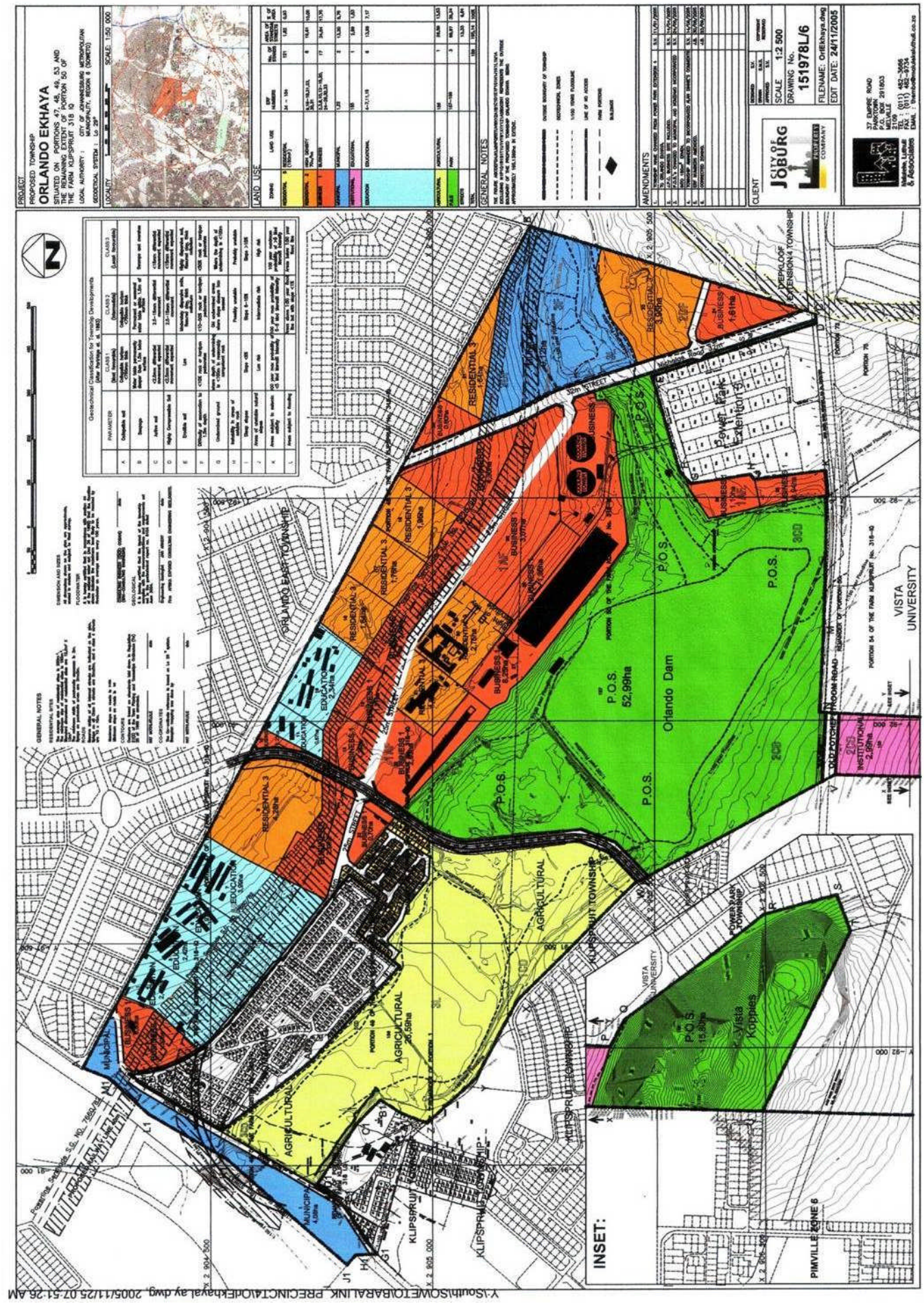


Figure 18: Orlando Ekaya Proposal by Johannesburg Development Company.

5. LEGAL CONSIDERATIONS

In the past the Environment Conservation Act, 1989 (ECA) (Act No 73 of 1989) identified activities (Section 21(1), Government Gazette #18261), which may have a substantial detrimental effect on the environment and that are subject to the Environmental Impact Assessment (EIA) regulations.

The EIA regulations in terms of ECA have recently been repealed and replaced by Regulations promulgated (GN R385, 2006) in terms of Chapter 5 of the National Environmental Management Act (NEMA), 1998. The Minister of Environmental Affairs and Tourism has in terms of section 24(5) read with section 44 of the National Environmental Management Act, 1998 (Act No. 107 of
1998), made the EIA Regulations.

The purpose of these Regulations is to regulate procedures and criteria as contemplated in Chapter 5 of the Act for the submission, processing, consideration and decision of applications for environmental authorization of activities and for matters pertaining thereto. Government Notice 386 and 387 identify activities in terms of NEMA that require the undertaking of either a Basic Assessment Report or a Scoping Study together with an Environmental Impact Assessment Report respectively.

The project that Eskom Transmission Services proposes entails the following activities which are listed in terms of the Environmental Impact Assessment (EIA) regulations under the NEMA Act:

Number and date of the relevant notice	**Activity No (s) in terms of the relevant notice**	**Description of each activity**
No. R387, 21 April 2006	1 (l)	The construction of facilities or infrastructure, including associated structures or infrastructure, for the transmission and distribution of above ground electricity with a capacity of 120 kilovolts or more

Table 10: Listed Activities in terms of Government Notice No. R387

As a result, the proposed development has to undertake both a Scoping Study and a Full Environmental Impact Assessment (Environmental Impact Report – EIR). In addition to the requirement for an authorization in terms of NEMA there may be additional legislative requirements which need to be considered prior to commencing with the activity, for example: The National Water Act (Act 36 of 1998); National Heritage Resources Act (Act 25 of 1999), National Forest Act (Section 7) etc. Naledzi Environmental Consultants were commissioned by the applicant, Eskom Transmission Services, to provide an environmental report that seeks to comply with the EIA regulations above.

The following are possible activities that may take place that might also require authorization:

Number and date of the relevant notice	Activity No (s) in terms of the relevant notice	Description of each activity
No. R386, 21 April 2006	1 (m)	The construction of facilities or infrastructure, including associated structures or infrastructure, for any purpose in the one in ten year flood line of a river or stream, or within 32 meters from the bank of a river or stream where the floodline is unknown, excluding purposes associated with existing

		residential use, but including canals, channels, bridges, dams and weirs.
No. R386, 21 April 2006	7	The above ground storage of a dangerous good, including petrol, diesel, liquid petroleum gas or paraffin, in containers with a combination capacity of more than 30 cubic meters but less than 1000 cubic meters at one location or site
No. R386, 21 April 2006	14	The construction of masts of any material or type and of any height, including those used for telecommunication broadcasting and radio transmission, but excluding Masts of 15 meters and lower exclusively used by radio amateurs or for lighting purposes Flag poles Lightning conductor poles
No. R386, 21 April 2006	15	The construction of a road that is wider than 4 meters or that has a reserve wider than 6 meters, excluding roads that fall within the ambit of another listed activity or which are access roads of less than 30 meters

Table 11: Listed Activities in terms of Government Notice no. R386

5.1 THE CONSTITUTION ACT, 1996 (ACT NO. 108 OF 1996)

The constitution states that:

"…everyone has the right 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". The Act therefore imply that measures must be implemented that 1) prevent pollution and ecological degradation; 2) promote conservation; and 3) secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development'.

5.2 ENVIRONMENT CONSERVATION ACT, 1989 (ACT NO 107 OF 1989)

The purpose of the Environment Conservation Act is to provide the effective protection and controlled utilization of the environment. The coming into effect of the National Environment Management Act (NEMA) repealed some but not all of ECA provisions, namely the control of environmental pollution, the control of activities which may have a detrimental effect on the environment and the remediation of environmental damage. Development must be environmentally, socially and economically sustainable. In terms of section 20, the developer is required to obtain a permit from the Department of Water Affairs and Forestry in order to establish, provide or operate any waste disposal site within the boundaries of the proposed development. Where hazardous or domestic wastes are to be removed from the site by contractors, the developer needs to place a contractual obligation on the contractor to dispose of the waste at a licensed site and to ensure that this is properly done.

The Act therefore implies that the developer must develop in a sustainable fashion in which integrated environmental management is implemented i.e. taking cognizance of ecological, social and economic issues. No waste disposal is proposed, but any hazardous waste created during construction will have to be disposed off at a permitted Waste Disposal Site. The developer will be responsible for rehabilitating disturbed sites.

5.3 NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998 (ACT NO. 107 OF 1998)

The act states that sustainable development requires the consideration of all relevant factors including:

(i) that the disturbance of ecosystems and loss of biological diversity are avoided, or, where they cannot be altogether avoided, are minimized and remedied;

(ii) that a risk-averse and cautious approach is applied, which takes into account the limits of current knowledge about the consequences of decisions and actions

(iii) the participation of all interested and affected parties in environmental governance is promoted, and all people have the opportunity to develop the understanding, skills and capacity necessary for achieving equitable and effective participation, and participation by vulnerable and disadvantaged persons must be ensured.

5.4 NATIONAL ENVIRONMENTAL MANAGEMENT: BIODIVERSITY ACT, 2004 (ACT NO. 10 OF 2004)

The purpose of the Biodiversity Act is to provide for the management and conservation of South Africa's biodiversity within the framework of NEMA and the protection of species and ecosystems that warrant national protection. As part of its implementation strategy, the National Spatial Biodiversity Assessment was developed.

The National Spatial Biodiversity Assessment (NSBA) classifies areas as worthy of protection based on their biophysical characteristics, which are ranked according to priority levels.

A total of nine vegetation zones were identified within the study area. All these vegetation zones are currently degraded or transformed. The main causes for this degradation and transformation are residential development, crop cultivation, wetland drainage, medicinal plant harvesting and topsoil excavation. The least disturbed vegetation zones are Wetlands, Degraded Rocky Ridges and Degraded Foot Slopes.

5.5 NATIONAL FOREST ACT, 1998 (ACT NO. 84 OF 1998)

This Act provides for the management, utilisation and protection of forests through the enforcement of permitting requirements associated with the removal of protected tree species, as indicated in a list of protected trees (first promulgated in 1976 and has been updated since). Permits are administered by the Department of Water Affairs and Forestry (DWAF).

Provincial ordinances were developed to protect particular plant species within specific provinces. The protection of these species is enforced through permitting requirements associated with provincial lists of protected species. Permits are administered by the provincial departments responsible for environmental affairs.

This act is most likely to be applicable to the huge tracks of land in the Lenasia areas that are not cultivated. A Permit Application for the removal of protected trees would need to be applied should any occur within the power line corridor.

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

National Government has overall responsibility for and authority over water resource management, including the equitable allocation and beneficial use of water in the public interest, a person can only be entitled to use water if the use is permissible under the Act.

The protection of water resources is fundamentally related to use, development, conservation, management and control. The purpose of the resource quality objectives of this act is to establish clear goals relating to the quality of the relevant water resources. In determining

resource quality objectives a balance must be sought between the need to protect and sustain water resources on the one hand, and the need to develop and use them on the other. The resource quality objectives have been determined in the act they are binding on all authorities and institutions.

This act governs the abstraction, use and return of wastewater back to a water resource. It legislate protection measures for water resources and the way they are developed and controlled.

Section 22.2 of the water Act states that a person who uses water (a) must use the water subject to any condition of the relevant authorization of that use; (b) is subject to any limitation, restriction or prohibition in terms of this act or any other applicable law and (c) in the case of the discharge or disposal of water containing waste contemplated in section 21 must comply with the waste standards or management practices prescribed under section 26 unless the conditions of the relevant authority provide otherwise.

- The applicant shall provide the Department with the source of that water
- The exact distance of the proposed project from a water resource. Indicate to the department the existence of any boreholes within 1km radius of the proposed project and the use of those boreholes

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- Proper storm water management must be in place during the construction phase
- Domestic solid waste generated during the construction phase shall be stored, handled and transported to a permitted waste disposal site in such a manner that does not cause related problems in surrounding areas.

Other aspects of the National Water Act that will be relevant include;

- Pollution of Water (section 19)
- Water uses (section 21)
- General authorizations (GN R1191 of 8/10/1999)

In terms of Section 22 of the National Water Act a water use must be authorized. In section 21 "water use" is defined to include: impeding or diverting the flow of water in a watercourse or altering the bed, banks, course or characteristics of a watercourse.

The Act implies that the developers are responsible for taking reasonable measures to prevent pollution of water resources that they own, control, occupy or uses on the proposed study area in question. The developers are required to remedy situation where pollution of a water resource occurs following emergency incident and where it is responsible for the incident or owns or is in control of the substance involved. The developers must take all reasonable measures to minimize the impacts of the incident, undertake cleanup procedures, remedy the effects of the incident and take measures as directed by the catchment agency.

The proposed substation site will be located in close proximity of the Bailey Spruit with its associated wetland. The wetland has been delineated and a 30m no development buffer zone implemented. Any developments should also remain above the 1:100 and 1: 50 year floodline unless otherwise applied for at DWAF.

The proposed power line corridors traverse wetlands, streams and the Kliprivier. Water uses (section 21) and or General authorizations (GN R1191 of 8/10/1999) may be required.

5.7 CONSERVATION OF AGRICULTURAL RESOURCES ACT

The objectives of this Act are to provide for the conservation of the natural agricultural resources of the Republic by the maintenance of the production potential of land, by the combating and prevention of erosion and weakening or destruction of water sources, and by the protection of the vegetation and the combating of weeds and invader plants. Regulations in favour of Conservationof Agricultural Resources. The following Impacts are all subject to the control measures prescribed in terms of the Act:

- Soil Surface erosion and deterioration of soil quality and productivity
- Flooding Potential
- Soil pollution
- Subsidence, waterlogging and mass movements such as landslides and rock falls
- Degradation, destruction or elimination of ecosystems
- Introduction of elements that are uncharacteristic with the aesthetics and landscape
- character of the area

Section 6 of the act outlines the control measures.

The three proposed route alternatives will traverse the Kliprivier and associated Olifantsvlei Nature Reserve from Etna Substation to the newly proposed Orlando Substation. The project must not cause erosion, weakening or destruction of this water source.

There is no distinct difference in the potential of land found under the three proposed routes in terms of agricultural potential. However route 3 traverse an area with slightly lower potential for agriculture but happens to traverse a large proportion of wetland which must be preserved and not disturbed. Route 1 traverses more arable and wetland than route 2. Route 2 could be considered more suitable for the construction due to its minimal impact on arable and wetlands at the project site. The construction of the power line along route 2 will however need to consider the necessary environmental legislations required.

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

The protection of archaeological and palaeontological sites and material is the responsibility of a provincial heritage resources authority and all archaeological objects, palaeontological material and meteorites are the property of the state. Any person who discovers archaeological or palaeontological objects or material or a meteorite in the course of development must immediately report the find to the responsible heritage resources authority, or to the nearest local authority offices or museum, which must immediately notify such heritage resources authority.

38. (1) Subject to the provisions of subsections (7), (8) and (9), any person who intends to undertake a development categorized as

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

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

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

(i) exceeding 5 000 m2 in extent; or

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

(iii) involving three or more erven or 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 re-zoning of a site exceeding 10 000 m2 in extent; or

(e) any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority, must at the very earliest stages of initiating such a development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development.

(2) The responsible heritage resources authority must, within 14 days of receipt of a notification in terms of subsection (1)—

(a) if there is reason to believe that heritage resources will be affected by such development, notify the person who intends to undertake the development to submit an impact assessment report. Such report must be compiled at the cost of the person proposing the development, by a person or persons approved by the responsible heritage resources authority with relevant qualifications and experience and professional standing in heritage resources management;

(b) notify the person concerned that this section does not apply.

The Act implies that no person may alter or demolish any structure or part of a structure, which is older than 60 years or disturb any archaeological or palaeontological site or grave older than 60 years without a permit issued by the relevant provincial heritage resources authority. No person may, without a permit issued by the responsible heritage resources authority destroy, damage, excavate, alter, deface or otherwise.

A Heritage Impact Assessment was compiled by Dr Julius Pistorius CC which indicated it is unlikely that any of the heritage resources recorded will be affected by the proposed Soweto Integration Project as they do occur some distance from the alignments for Alternatives 1 to 3 for the 400kV power lines.

5.9 NATIONAL ENVIRONMENTAL MANAGEMENT: PROTECTED AREAS ACT, 2003 (ACT NO. 57 OF 2003)

The purpose of this Act is to provide for the protection, conservation and management of ecologically viable areas representative of South Africa's biological diversity and its natural landscapes.

The Olifantsvlei Nature Reserve is located within the study area. Necessary precautionary measures will be implemented to eliminate potential impacts on the Reserve.

5.10 ELECTRICITY ACT, 1987 (ACT 41 OF 1987)

This Act seeks to provide for the continued existence of the Electricity Control Regulator and for control of the generation and supply of electricity; and for matters connected therewith.

Aspects of this act that is relevant to this project;

Proposed erection or enlargement of power stations by local authorities
(1) Whenever any local authority intends to erect a power station, or to enlarge any existing power station to an extent exceeding within any period of 12 months 10 per cent of the existing rated generating capacity, it shall apply to the regulator for approval and shall submit to it a full report by a professional engineer on its proposals regarding the erection or enlargement.
(2) Before considering the application, the regulator shall call upon Eskom for a report on the proposals, and thereupon the local authority shall supply Eskom with such information as Eskom may require for the purpose of drawing up the report.
(3) In its report to the regulator Eskom shall state; what in its opinion is the best course for the local authority to pursue, and in particular whether Eskom can itself generate a supply of electricity with advantage to the interest of ratepayers and consumers, and if so, Eskom shall submit its estimates and terms.
(4) The local authority shall pay to Eskom, in respect of any report furnished under this section, a sum of money the amount of which, if not agreed upon, shall be determined by the Minister.

[S. 16 amended by s. 10 of Act 46 of 1994.]

5.11 ELECTRICITY REGULATIONS ACT, 2006 (ACT 4 OF 2006)

To establish a national regulatory framework for the electricity supply industry; to make the National Energy Regulator the custodian and enforcer of the national electricity regulatory framework; to provide for licences and registration as the manner in which generation, transmission, distribution, trading and the import and export of electricity are regulated; and to provide for matters connected therewith.

Other sections of the act that are relevant
(d) Facilitate universal access to electricity;
(e) Promote the use of diverse energy sources and energy efficiency;
(f) Promote competitiveness and customer and end user choice; and
(g) Facilitate a fair balance between the interests of customers and end users, licensees, investors in the electricity supply industry and the public.

24. **(1)** Any asset belonging to a licensee that is lawfully constructed, erected, used, placed, installed or affixed to any land or premises not belonging to that licensee, remains the property of that licensee notwithstanding the fact that such an asset may be of a fixed or permanent nature.

