ENVIRONMENTAL IMPACT ASSESSMENT REPORT FOR THE PROPOSED ESTABLISHMENT OF NINE 132 kV POWERLINES BETWEEN GRASSRIDGE SUBSTATION (near Port Elizabeth) AND THE COEGA INDUSTRIAL DEVELOPMENT ZONE, EASTERN CAPE PROVINCE

4 November 2002

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EXECUTIVE SUMMARY

1. OVERVIEW OF THE PROPOSED PROJECT

1.1. Need for the Proposed Project

The proposed Coega Industrial Development Zone (IDZ) is situated in the Eastern Cape Province, along the north-eastern coastline of Algoa Bay, approximately 20 km from Port Elizabeth. The Coega IDZ will include commercial and industrial activities as well as the Port of Ngurha and requires that the land be rezoned from Agriculture to Special Purposes. The Coega IDZ development is planned to be implemented in a phased approach, and is to include, among others, land uses such as businesses, commercial industrial areas, bulk import/export facilities, metallurgical areas and open spaces.

A key requirement for the operation of these proposed developments is the supply of power. The existing power supply network to the greater Port Elizabeth area is already considered to be unstable, and load-shedding schemes are installed. Eskom Transmission has been approached by the Nelson Mandela Metropolitan Municipality (NMMM), in consultation with the Coega Development Corporation (Pty) Ltd (CDC) to provide additional power to service the proclaimed Coega IDZ and associated Port of Ngurha.

Aluminium Pechiney, a potential tenant of the Coega IDZ, is planning to construct a new aluminium smelter to meet rising demands for aluminium internationally. In an international site selection study, the Coega IDZ was identified as one of two preferred sites for the establishment of the new smelter. One of the main criteria in the selection of the final site is the availability of a firm energy supply. The operation of the proposed aluminium smelter within the Coega IDZ will require a minimum power supply of 500 MVA for the smelter development. There exists the potential for a second potline to be constructed at a later stage, although at this stage, there is no proposal to establish to establish a second potline (CSIR, 2002). However, if at some stage Aluminium Pechiney propose to develop a second potline, this would effectively result in the doubling of the power demand.

Eskom are required to acquire the relevant servitudes and establish the necessary Transmission infrastructure in order to accommodate the ultimate firm energy demand from potential Coega IDZ tenants, including Aluminium Pechiney. Therefore, Eskom Transmission propose the construction of nine powerlines between Grassridge Substation

(located near Coega) and the proposed Coega Main Substation and the proposed Aluminium Smelter Substation for Aluminium Pechiney, located within the Coega IDZ.

A number of alternative alignments between the Grassridge Substation and the Coega Main and Aluminium Pechiney Smelter Substations have been identified and evaluated. From environmental, technical, social and economic perspectives, three feasible alternative powerline corridors have been identified for further investigation within environmental studies (refer to Figure 1 overleaf). It is these alternative corridors which have been considered in detail within this Environmental Impact Assessment (EIA).

1.2. Alternate Powerline Corridors

1.2.1. Alternative A

This corridor is proposed to transfer power from Grassridge Substation extension in a south-westerly direction parallel to two existing distribution lines. This alignment follows the Coega IDZ boundary to the west, and then turns in at the point where the IDZ boundary line turns south east. The corridor descends into and follows the floodplain of the Coega River (in an east-west direction), before turning south to the proposed Coega Main and Aluminium Pechiney Smelter Substation sites. The total line distance is approximately 15 km.

1.2.2. Alternative B

This alternative initially follows the same route as Alternative A, but follows a straight route across the Coega River valley in the vicinity of Coega Kop, and then bends to follow the flatter terrain north of the proposed smelter site. The total line distance is approximately 16 km. With this option, the lines will encroach on the proposed future railway line servitude within the Coega IDZ in the vicinity of the existing small Distribution line.

1.2.3. Alternative C

This alternative considers the construction of overhead lines in a straighter route directly linking the Grassridge Substation extension and the proposed Coega Main and Aluminium Pechiney Smelter Substations, thereby reducing the number of bend points. The total line distance would be approximately 10 km. This alternative crosses that section of the Coega IDZ earmarked for the future construction of an airport.