30(2) An asset belonging to a licensee in terms of subsection (1)-
(a) may not be attached or taken in execution under any process of law, or be the subject of any insolvency or liquidation proceedings, instituted against the owner of the land, the landlord or the occupier of the premises concerned;
(b) may not be subjected to a landlord's hypothec for rent; and
(c) may only be validly disposed of or otherwise dealt with in terms of a written agreement with the licensee.

Rights over streets
25. (I)
(a) A licensee may do all such things over, in or along roads or streets and associated infrastructure as may be necessary to carry out its licensed activities.
(b) Any activity contemplated in paragraph (a) must be undertaken subject to the right of supervision and in accordance with the plans, routes and specifications of the authority or person in control of that street, except in cases of emergency or where the authority concerned fails or refuses to co-operate with the licensee.
(2) A licensee may only exercise its rights in terms of subsection (1) to the extent necessary to carry out its licensed activities, and must in doing

40(a) comply with any laws or by-laws that may be applicable;

(b) complete its activities within a reasonable time; and

5.12 NATIONAL ENERGY REGULATOR ACT, 2004 (ACT 40 OF 2004)

The National Energy Regulator of South Africa (NERSA) is the regulatory authority over the energy Sector in South Africa, a mandate that includes regulating the electricity distribution industry.

Established under the *National Energy Regulator Act* 40 of 2004 and the *Electricity Regulation Act* 4 of 2006, NERSA has statutory responsibility for the issuing of licenses to all players involved in the production and supply of electricity and to "regulate prices and tariffs" that are supplied by electricity licensees.

Internationally, regulators have over the years developed various methodologies to determine appropriate revenue levels required by regulated entities, for them to efficiently generate, transmit and distribute electricity to customers. The purpose of this report is to provide a framework that will be used to regulate the revenue of large municipal distributors and then translate the approved revenue into tariffs.

The framework provides guidance in the application of the ROR methodology as the applicable methodology for large municipal distributors, and sets various rules which NERSA

will employ in the assessment of all applications for price and/or revenue increases from licensees.

In terms of section 3 of the *Electricity Regulation Act* (Act No. 4 of 2006), the National Energy Regulator of South Africa (NERSA) is the custodian and enforcer of the regulatory framework. NERSA is entrusted to perform all the functions that the National Electricity Regulator used to perform, and amongst others to regulate prices at which electricity is sold to customers.

5.13 MUNICIPAL SYSTEMS BILL

The Municipal Systems Bill gives a developmental role to municipalities.

Municipalities are required to produce integrated development plans (IDPs) for the medium term (up to 5 year) development of their municipal areas to *POLICY NER 01-2001-IRPFirst Draft 03/11/05* 3 meet the needs of their communities and stakeholders. The IDPs give priority to basic needs, promote social and economic development and include the land development objectives (LDOs) of the municipality. The Municipal Systems Bill directs municipalities to provide sustainable services to their communities. The use of municipal service partnerships is encouraged. This Allows a contractual arrangement with another body for the delivery and performance of any municipal service.

5.14 NATIONAL VELD AND FOREST FIRE ACT, 1998 (ACT 101 OF 1998)

It prescribes and regulates the protection of forests and velds from fire. Section 12 of the act outlines the use of fire breaks and precautionary practices are also outlined in section 13.This act is most likely to be applicable to the huge tracks of land in the Lenasia areas that are not cultivated.

5.15 MINERALS AND PETROLEUM RESOURCES AND DEVELOPMENT ACT, 2002 (ACT 28 OF 2002)

Regulates prospecting and mining activities including the environmental assessments undertaken for these activities. Quarries and borrow pits fall under the jurisdiction of this Act and the Department of Minerals and Energy. There are traces of quarrying on the proposed Orlando Substation site. The existing borrow pits and their closure will have to be investigated. This act will be principally looking at prospecting potential of the substation site.

5.16 OCCUPATION HEALTH AND SAFETY ACT, 1993 (ACT 85 OF 1993)

The Erection of a new Substation means the introduction of permanent above normal electromagnetic waves. These waves have detrimental effects on the health of neighbouring communities.

To provide for the health and safety of persons at work and for the health and safety of persons in connection with the use of plant and machinery; the protection of persons other than persons at work against hazards to health and safety arising out of or in connection with the activities of persons at work; to establish an advisory council for occupational health and safety; and to provide for matters connected therewith. This act will regulate the activities and limits of the contracted labour force as per requirements of Eskom policy. The labour force must significantly be composed of local people hence these provisions have to be adhered to.

6. AUTHORITY CONSULTATION AND PUBLIC PARTICIPATION

6.1 APPLICATION TO THE AUTHORITIES

The National Department of Environmental Affairs and Tourism was identified as the relevant competent authority for this project. An Application Form was submitted to DEAT on 17 July 2007. Subsequent to the submission of the application form, an acknowledgment letter (**Appendix 3**) with a Reference Number (12/12/20/984) was received on 24 July 2007. The letter called for the environmental assessment practitioners to submit the scoping report.

6.2 EIA COMMENCEMENT PRESS ADVERTISEMENTS

Advertisements **(Volume 2)** were placed in national newspapers to notify people of the commencement of the environmental impact assessment process. The adverts were placed in the following newspapers:

Name of the newspaper	Date of placement
Sowetan	07 August 2007
Beeld	07 August 2007

Table12: List of newspapers where the EIA commencement was announced

6.3 EIA COMMENCEMENT ON-SITE ADVERTISEMENTS

On-site advertisements **(Volume 2)** were placed at and along the proposed route corridors; at proposed new Orlando (Quattro) Substation, Shoprite Checkers, Barra Mall, BP Filling Station, Golden Highway (R553), Buschkoppie Works, Johannesburg Water and Zakariyya Shopping Centre in Zakariyya Park at the same time when newspaper advertisements were released. A0 size on-site advertisements were used to enhance their visibility. A map clearly showing the study area was placed next to the EIA advertisement site notice. Both the newspaper and site advertisements called for Interested and Affected Parties (I&APs) to register their names, organizations as I&APs so that they could receive project information or invited to public open days.

6.4 IDENTIFICATION OF KEY STAKEHOLDERS AND I&APS

Immediately after both the newspaper and on-site advertisements, the project team started identifying individuals, organizations and/or their representatives who could potentially be interested and/or affected by the development. This included authorities in whose jurisdiction the project study area falls. A database **(Volume 2)** of interested and affected parties, including key stakeholders was created and is being updated on regular bases.

6.5 FOCUS GROUP MEETINGS

Focus group meetings were arranged with relevant metro council in whose jurisdiction the project falls. The following regions of the metro council were invited to these focus group meetings:

Joburg City Council	Focus Group Meeting Date
Councillors of Region D Wards 17-19, 22, 24-26, 28 & 29	20 November 2007
Councillors of Region G, Ward 8	13 December 2007

Table 13: Joburg City Council councilors invited to Focus Group Meetings

6.6 KEY STAKEHOLDER WORKSHOP

A key stakeholder workshop was held on 22 January 2008 with identified key stakeholders. The following organizations, departments and individuals were invited to the Key Stakeholder Workshop:

- Commissioner of Restitution of Land Rights
- Department of Agriculture
- Department of Land Affairs
- Department of Provincial and Local Government
- Department of Transport
- Department of Water Affairs and Forestry (including Gauteng)
- National Department of Environmental Affairs and Tourism
- Department of Minerals and Energy (including Gauteng)
- Department of Public Works

- Gauteng Department of Agriculture, Conservation and Environment (Fauna, Flora, Minerals and Energy)
- Gauteng Land Affairs
- Gauteng Provincial Government
- African Pilot
- Gautrans
- Johannesburg City Council
- Johannesburg Development Agency
- Johannesburg Water
- Air Traffic and Navigation Services
- Airports Company South Africa
- City Power
- Civil Aviation Authority
- MTN
- National Electricity Regulator
- NMA Effective Social Strategists
- Rand Water
- South African Road Agency Limited
- Spoortnet
- Agric South Africa
- Telkom
- Gauteng Farmers Union
- Transvaal Agricultural Union
- Birdlife South Africa
- Earth Life Africa
- Endangered Wildlife Trust
- Environment and Conservation Association
- Environmental Justice Network Forum
- Gauteng Conservancy Association
- Grassland Society South Africa
- Group of Environmental Monitoring
- Mondi Wetland Project
- National Association of Conservancies South Africa
- NEMAI Consulting
- South African Heritage Resources Agency
- South African Botanical Institution
- WESSA
- WWF
- Federation of Sustainable Environment

6.7 PROJECT PUBLIC OPEN DAY ADVERTISEMENTS

An invitation was published in newspapers **(Volume 2)** calling for all interested and affected parties to attend public open days. Advertisements appeared in the following newspapers:

Name of the newspaper	Advertisement date
Sowetan	18 January 2008
Daily Sun	21 January 2008
Beeld	21 January 2008

Table 14: Public meetings newspaper advertisements

The Public Open Days were scheduled for 22 January 2008 from 16:00 to 19:00 at the Don Mateman Centre at Eldorado Park and for 26 January 2008 from 10:00 to 13:00 at the Lehae Primary School in Lehae.

On-site public meetings advertisements/posters, flyers (Zulu, Sesotho and English) (**Volume 2**) were distributed throughout the study area at least four days prior to the public open days. These posters/adverts informed the general public about the intended public open days

details eg. date, venue and time. Loud Hailing was also used to remind the communities regarding the public open days during the weekends and the specific days prior to the open days. The combination of all the above approaches were aimed at notifying potential interested and affected parties, government departments and other organizations about the project and an opportunity for them to get involved. Background information documents were prepared in English (**Volume 2**) and distributed to those who showed interest on the project and to those identified as potential I&APs including key stakeholders. Comment and registration form **(Volume 2)**, with spaces provided for comments were also distributed along with the BIDs.

Personalized letter were also sent to those who requested to be registered as I&APs in the project. Issues were raised and discussed throughout the public participation process. A Comment and Issues Response Report **(Volume 2)** was prepared. It should be noted that both I&APs identification and engagement are ongoing processes that would continue throughout the environmental impact assessment

6.8 DRAFT SCOPING REPORT

The draft scoping report (DSR) was prepared and made available to the public and key stakeholders from 27 February 2008 until 28 March 2008 through newspaper advertisements and placing in public places. Advertisements appeared in the following newspapers; Sowetan, Daily Sun, Eldorado News on 27 February 2008 and Beeld on 29 February 2008 respectively. The DSR was placed in the following public places:

- Orlando East Public Library
- Pimville Skills Centre
- Pimville Public Library
- Eldorado Park Public Library (Ext. 2)
- Don Mateman Centre
- Klipspruit Children's Library
- Zakariyya Park Community Centre

Interested & Affected Parties, key stakeholders and authorities were invited to review the draft scoping report and comment. Comments received during the scoping process were captured in the Comments and Issues Response Report. City of Johannesburg Council made their comments on the Draft ESR available on 4 April 2008. These comments are also captured in the Comments and Issues Response Report included in Volume 2 to the DEIR. Information about the availability of the draft scoping report was also sent to Interested & Affected Parties and Stakeholders in the project database through e-mails and personalized letters. A reminder was sent to all stakeholders informing them of the end of the public review period on the DSR. No further replies were received.

6.9 FINAL SCOPING REPORT

The final Scoping Report was submitted to DEAT on 9 April 2008. Subsequent to the submission DEAT sent an acknowledgement of receipt letter for the Final Scoping Report dated 24 April 2008.

The approval / acceptance of the Final Scoping Report was issued by DEAT on 23 June 2008.

6.10 PLACEMENT OF PROJECT INFORMATION ON ESKOM'S WEBSITE

Public documents described above were also posted on the Eskom Holdings Limited website address. The aim was also to create different ways in which people could access project information.

7. SOWETO INTEGRATION SPECIFIC ENVIRONMENTAL ASSESSMENT

In the Scoping Phase of the project, information was gathered, and together with specialist and technical input, used to identify potential impacts associated with the proposed project, and to highlight areas, which should be avoided in order to minimise these impacts. A public participation process was undertaken to identify issues and concerns of key stakeholders and Interested and Affected Parties (I&APs). The results are documented in the Final Scoping Report.

A number of potentially significant issues were highlighted and further investigated in the Impact Assessment phase in order to assess their significance, and to determine the need for the implementation of measures in order for the overall project to be environmentally sustainable. The following key issues were identified in the scoping phase:

- Visual impacts
- Soils, geology and agricultural impacts
- Archaeology and/or heritage resources impacts
- Ecology and ecological sensitivity impacts
- Social and economic impacts (including current and future developments)
- Birds (Avi-fauna) impacts
- Impacts on regional planning (development assessment)

7.1 SUMMARY OF FINDINGS OF SPECIALIST STUDIES

Specialists were appointed to form part of the EIA project team. The team of specialists competent in the following areas has been included:

Organization	**Name of Specialist**	**Specialist Study**
Axis Landscape Architects (cc)	Gerhard Griesel	Visual Impact Assessment
Africa Geo-Environmental Services	Kingsley Ayisi	Agricultural Impact Assessment
Archaeologist & Heritage Management Consultant	Julius Pistorius CC And Mr. Eric Mathoho	Heritage Impact Assessment
Bushveld Ecological Services	Fritz Von Oudshoorn And Mr. Jacobus Steyn	Vegetation Impact Assessment
Ingrid Snyman Development Cons	Ingrid Snyman	Social Impact Assessment
Taka Echo and Land Rehab CC	Vhangani Silima	Wetland and Stream Crossing Study
Eduard van der Linde Development Planners	Eduard van der Linde	Development Assessment
Endangered Wildlife Trust	Jon Smallie and Luke Strugnell	Avi-faunal Impact Assessment

Table 15: List of Specialists involved in the project

7.1.1 VISUAL IMPACTS

7.1.1.1 Potential Landscape Impacts

Landscape impacts are alterations to the fabric, character, visual quality and/or visual value which will either positively or negatively affect the landscape character. During the construction and operational phases, the project components are expected to impact on the landscape character of the landscape types it traverses. The magnitude/severity of this intrusion is measured against the scale of the project, the permanence of the intrusion and the loss in visual quality, -value and/or VAC.

The following are consequential effects of the proposed new substation and 2x400kV transmission line project on the landscape character:

- Clearing of servitudes to accommodate new transmission lines;
- Construction of foundations and erection of transmission lines;
- Installation of overhead lines;
- Construction of camps, lay-down yards and other construction equipment;
- Construction of access roads to inaccessible points and;
- Construction of service roads

Activities listed above are expected to cause landscape impacts in the construction phase.

The extent of the disturbances will generally affect a relative small footprint area. Access roads to the towers are expected to be a two-track dirt road which will create the minimum disturbance. During construction, the area around the individual towers will be disturbed. The construction camp and lay-down yards are anticipated to disturb a much larger area. The size and location of the construction camp will play a major role in the severity of the landscape impact.

Servitudes will generally be cleared of higher growing and dense vegetation to educe biomass that may cause a fire hazard if ignited. The presence of the roads, existing industrial and residential areas as well as existing power lines has caused a localised reduction in the visual quality. Areas along the proposed routes are occupied by active wetlands and drainage systems as well as rocky outcrops, which increases the quality of the landscape. The VAC between Edna and Orlando Substations is considered Moderate. These factors limit the severity of landscape impact of alternatives 1 and 2 to a moderate degree. The majority of the alignment for alternative 3 runs through wetlands and drainage areas with a high landscape quality and increases the severity of landscape impact to high.

The impact will extend over the entire length of the different alignments and may vary in degrees of severity along the linear length as it transects landscape types of varying VAC. Surface disturbances are also minimised through, for example, utilising existing roads. The severity of the landscape impact can however be mitigated to a low severity for alternatives 1 and 2 and moderate severity for alternative 3. Sensitive placement of the construction camp, limited surface disturbance and prompt rehabilitation are prerequisite conditions if the severity of impact is to be reduced.

Operational phase

Surface disturbances created during construction may remain for an extended period during the operational phase. These are seen as residual affects carried forward from the construction phase and can be completely or substantially mitigated if treated appropriately during the construction phase.

An additional impact will be caused as a result of the presence of the completed transmission line, i.e. that of the evenly spaced towers. The industrial character and the near monumental vertical scale of the towers will severely contrast with the uniform landscape character that prevails through most of the study area.

7.1.1.2 Potential Visual Impacts

Severity of visual impact refers to the magnitude of change to specific visual receptor's views and/or experience of the landscape. Severity of visual impact is influenced by the following factors:

The **viewer's exposure** to the project:

- Distance of observers from the proposed project;
- The visibility of the proposed project (ZVI);
- Number of affected viewers; and
- Duration of views to development experienced by affected viewers.
- Degree of **visual intrusion** created by the project.

All residential areas within the study fall within the high visibility zone: Diepkloof, Lenasia, Kliptown, Pimville, Klipriviersoog, Soweto, Klipspruit, West Tshiawelo, Eldorado Park, Senoane, Zakariyya Park and Dlamini.

Some of the residents in the study area are farm residents, which are sparsely scattered across the study area.

During the construction phase, unsightly views may be created by the presence of the construction camp and the lay-down yards. The duration of the potential visual impact will be temporary which will result in an anticipated *low* significance of visual impact for alternative 1. The significance will be moderate for alternatives 2 and 3 due to the alignment that runs closer to residents. The visual exposure to the construction activity will initially be limited and only local residents will experience views of the site preparation activity. As the structures increase in scale and height, the ZVI increases, resulting in a greater number of affected viewers and a subsequent increase in visual exposure.

The visual intrusion will progressively increase in severity as the power line increase in scale. The cleared site, construction camp and material lay-down yards will appear unsightly and out of character. Large scale construction elements such as cranes, will be highly visible and increase awareness of the construction activity over a considerable area. The visual intrusion caused during the construction stage will be high, but will be temporary in nature.

The residential areas and farming communities along the power lines may experience a high degree of visual intrusion due to their proximity to all the Alternatives. These residents are within 5 km and in some instances within 1 km from the proposed alignments. This is considered the zone of highest visibility in which the highest degree of visual intrusion can be expected.

The presence of a transmission line in the visual field of the residents in this part of the study area will minimally affect the views they currently experience. The silhouette of a transmission line on the horizon will be visible from a great distance and thus increase the ZVI considerably, potentially impacting on more residents.

Tourists

The potential visual impact on tourists during the construction phase of the proposed project can be mitigated with relative ease. The greatest factor to consider is the location of the construction camp out of potential views that may be experienced from scenic routes or tourist hotspots.

It can be concluded that all the alternatives will cause minimal visual intrusion for tourists travelling through the study area.

Motorists

The major routes in the study area are the N1, N12 and R533 connecting the towns and informal settlements. The secondary road network in the study area carries a much lower volume of motorists. Many of the roads are residential roads which are mostly utilised by the local residents. Their duration of views will be temporary and it is expected that the visual intrusion that they will experience will be low. For this report only motorists using the main routes will be considered as there are many countless smaller roads within the study area.

It is anticipated that views of the construction camps and lay-down yards of alternatives 1 and 2 will be visible from the N1, N12, R533 and local roads and for alternative 3 will it only be the N12 and local roads.

The presence of the construction camp and lay-down yards may create unsightly views. Motorists' visual exposure to the impact will be brief and the severity of visual impact will be *low*. The significance of potential visual impact for alternative 1 and 3 is expected to be *low* and moderate alternative 2 due to the close proximity to the R533.

7.1.2 SOILS, GEOLOGY AND AGRICULTURE

By definition (based on Part 1 of the Regulation of Conservation of Agricultural Resources Act 43 of 1983), the land occurring at the project site consist of combination of areas classified as high and low potential for agriculture. There are also some areas which may be considered medium potential. The high and medium potential areas are found at the old croplands which cover approximately 1062 ha. The site is considered to cover low, medium and high potential area due to the following reasons:

7.1.2.1 Low potential

All the three proposed power line routes will traverse significant portion of land areas that are rocky, urbanised with human settlement and industries. These are not suitable for agricultural activities.

7.1.2.2 Medium potential

1) There are localised pockets of undesirable soil forms such as Mispah, in addition to Rock outcrop on the previously cropped lands.
2) The abundance of *Themida triandria* will not support good livestock grazing.
3) Low pH and sub-optimal concentrations of some minerals and organic matter.

7.1.2.3 High potential

1) A large proportion of the area under assessment contains Hutton soil forms which is considered high potential at the project site
2) The average topsoil clay content range from 10 to 32 %, which qualifies it to be of high potential.
3) There is presence of perennial surface water which is of good quality for irrigation.
4) The project site is expected to receive moderate rainfall and is classed as 2, which is considered to be conducive to rainfed agriculture.

7.1.3 ARCHAEOLOGICAL AND/OR CULTURAL RESOURCES

The following types and ranges of heritage resources as outlined in Section 3 of the National Heritage Resources (No 25 of 1999) near the Project Area, namely:

- A stone walled site which date from the Late Iron Age.
- A farmstead complex and house which are older than sixty years and which qualify as historical structures.
- A large formal cemetery.
- Remains from the recent past.

It is unlikely that any of these heritage resources will be affected by the proposed Soweto Integration Project as they do occur some distance from the alignments for Alternatives 1 to 3

for the 400kV power lines. Consequently, no mitigation measures are outlined for any of the types and ranges of heritage resources observed near the project area.

7.1.4 ECOLOGY AND ECOLOGICAL SENSITIVITY

The study area is exceptional in the sense that it occurs over two biomes, three bioregions and six vegetation units, as described by Mucina and Rutherford (2006). This extraordinary diversity in vegetation types can mainly be ascribed to the topographical and geological range within the study area as well as the altitude and climate which allows for indigenous tree growth in protected areas.

However, due to the high level of development within the study area very little undisturbed natural vegetation exists. The main causes for this degradation and transformation of natural rangeland are residential development, wetland drainage, topsoil excavations, cultivation, medicinal plant harvesting and exotic plant invasions.
During the vegetation assessment nine vegetation zones were identified. These are:

1. Wetland
2. Degraded Rocky Ridge
3. Degraded Foot Slope
4. Degraded Woodland Ridge
5. Drained Wetland
6. Transformed Grassland
7. Eucalyptus Woodland
8. Old Croplands
9. Developed area (no natural vegetation)

Sensitivity analysis
The sensitivity analysis indicated that the three most sensitive vegetation zones in the study area are Wetlands, Degraded Rocky Ridges and Degraded Foot Slopes. The least sensitive vegetation zones are Transformed Grassland, Eucalyptus Woodland and Old Croplands. Due to its complete lack of indigenous vegetation the Developed Area zone is regarded as having zero sensitivity for vegetation impact.

Species of special concern
No Red Data species were recorded or are directly associated with the area. No suitable habitats to maintain viable populations of Red Data species were also recorded.

These potential impacts are listed below (significance in brackets):
A. Impacts during Construction and Maintenance of Proposed Transmission Line

- Vegetation removal/destruction on pylon footprints during construction. (High)
- Vegetation removal and soil disturbance caused by the construction and use of access roads. (Medium to High)
- Vegetation and soil disturbance around construction sites due to general pylon construction activities. (Medium to High)
- Vegetation destruction and disturbance during servitude maintenance.(Medium)
- Soil contamination, vegetation loss and vegetation disturbance due to fuel and chemical spills. (Medium)
- Vegetation disturbance in and around construction camps. (Medium)
- Vegetation and habitat disturbance due to the accidental introduction of alien species. (Medium)

- Vegetation and habitat disturbance due to pollution and littering during construction phase. (Medium to Low)
- Vegetation disturbance due to increased dust during construction phase. (Medium)
- Vegetation damage due to increased risk of veld fires during construction phase. (Low)

B. Impacts during Construction and Maintenance of Proposed Substation

- Vegetation removal on substation site. (High)
- Vegetation and soil disturbance surrounding the substation site due to general construction activities. (Medium to High)
- Vegetation disturbance in and around construction camp. (Medium)
- Vegetation and habitat disturbance due to the accidental introduction of alien species. (Medium)
- Vegetation and habitat disturbance due to pollution and littering during construction phase. (Medium to Low)
- Vegetation disturbance due to increased dust during construction phase. (Low)
- Vegetation damage due to increased risk of veld fires during construction phase. (Low)

7.1.5 SOCIAL AND ECONOMIC ASPECTS

- The positive impacts associated with the proposed project such as job creation, and regional and national economic development due to an improvement in the electricity supply should be enhanced as far as possible.
- The anticipated negative social impacts mainly relate to the influx of jobseekers or outsiders to the area, intrusion impacts, visual impacts, impacts on the daily living and movement patterns of locals, safety and security impacts, and health related impacts.
- Based on the findings of the study it is anticipated that these negative impacts could respond well to mitigation and that none of these impacts seem fatal.
- The issues of job creation, employment of local labour, skills transfer and capacity building have been repeatedly raised during the public participation process undertaken as part of the study. As limited employment opportunities would be created during the construction and operational phases of the project, care should be taken not to create expectations which, if not satisfactorily met, could give rise to discontentment and social mobilisation against the proposed project.

The impacts are discussed in full below.

7.1.5.1 Population impacts (population change)

A population change is associated with the influx of construction workers to the area during the construction phase of a project. The proposed project is expected to create in the order of sixty five (65) temporary jobs for the construction of the transmission lines.

Construction of transmission lines and a substation involves highly skilled resources, although some semi-skilled and unskilled workers are also required. It is expected that workers from outside the study area would form part of the construction workforce. The study area is densely populated (especially in the Soweto and Eldorado Park areas) and it is *not* expected that the small number of construction workers required for the transmission lines and the substation, even if all are sourced from outside the study area, would have any significant impact on the size and density of the population, as well as on the demographic profile. Should a number of these workers be sourced locally, the impact could be further minimised. This impact remains neutral for all three alternatives.

7.1.5.2 Impact on job opportunities

For the construction of the proposed transmission lines the following temporary job opportunities are expected[18]:

[18] Information sourced from Eskom Project Manager: Communication via e-mail

UNSKILLED POSITIONS	SEMI-SKILLED POSITIONS	FOREMAN SKILLED POSITIONS	SUPERVISORS	SITE MANAGER
20	30	10	4	1
TOTAL POSSIBLE POSITIONS				65

It is anticipated that the unskilled and semi-skilled positions could be filled by local community members. Short term employment possibilities, although limited, therefore exist for local labourers during the construction of the transmission lines. This could be viewed as a temporary benefit to the local communities.

The number of job opportunities for the construction of the Quattro Substation has not yet been determined by Eskom, although this usually requires more skilled workers compared to those involved with transmission line construction. It is even possible that international companies can be approached for the construction of the substation. However, it is fair to state that the construction of the Quattro Substation would also create some job opportunities for unskilled and semi-skilled labourers which could be sourced locally.

Although the job creation is very limited (given the population density of the study area), this impact is still rated as positive. The benefit could be further improved by additional appropriate on-site skills training which would not involve additional resources, funds and time. This training should thus aim to provide locals with the opportunity to achieve their maximum potential to ensure future employment on other projects.

Further possible benefits to local industries could be through the utilisation of local equipment, supplies and services during the construction phase of the transmission lines and Orlando (Quattro) Substation.

Management of the operational activities of the substations and transmission lines would mainly be the responsibility of City Power (substation) and Eskom (transmission lines). Other limited job opportunities would, however, become available, such as the clearing of the servitude. This would create the opportunity for local SMMEs or local labourers to source temporary employment. It is thus not expected that any significant long term benefits could accrue to the local communities in terms of employment.

Due to the high unemployment levels in the area, any job creation should be seen as a positive. Moreover, cumulative economic spin-offs associated with job creation as a result of the improvement in the electricity supply should also be taken into account. Based on these, this impact is thus still rated as positive.

7.1.5.3 Inflow of workers

Highly skilled contractors are required for the construction of a substation. Details of the number of workers and skills required for the Quattro substation were not available when the report was compiled and the anticipated inflow of workers for this section of the project can therefore not be determined.

For the construction of the proposed transmission lines approximately sixty five (65) workers are expected to be on site on average, but during peak construction periods this could increase to approximately hundred (100) workers. Opportunities for local labour are thus possible especially for the semi-skilled and unskilled positions (approximate total of 50 workers). Again, during the *peak* construction periods the opportunities for local labour could again increase to be more than the actual fifty (50) unskilled and semi-skilled positions.

It is thus not foreseen that large numbers of workers would be introduced into the densely populated area. Due to this factor and the intermittent construction process of transmission lines, the negative intrusion and disruptive social impacts usually associated with a large outside workforce are therefore not expected to materialise along the route. However, conflict between private property owners and/or the local community and an outside workforce, even if relatively small, is always possible and therefore mitigation measures to avoid conflict are

proposed. Conflict is also more likely to appear at the "stationary" construction area for the proposed Quattro Substation.

The positive impact associated with an influx of an outside workforce relate to the increase in temporary buying power, therefore an increase in informal vendors at the construction camp and construction sites are expected. Informal vendors should thus be accommodated where possible as there is a high demand for informal businesses in the study area, as indicated by the Regional Spatial Development Frameworks for the area.

It is not expected that the management of the Quattro Substation or additional feeder bays at the Etna Substation would result in any additional employment opportunities and therefore no inflow of additional workers to the area is expected.

Maintenance of the transmission lines would result in an inflow of workers, but it is not anticipated to have any long term negative impact on the local communities.

7.1.5.4 Influx of Jobseekers

Due to the high unemployment rate in the entire study area and overall poverty levels (e.g. Region G), it is highly likely that there would be a significant influx of jobseekers to the construction sites or areas. This impact might even materialise prior to construction and is anticipated to be more severe around the Quattro Substation and existing Etna Substation. Cumulative impacts in this regard could result in social and environmental problems e.g. conflict between outsiders and locals, especially regarding employment prospects, conflict between informal vendors for "new" business, lack of sufficient accommodation and other infrastructure to cater for their needs, pressure on water and sanitation related facilities, and so forth. One should, however, note that the potential jobseekers could already be residing in the local neighbourhoods, which could limit the negative impact.

7.1.5.5 Impacts on daily living and movement patterns

Construction work associated with the transmission lines could impact on the daily living and movement patterns of the locals e.g. increased construction vehicle activity on the local roads and possible construction of new access roads. This impact is expected to be more evident in the vicinity of the Quattro Substation site and area surrounding the existing Etna Substation, but also along major routes along the three route corridors (e.g. Golden Highway/R553, N1, R554, section of N12, and Old Potchefstroom Road), and the areas adjacent to the construction camp site[19].

Construction vehicles making use of the local roads on a daily basis could include trucks (possibly four), mini bus taxis (possibly two), 4 x 4 vehicles (possibly four) and a crane. In the densely populated residential areas, especially in the northern section of the study area, peak hour traffic congestions are common. The number of construction vehicles, however, is not expected to exacerbate this problem.

The main concern in terms of the impact on the daily living and movement patterns of the locals revolves around the safety of pedestrians in areas with high levels of pedestrians (near schools). This is possible with regards to Alternative 2 in the Eldorado Park area (possible impact on approximately ten schools) and at the Inkululeko Yesizwe Primary School in Vlakfontein Proper situated in close proximity to the Etna Substation. A further hotspot along this alignment (Alternative 2) to be noted is the crossing between the R554 and the Golden Highway where numerous school pupils walk alongside the road from the Moses Maren Mission School to the Lehae and Lenasia areas. In terms of Alternative 3, the section to be constructed through Klipspruit West and Eldorado Park is also a concern due to the proximity to approximately ten schools.

Where construction work has to be undertaken on private properties it could also have a negative impact on those owners' daily living and movement patterns. In the case of

[19] A site has not been earmarked for the construction camp yet, as this has to be identified by the appointed contractor.

Alternative 2, general construction activities could disrupt lessons at the Inkululeko Yesizwe Primary School due to noise made by construction workers and machinery, but also due to the children's curiosity as the construction sites could be viewed from the schoolyard if the towers are situated to the east of the existing lines (Alternative 2). This impact is, however, temporary and not continuous, and could thus satisfactorily respond to mitigation.

The erection of a possible construction camp(s) in the study area could impact on the daily living and movement patterns of those living in close proximity to such a facility. Cumulative impacts regarding misbehaviour of construction workers at the construction camp and mismanagement could result in safety and security concerns, social conflict and environmental problems.

When transmission lines are constructed in close proximity to dwellings and sensitive receptor areas (e.g. schools, old age homes, hospitals) it could have a negative impact on the daily living and movement patterns of the affected individuals. The main disruption in this regard is attributed to the change in the *visual environment* as a result of the proposed substation and power lines. This could influence the communities' perception of their environment. The proposed transmission lines, new Quattro Substation and microwave tower would have a permanent negative visual impact on the landscape. The social impact in this regard would thus be more severe in areas with a high volume of tourist flow such as Soweto, or in areas where the lines are not able to easily blend in with the surrounding environment (e.g. the southern section of the study area with its open flat spaces with similar natural features) or where these transmission lines are erected in close proximity to dwellings.

It should, however, be noted that the northern section of the study area is a built up area with various types of infrastructure already present. The visual character of the northern section of the study area also already includes the decommissioned Orlando Power Station which is an existing impact on the visual quality and "sense of place" of this section of the study area. The southern section of the study area is not as built up as the northern section, and is characterised by some agricultural activities on open flat areas. Nonetheless, this section of the study area is also already disturbed by the existing power lines and the Etna Substation. It is thus not anticipated that community members would move elsewhere due to the presence of the Quattro Substation and/or transmission lines, but that some movement patterns would just be adapted (e.g. farming activities). The impact on the daily living and movement patterns in the less densely populated areas are thus not intense, as general farming activities such as grazing and crop production could continue underneath transmission lines.

Concerns with regards to the impact on the daily living and movement patterns along Alternative 3 also relate to the impact of the transmission lines on the helicopter take-off and landing area of the Rietfontein Fire Training Academy. Although these helicopters are only used in cases of emergency, power lines still pose a safety risk to helicopter pilots. Crashes into power lines could result in further cumulative impacts due to power outages as a result of damages to the lines.

Further intrusions by the transmission lines could especially be evident in the areas where the alternatives traverse Eldorado Park (Alternatives 2 and 3), Motsoaledi (the township development near Devland and Goldev adjacent to the Golden Highway) and Soweto (when approaching the proposed Quattro Substation (all alternatives combined into one option). The extension of the Lehae township to the west could also be hampered by the proposed servitude of Alternative 3.

7.1.5.6 Impacts associated with Construction Camp

Indications from Eskom are that one construction camp where workers would be housed would be developed. No site has been earmarked for this yet, as it is the responsibility of the appointed contractor to identify a site which has to be approved by Eskom[20]. As approximately sixty five temporary jobs would be created during the construction of the

[20] Information obtained from Eskom's Project Manager via e-mail correspondence.

transmission lines one could expect that a construction camp would have to cater for at least sixty five workers. The construction workforce for the Quattro Substation would thus also have to be accommodated, but no information on the size of this workforce was available when the report was compiled. It is, however, anticipated that the proposed construction camp would be relatively small.

The area surrounding the Quattro Substation is heavily built-up and densely populated. If the construction camp is located in this area it would ease the movement patterns for those workers involved in the construction of the Substation. Shops and other facilities are also located nearby, but it should be noted that space for a construction camp in this area is limited and due to its proximity to the local communities, could result in severe negative social impacts.
Negative social impacts, usually associated with a construction camp, that could materialise include the following:

- Misbehaviour of construction workers at the construction camp (alcohol abuse, prostitution, temporary sexual relationships with local women with possible unwanted pregnancies, spreading of sexually transmitted diseases and so forth);
- Disrespect for the local culture;
- Mismanagement which could result in safety and security concerns;
- Social conflict between the local community and outsiders;
- Mismanagement which could lead to localised environmental problems (lack of sanitation and waste management, littering and so forth);
- Negative impacts on the environment could result in related health impacts on the surrounding communities such as pollution of water sources due to improper sanitation facilities, solid waste management or wastewater management.
- The development of informal vending “stations” where food and small goods are sold could, if not properly managed, also lead to littering, and possible pollution of water sources.

It is further anticipated that any increase in crime could be attributed by the locals to these “outside” workers residing in a study area and should therefore be carefully managed.

7.1.5.7 Relocation of families

Relocation is associated with the construction phase of the project as resettlement has to occur before construction can take place. The impact, however, has long term consequences.

Relocation could occur in some of the informal settlements where the dwellings are situated in very close proximity to each other or where dwellings have been erected within existing servitudes. The impact would extend to the tower footprint and servitude area. This is possible along all three route alternatives, especially where the routes traverse highly built up areas in Eldorado Park and in the Motsoaledi area close to the Quattro Substation.

The intensity of the possible relocation of families would depend on the final route alignment of the transmission lines as it can then be determined whether select relocation would be necessary and the number of dwellings that would be affected.

7.1.5.8 Health related impacts

Health related impacts during the construction phase of the proposed project are associated with the influx of outsiders to the area, whether these are jobseekers or construction workers. The spread of HIV/Aids, with long-term possible regional consequences, is always a source of concern. A large proportion of the population in the CJM area is under the age of 25,

especially within the affected wards (figures for those under the age of 25 vary between 42% to 50%) and thus a large proportion of the population is part of the “high risk” age category. The location of the construction site should thus take this risk into account.

Inadequate accommodation for jobseekers and workers could also result in health risks due to pollution of water resources, improper waste management and so forth.

Concerns regarding Electromagnetic Fields (EMFs) and specific carcinogenic risks associated with living in close proximity to power lines and substations are always present among some community members. As the proposed Quattro Substation would be situated within close proximity to the residential areas, it is highly likely that these health related concerns could be present amongst the community members, especially those living or working in close proximity to the Substation site or establishments with sensitive receptors such as schools, medical facilities, and old age homes. The proposed Quattro substation near the Chris Hani Baragwanath and Lesedi Hospitals is thus a cause for concern.