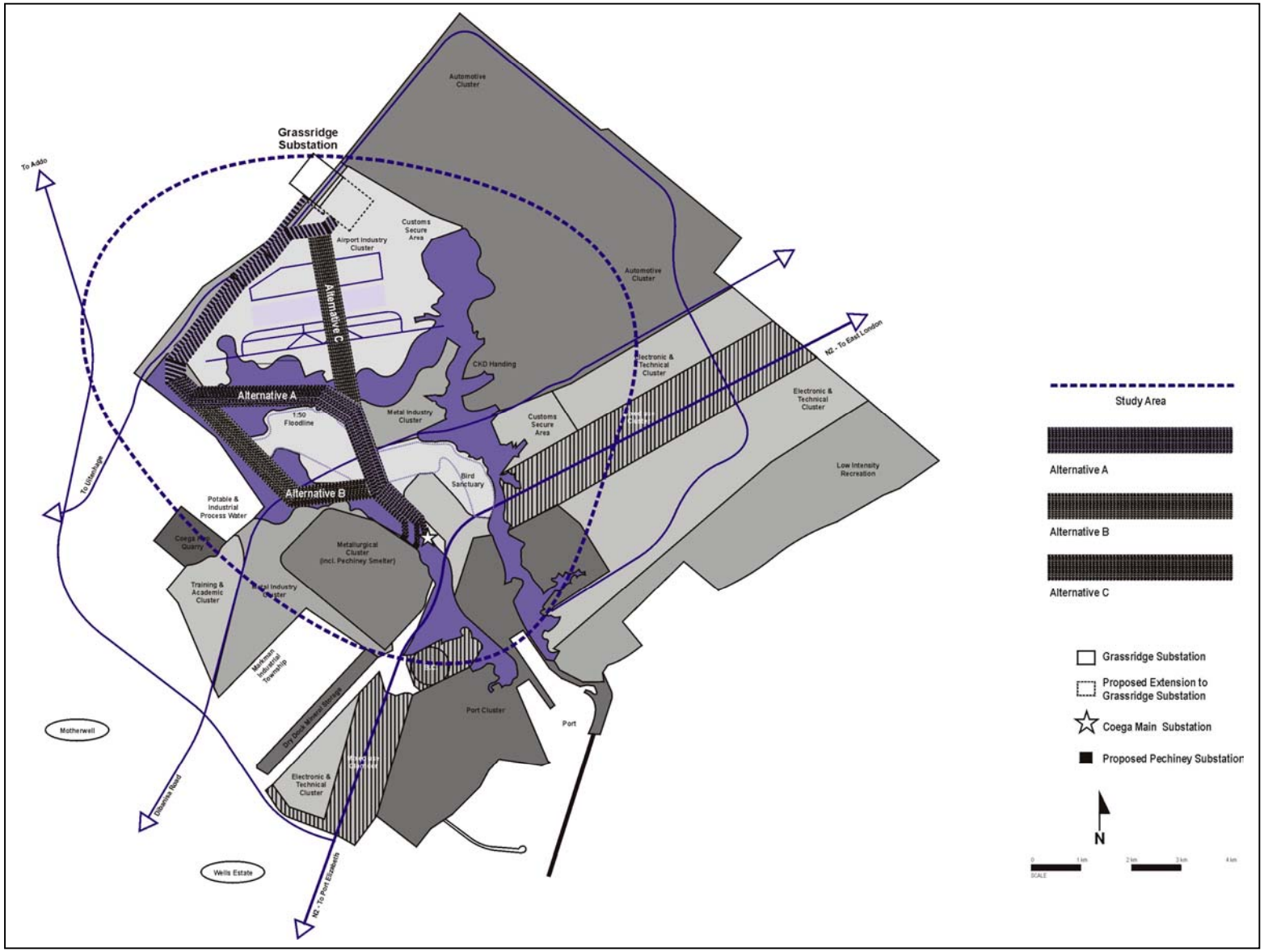

Figure 1: Technically feasible alternatives identified for investigations within the Environmental Impact Assessment

1.2.4. Technical Details

A total servitude width of approximately 310 m will be required to accommodate the nine parallel powerlines. When lines are constructed in parallel, towers can be placed next to one another and the servitude width for each individual line can be reduced, effectively reducing the total servitude width required.