Experience has also shown that in high density areas, people tend to settle in the servitudes or very close by. This could result in negative health related impacts as the lines could result in electrocutions.

Mitigation and effective management of the servitudes therefore remain critical. From a social point of view it is furthermore essential that these health related fears (regarding EMFs) should not be dismissed as irrelevant and therefore unimportant.

As Alternative 2 and 3 would traverse densely populated areas such as Eldorado Park with numerous schools in close proximity to the route alignments, the health related impacts for these alternatives are rated higher compared to Alternative 1.

7.1.5.9 Safety and Security impacts

Safety and security impacts refer to the increased risks of veld fires, due to construction worker practices (e.g. cooking/heating), the increased risk of vehicular/pedestrian accidents due to construction vehicle movements, general risks related to construction activities (e.g. electrocution, risks of falling from working heights and so forth), as well as the perceived increase in crime as a result of outsiders being in the area.

Due to the study area being densely populated, the safety impacts with regards to the increase in vehicular traffic through the residential areas, especially the safety of pedestrians (school children) is of serious concern. This is the case along Alternatives 2 and 3 where the proposed route alignment would traverse Eldorado Park. Approximately ten schools in close proximity to each of these alternatives could be negatively affected.

This impact would manifest during the construction period and is perceived to be of a short duration. This impact, however, could be successfully mitigated due to the limited number of construction vehicles involved and traveling times of these vehicles.

Unauthorised entry of maintenance personnel on private properties could result in safety and security impacts during the operational phase of the proposed project. The Substation facility itself could pose safety risks to the community in the event of unauthorised entries.

In addition, transmission lines and the presence of a substation increase the risks of fires and electrocutions. This would have a more marked impact around the Quattro Substations site and in areas where the lines are in close proximity to dwellings or places where animals are kept.

Power lines pose a safety risk to helicopter pilots and one could argue that there is thus a risk involved if situated in close proximity to the Rietfontein Fire Training Academy (Alternative 3), even though these helicopters are only used in emergency situations.

Most of the safety and security impacts, however, are anticipated to successfully respond to mitigation.

7.1.5.10 Noise Impact

Noise pollution is expected to emanate from construction machinery and vehicles such as trucks, excavators, compressors, jackhammers, and cranes. Another source of noise pollution would be from the construction camp. The proximity of residences, communities and businesses to the construction sites and camps would determine the intensity of this impact. It is anticipated that the noise factor would be more severe in the residential area in close proximity to the Quattro Substation due to the construction activities associated with the building of a substation, as well as a result of the longer construction period.

The noise impact could, however, only be viewed as a temporary nuisance which could respond to mitigation.

7.1.5.11 Dust Pollution

Possible dust pollution due to construction activities and vehicular movement is expected along existing gravel roads and areas where new access roads have to be created. This impact is anticipated to be more concentrated along areas of route Alternative 1 in the vicinity of Fun Valley, the Bushkoppie Wastewater Treatment Works, and at Olifantsvlei and Van Wyksrus (all situated on or in close proximity to the farm Misgund 322 IQ), and route Alternative 2 between the R554 and from where it moves in a north-easterly direction towards Slovo Park, as well as along route Alternative 3 between the R554 and the N12.

In the Soweto area, where the Quattro Substation would be located, it should be noted that the existing air quality is "poor due to coal and motor emissions, untarred roads, mine dust and recordings of asbestos fibres (mostly used in low cost housing). Air pollution is high (especially during the winter months) and the main source of air pollution is the domestic coal fires"[21]. It is, however, not anticipated that the dust pollution created during the construction of the substation would severely add to this problem and therefore this impact is rated as moderate.

7.1.5.12 Impacts on regional and local economy

It is not expected that there would be any direct economic benefits to the local communities as a result of the proposed transmission lines and Quattro Substation.

7.1.5.13 Change in Tourism and Leisure Opportunities

The impact of a substation and transmission lines on tourism activities is usually concerned with the visual intrusiveness of such facilities and lines as these could be seen to cause the area to be less attractive. The impact of the proposed Quattro Substation is not expected to have a severe negative impact on the tourism activities due to the character of the already built up area and the presence of the old Orlando Power Station. It is also not anticipated that the substation would have any severe negative impacts on tourists travelling past the site. The intensity, however, would depend on whether the substation will be clearly visible from specific tourism sites and from the Chris Hani Baragwanath Node, along the old Potch Road.

Along the proposed route alignments of the transmission lines no specific major tourist related sites or activities have been identified. Alternative 3 is in close proximity to the Kliptown Regeneration Project, but transmission lines along this alternative are not expected to have a visual impact on the Kliptown project. No immediate impact on these tourism facilities is thus foreseen. Care, should, however, be taken to not place the transmission lines in close proximity to the main tourists routes used to access the Kliptown Regeneration Project (an average of 445 foreign tourists are anticipated to visit these facilities per day which result in 162 340 per annum. This is anticipated to increase to 189 915 tourists per annum by 2009/2010[22]).

[21] City of Johannesburg Regional Spatial Development Framework for Region D: Draft (2008/2009)
[22] Kliptown Business Plan: Heritage, Education and Tourism: May 2004

With regards to Alternative 1 and Alternative 2, the proposed transmission lines would be situated within close proximity to Fun Valley which is situated to the east of the Golden Highway (R553) and to the north of the R554. Alternative 2 (the option proposed to the east of the Golden Highway) would cross the entrance to this facility and Alternative 1 would be to the east of this facility. Fun Valley is a resort with picnic, conference, wedding and accommodation (beds for 128 people) facilities. It is, however, not anticipated that the proposed transmission lines would have a direct negative impact on the operations at this facility, but care should be taken with the final route alignment to limit the visual impact on e.g. the wedding and picnic areas.

Although the tourism related facilities in the southern section of the study area are very limited, the impact of the transmission lines on the tourism facilities in the area, would still depend on the final route alignment. The intensity of the impact on tourism and recreational facilities would thus also depend on the findings of the Visual Impact Assessment undertaken as part of the EIA.

7.1.5.14 Property value

As the proposed power lines (all three alternative route alignments) are not expected to impact on major communication related infrastructure, farming activities, roads (access to areas) or commercial ventures in the long term, the impact on the property values along the routes are expected not to result in long term negative financial consequences. Due to the long term visual impact of transmission lines on properties, this impact is, however, still rated negative.

7.1.5.15 Future Developments

When finalising a transmission line route alignment and with regards to the construction of the Quattro Substation, the Baralink Development Framework with the following components should be considered[23]:

- Orlando eKhaya Project which would be a mixed-use development centred around the Orlando Dam;
- Bara Central Project which consists of the revitalisation of the old shops on the northern side of the taxi rank;
- Bara Square Project is the revitalisation and building of a public square situated between the shops and the taxi rank. It is aimed to function as a tourist attraction point;
- Formalisation of the Elias Motsoaledi Informal Settlement and provision of new higher density housing;
- The redevelopment of the Diepkloof Hostel to provide approximately 2000 units;
- Baragwanath Transport Facility Project which is the redevelopment of the public transport facility and traders market; and
- The proposed Soweto Empowerment Zone aimed at establishing a hub for local entrepreneurs to establish and operate their businesses.

The Orlando Ekhaya Project[24], a multi-million investment in Soweto, expected to start with construction in the near future, will include the redevelopment of Soweto's famous landmarks. This project is situated immediately to the west of the proposed Quattro Substation. The project will include the following developments:

[23] City of Johannesburg Regional Spatial Development Framework for Region D: Draft (2008/2009)
[24] www.jhbproperty.co.za

- The Orlando Power Station mall (mixed used development comprising retail, offices and stylish loft apartments);
- Orlando Housing (approximately 700 new middle income houses);
- Extreme Heights Centre (conversion of the old high cooling towers to a permanent extreme heights centre featuring the only indoor bungee jump in the world);
- Elangeni (20 000 seater outdoor events venue with a floating stage on the dam); and
- University of Johannesburg expansion (expansion and consolidation of Soweto's university including investigations into launching a business school on site).

Future developments (buildings) towards the west of the Rietfontein Fire Training Centre should also be considered when finalising the route alignments, as well as the extension of the Lehae township to the west of the existing Lehae settlement (Alternative 3).

Any future town planning developments are critical for the construction of a transmission line, as these pose numerous challenges in terms of finalising a route alignment. This is applicable in areas where the informal settlements along the routes are being formalised such as Motsoaledi (all alternatives combined into one), and the township developments near Goldev and Devland, as well as the formalisation of Slovo Park. Indications are that a power line along this alternative could also be problematic in the area at the intersection of the Golden Highway (R553) and the R554, as it could restrict the ability for this area as development node.[25] (Alternative 2).

It should, however, be noted that the SDFs for both Region D and G[26] do not indicate any specific new township or other developments in the study area apart from the proposed Orlando Ekhaya project.

7.1.6 EXISTING AND FUTURE DEVELOPMENT AND INFRASTRUCTURE

No matter how carefully power line corridors are planned and set to have the least environmental impact these corridors need also to take account of existing and future developments.

Impacts are considered in terms of the interference with existing land uses, development trends, land use rights, existing and planned infrastructure and official land use policies. These impacts were also considered in the Social Assessment.

The corridors may impact on the following:

- Residential settlements proposed by Johannesburg Property Company and Gauteng Department of Housing;
- Long term routes proposed by Gautrans;
- Sewer lines and water lines proposed by Johannesburg Water;
- Agricultural activities.

The servitude required for the power line may result in loss of development space or restriction of development planning.

[25] Discussions at Specialist Integration Meeting held on 16 October 2008 at Eskom Megawatt Park.
[26] City of Johannesburg Regional Spatial Development Framework for Region D: Draft (2008/2009) and City of Johannesburg Regional Spatial Development Framework for Region G: Draft (2008/2009)

7.1.7 AQUATIC ECOSYSTEMS

The study found that the project area is situated within the upper Klip River Catchment. Rivers covered by the area include Bailey Spruit, Diepkloofspruit, Kliprivier, Olifantsvlei. The Klip River is the river with the most important flow to be taken into consideration during the installation of the power line in the study area.

Other rivers are trubutaries to the Klip River, some are small and seasonal . The investigation identified 17 wetlands and river crossing areas that have a relationship with the proposed power stations and power line corridors within the study area. Of the 17 wetlands were identified within the study area and only one is occurring adjacent to the proposed Quarto Power Station, that is were the study found it necessary to delineate this wetland.

The construction of the power line will affect wetlands as shown in figure 6.1.2.1. The proposed project may affect the wetlands, river crossing or floodplain areas in the following way.

- Heavy machinery may crush wetland vegetation, creating opportunity for exotic and invader plants to colonise the area.
- Wetland soils may easily be compacted. Soil compaction increases runoff, greatly decreases the water retention capacity and encourage surface runoff. If there are new access roads made, they may alter the quantity and direction of the flow and cause damage to wetland soils and vegetation.
- Working in the wetland may endanger fish species and other aquatic life.
- The construction machines may introduce and spread exotic and invasive plants into the wetlands. Some species if they are in the area they reproduce quickly and to destroy native species.
- Organic soils forms very slowly, when disturbed by excavation the wetland soil cannot recover quickly and within that study areas there may be dangers of exposing hazardous chemicals.
- Option 2 and 3 routes will have many power line poles installed in, along or near the aquatic systems. Option 1 has less river or wetlands crossing that will be affected by installation of power line, meaning that there will be less impact on the wetland and river crossing during installation.

This study has observed that the wetland areas in the study area support wide range of vegetation type growing according to wetness area. The overall wetlands areas dominated by Reeds *(Phragmites australis)* with pockets of bulrushes *(Typha capensis)*, and soft rushes *(Juncus spp)*. These plants are mainly occurring in the wetlands that are like dams (upper side of the roads). Generally, wetland vegetation is quite distinct from other terrestrial vegetation and as such can provide a clue as to the extent of the wetland. In the case of the study area the abundance of wetland species is due to the poor draining/drying effect caused by roads that serve as dam wall.

7.1.8 BIRDS (AVI-FAUNA) AND THEIR HABITATS

Because of their size and prominence, electrical infrastructures constitute an important interface between wildlife and man. Negative interactions between wildlife and electricity structures take many forms, but two common problems in southern Africa are the electrocution of birds (and other animals) and birds colliding with power lines. Other problems are: electrical faults caused by bird excreta when roosting or breeding on electricity infrastructure; and disturbance and habitat destruction during the construction and maintenance activities associated with electrical infrastructure.

Electrocution of birds on overhead lines is an important cause of unnatural mortality of raptors and storks. It has attracted plenty of attention in Europe, USA and South Africa (APLIC 1994; van Rooyen and Ledger 1999). However, in the context of overhead lines above 132kV, electrocutions are not of major concern. Electrocution refers to the scenario where a bird is perched or attempts
to perch on the electrical structure and causes an electrical short circuit by physically bridging the air gap between live components and/or live and earthed components (van Rooyen

2004). Due to the large size of the clearances on most overhead lines above 132kV, electrocutions are generally ruled out as even the largest birds cannot physically bridge the gap between dangerous components. In fact, transmission lines have proven to be beneficial to many birds, including species such as Southern Bald Ibis, Martial Eagles, Tawny Eagles, African White-backed Vultures, and even occasionally Verreaux's Eagles by providing safe nesting and roosting sites in areas where suitable natural alternatives are scarce (van Rooyen 2004).

Electrocutions are not envisaged as an impact on the proposed lines primarily because of the obvious size of the clearances between the live and earthed components and secondly, the unlikely occurrences of any of these species within the study area. Electrocution in the new substation could be possible for certain species and has been assessed further below.

Collision of birds is the biggest single threat posed by transmission lines to birds in southern Africa (van Rooyen 2004) and refers to the scenario where a bird collides with the conductors or earth wires of overhead power lines. Most heavily impacted upon are bustards, storks, cranes and various species of water birds. These species are mostly heavy-bodied birds with limited maneuverability, which makes it difficult for them to take the necessary evasive action to avoid colliding with power lines. Unfortunately, many of the collision sensitive species are considered threatened (Red Data status) in southern Africa. The Red Data species vulnerable to power line collisions are generally long living, slow reproducing species under natural conditions. These species have not evolved to cope with high adult mortality, with the result that consistently high adult mortalities over an extensive period could have a serious effect on a population's ability to sustain itself in the long or even medium term. Many of the anthropogenic threats to these species are non-discriminatory as far as age is concerned (e.g. habitat destruction, disturbance and power lines) and therefore contribute to adult mortality, and it is not known what the cumulative effect of these impacts could be over the long term.

Collisions are envisaged as an impact in the study area. The most sensitive area will be where the lines run adjacent to and across the Kliprivier wetland system, and adjacent to small dams. This is described later in this report.

Agricultural lands are also sensitive from a collision point of view as these areas are much sought after by storks. The areas where the alignment will cross or run parallel to the large concentration of irrigated lands to the south will pose a higher risk in terms of collisions.

Destruction of bird habitat. During the construction phase and maintenance of power lines and substations, some destruction and alteration of habitat inevitably takes place. This happens with the construction of access roads, the clearing of servitudes and the leveling of substation yards.

Servitudes have to be cleared of excess vegetation at regular intervals in order to allow access to the line for maintenance, to prevent vegetation from intruding into the legally prescribed clearance gap between the ground and the conductors and to minimize the risk of fire under the line which can result in electrical flashovers. These activities have an impact on birds breeding, foraging and roosting in or in close proximity of the servitude, through the modification of
habitat.

This study area is largely disturbed already, and little natural habitat remains. This impact is therefore expected to be of low significance. The exception to this is the Kliprivier wetland, and the grassland in the south of the study area, close to Etna Substation.

Disturbance of birds in the study area. Similarly, the above mentioned construction and maintenance activities impact on birds through disturbance, particularly during the bird's breeding activities.

This impact is anticipated to be of low significance due to the already disturbed nature of the study area.

Impact of the birds on the proposed power line: Although this does not form part of the brief, it is important to mention that birds could have an impact on the line, primarily through causing electrical faults with their faeces or nests.

This impact could potentially occur close to the Klipriver wetland and other water sources.

7.2 IMPACT ASSESSMENT, RANKING AND RATING

Key issues identified during the scoping phase informed the structure of the specialist studies. Each issue consists of components that on their own or in combination with each other give rise to potential impacts, either positive or negative and from the project onto the environment or from the environment onto the project. This chapter assesses these potential impacts for each of the three possible corridors considered, identifies recommended mitigation and provides an indication of the significance of the impacts after mitigation. A description of the assessment criteria was highlighted in the Plan of Study for EIA. The following criterion was used to evaluate significance:

EXTENT - Magnitude of the impact, which is classified as:
Local: the impacted area is only at the site- the actual extent of the activity
Regional: the impacted area extends to the surrounding, the immediate and the neighbouring properties
National: the impact can e considered to be of national importance

DURATION - This measures the lifetime of the impact
Short term: the impact will be for 0-3 years, or only last for the period of construction
Medium term: three to ten years
Long term: longer than 10 years or the impact will continue for the entire operational lifetime of the project
Permanent: this applies to the impact that will remain after the operational lifetime of the project

INTENSITY - This is the degree to which the project affects or changes the environment, and is classified as follows:
Low: the change is slight and often not noticeable, and the natural functioning of the environment is not affected
Medium: the environment is remarkably altered, but still functions in a modified way
High: Functioning of the affected environment is disturbed and can cease

PROBABILITY - This is the likelihood or the chances that the impact will occur, and is classified as:
Low: during the normal operation of the project, no impacts are expected
Medium: the impact is likely to occur if extra care is not taken to mitigate them
High: the environment will be affected irrespectively, in some cases, such impact can be reduced

CONFIDENCE - This is the level of knowledge/information that the environmental assessment practitioner or specialist had in his/her judgement
Low: the judgement is based on intuition and not on knowledge or information
Medium: common sense and general knowledge informs the decision
High: Scientific and or proven information has been used to give such a judgement

Based on the above criteria, the **SIGNIFICANCE** of issues will be determined. This is the importance of the impact in terms of physical extent and time scale.

Low: the impact are less important, but my require some mitigation action
Medium: the impacts are important and require attention; mitigation is required to reduce the negative impacts
High: the impacts are of great importance and mitigation is critical

7.2.1 VISUAL CHARACTER OF THE AREA

7.2.1.1 Impacts on the landscape

Activity	Nature of impact	Extent of impact	Duration of impact	Severity of impact	Probability of impact	Significance without mitigation	Significance with mitigation	Level of confidence
Construction Phase								
Alternative 1	Negative – Impacting on the visual quality of the landscape due to the presence of foreign elements and a loss of vegetation cover.	Local	Permanent if not mitigated	Medium	Definite	Medium	Low	High
Alternative 2				Medium	Definite	Medium	Low	High
Alternative 3				High	Definite	High	Medium	High
Operational Phase								
Alternative 1	Negative – Impacting on the visual quality of the landscape due the presence of a transmission line.	Local	Permanent	Medium	Definite	Medium	Low	High
Alternative 2				Medium	Definite	Medium	Low	High
Alternative 3				High	Definite	High	Medium	High

Table 18: Impact Rating Table; Landscape (transmission line)

Activity	Nature of impact	Extent of impact	Duration of impact	Severity of impact	Probability of impact	Significance without mitigation	Significance with mitigation	Level of confidence
Construction Phase								
Substation Site A	Negative – Impacting on the visual quality of the landscape due to the presence of foreign elements and a loss of vegetation cover.	Local	Permanent if not mitigated	Low	Definite	Low	Low	High
				Low	Definite	Low	Low	High
Substation Site B				Moderate	Definite	Moderate	Low	High
Substation Site C								
Substation Site D				Moderate	Definite	Moderate	Low	High
Operational Phase								
Substation Site A	Negative – Impacting on the visual quality of the landscape due the presence of a substation	Local	Permanent	Low	Definite	Low	Low	High
Substation Site B				Low	Definite	Low	Low	High
Substation Site C				Moderate	Definite	Moderate	Low	High
Substation Site D				Moderate	Definite	Moderate	Low	High

Table 18.1: Impact Rating Table; Landscape (substation)

7.2.1.2 Visual Impacts on Residents

Activity	Nature of impact	Extent of impact	Duration of impact	Severity of impact	Probability of impact	Significance without mitigation	Significance with mitigation	Level of confidence
Construction Phase								
Alternative 1	Negative – Construction camp and laydown yards may cause unsightly views.	Local	Temporary	Low	Probable	Low	Low	High
Alternative 2				Medium	Probable	Medium	Low	High
Alternative 3				High	Probable	Medium	Low	High
Operational Phase								
Alternative 1	Negative – The presence of a transmission line intrudes on existing views and spoils the open views of the landscape.	Local	Permanent	Low	Definite	Low	Low	High
Alternative 2				Medium	Definite	Medium	Low	High
Alternative 3				Medium	Definite	Medium	Low	High

Table 19: Impact Rating Table; Visual Impacts on Residents from the substation sites

Activity	Nature of impact	Extent of impact	Duration of impact	Severity of impact	Probability of impact	Significance without mitigation	Significance with mitigation	Level of confidence
Construction Phase								
Substation Site A	Negative – Construction camp and laydown yards may cause unsightly views.	Local	Temporary	Moderate	Probable	Low	Low	High
Substation Site B				Low	Probable	Low	Low	High
Substation Site C				Moderate	Probable	Low	Low	High
Substation Site D				Moderate	Probable	Low	Low	High
Operational Phase								
Substation Site A	Negative – The presence of a substation intrudes on existing views and spoils the open views of the landscape.	Local	Permanent	Moderate	Probable	Low	Low	High
Substation Site B				Low	Probable	Low	Low	High
Substation Site C				Moderate	Probable	Low	Low	High
Substation Site D				Moderate	Probable	Low	Low	High

Table 19.1: Impact Rating Table; Visual Impacts on Residents from the substation sites

7.2.1.3 Visual Impacts on Tourists

Activity	Nature of impact	Extent of impact	Duration of impact	Severity of impact	Probability of impact	Significance without mitigation	Significance with mitigation	Level of confidence
Construction Phase								
Alternative 1	Negative – Construction camp and laydown yards may cause unsightly views and spoil the undisturbed views over the landscape.	Local	Temporary	Medium	Probable	Medium	Low	High
Alternative 2				Low	Probable	Low	Low	High
Alternative 3				Medium	Probable	Medium	Low	High
Operational Phase								
Alternative 1	Negative – The presence of a transmission line intrudes on existing views of the landscape	Local	Permanent	Low	Definite	Low	Low	High
Alternative 2				Low	Definite	Low	Low	High
Alternative 3				Medium	Definite	Medium	Low	High

Table 20: Impact Rating Table; Visual Impacts on Tourists

Activity	Nature of impact	Extent of impact	Duration of impact	Severity of impact	Probability of impact	Significance without mitigation	Significance with mitigation	Level of confidence
Construction Phase								
Substation Site A	Negative – Construction camp and laydown yards may cause unsightly views and spoil the undisturbed views over the landscape.	Local	Temporary	Low	Probable	Low	Low	High
Substation Site B				Low	Probable	Low	Low	High
Substation Site C				Low	Probable	Low	Low	High
Substation Site D				Low	Probable	Low	Low	High
Operational Phase								
Substation Site A	Negative – The presence of a substation intrudes on existing views of the landscape	Local	Permanent	Low	Probable	Low	Low	High
Substation Site B				Low	Probable	Low	Low	High
Substation Site C				Low	Probable	Low	Low	High
Substation Site D				Low	Probable	Low	Low	High

Table 20.1: Impact Rating Table; Visual Impacts on Tourists

7.2.1.4 Visual Impacts Motorists

Activity	Nature of impact	Extent of impact	Duration of impact	Severity of impact	Probability of impact	Significance without mitigation	Significance with mitigation	Level of confidence
Construction Phase								
Alternative 1	Negative – Intruding on existing views of the landscape.	At a number of point locations	Short period	Low	Probable	Low	Low	High
Alternative 2				Moderate	Probable	Moderate	Low	High
Alternative 3				Low	Probable	Low	Low	High
Operational Phase								
Alternative 1	Negative – Intruding on existing views of the landscape.	Local	Intermittent	Low	Definite	Low	Low	High
Alternative 2				Moderate	Definite	Moderate	Low	High
Alternative 3				Low	Definite	Low	Low	High

Table 21: Impact Rating Table; Visual Impacts on Motorists

Activity	Nature of impact	Extent of impact	Duration of impact	Severity of impact	Probability of impact	Significance without mitigation	Significance with mitigation	Level of confidence
Construction Phase								
Substation Site A	Negative – Intruding on existing views of the landscape.	At a number of point locations	Short period	Low	Probable	Low	Low	High
Substation Site B				Low	Probable	Low	Low	High
Substation Site C				Low	Probable	Low	Low	High
Substation Site D				Low	Probable	Low	Low	High
Operational Phase								
Substation Site A	Negative – Intruding on existing views of the landscape	Local	Intermittent	Low	Probable	Low	Low	High
Substation Site B				Low	Probable	Low	Low	High
Substation Site C				Low	Probable	Low	Low	High
Substation Site D				Low	Probable	Low	Low	High

Table 21.1: Impact Rating Table; Visual Impacts on Motorists (Substation)

7.2.2 SOILS, GEOLOGY AND AGRICULTURE

Activity	Nature of impact	Extent of impact	Duration of impact	Severity of impact	Probability of impact	Significance without mitigation	Significance with mitigation	Level of confidence
Construction Phase								
Alternative 1	Negative- Physical reduction of available arable land, introduction of foreign material on land	Local	Short period	Medium	Highly probable	Low	Low	Medium
Alternative 2				Low	Highly probable	Low	Low	Medium
Alternative 3				Medium-Low	Highly probable	Low	Low	Medium
Operational Phase								
Alternative 1	Negative- Soil fertility not suitable for productive crop production.	Local	Long term	Medium	Probable	Low	Low	Medium
Alternative 2				Low	Probable	Low	Low	Medium
Alternative 3				Medium-Low	Probable	Low	Medium	Medium

Table 22: Impact Rating Table; Soils, Geology and Agriculture

Activity	Nature of impact	Extent of impact	Duration of impact	Severity of impact	Probability of impact	Significance without mitigation	Significance with mitigation	Level of confidence
Construction Phase								
Substation Site A	Negative- Physical reduction of available arable land, introduction of foreign material on land.	Local	Short period	Medium	Highly probable	Low	Low	Medium
Substation Site B				Medium	Highly probable	Low	Low	Medium
Substation Site C				Medium	Highly probable	Low	Low	Medium
Substation Site D				Medium	Highly probable	Low	Low	Medium
Operational Phase								
Substation Site A	Negative- Soil fertility not suitable for productive crop production.	Local	Long term	Medium	Highly probable	Low	Low	Medium
Substation Site B				Medium	Highly probable	Low	Low	Medium
Substation Site C				Medium	Highly probable	Low	Low	Medium
Substation Site D				Medium	Highly probable	Low	Low	Medium

Table 22.1: Impact Rating Table; Soils, Geology and Agriculture

7.2.3 ARCHAEOLOGICAL AND/OR CULTURAL RESOURCES

Activity	Nature of impact	Extent of impact	Duration of impact	Severity of impact	Probability of impact	Significance without mitigation	Significance with mitigation	Level of confidence
Construction Phase								
Alternative 1	Constructing the towers of the transmission line at a site having historical and cultural significance, along any one of the corridors	Local	Short	High	Improbable	Low	n/a	High
Alternative 2				High	Improbable	Low	n/a	High
Alternative 3				High	Improbable	Low	n/a	High
Operational Phase								
Alternative 1	Damage and looting of cultural heritage sites, resulting in loss of heritage.	Local	Short	High	Improbable	Medium	Low	High
Alternative 2				High	Improbable	Medium	Low	High
Alternative 3				High	Improbable	Medium	Low	High

Table 23: Impact Rating Table; Heritage and Archaeological Resources

Activity	Nature of impact	Extent of impact	Duration of impact	Severity of impact	Probability of impact	Significance without mitigation	Significance with mitigation	Level of confidence
Construction Phase								

Substation Site A	Constructing the towers of the substations at a site having historical and cultural significance	Local	Short	High	Improbable	Low	n/a	High
Substation Site B				High	Improbable	Low	n/a	High
Substation Site C				High	Improbable	Low	n/a	High
Substation Site D				High	Improbable	Low	n/a	High
Operational Phase								
Substation Site A	Damage and looting of cultural heritage sites, resulting in loss of heritage.	Local	Short	High	Improbable	Medium	Low	High
Substation Site B				High	Improbable	Medium	Low	High
Substation Site C				High	Improbable	Medium	Low	High
Substation Site D				High	Improbable	Medium	Low	High

Table 23.1: Impact Rating Table; Heritage and Archaeological Resources on proposed substation sites

7.2.4 ECOLOGY AND ECOLOGICAL SENSITIVITY

7.2.4.1 Impacts on vegetation

Activity	Nature of impact	Extent of impact	Duration of impact	Severity of impact	Probability of impact	Significance without mitigation	Significance with mitigation	Level of confidence
Construction and Operation								

Transmission line (Alternative corridor 1, 2 and 3)	Vegetation removal/destruction on pylon footprints during construction.	Site	Permanent	High	Definite	High	Medium	High
	Plant removal and soil disturbance caused by the construction and use of access roads.	Regional	Long term	High	Probable	Medium-High	Medium	High
	Vegetation and soil disturbance around construction sites during pylon construction activities.	Site/Regional	Medium term	Medium	Definite	Medium –High	Medium-Low	High
	Vegetation destruction and disturbance during servitude maintenance.	Regional	Long term	Low	Highly Probable	Medium	Low	High
	Soil contamination, vegetation loss and vegetation disturbance due to fuel and chemical spills.	Site/Regional	Long term	Medium	Probable	Medium	Low	High
	6. Vegetation disturbance in and around construction camps.	Regional	Medium term	Medium	Probable	Medium	Low	High
	Vegetation and habitat disturbance due to the accidental introduction of alien species.	Regional	Long term	Medium	Improbable	Medium	Low	High
	Vegetation and habitat disturbance due to pollution and littering during construction phase.	Site/Regional	Long term	Low	Probable	Medium-Low	Low	High
	Vegetation disturbance due to increased dust during construction.	Regional	Short term	Low	Highly probable	Medium-Low	Low	High
	Vegetation damage due to increased risk of veld fires during construction phase.	Regional	Short term	Low	Improbable	Low	Low-zero	High
Construction and Operational Phase – Substation								
Substation sites A, B, C and D	Vegetation removal	Site	Permanent	High	Definite	High	Medium	High
	Vegetation and soil disturbance surrounding the construction site due to general construction activities.	Site/Regional	Medium	Medium	Definite	Medium-High	Medium	High
	Vegetation disturbance in and around construction site.	Regional	Medium	Medium	Probable	Medium	Medium-Low	High
	Vegetation and habitat disturbance due to the accidental introduction of alien species	Regional	Long	Medium	Improbable	Medium	Low	High

	Vegetation and habitat disturbance due to pollution and littering during construction	Site/Regional	Long	Low	Probable	Medium-Low	Low	High
	Vegetation disturbance due to increased dust during construction.	Regional	Short	Low	Probable	Low	Low	High
	Vegetation damage due to increased risk of veld fires during construction phase.	Regional	Short	Low	Improbable	Low	Low-zero	High

Table 24: Impact Rating Table; Ecology and Sensitivity

7.2.4.2 Impacts on aquatic ecosystems

Activity	Nature of impact	Extent of impact	Duration of impact	Severity of impact	Probability of impact	Significance without mitigation	Significance with mitigation	Level of confidence
Construction Phase								
Alternative 1	Negative- Impacting on wetlands due to the physical damage as a result of construction and erection activities	Local	Short period	Low	Probable	Low	Very-Low	Medium
Alternative 2				Medium	Probable	Medium	Low	Medium
Alternative 3				High	Probable	High	Medium	Medium
Operational Phase								
Alternative 1	Negative- impacting on wetlands due to			Low	Probable	Low	Very-Low	Medium

Alternative 2	existence of servitude and other service or temporary roads, the presence of pylon foundations and foot blocks	Local	Long term	Medium	Probable	Medium	Low	Medium
Alternative 3				High	Probable	High	Medium	Medium

Table 25: Impact Rating Table; Aquatic Ecosystems

Activity	Nature of impact	Extent of impact	Duration of impact	Severity of impact	Probability of impact	Significance without mitigation	Significance with mitigation	Level of confidence
Construction Phase								
Substation Site A	Negative- Impacting on wetlands due to the physical damage as a result of construction and erection activities	Local	Short period	Medium	Probable	Medium	Medium	Medium
Substation Site B				Medium	Probable	Medium	Medium	Medium
Substation Site C				Medium	Probable	Medium	Medium	Medium
Substation Site D				High	Probable	High	Medium	Medium
Operational Phase								
Substation Site A	Negative- impacting on wetlands due to existence of substation and other service or temporary roads, the presence of foundations and	Local	Long term	Medium	Probable	Medium	Low	Medium
Substation Site B				Medium	Probable	Medium	Low	Medium
Substation Site C				Medium	Probable	Medium	Low	Medium

Substation Site D	foot blocks			High	Probable	High	Medium	Medium

Table 25.1: Impact Rating Table; Aquatic Ecosystems

7.2.4.3 Impacts on Pristine Patches of Grassland Habitats

Activity	Nature of impact	Extent of impact	Duration of impact	Severity of impact	Probability of impact	Significance without mitigation	Significance with mitigation	Level of confidence
Construction Phase								
Alternative 1	Negative- Impacting on pristine patches of grassland habitats due to the physical damage as a result of construction and erection activities	Local	Short period	Low	Improbable	Low	Low	Medium
Alternative 2				Low	Improbable	Low	Low	Medium
Alternative 3				Low	Improbable	Low	Low	Medium
Operational Phase								
Alternative 1	Negative- impacting on pristine patches of grassland habitat due to existence of servitude and other service or temporary roads, the presence of pylon foundations and foot blocks	Local	Long term	Low	Improbable	Low	Low	Medium
Alternative 2				Low	Improbable	Low	Low	Medium
Alternative 3				Low	Improbable	Low	Low	Medium

Table 26: Impact Rating Table; Pristine Patches of Grassland Habitats

7.2.4.4 Impacts on Faunal Species

Activity	Nature of impact	Extent of impact	Duration of impact	Severity of impact	Probability of impact	Significance without mitigation	Significance with mitigation	Level of confidence
Construction Phase								
Alternative 1	Negative- Impacting on fauna due to the physical damage as a result of construction and erection activities	Local	Short period	Low	Improbable	Medium	Low	Medium
Alternative 2				Medium	Probable	Medium	Low	Medium
Alternative 3				Medium	Probable	Medium	Low	Medium
Operational Phase								
Alternative 1	Negative- impacting on fauna due to existence of servitude and other service or temporary roads, the presence of pylon foundations and foot blocks	Local, but could be regional and national for some bird species	Long term	Medium	Probable	Medium	Low	Medium
Alternative 2				Low	Probable	Medium	Low	Medium
Alternative 3				Medium	Probable	Medium	Low	Medium

Table 27: Impact Rating Table; Faunal Species

7.2.5 SOCIAL AND ECONOMIC ASPECTS

7.2.5.1 Population Change

Activity	Nature of impact	Extent of impact	Duration of impact	Severity of impact	Probability of impact	Significance without mitigation	Significance with mitigation	Level of confidence
Construction Phase								
Quattro Substation	Neutral impact on size and density of population	Local	Short term	Low	Improbable	Low	Low	High
Alternative 1								
Alternative 2								
Alternative 3								
Operational Phase								
Quattro Substation	Neutral impact on the and density of the population	Local	Long term	Low	Improbable	Very low	Very low	High
Alternative 1								
Alternative 2								
Alternative 3								

Table 28: Impact Rating Table; Population Change

7.2.5.2 Impact on Job Opportunities

Activity	Nature of impact	Extent of impact	Duration of impact	Severity of impact	Probability of impact	Significance without mitigation	Significance with mitigation	Level of confidence
Construction Phase								
Quattro Substation	Positive- utilisation of local labour and equipment	Local	Short term	Medium	Highly Probable	Medium	Medium-High	High
Alternative 1								
Alternative 2								
Alternative 3								
Operational Phase								
Quattro Substation	Positive- Utilisation of local labour in study area	Local	Short term	Low	Improbable	Low	Low	High
Alternative 1								
Alternative 2								
Alternative 3								

Table 29: Impact Rating Table; Job Opportunities

7.2.5.3 Inflow of workers

Activity	Nature of impact	Extent of impact	Duration of impact	Severity of impact	Probability of impact	Significance without mitigation	Significance with mitigation	Level of confidence
Construction Phase								
Quattro Substation	Positive impact- not foreseen that large number of workforce will be introduced to the area	Local	Short term	Medium- Substation Low- Transmission line	Probable - Substation Improbable – Transmission line	Medium- Substation Low- Transmission line	Low	Medium
Alternative 1								
Alternative 2								
Alternative 3								
Operational Phase								
Quattro Substation	Neutral-no additional inflow of workers expected	Local	Medium term - substation Short term (due to intermittent nature of maintenance)	Low	Improbable	Low	Low	High
Alternative 1	Possibly negative- due to inflow of workers during maintenance of the power line							
Alternative 2								
Alternative 3								

Table 30: Impact Rating Table; Inflow of Workers

7.2.5.4 Influx of Jobseekers

Activity	Nature of impact	Extent of impact	Duration of impact	Severity of impact	Probability of impact	Significance without mitigation	Significance with mitigation	Level of confidence
Construction Phase								
Quattro Substation	Negative impact Significant influx to construction sites and areas	Local	Short term	Medium	Highly Probable	Medium	Medium-Low	High
Alternative 1					Probable			
Alternative 2								
Alternative 3								
Operational Phase								
Quattro Substation	No impact anticipated							
Alternative 1								
Alternative 2								
Alternative 3								