The powerlines are to be constructed as 275 kV Transmission lines but are to be operated as 132 kV Distribution lines. This will allow the lines to be operated at a higher capacity (i.e. 275 kV) if required in the future. In addition, the 275 kV tower structure provides additional stability to the powerline.

Where feasible, the "cross-rope suspension" (CRS) tower will be used. This tower type consists of two masts and four anchor cables. These towers have a reduced steel-component, and are, therefore, both less expensive and less visually intrusive than conventional self-supporting tower structures. The parallel towers required for the none powerlines will be constructed within 3 m of one another such that the support guys can be staggered to fit within a 310 m servitude.

The CRS tower has limitations in that bends greater than 3° and steep surfaces will require that more stable "strain" or self-supporting towers be used.

2. ENVIRONMENTAL STUDIES AND PUBLIC PARTICIPATION

An Environmental Impact Assessment (EIA) for the proposed powerlines has been undertaken in accordance with the Environmental Impact Assessment (EIA) Regulations published in Government Notice R1182 to R1184 of 5 September 1997 in terms of Section 21 of the Environment Conservation Act (No 73 of 1989), as well as the National Environmental Management Act (NEMA; No 107 of 1998). This EIA was undertaken in order to identify and assess potential environmental impacts (biophysical and social) associated with the proposed project, and nominate a preferred powerline corridor.

Specialist studies undertaken within the EIA included the assessment of potential impacts on:

- geology and soils;
- vegetation;
- avifauna (bird life);

- terrestrial fauna
- land use;
- aesthetics and visual quality;
- archaeological, cultural and historical sites; and
- the social environment.

To ensure effective public participation throughout the environmental studies for this project, an on-going public participation process was implemented. The aim of the public participation process was to establish efficient communication channels which would provide all I&APs with the opportunity to participate meaningfully in the process. Individuals and organisations throughout the broader study area representing a broad range of sectors of society were consulted telephonically, through individual meetings/interviews, through documentation distributed via mail and via the printed media throughout the EIA process. Special attention was paid to consultation with potentially directly affected landowners (e.g. within the demarcated corridors).

The EIA process identified and recorded landowners' details within the study area, as well as issues and concerns raised. Issues and concerns raised during the environmental were recorded, and incorporated as the core of the assessment of social issues within this Environmental Impact Assessment Report.

The Draft Environmental Impact Assessment Report has been made available for public review. Comments received from the public will be captured within a final Environmental Impact Assessment Report, which is to be presented to the National and Eastern Cape Departments of Environment Affairs for comment and approval.

3. SUMMARY OF SPECIALIST STUDY FINDINGS

It is acknowledged that any development will impact on the environment. The construction of the proposed powerlines will have impacts on the biophysical and the social environment. This EIA investigated and assessed these impacts as a result of project actions. The significance of the impact is predominately determined by the final alignment, the final design, the final construction activities, and how achievable the mitigation measures to minimise such impacts are. Therefore, once a final alignment has been determined and approved, and tower positions have been determined, a detailed survey of this route will be required to be undertaken in terms of botanical, avifaunal and heritage aspects in order to

determine site-specific impacts and mitigation measures. These site-specific mitigation measures, together with the mitigation measures recommended within this EIA should be included within an Environmental Management Plan (EMP) for construction, operation and maintenance.

Table 1 overleaf provides a summary of the recommendations made within the specialist studies regarding the proposed powerline between the Grassridge Substation and the Coega Main and Aluminium Pechiney Smelter Substations. Considering the findings of all the detailed studies undertaken (refer to Table 1), the order of preference for the corridor for the construction of the powerlines is as follows:

- Alternative C (or a minor realignment of this alternative to follow the Brakrivier road; refer to Figure 2) is recommended as the best practicable option in terms of environmental considerations.
- Alternative A is recommended as the second option.
- Alternative B is the least preferred option, as it is anticipated to have an impact of high significance on both the biophysical and social environment.