Table 31: Impact Rating Table; Influx of Jobseekers

7.2.5.5 Impacts on Daily living and movement patterns

Activity	Nature of impact	Extent of impact	Duration of impact	Severity of impact	Probability of impact	Significance without mitigation	Significance with mitigation	Level of confidence

Construction Phase								
Quattro Substation	Negative impact on pedestrians (schools) in Eldorado Park, Crossing R554 and Golden Highway near Lehae and Lenasia	Local	Short term	Medium	Probable	Medium	Low	High
Alternative 1				Low	Improbable	Low	Low	High
Alternative 2				Medium	Probable	Medium	Low	High
Alternative 3				Medium	Probable	Medium	Low	High
Operational Phase								
Quattro Substation	Negative impact Close proximity to dwellings and sensitive receptor areas	Local	Medium term	Medium	Probable	Medium	Medium-Low	High
Alternative 1								
Alternative 2								
Alternative 3								

Table 32: Impact Rating Table; Daily living and movement patterns

7.2.5.6 Impacts associated with construction camps

Activity	Nature of impact	Extent of impact	Duration of impact	Severity of impact	Probability of impact	Significance without mitigation	Significance with mitigation	Level of confidence

Construction Phase								
Quattro Substation	Negative impact Due to proximity to local communities	Local	Short term	Medium	Highly Probable	Medium	Medium-Low	High
Alternative 1					Probable			
Alternative 2					Probable			
Alternative 3					Probable			

Table 33: Impact rating table; Construction camps

7.2.5.7 Relocation of families

Activity	Nature of impact	Extent of impact	Duration of impact	Severity of impact	Probability of impact	Significance without mitigation	Significance with mitigation	Level of confidence
Construction Phase								
Quattro substation is clear of any illegal squatting	Negative impact Transmission line traverse extreme built up area, informal settlement with existing servitudes	Local	Short term	Medium	Improbable	Low-Substation	Low-Substation	High
Alternative 1					Probable	Transmission line-Medium	Medium-Transmission line	
Alternative 2					Probable			
Alternative 3					Probable			

Table 34: Impact rating table; Relocation of families

7.2.5.8 Health related impacts

Activity	Nature of impact	Extent of impact	Duration of impact	Severity of impact	Probability of impact	Significance without mitigation	Significance with mitigation	Level of confidence
Construction Phase								
Quattro Substation	Negative impact Due to influx of outsiders to area could spread HIV/Aids Inadequate accommodation cause environmental pollution	Local	Medium term	Medium	Highly Probable	Medium	Low	Medium
Alternative 1								
Alternative 2								
Alternative 3								
Operational Phase								
Quattro Substation	Negative-EMF's and carcinogenic risks in close proximity to community members (schools, old age homes)	Local	Medium term	Low	Medium	Low	Low	Medium
Alternative 1				Medium		Medium		
Alternative 2								
Alternative 3								

Table 35: Impact rating table; Health impacts

7.2.5.9 Safety and Security impacts

Activity	Nature of impact	Extent of impact	Duration of impact	Severity of impact	Probability of impact	Significance without mitigation	Significance with mitigation	Level of confidence
Construction Phase								
Quattro Substation	Negative impact Increased risk of veld fires, vehicular and pedestrian accidents	Local	Short term	Low	Probable	Low	Low	Medium
Alternative 1				Medium	Highly Probable	Medium	Low	Medium
Alternative 2				Medium	Highly Probable	Medium	Low	Medium
Alternative 3				Low	Probable	Low	Low	Medium
Operational Phase								
Quattro Substation	Negative impact Unauthorised entry by maintenance personnel and community, electrocution and fire risk due to proximity to community	Local	Medium term	Medium	Probable	Medium	Low	Medium
Alternative 1								
Alternative 2								
Alternative 3								

Table 36: Impact rating table; Safety and security impacts

7.2.5.10 Noise impact

Activity	Nature of impact	Extent of impact	Duration of impact	Severity of impact	Probability of impact	Significance without mitigation	Significance with mitigation	Level of confidence
Construction Phase								
Quattro Substation	Negative impact Due to proximity of construction camp and use of equipment to community	Local	Short term	Medium	Highly Probable	Medium	Low	High
Alternative 1				Low	Probable	Low	Low	High
Alternative 2				Low	Probable	Low	Low	High
Alternative 3				Low	Probable	Low	Low	High
Operational Phase								
Quattro Substation	No significant noise is expected from the elements of the proposal during operation.							
Alternative 1								
Alternative 2								
Alternative 3								

Table 37: Impact rating table; Noise impact

7.2.5.11 Dust impact

Activity	Nature of impact	Extent of impact	Duration of impact	Severity of impact	Probability of impact	Significance without mitigation	Significance with mitigation	Level of confidence
Construction Phase								
Quattro Substation	Negative impact- Dust emissions due to vehicular movement	Local	Short term	Medium	Probable	Medium	Low	High
Alternative 1								
Alternative 2								
Alternative 3								
Operational Phase								
Quattro Substation	No significant dust is expected from the elements of the proposal due to maintenance.							
Alternative 1								
Alternative 2								
Alternative 3								

Table 38: Impact rating table; Dust pollution

7.2.5.12 Impact on regional and local economy

Activity	Nature of impact	Extent of impact	Duration of impact	Severity of impact	Probability of impact	Significance without mitigation	Significance with mitigation	Level of confidence
Operational Phase								
Quattro Substation	Positive- proposal will result in further development	Regional (possible at National level)	Medium term	Medium	Probable	Medium	Medium	High
Alternative 1								
Alternative 2								
Alternative 3								

Table 39: Impact rating table: Impact on regional and local economy

7.2.5.13 Change in Tourism and Leisure Opportunities

Activity	Nature of impact	Extent of impact	Duration of impact	Severity of impact	Probability of impact	Significance without mitigation	Significance with mitigation	Level of confidence
Operational Phase								
Quattro Substation	Negative – close proximity to tourist attractions in Soweto	Local	Medium term	Low	Low Probability	Low	Low	Medium
Alternative 1				Medium	Improbable			
Alternative 2				Medium	Low Probability			

Alternative 3				Medium-Low	Low Probability			

Table 40: Impact rating table; Change in Tourism and Leisure Opportunities

7.2.5.14 Property Values

Activity	Nature of impact	Extent of impact	Duration of impact	Severity of impact	Probability of impact	Significance without mitigation	Significance with mitigation	Level of confidence
Operational Phase								
Quattro Substation	Negative – negative visual impact therefore devaluation of property	Local	Medium term	Low	Medium Probability	Low	Low	High
Alternative 1				Low	Low Probability	Low		
Alternative 2				Medium	Medium Probability	Medium		
Alternative 3				Low	Low Probability	Low		

Table 41: Impact rating table; Property values

7.2.5.15 Existing and Future Developments

Activity	Nature of impact	Extent of impact	Duration of impact	Severity of impact	Probability of impact	Significance without mitigation	Significance with mitigation	Level of confidence
Operational Phase								

Quattro Substation	Negative – impact on existing developments and may hamper future developments planned	Local	Medium term	Medium	Medium Probability	Medium	Low	High
Alternative 1								
Alternative 2								
Alternative 3								

Table 42: Impact rating table: Existing and Future Developments

7.2.6 BIRDS (AVI-FAUNA) AND THEIR HABITATS

7.2.6.1 Habitat Disturbance

Activity	Nature of impact	Extent of impact	Duration of impact	Severity of impact	Probability of impact	Significance without mitigation	Significance with mitigation	Level of confidence
Construction Phase								
Quattro Substation	**Habitat disturbance** (negative impact) Project proposal will affect Red Data and non Red Data species	Local (site)	Permanent	Low due to already disturbed nature	Low Probability	Low	Low	High
Alternative 1								
Alternative 2								
Alternative 3								
Operational Phase								
Quattro	**N/A**							

Substation								
Alternative 1	**Electrical faulting** (Negative Impact- for line not birds). Electrical faulting can be caused by Herons and Ibises.	Permanent	Low	Medium	Medium Probability	Medium	Low-line should be built on cross rope suspension tower, and all self support type towers should be installed with bird guards as per Eskom Transmission Standard.	High
Alternative 2								
Alternative 3								

Table 43: Impact Rating Table; Bird Habitat Disturbance

7.2.6.2 Habitat Destruction

Activity	Nature of impact	Extent of impact	Duration of impact	Severity of impact	Probability of impact	Significance without mitigation	Significance with mitigation	Level of confidence
Construction and Operation Phase								
Quattro Substation	Habitat destruction (negative impact)	Local	Permanent	Low-with exception of Kliprivier wetland, and grassland close to Etna Substation	Medium Probability	Mostly low, Medium at wetland & grassland	Low- all construction & maintenance activities must be undertaken according to generally environmental best practice	
Alternative 1	Red Data and non Red Data bird species will be affected by the project							
Alternative 2								
Alternative 3								

Table 44: Impact Rating Table; Bird Habitat Destruction

7.2.6.3 Collisions, Electrocution and Disturbance Impacts during Operational Phase

Activity	Nature of impact	Extent of impact	Duration of impact	Severity of impact	Probability of impact	Significance without mitigation	Significance with mitigation	Level of confidence
Operational Phase Electrocution								
Quattro Substation site	Negative impact Could affect non Red Data species	Local	Permanent	Low	Low	Low	Low-no mitigation required until a problem is identified by Eskom during operation of substation	High
Alternatives 1, 2, 3	Negative impact Electrocution on power line not possible due to clearance							
Operation Phase Collision – Red Data such as White-bellied Korhaan, White Stork								
Quattro Substation	**N/A**							
Alternative 1	**Collision** (negative impact) Collisions are envisaged as an impact by the proposed lines especially where the power lines cross dams, grassland areas and cultivated lands and the Kliprivier	Local	Permanent	Low	Improbable	Low	Low	High
Alternative 2								
Alternative 3								
Operation Phase Collision – Non Red Data: assorted water birds								
Alternative 1,2 and 3	Collision (negative impact) Collisions are envisaged as an impact by the	Local	Permanent	Medium	Probable	Medium	Low-high risk section of line will be at the Kliprivier and	High

	proposed lines especially where the power lines cross dams, grassland areas and cultivated lands and the Kliprivier						dams and should be marked with a suitable anti collision marking device on the earth wires as per Eskom Transmission Standard	
Operational Phase Disturbance								
Quattro Substation Alternative 1 Alternative 2 Alternative 3	**Disturbance** (Negative Impact). Resident bird species will almost invariably be affected through disturbance as a result of maintenance activities taking place along the power line	Local	Permanent	Low due to already disturbed nature of site	Low probability	Low	Low – all construction & maintenance activities must be undertaken according to generally environmental best practice	High

Table 45: Impact Rating Table; Collisions and impacts during operation

8. IMPACTS MITIGATION MEASURES

8.1 VISUAL IMPACTS

The aim of mitigation is to reduce or alleviate the intrusive contrast between the proposed project components and activities, and the receiving landscape to a point where it is acceptable to visual and landscape receptors.

8.1.1 GENERAL

Proceed with construction of the transmission line during the off peak tourism season. Where areas are going to be disturbed through the destruction of vegetation, for example the establishment of the construction camp, the vegetation occurring in the area to be disturbed must be salvaged and kept in a controlled environment such as a nursery, for future re-planting in the disturbed areas as a measure of rehabilitation.

8.1.2 TRANSMISSION TOWERS

Avoid crossing over or through ridges, rivers, pans or any natural features that have visual value. This also includes centres of floral endemism and areas where vegetation is not resilient and takes extended periods to recover;

- The preferred type of tower is the compact cross-rope or the cross-rope suspension tower.
- These two tower types are the most visually permeable and create an extremely low degree of visual obstruction;
- Avoid changing the alignment's direction too often in order to minimise the use of the selfsupporting strain tower. This tower type is the most visually intrusive as the steel lattice structure is more dense than the other two tower types, hence creating more visual obstruction;
- Where practically possible, provide a minimum of 1 km buffer area between the transmission line and sensitive visual receptors; and
- Rehabilitate disturbed areas around pylons as soon as practically possible after construction. This should be done to restrict extended periods of exposed soil.

8.1.3 ACCESS ROADS

Make use of existing access roads where possible;

- Where new access roads are required, the disturbance area should be kept as small as possible. A two-track dirt road will be the most preferred option;
- Locate access routes so as to limit modification to the topography and to avoid the removal of established vegetation;
- Avoid crossing over or through ridges, rivers, pans or any natural features that have visual value. This also includes centres of floral endemism and areas where vegetation is not resilient and takes extended periods to recover;
- Maintain no or minimum cleared road verges;
- Access routes should be located on the perimeter of disturbed areas such as cultivated/fallow lands as not to fragment intact vegetated areas; and
- If it is necessary to clear vegetation for a road, avoid doing so in a continuous straight line. Alternatively, curve the road in order to reduce the visible extent of the cleared corridor.

8.1.4 CLEARED SERVITUDES

Locate the alignment and the associated cleared servitude so as to avoid the removal of established vegetation; and avoid a continuous linear path of cleared vegetation that would strongly contrast with the surrounding landscape character. Feather the edges of the cleared corridor to avoid a clearly defined line through the landscape.

8.1.5 CONSTRUCTION CAMPS

If practically possible, locate construction camp in a area that are already disturbed or where it isn't necessary to remove established vegetation like for example, naturally bare areas;

- Utilise existing screening features such as dense vegetation stands or topographical features to place the construction camps and lay-down yards out of the view of sensitivity visual receptors;
- Keep the construction sites and camps neat, clean and organised in order to portray a tidy appearance; and
- Screen the construction camp and lay-down yards by enclosing the entire area with a dark green or black shade cloth of no less than 2 m height.

8.1.6 OPTIMUM ALTERNATIVE

Alternative 2 is regarded as the most preferred alternative for the line. Its alignment along the existing roads and agricultural fields is considered to cause the least impact on the landscape character due to the reduced sensitivity of the landscape.

Alternative B is regarded as the most preferred alternative for the Substation site. Its location in the industrial area with less visual impacts and degraded vegetation is considered to cause the least impacts on the landscape character due to reduced sensitivity of the landscape.

8.2 AGRICULTURAL POTENTIAL, SOILS AND GEOLOGY

There is no distinct difference in the potential of land found under the three proposed routes. However route 3 traverse an area with slightly lower potential for agriculture but happens to traverse a large proportion of wetland which must be preserved and not disturbed. Route 1 traverses more arable and wetland than route 2. Route 2 could be considered more suitable for the construction due to its minimal impact on arable and wetlands at the project site. The construction of the power line along route 2 will however need to consider the necessary environmental legislations required.

8.3 ARCHAEOLOGY AND HERITAGE RESOURCES

The following was identified on site:

- A stone walled site which date from the Late Iron Age.
- A farmstead complex and house which are older than sixty years and which qualify as historical structures.
- A large formal cemetery.
- Remains from the recent past

It is unlikely that any of these heritage resources will be affected by the proposed Soweto Integration Project as they do occur some distance from the alignments for Alternatives 1 to 3 for the 400kV power lines.

Consequently, no mitigation measures are outlined for any of the types and ranges of heritage resources observed near the project area.

8.4 ECOLOGY AND ECOLOGICAL SENSITIVITY

A total of nine vegetation zones were identified within the study area. All these vegetation zones are currently degraded or transformed. The main causes for this degradation and transformation are residential development, crop cultivation, wetland drainage, medicinal plant harvesting and topsoil excavation. The least disturbed vegetation zones are Wetlands, Degraded Rocky Ridges and Degraded Foot Slopes.

The alternative route that intersects the least sensitive areas is Alternative Nr.1. This route is also the shortest and is therefore, from a vegetation impact viewpoint, recommended to be used in this proposed project. The alternative routes that intersect the most sensitive areas are Alternative 2a and 3 and should preferably not be used Soweto Integration Vegetation Assessment. The proposed site for the construction of the Orlando (Quattro) substation falls within the Transformed Grassland vegetation zone. This zone is

already transformed and has a low ecological sensitivity. **It is however recommended that the substation is not constructed near the Bailey Spruit but preferably constructed in the severely transformed south-western portion of the proposed site.**

Mitigation Measures for impacts identified for the proposed Transmission Line:

Vegetation removal/destruction on pylon footprints during construction.

- Prevent construction of pylons in wetland and woody vegetation as far as possible.
- Remove and transplant succulent and other rare vegetation occurring within footprint area before construction.

Plant removal and soil disturbance caused by the construction and use of access roads.

- Restrict construction of access roads by utilizing existing roads.
- Do careful planning of access roads in order to prevent excessive removal of trees and prevent soil erosion.
- Construct proper spill ways to divert runoff water to prevent erosion.
- Rehabilitate all temporarily access roads.
- Construct access roads in previously disturbed land such as old croplands

Vegetation and soil disturbance around construction sites during pylon construction activities.

- Minimise topsoil disturbance as far as possible.
- Level and landscape disturbed topsoil areas to facilitate plant succession.
- Where construction is on slopes, erosion control measures, such as stone packing, brush packing and reseeding, should be included on disturbed areas.

Vegetation destruction and disturbance during servitude maintenance.

- Only selectively control indigenous trees.
- Use competent personnel/contractors to apply chemicals

Soil contamination, vegetation loss and vegetation disturbance due to fuel and chemical spills.

- Employ on site personnel responsible for preventing and controlling potential soil pollution through fuel and oil leaks and spills.
- Make sure construction vehicles do not leak oil and fuel.
- Have equipment ready to deal with soil pollution and littering.

Vegetation disturbance in and around construction camps

- Fencing off of construction camps.
- Construction camps should be as small as possible
- Level and landscape disturbed topsoil areas to facilitate plant succession.
- Erect construction camps at previously disturbed areas.
- Erect construction camps on level surfaces only.

Vegetation and habitat disturbance due to the accidental introduction of alien species.

- Promote awareness of all personnel.
- After construction monitoring and control of alien weeds and invaders through hand removal, slashing (annuals) or chemical control (perennials) is important.

Vegetation and habitat disturbance due to pollution and littering during construction phase.

- Employ personnel on site responsible for preventing and controlling of litter.
- Have equipment ready to deal with litter control

Vegetation disturbance due to increased dust during construction.

- To decrease the effect of dust, construction should take place during the rainy season when there is less expected wind and more often rain to clear vegetation from dust.
- Cultivate awareness among personnel to limit excessive and unnecessary dust.

Vegetation damage due to increased risk of veld fires during construction phase.

- Conduct awareness on veld fire prevention among personnel.
- Have firefighting equipment at hand
- Prevent open fires.
- Notify local Fire Protection Association before construction starts.

Mitigation measures proposed for the substation:
Vegetation removal on substation site.

- Construct Substation on disturbed area
- Prevent construction the substation near sensitive areas such as rivers and streams.

Vegetation and soil disturbance surrounding the construction site due to general construction activities.

- Minimise topsoil disturbance as far as possible.
- Level and landscape disturbed topsoil areas to facilitate plant succession.
- Do levelling and reseeding of disturbed soil. An indigenous grass seed at about 5 kg/ha can be used for reseeding.