Table 1: Summary of findings of detailed specialist studies undertaken regarding the proposed 132 kV powerlines between the Grassridge Substation and the Coega IDZ

Issue	Alternative A	Alternative B	Alternative C
		Biophysical Environment	
Geology and soils	Follows the Coega River valley side slopes for a portion of its length. The undifferentiated soils within the valley could potentially be susceptible to erosion, particularly once vegetation has been removed. New access/service roads would be required to be constructed for a portion of the route length. Option 2	Follows the Coega River valley side slopes for a portion of its length. The undifferentiated soils within the valley could potentially be susceptible to erosion, particularly once vegetation has been removed. Risk of erosion likely to be significant for that portion which traverses the high-lying area in the vicinity of Coega Kop. New access/service roads would be required to be constructed for a portion of the route length. Option 2	Traverses terrain with very little relief ahead of the Coega River valley. The river valley is crossed at one point, and spans across a shorter section of undifferentiated deposits associated with the Coega River valley. The existing Brakrivier road could be utilised as an access/service road. Option 1
Flora	Potential impacts on sensitive flora at tower positions and along new access/service roads. Positive impacts in terms of the management of alien vegetation within the servitude. There is the potential for the conservation of flora within the servitude in the long-term as development will not be permitted below the lines. Option 2	Potential impacts on sensitive flora at tower positions and along new access/service roads. Potential impacts on *Aloe boweiea* (critically endangered). Positive impacts in terms of the management of alien vegetation within the servitude. There is the potential for the conservation of flora within the servitude in the long-term as development will not be permitted below the lines. Option 3	Potential impacts on sensitive flora at tower positions. The existing Brakrivier road could be utilised as an access/service road. Positive impacts in terms of the management of alien vegetation within the servitude. There is the potential for the conservation of flora within the servitude in the long-term as development will not be permitted below the lines. Option 1

Issue	Alternative A	Alternative B	Alternative C
Terrestrial fauna	Sensitive habitats in which key species are found or are likely to be found occur within this alternative corridor. Option 2	Sensitive habitats in which key species are found or are likely to be found occur within this alternative corridor. Option 2	This route does not cut through prime habitat for any of the key species found or likely to be found in the area, although it does pass in close proximity to an area which is anticipated to provide habitat to the butterfly species which occur in the area. Option 1
Avifauna	Follow an existing powerline corridor for the first portion of the route, and therefore it is unlikely that they will have an additional impact on the habitat and avifauna in this area. The east-west orientation of the section of the corridor following the Coega River valley assists in reducing the number of possible collisions, as powerlines running in a north-south direction are more likely to cause bird collisions. Option 1	Follow an existing powerline corridor for the first portion of the route, and therefore it is unlikely that they will have an additional impact on the habitat and avifauna in this area. The east-west orientation of the section of the corridor following the Coega River valley assists in reducing the number of possible collisions, as powerlines running in a north-south direction are more likely to cause bird collisions. Option 1	The area just south of Grassridge Substation is likely to be transformed into many small seasonal marshy pans, which will attract many birds and additional species to the area. This would increase the probability of interactions with the powerlines during these periods. The route followed by this alternative is proposed to follow a north-south orientation between Grassridge Substation and the Coega Main and Aluminium Pechiney Smelter Substations, which could potentially increase the probability of bird collisions. Option 2
Social Environment			
Land use	Potential conflicts with proposed future land use, particularly: • Open space management area • Airport cluster of the Coega IDZ	Potential conflicts with proposed future land use, particularly: • Open space management area • Airport cluster of the Coega IDZ • Coega Kop Quarry • Conservation area over Coega Kop	Potential conflicts with proposed future land use, particularly: • Airport cluster of the Coega IDZ

Issue	Alternative A	Alternative B	Alternative C
Visual impacts	Visual absorption capacity of the landscape is considered to be high, resulting in a low visual impact on critical viewpoints. The visual intrusiveness of the proposed development can be considered to be low due to its compatibility with future surrounding land uses. Option 2	Visual absorption capacity of the landscape is considered to be high, resulting in a low visual impact on critical viewpoints. This proposed corridor does, however, pass in close proximity to Coega Kop, which is the highest point within the Coega IDZ area, and is considered to be a critical viewpoint. The visual intrusiveness of the majority of the proposed development can be considered to be low due to its compatibility with future surrounding land uses. In passing over the higher-lying area in the vicinity of Coega Kop, the proposed powerlines would intrude on the skyline, resulting in higher visual intrusiveness. Option 3	Located on a flat plateau, and therefore visibility decreases rapidly with distance. In addition, due to future development within the IDZ, as well as screening of structures to some extent by vegetation, the visual absorption capacity of the landscape is considered to be high, resulting in a low visual impact on critical viewpoints. The visual intrusiveness of the proposed development can be considered to be low due to its compatibility with future surrounding land uses. Option 1
Archaeological, Cultural and Historical Sites	No significant sites identified.	No significant sites identified.	No significant sites identified.
Social environment	Social impacts associated with this alternative include: • Visual impacts • Impacts on the open space area of the Coega IDZ • Impacts on landowners on the Farm Welbedachtsfontein • Intrusion impacts during construction Option 2	Social impacts associated with this alternative include: • Visual impacts • Impacts on the open space area of the Coega IDZ • Impacts on landowners on the Farm Welbedachtsfontein • Intrusion impacts during construction Option 2	Social impacts associated with this alternative include: • Visual impacts • Intrusion impacts during construction Option 1