Vegetation disturbance in and around construction camp.

- Fencing off of construction camp.
- Construction camp should be small as possible
- Level and landscape disturbed topsoil areas to facilitate plant succession.
- Erect construction camps at previously disturbed areas, e.g. old lands.
- Erect construction camps on level surfaces only.

Vegetation and habitat disturbance due to the accidental introduction of alien species.

- Promote awareness of all personnel.
- After construction monitoring and control of alien weeds and invaders through hand removal, slashing (annuals) or chemical control (perennials).

Vegetation and habitat disturbance due to pollution and littering during construction phase.

- Employ personnel on site responsible for preventing and controlling litter.
- Employ on site personnel responsible for preventing and controlling potential soil pollution e.g. fuel and oil spills.
- Have equipment ready to deal with soil pollution and littering.

Vegetation disturbance due to increased dust during construction.

- Promote awareness among personnel to limit excessive and unnecessary dust.

Vegetation damage due to increased risk of veld fires during construction phase.

- Conduct awareness among personnel.
- Have fire fighting equipment at hand
- Prevent open fires.
- Notify local Fire Protection Association before construction starts.

8.5 AQUATIC ECOSYSTEMS

POWER LINE	**Number of identified wetlands and river crossing**	**Total length of wetlands or river crossing**	**Comment**
OPTION 1	**FIVE**	**1164M**	Less impact on aquatic systems
OPTION 2	**NINE**	**4140M**	Average impact on aquatic systems
OPTION 3	**ELEVEN**	**151490M**	High impact on aquatic systems

The construction of the power line will affect wetlands. The proposed project may affect the wetlands, river crossing or floodplain areas in the following way;

- Heavy machinery may crush wetland vegetation, creating opportunity for exotic and invader plants to colonise the area.
- Wetland soils may easily be compacted. Soil compaction increases runoff, greatly decreases the water retention capacity and encourage surface runoff. If there are new access roads made, they may alter the quantity and direction of the flow and cause damage to wetland soils and vegetation.
- Working in the wetland may endanger fish species and other aquatic life.
- The construction machines may introduce and spread exotic and invasive plants into the wetlands. Some species if they are in the area they reproduce quickly and to destroy native species.
- Organic soils forms very slowly, when disturbed by excavation the wetland soil cannot recover quickly and within that study areas there may be dangers of exposing hazardous chemicals.

Below are some of the issues that can be considered of high risk if power line installation is to be within, near or along the aquatic system.

Erosion

Soil erosion is regarded as one of South Africa's most significant environmental problems. Erosion is one of the major issues associated with power line development. The erosion issues in many instances are found to be worse than anticipated. The installation of the transmission line could cause erosion, particularly if the lines are to be installed in areas of surface water movement and of steeply sloping terrain. The other source of erosion would include borrow pit sites, digging of holes, alteration of the natural drainage pattern and clear cutting of vegetation. According to Ward (2007) "building of towers, access roads, and right-of-way would cause soil erosion and sedimentation of streams and wetlands, which in turn would harm fish, amphibians and other aquatic life".

This study recommends that: Potential sources of erosion should be taken into consideration. Borrow pits should be monitored, any disturbances within the floodplain or wetlands should be rehabilitated and clear cutting of vegetation should be avoided by using a selective clearing technique. There should be temporary erosion control measures during the construction to minimize the loss of soil.

Pollution

One of the major threats identified to threaten the aquatic systems is pollution. Pollution of water resources from spills of hazardous or toxic materials renders water unfit for use and destroys organisms living within that ecosystem. Poor people that still rely on rivers, springs and marshes for water supply are vulnerable to the dangers of aquatic system pollution. The National Water Act encourages all people to reduce the discharges of waste or water containing waste into water resources. In case of emergency, were hazardous substances are discharged into the water resources; the Act makes those who caused pollution responsible for remedying the effects. This study recommends that a clean up process should be arranged and the incident reported to the relevant authorities.

The most visible consequence of the power line construction is the generation of muddy water downstream. The production of sediments in suspension may lead to impacts on sensitive fish species and macro-invertebrates. Most of the wetlands and river crossing to be crossed by all both options are permanent thus the will be impacts generated. The impacts can be minimized if construction is done a) in winter and largely if option one is chosen b) by constructing erosion protection barriers in construction areas adjacent to the macro canal margins so as to avoid falling away or erosion of the banks.

During the construction phase of the Quattro substation and the power line some waste will be generated, including domestic waste and scrap metal. Some workers should take it upon themselves to keep the corridor clean by collecting all the waste produced taking it to the main camp and disposed to the refuse bins.

Floods
One of the climatic condition disasters associated with wetlands and river crossing is floods. FloodsM threatens life, health and livelihoods and above that floods damage valuable infrastructure. Many people perceive floods as a natural phenomenon due to variable climatic conditions. There are other floods that can be cause by bursting or failure of dams. Regardless of floods being natural or not floods cause damages to roads, railways, water distribution, community dwellings, telecommunication infrastructure and POWER LINES particularly those that are within the floodplains of rivers.

Option 2 and 3 power line corridors are largely in the floodplain areas. It should be thought that floods may occur while the workforce is installing the power line. As the times of unpredictable climates due to scare of global warming one of the days floods may occur or dams (e.g Moroka dam) may fail and the installed power line should be designed to stand the test of that time. If possible floodplain and wetlands areas should be avoided.

Soweto has mainly two extreme seasons, the very cold winters and summers characterized by heavy showers. This study recommends that the workforce should avoid working within floodplains or wetland during rainy times.

The following are norms and standards relating to the stream and the wetland.

- It is recommended that infilling, excavation; drainage and hardened surfaces (including building and asphalt) should not be located in any of the wetland zones (i.e. permanent, seasonal or temporary). Such activities usually result in significant impacts on a wetland's hydrology, hydraulics and biota, thereby threatening biodiversity and the goods and services wetlands provide. Thus, such activities are not considered generally sustainable practice. All hardened surfaces should take place at least 15 m outside of the outer boundary of the seasonal/ permanent wetland zone and 30 m away from the stream.
- Extensive hardened surfaces in the catchment and delivery of runoff by stormwater drains significantly increase the stormwater runoff, which increases the risk of destruction of the developed infrastructure if it is close to the river. The buffer zone inclusion is to minimize the impact of concentrated storm water runoff into the river and also minimize the destruction of the developed properties during flood times. The buffer zone should be predominately vegetated (indigenous vegetation) area between 20m - 30m wide between the developed properties and the outer boundary of the wetland or river bank (refer to Map 6). A well-vegetated buffer zone has a mechanism for dissipating water energy by spreading, slowing water flow and preventing erosion.

- Soil compaction may happen due to the successive movement of heavy machinery. Compaction results in the decrease of space for water and air in the soil, hampering the development of roots and affecting plant growth. Stringent controls should be put in place to prevent any unnecessary disturbance or compaction of wetland soils. Where any disturbance of the soil takes place in the wetland, this place must be stabilized.
- Disturbances of a wetland may contribute to erosion degradation of the wetland.
- Compaction of wetland soil may lead to altered flow patterns through a wetland negatively affect the functioning of the wetland. After the conclusion of the construction phase, the subsoil decompaction should be done with the use of a ripper.
- As part of the planning process a common understanding of the wetland hydrological functions should be fostered amongst all the Interested and Affected Parties (I&AP). All possible developments should be communicated to all others and other interested stakeholders beforedeciding on the appropriate course of action.

Water and flooding

- Teams working near open water should have a life jacket on site.
- Consideration should be given to the safety of team members working near water who are unable to swim. This study recommends study that the workforce that is expected to work near water should undergo swimming training.
- Given the nature of the work, project managers and contractors should be sensitive to the potential dangers of floods. A highly risk averse approach is to be followed whenever dealing with an actual or potential flood event.
- The workforce should be trained on conservation consciousness and penalization for the hunting of birds.
- Rainfall in the catchment, and flow within the wetland/streams should continually be visually monitored by project managers and contractors. In high rainfall events where there is an increased risk of sudden floods, workers should be withdrawn from the site.
- Design criteria for the power line situated on or adjacent to wetlands or rivers to maintain an optimal balance to resist damage from flood.
- Effective flood warning system for all flood hazard areas coupled with awareness creation of the general public.
- Construction should be limited to the dry season (dry months).

Power line and substation concrete work

- Concrete mix should be according to specifications and correct MPA concrete will be used. Manufacturer's directions for mixing, consistency and treatment after pouring will be complied with. The pegging designing, pegging and signing off the structure should be done appropriate people (engineers).
- Cement will be stored in dry conditions for no longer than six weeks after delivery and when cement is stored temporarily infield it will be kept on a dry waterproof base with a waterproof cover.
- A demarcated site at least 20m away from water/wetland edge will be used for cement mixing. Water runoff will be contained and leaching to ground water prevented. Mixing will be done in such a way as to limit damage to surrounding vegetation.
- Water used for mixing purposes will be of suitable quality.
- Construction using shuttering will not take place at more than 1m height increments.
- Reinforcing will be used according to specification.
- Concrete will be mixed and used on the same day.
- Sand and stone shall be hauled to its point of placement by means of wheelbarrows where the haul distance is not greater than 150m.

Power line projects guidelines

- Transmission lines across wetlands areas should be designed to prevent or minimize risk of electrocution of birds, raptors in particular. Protect known nest tree groups. If possible the lines should be visible to birds.

- Existing roads and trials used be followed where is possible. Roads should avoid all wetlands areas such as reeds marsh and floodplains. Temporary roads should be obliterated and revegatated immediately after construction.
- Clearing should be selective, leaving shrubs, reeds and grasses undisturbed where possible. Where possible clearing of riparian areas should be avoided.
- Where there is construction of structures such as bridges and culverts the structural designed should not impede passage of fish and other aquatic organisms. Water hydrology should and stream course should remain unchanged.
- Special techniques and structures should be employed as to minimize erosion and sedimentation to wetlands areas.
- Winter construction scheduling is preferred in areas of flood plain, riparian, marsh, seeps, springs, and water development areas to avoid flooding risks.
- Special consideration should be given to wetlands areas motioned in f). These areas should be protected against damage during construction.
- A reclamation plan is recommended for all short term and long term surface disturbances.
- The construction equipment should be carefully cleaned particularly in weed infested areas.
- Spilling of fuel and lubricants should be avoided at all cost.
- Pylon foundations should be constructed with non pollutants materials and resistant to corrosion.
- A provision for an aquatic species specialist should be made to collect reptiles and amphibians if found in certain areas. Specimens collected should be sent to a centre where they will be identified and registered by competent authorities. Rescue programme should also be developed for threatened species.

8.6 SOCIAL AND ECONOMIC ENVIRONMENT

8.6.1 POPULATION CHANGE

Although no significant change in size and density of the population is expected, the employment of local community members, where possible, e.g. during site preparation could further minimise any possible negative impacts.

8.6.2 IMPACT ON JOB OPPORTUNITIES

During the construction phase the following enhancement measures are proposed to maximise the job opportunities and associated benefits:

- The use of local labour should be maximised.
- Contractors should capacitate local labourers where possible to also ensure that they are “employable” for future projects in the area (portable skills).
- The recruitment process and policy of the contractor should be widely communicated to limit the influx of potential job seekers. A focused communication strategy could be implemented via the labour desks.
- Local SMMEs should be allowed the opportunity to become involved as e.g. input suppliers for equipment and services. Their involvement should be co-ordinated by labour desks to be established in potential beneficiary communities.
- During the construction phase an equitable process should be achieved whereby minorities and previously disadvantaged individuals (women) are taken into account.
- The local communities should be involved in identifying individuals with the necessary skills that will correspond with the necessary job specifications.

During the operation phase the following mitigation measures are proposed:

- During the operational phase, local labour should be used where possible for e.g. maintenance of the servitudes, or maintenance and upgrading of any of the facilities at the substation.
- Where there is a lack of the necessary skills (e.g. maintenance), consideration should be given to possible on-site training for locals.
- Recruitment procedures should give preference to women where possible.

8.6.3 INFLOW OF WORKERS

During the construction phase the following mitigation measures are proposed:

- Conditions stipulated by property owners in terms of the construction activities should be implemented and monitored.
- Contractors and temporary employees should behave fittingly at all times.
- Workers should receive fines if they do not adhere to the conditions, rules and regulations.
- Workers should be made aware of property owners' concerns regarding construction work on their properties so that they are familiar with the sensitive issues.
- A specific contact person should be identified to allow community members and property owners to easily direct their queries and concerns and obtain general information regarding the construction process.
- Dedicated and adequate areas for informal vendors should be made available in anticipation to their presence at the construction camp and construction areas.

During the operation phase the following mitigation measures are proposed:

- Eskom personnel should preferably not access private properties without prior notification of the property owners.
- Eskom maintenance personnel should be in possession of the required identification documents when undertaking maintenance work.
- Eskom personnel should behave properly at all times.

8.6.4 INFLUX OF JOBSEEKERS

During the construction phase the following mitigation measures are proposed:

- The recruitment process and policy of the contractor should be widely communicated to limit the influx of potential job seekers.
- The contractors, should, where possible, employ local community members.
- The contractors' contracts should restrict them from employing "outsiders" where local skills are available.
- A formal recruitment process should be agreed upon between the contractor and Eskom. Adherence to this process should be monitored throughout the construction phase.
- Unrealistic expectations with regards to employment opportunities should be guarded against

8.6.5 IMPACTS ON DAILY LIVING AND MOVEMENT PATTERNS

During the construction phase the following mitigation measures are proposed:

- The movement of construction vehicles through the residential areas on local residential streets should be limited to off-peak periods to minimise the adverse impacts on private vehicular traffic and the movement of pedestrians.
- Specific emphasis should be placed on the crossing between the R554 and the Golden Highway to ensure the safety of pupils of the Moses Maren Mission School.
- The construction of additional access roads should be limited.
- Construction vehicles should rather keep to the mobility roads which were designed to carry intra regional traffic.
- Construction vehicles should adhere to the speed levels.
- It would be advisable for the appointed contractor to consult with local residents' associations and school management to address concerns with regards to heavy vehicles making use of local roads.
- Appropriate notification signs must be erected at entrances to the proposed Quattro Substation site and existing Etna Substation site, as well as along the route. These signs should warn residents and visitors about the hazards around the construction site and the presence of heavy vehicles.

Further mitigation measures are required during the operation phase and are listed below:

- Consideration should be given to the placement of the towers and the type of towers that would be used. Towers with the smallest footprint (e.g. multi circuit structures or monopoles) with its associated more confined impact would be preferable.
- Heavy vehicles and machinery should make use of existing roads where possible and limit unauthorised entry to private properties.
- Heavy vehicles should adhere to the speed limits.
- Eskom should communicate their maintenance work schedule to the private property owners. Should maintenance be undertaken near roads, and if traffic could be affected, the work should be communicated via large reflective signs along these roads.

8.6.6 IMPACTS ASSOCIATED WITH A CONSTRUCTION CAMP

The following mitigation measures are proposed:

- The construction camp should not be located in close proximity to tourist facilities or next to the major roads in the study area such as the R553, R554, N12 and N1.
- Proper sanitation related facilities (e.g. sufficient number of ablution facilities) should be provided.
- The workforce should be sensitised to the proper use of these ablution facilities.
- Littering should not be allowed and the neatness of the construction camp should be monitored.

- Correct procedures for rubble and waste disposal should be communicated to the workforce and should be monitored on a continuous basis by the Environmental Control Officer.
- The camp layout and site should be assessed and approved by Eskom whilst taking the possible negative social impacts into account.
- Proper cooking facilities should be provided at the construction camp.
- The construction camp should be fenced and adequate security should be provided.
- Sufficient water for drinking, washing and cooking purposes should be provided with associated waste water management plans.
- Basic first aid and emergency services should be readily available at the construction camp.
- Wastewater management as stipulated in the Environmental Management Plan should be strictly adhered to.
- A parking area for taxi's or busses should be provided (those vehicles that transport workers to the construction area/site on a daily basis)
- A suitable area for informal vendors should be developed.

8.6.7 RELOCATION OF FAMILIES

During the construction phase the following mitigation measures are proposed:

- As much information as possible (including compensation) should be made available to potentially affected parties as soon as any possibility of relocation has been established.
- Proper communication with the affected parties would allow them to anticipate the potential relocation, thus allowing them to plan accordingly and thereby lessening the uncertainty of this issue.

8.6.8 HEALTH RELATED IMPACTS

During the construction phase the following mitigation measures are proposed:

- Local labour should be used where possible.
- HIV/AIDS awareness and education programmes undertaken in the area should be extended to contract workers.
- The location of the construction camp should be carefully planned, although this would not necessarily combat the spread of the disease.
- The construction camp should be managed according to the specific conditions set in the contract and Environmental Management Plan to limit any form of pollution.
- Ensure that there are local health care facilities available to cater for the needs of the workforce.

During the operational phase the following mitigation measures are proposed:

- An emergency management plan should be developed in conjunction with the City of Johannesburg Metropolitan (CJM).

- A fire management plan should be developed in conjunction with the City of Johannesburg Metropolitan (CJM).
- The substation should be designed in such a manner as to limit any possible fires (e.g. fire walls between transformers).
- The power lines should be situated as far as possible from residential and other dwellings or sensitive receptors, where feasible.
- The safety exclusion zone should be strictly adhered to.

8.6.9 SAFETY AND SECURITY

During the construction phase the following mitigation measures are proposed:

- Once a final alignment has been established, and prior to the construction phase, Eskom should embark on a traffic safety awareness campaign focused on the affected schools.
- Heavy vehicles should not make use of local roads during peak traffic (including pedestrians e.g. school hours) hours.
- Construction vehicles should keep to the speed limits.
- The contractor and Eskom should develop safety management plans which should be discussed with construction workers prior to construction.
- Construction workers should preferably not prepare food at the construction sites to limit the risks of veld fires.
- Contractors should comply with the relevant safety regulations (The Occupational Health and Safety Act).
- Construction sites should be fenced off to avoid unauthorised entry.
- Local labour should be used as far as possible to limit the influx of an outside work force and potential outside jobseekers.
- Safety and security measures should be discussed with the property owners and local safety and security structures e.g. the local Community Policing Forums.
- Construction camps should be properly managed and should preferably not be situated close to private residences.
- Eskom vehicles should be marked.
- Eskom workers must notify property owners before entering properties. If they are unable to do so, they should have some proof of identification.

During the operational phase the following mitigations are proposed:

- Sound servitude management measures should be implemented.
- The implementation of the servitude management measures should be monitored on an ongoing basis.
- An emergency management plan should be developed in conjunction with the City of Johannesburg Metropolitan (CJM).

- A fire management plan should be developed in conjunction with the City of Johannesburg Metropolitan (CJM).
- The substation should be designed in such a manner as to limit any possible fires (e.g. fire walls between transformers).
- Safety and security measures at the substation should be strictly enforced.

8.6.10 NOISE IMPACT

During the construction phase the following mitigation measures are proposed:

- Noise generated by the construction activities (especially vehicles and heavy machinery should be kept to a minimum).
- The conduct of workers residing in the construction camps should be monitored.
- The construction schedule should be communicated to potentially affected parties.
- Noise reduction guidelines to be included in the EMP.

8.6.11 DUST IMPACT

During the construction phase the following mitigation measures are proposed:

- Limit additional access roads.
- In cases where access roads should be created, these should not be in close proximity to dwellings, or other public gatherings/venues.
- During the peak construction period, gravel roads should be sprayed with water to limit dust creation.

8.6.12 IMPACT ON REGIONAL AND LOCAL ECONOMY

No mitigations are proposed.

8.6.13 CHANGE IN TOURISM AND LEISURE OPPORTUNITIES

During the operational phase the following mitigation measures are proposed:

- Recommendations listed by the Visual Impact Assessment should be implemented.
- Should Alternative 3 be the preferred route alignment, the final alignment should not move to the west as it could then have some negative visual impacts with associated impacts on the tourism facilities of the Kliptown Regeneration Project.
- Care should be taken with the final route alignment in close proximity to the Fun Valley Resort.

8.6.14 PROPERTY VALUE

During the operational phase the following mitigation measures are proposed:

- Issues regarding surface and sub-surface infrastructure should be dealt with during the Eskom Servitude Negotiation Process.
- If technically feasible the route alignment along Alternative 2 (from the Etna Substation) should be situated to the west of the existing power line to limit any negative impacts on the Inkululeko Yesizwe Primary School at Vlakfontein Proper.
- The route alignment should be planned in such a way to ensure minimal disruption of such infrastructure.

- Recommendations listed by the Visual Impact Assessment should be implemented

8.6.15 FUTURE DEVELOPMENTS

During the operational phase the following is proposed:

Eskom should liaise with the developers, representatives of the CJM and project proponents during the negotiation phase of the project to ensure a route alignment which would ensure the protection of the land value and resources and which would also be to the socio-economic benefit of the communities.

8.6.16 OPTIMUM ALTERNATIVE

From a social point of view the preferred alternative is Alternative 1 (which starts as Alternative 2 from the Etna Substation). Alternative 3 could also be persued.

8.7 BIRDS IMPACTS MITIGATION MEASURES

The following are recommended in order to mitigate as far as possible for the impacts related to birds:

8.7.1 COLLISION WITH OVERHEAD CABLES:

The earth wire of those sections of line that are in close proximity to the dams and the Kliprivier should be marked with a suitable marking device.

8.7.2 DISTURBANCE AND HABITAT DESTRUCTION:

All construction and maintenance activities should be carried out according to generally accepted environmental best practices. In particular, care should be taken in the vicinity of the river crossings, and existing roads must be used as far as possible for access during construction.

8.7.3 STREAMER RELATED FAULTS ON THE STRAIN TOWERS:

It is suggested that the transmission line be built on cross rope suspension tower and all self support type towers should be installed with bird guards which are fitted to strain towers above the phases as a precautionary measure.

Please note that site specific recommendations will be provided prior to construction during the EMP phase of this project.

8.7.4 ELECTROCUTION OF BIRDS:

The electrocution of birds on the power line is not possible due to the clearance. At the substation yard it is extremely unlikely to occur due to the high disturbance levels.

No mitigation is required until a problem is identified by Eskom during the operation of the substation.

8.8 EXISTING AND FUTURE DEVELOPMENTS – TOWN PLANNING INPUT

Based on the information provided Alternative 1 encounters the least possible encumbrances. The largest part of Alternative 1 passes through agricultural land that falls outside the Urban Development Boundary. Farming activities along this route also appears to be limited.

Cognizance should be taken of the environmental sensitivity of the ridges in the Vlakfontein area. Slight deviations in the existing proposed alignment of the Red Route (and final sections of the Blue Route to Etna) should lessen the impact.

The section of the Red Route between the Golden Highway and the N12 runs in an existing servitude corridor that previously also accommodated a power line. The only uncertainty is whether this servitude is wide enough to accommodate the proposed two 400 kV transmission lines along this proposed route.

Finally, based on the available information and in particular, discussions with the officials of Development Planning and Facilitation, the Purple Route seems to be the least desirable alternative. The Kliptown Node, as well as the wetlands encountered on this route, are issues of major concern.

9. IMPACT STATEMENT

The assessment of potential impacts was carried out above. The mitigation measures were also suggested. The proposed Quattro Substation and three alternative corridors (500m wide each) identified would have environmental (bio-physical, social and economic) impacts that are unique to each alternative route or corridor. At the same time, the construction of the 2x400kV power line would bring about a lot of relief on the current load build ups in the area. This will go a long way in addressing the power dips/shortages that are being experienced in the area, including enabling new business activities that rely on the supply of electricity.

Between the three identified corridors, a number of impacts were identified and are summarized as follows:

- Impacts on wetlands and rivers
- Impacts on current and future development activities
- Impacts on the visual character of the landscape

Such being the case, there are differences in the manner in which these impacts would be felt along the proposed three corridors as reflected during the impact assessment and ranking of each identified impact. Management measures recommended for each impact would mitigate the impacts differently from each alternative corridor. It is the believe and understanding of the Environmental Impact Assessment Team that after taking all these into consideration, alternative corridor 1 might have minimal environmental impacts, hence it is recommended

SPECIALIST	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
Visual Impacts	✗	✓	✗
Avi-Fauna	✗	✓	✗
Agriculture	✗	✓	✗
Ecological Impact	✓	✗	✗
Heritage Impacts	✓	✓	✓
Town Planning Input	✓	✗	✗
Aquatic Ecosystem	✓	✗	✗
Social Impacts	✓	✓	✗

(without influencing DEAT from considering other corridors) for possible authorization. The table below summarizes the findings of the specialist studies carried out.

✓ = Recommended

✗ = Not Recommended

It is the believe and understanding of the Environmental Impact Assessment Team that after taking all these into consideration, Substation site B might have minimal environmental impacts, hence it is recommended

(Without influencing DEAT from considering other substation sites) for possible authorization. The table below summarizes the findings of the specialist studies carried out.

✔ = Recommended

✘ = Not Recommended

SPECIALIST	Substation Site A	Substation Site B	Substation Site C	Substation Site D
Visual Impacts	✘	✔	✘	✘
Avi-Fauna	✔	✘	✔	✔
Agriculture	✔	✔	✘	✘
Ecological Impact	✔	✘	✘	
Heritage Impacts	✔	✔	✔	✔
Town Planning Input				
Aquatic Ecosystem	✔	✔	✘	✘
Social Impacts	✔	✔	✘	

10. CONCLUSIONS AND RECOMMENDATIONS

The EIA team believes that the EIA for the proposed new Quattro Substation and 2x400kV double circuit power line between Quattro Substation and Etna Substations fulfils the process requirements of current environmental legislation. Issues and associated impacts have been investigated by a team of qualified specialists who have reported on their findings without reservations. Extensive efforts have been made to identify and involve all potentially affected parties in the public participation process. The public has been afforded opportunities to participate in the EIA. The recommendations set out in the findings section of the EIA are therefore presented for project implementation and the EIR is hereby presented to the relevant authorities for decision making.

11. REFERENCES

11.1 VISUAL

BLM (Bureau of Land Management). (1986). Handbook H-8431-1, Visual Resource Contrast Rating. U.S. Department of the Interior BLM. http://www.blm.gov/nstc/VRM/vrmsys.html

Government Office of the South West - England (2006). Using landscape sensitivity for renewable energy. REvision 2010 – Empowering the region [Online]. http://www.oursouthwest.com/revision2010/lca_methodology_windbiomass.doc [Accessed 8 November 2006]

Landscape Institute and the Institute of Environmental Assessment and Management. (2002). Guidelines for Landscape and Visual Impact Assessment (GLVIA). Second Edition, E & FN Spon Press.

M. Hill, J. Briggs, P. Minto, D. Bagnall, K. Foley, A.Williams. (March 2001). Guide to Best Practice in Seascape Assessment. Maritime (Ireland / Wales) INTERREG Programme-Building Bridges.

Oberholzer, B. (2005). Guideline for involving visual and aesthetic specialists in EIA processes: Edition 1. CSIR Report No ENV-S-C 2005 053 R. Republic of South Africa, Provincial Government of the Western Cape, Department of Environmental Affairs and Development Planning, Cape Town.

Swanwick, C. Department of Landscape, University of Sheffield and Land Use Consultants. (2002). Landscape Character Assessment:: Guidance for England and Scotland. The Countryside Agency / Scottish Natural Heritage.

Van Riet, W., Claassens, P., Van Rensburg, J., Van Viegen, T., Du Plessis, L. 1997. *Environmental Potential Atlas for South Africa.* The Department of Environmental Affairs and Tourism in conjunction with The Geographic Information Systems Laboratory CC and the University of Pretoria. J.L. van Schaik.

Van Rooyen, M.W. 2002. Management of the old field vegetation in the Namaqua National Park, South Africa: conflicting demands of conservation and tourism.

Published paper from *The Geographical Journal*, Vol. 168, No.3, September 2002, pp. 211-223.

U.S.D.O.T., Federal Highway Administration, Office of Environmental Policy. (March 1981). Visual Impact Assessment for Highway Projects. U. S. Department of Transportation Washington D. C.
Urban Land Institute, 1980. Visual Resource Management 0510-1: Environmental Comment (May 1980). Washington D.C.

11.2 AGRICULTURE, SOILS AND GEOLOGY

ARC. Areas in which high potential agricultural land may occur, superimposed on moisture availability zones. 2002. Map Scale: 2 500 000. Project No. 041_2000/bw/Mois.gra.

Brady, N. C. 1974. the nature and properties of soils. 8th Edition. MacMillan Publishing Co., Inc. New York.

COMBUD, 2005. Enterprise Budgets. Sub-directorate: Economic and Statisitics, economics, Marketing and Transformation. Limpopo Department of Agriculture.

Frnazmeir, D.P., E.J. Pedersen, T.J. Longwell, J.G. Byrne, and C. Losche. 1969. Properties of some soils in the cuberland plateau as related to slope aspect and position. Soil Sci. Soc. Am. Proc. 33:755-761.

Huschke, R.E. 1959. *Glossary of Meteorology*, American Meteorological Society, Boston, Second printing-1970.

Jiang, P., and K.D. Thelen. 2004. Effect of soil topographic properties on crop yield in northcentral corn-soybean cropping system. Agron. J. 96:252-258.

Laker, M.C. 2005. South Africa's soil resources and sustainable development. http://www.environment.gov.za/nssd_2005/Web/NSSD%20Process%20Documents%20and%2 0Reports/REVIEW_Soil_and_Sustainability_Oct 05.pdf.

Mucina L., Rutherford M.C. & Powrie L.W. (eds) (2005). Vegetation Map of South Africa,

Lesotho and Swaziland, 1:1000000 scale sheet maps.

Peverill, K.I., l.A. Sparrow, and D.J. Reutter. 1999. Soil Analysis, an Interpretation Manual. CSIRO Publication. Collingwood, Victoria. Australia

Schoeman, J.L. National Department of Agriculture. 2002. Criteria for prime or unique agricultural land in South Africa. Report Number GW/A/2002/21.

Soil classification working group. 1991. Soil classification, A Taxonomic System for South Africa. Soil and Irrigation Research Institute, Department of Agricultural Development Pretoria.

Stone, J.R., J.W. Gilliam, D.K. Cassel, R.B. Daniels, L.A. Nelson, and H.J. Kleiss. 1985. Effect of erosion and landscape position on the productivity of piedmont soils. Soil Sci. Am. J. 49:987-991.

11.3 ARCHAEOLOGY AND HERITAGE

None were referred to.

11.4 ECOLOGY AND ECOLOGICAL SENSITIVITY

ACOCKS, J.P.H. 1953. Veld types of South Africa. *Memoirs of the Botanical Survey of South Africa* 57: 1–146.

AGIS, 2008. Agricultural Geo-Referenced Information System, accessed from www.agis.agric.za.

DRIVER, A, MAZE, K, ROUGET, M, LOMBARD, AT, NEL, J, TURPIE, JK, COWLING, RM, DESMET, P, GOODMAN, P, HARRIS, J, JONAS, Z, REYERS, B, SINK, K & STRAUSS, T. 2005. National Spatial Biodiversity Assessment 2004: Priorities for Biodiversity Conservation in South Africa. *Strelitzia* 17.

ERASMUS, J.F. 1985. Rainfall deciles for the Transvaal Region. In: *Unpublished Report No. GB/A/87/18:147-216*. SIRI, Pretoria.

HAMMOND, E.H., 1964. Analysis of properties in land form geography: an application to broad-scale land form mapping. *Ann. Ass. Am. Geogr.* 54, 11-19.

KRUGER, G.P., 1973. Konsepte, tegnieke en prosedures vir die globale hulpbronopnameprogram (terrein). ARC-ISCW Report 784/154/73 ARC-Institute for Soil, Climate and Water, Pretoria.

KÖPPEN, W. 1931. *Grundriss der Kimakunde*. Walter de Gruyter, Berlin, Germany.

LOW, A.B. AND REBELO, A.G. (EDS) 1998. *Vegetation of South Africa, Lesotho and Swaziland.* Published by the Department of Environmental Affairs and Tourism. Pretoria.

MUCINA, L. & RUTHERFORD, M.C. (eds) 2006. The vegetation of South Africa, Lesotho and Swaziland. *Strelitzia 19*. South African Biodiversity Institute, Pretoria.

POSA, 2007. Plants of Southern Africa, an online checklist. South African National Biodiversity Institute. Accessed from http://www.sanbi.org/frames/posafram.htm.

RAIMONDO *et a.l,* 2009. National Red List of Threatened Plants of South Africa. Strelitzia, in press.

SCHULZE, R.E., MAHARAJ, M. & GHILE, Y. 2006b. Climatic Zonation. In: Schulze, R.E. (ed). 2006. *South African Atlas of Climatology and Agrohydrology*. Water Research Commission, Pretoria, RSA, WRC Report 1489/1/06, Section 3.3.

11.5 SOCIAL AND ECONOMIC

Documents:

- Axis Landscape Architecture (2008): Visual Impact Assessment for the proposed Soweto Integration Project
- City of Johannesburg Metropolitan, (2007/8): Integrated Development Planning (IDP) Document
- City of Johannesburg Regional Spatial Development Framework for Region D (2008/2009)
- City of Johannesburg Regional Spatial Development Framework for Region G (2008/2009)
- Kliptown Business Plan (2004): Heritage, Education and Tourism
- Naledzi Environmental (2007): Background Information Document
- Naledzi Environmental (2008): Comments and Response Report for the proposed Soweto Integration Project
- Naledzi Environmental (2008): Scoping Report for the proposed Soweto Integration Project

Internet:

- http://www.demarcation.org.za
- http://www.en.wikipedia.org
- http://www.goafrica.about.com
- http://www.jda.co.za
- http://www.jhbproperty.co.za
- http://www.joburg.org.za
- http://www.lezinfo.org.za
- http://www.mysoweto.co.za
- http://www.places.co.za
- http://www.statssa.org.za
- http://www.virtualtourist.com

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- Mrs. Shareen Mamphoto: Deputy Principal of Inkululeko Yesizwe Primary School
- Mr. Imtiaz Moola: Representative of Eldo Coaches
- Mr. Phaka: Principal of Inkululeko Yesizwe Primary School
- Mr. Louis Smit: Owner of DJ Truck City and Eikenhof Metals
- Mr. Freddie Thaver: Rietfontein Fire Training Centre

11.6 BIRDS

AVIAN POWER LINE INTERACTION COMMITTEE (APLIC). 1994. Mitigating Bird Collisions with Power Lines: The State of the Art in 1994. Edison Electric Institute. Washington D.C

BARNES, K.N. (ed.) 2000. The Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland. BirdLife South Africa, Johannesburg.

HARRISON, J.A., ALLAN, D.G., UNDERHILL, L.G., HERREMANS, M., TREE, A.J., PARKER, V & BROWN, C.J. (eds). 1997. The atlas of southern African birds. Volume 1 & 2. BirdLife South Africa, Johannesburg.

McCANN, K.I., MORRISON, K., BEYERS, A., MILLER, P. & FRIEDMAN, Y. (eds). 2002. Population and Habitat Viability Assessment for the Blue Crane (Anthropoides paradiseus). Final Workshop Report. IUCN/SSC Conservation Breeding Specialist Group.

VAN ROOYEN, C.S. 2004. The Management of Wildlife Interactions with overhead lines. In The fundamentals and practice of Overhead Line Maintenance (132kV and above), pp217-245. Eskom Technology, Services International, Johannesburg.

VAN ROOYEN, C.S. and LEDGER, J.A. 1999. “Birds and utility structures: Developments in southern Africa” in Ferrer, M. & G.F.M. Janns. (eds.) Birds and Power lines. Quercus: Madrid, Spain, pp 205-230

11.7 AQUATIC ECOSYSTEMS

Breen, C. & Begg, G.W. (1989). Conservation status of southern African wetlands. In Huntley, B. (Ed). *Biotic diversity in southern Africa: Concepts and conservation.* Oxford University Press, Cape Town.

Cowan, G.I. (ed) 1995. *Wetlands of South Africa*. Pretoria: Department of Environmental Affairs and Tourism.

Department of Water Affairs and Forestry (undated). A practical field procedure for identification and delineation of wetlands and riparian areas. Department of Water Affairs and Forestry, South Africa.

Lindley, D.L. (2004, January 28). Project Manager, Mondi Wetlands Project. Pretoria. Personal communication.

Kotze, D.C & Breen, C. (2000). Wetland-Use; A wetland management decision system for South African fresh water palustrine wetlands. Department of Environmental Affairs and Tourism, Pretoria.

Mutshatshi, T, (2008). Environmental Consultant, Naledzi Environmental Consultant cc. Personal communication.

Ramsar Convention Bureau, (2000). *Ramsar Handbook 8 for the wise use of wetlands: Frameworks for managing wetlands of international importance and other wetlands*. Ramsar Convention Bureau, Gland Switzerland.

Republic of South Africa. (1998). *Environment Conservation Act, Act 73 of 1998* Pretoria: Government Printers.

Republic of South Africa. (1998). *National Environment Management Act, Act 107 0f 1998* Pretoria:bGovernment Printers.

Republic of South Africa. (1998). *National Water Act, Act 36 of 1998* Pretoria: Government Printers.

Wetland Research Programme (1997). Wetland Delineation Manual, Department of the Army Environmental Technical Services, US Army Corp of Engineers, Washington DC

APPENDIX 1

DEAT approval letter for Scoping Report and Plan of Study for EIR

APPENDIX 2

Locality Map (Alternative Route Corridors)

APPENDIX 2

Locality Map with the four proposed substation sites

APPENDIX 3

DEA acknowledgment letter for Application

APPENDIX 4

DEA amendment letter for the Final EIR submitted, dated 05 June 2009