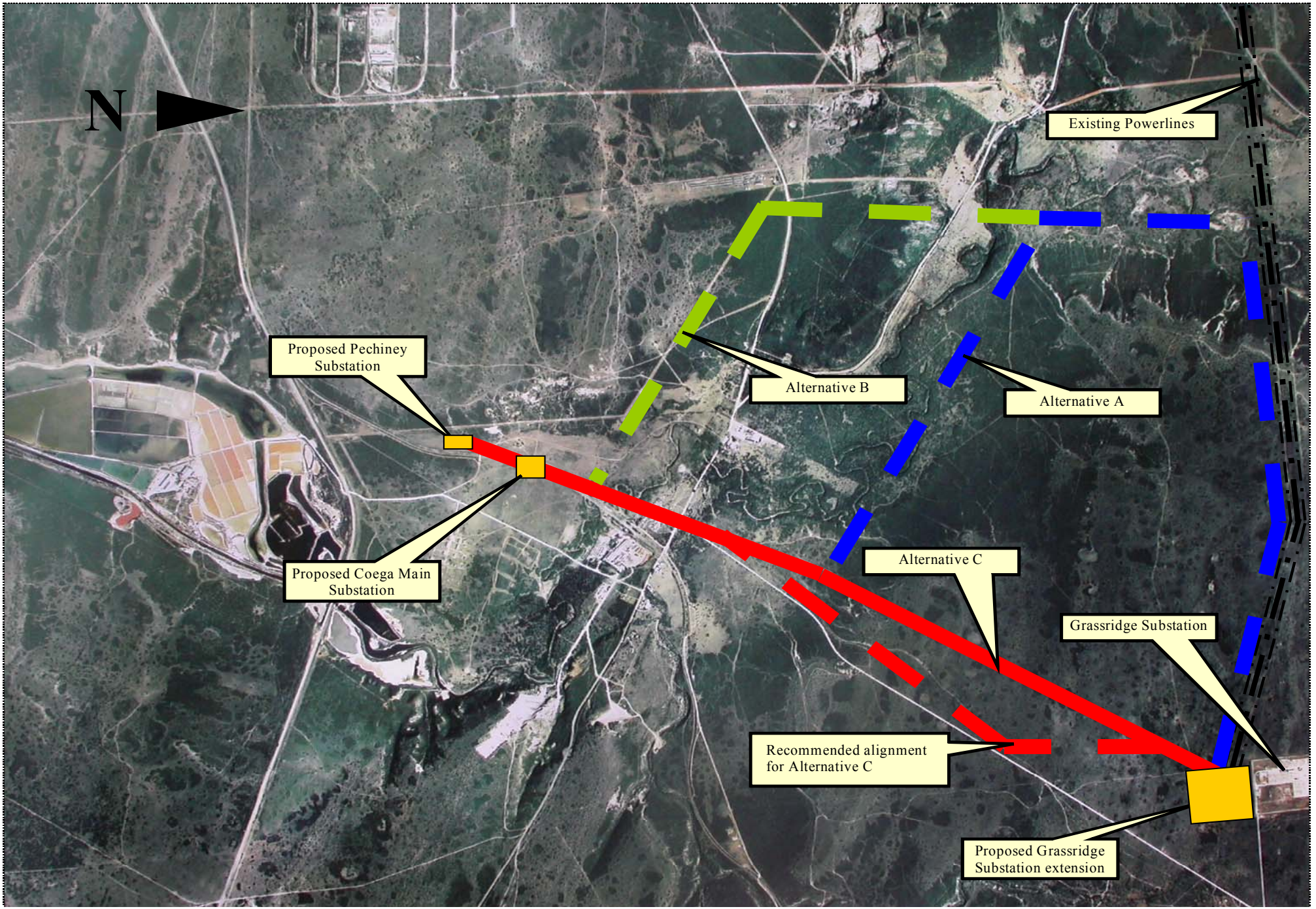

Figure 2: Aerial photograph of the study area showing the preferred alternative (Alternative C), identified from investigations undertaken within the EIA, in red

4. OVERALL CONCLUSION AND RECOMMENDATIONS

The results of this EIA indicate that Alternative C is the best practicable environmental option for the construction of the planned powerlines.

The detailed investigations which have been undertaken as part of this EIA have not identified any issues of high significance which could not be mitigated, such that the proposed project can not be accepted from an environmental perspective. However, the potential conflict of land use on the Farm Bontrug (i.e. the proposed site for the airport development cluster) has been identified and flagged as a critical issue requiring resolution outside of this EIA process. All the potentially negative impacts identified for the preferred corridor alternative can potentially be mitigated through controls in the construction and rehabilitation phases in order to reduce their severity and significance to acceptable levels. In addition, a number of potentially positive impacts have been highlighted which will result in benefits to the region.

The conclusions of this EIA are the result of specialist assessments, based on issues identified within the Scoping Phase, as well as the parallel process of public participation. The public consultation process has been extensive and every effort has been made to include representatives of all stakeholders in the study area.

The finalisation of these conclusions and detailed input into the EMP will be informed by final comment from key stakeholders, the public and the relevant environmental authorities on this draft EIA report.

The issuing of an authorisation for this project EIA by the National Department of Environmental Affairs and Tourism (DEAT) in consultation with the relevant provincial department will permit the negotiation for the servitudes and the final design of the powerlines to be undertaken. At this stage, details in terms of final placement of towers and access roads will be determined and the technical aspects of the powerline will be finalised.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ACRONYMS AND ABBREVIATIONS

amsl	Above mean sea level
CAA	Civil Aviation Authority
CDC	Coega Development Corporation (Pty) Ltd
CES	Coastal and Environmental Services
CRS	Cross-rope suspension
DEAT	National Department of Environmental Affairs and Tourism
EC DEAET	Eastern Cape Department of Economic Affairs, Environment and Tourism
EIA	Environmental Impact Assessment
ESS	Environmental Scoping Study
EMP	Environmental Management Plan
I&AP	Interested and affected party
I&APs	Interested and affected parties
IDZ	Industrial Development Zone
kV	Kilovolt
NEMA	National Environmental Management Act
NMMM	Nelson Mandela Metropolitan Municipality
NGOs	Non-governmental Organisations
SIA	Social Impact Assessment

ACKNOWLEDGEMENTS

The authors would like to acknowledge the contributions of the following individuals and organisations to the compilation of this report:

Mr J Geeringh	Eskom Transmission
Dr P Inman	Coega Development Corporation
Mr J Raimondo	Coega Development Corporation
Ms C Streaton	Eskom Transmission

1. INTRODUCTION

1.1. Need for the Proposed Project

The proposed Coega Industrial Development Zone (IDZ) is situated in the Eastern Cape Province, along the north-eastern coastline of Algoa Bay, approximately 20 km from Port Elizabeth (CES, 2000). The Coega IDZ will include commercial and industrial activities as well as the Port of Ngurha and requires that the land be rezoned from Agriculture to Special Purposes. The Coega IDZ development is planned to be implemented in a phased approach, and is to include, among others, land uses such as businesses, commercial industrial areas, bulk import/export facilities, metallurgical areas and open spaces (refer to Figure 1.1 overleaf).

A key requirement for the operation of these proposed developments is the supply of power. The existing power supply network to the greater Port Elizabeth area is already considered to be unstable, and load-shedding schemes are installed. Eskom Transmission has been approached by the Nelson Mandela Metropolitan Municipality (NMMM), in consultation with the Coega Development Corporation (Pty) Ltd (CDC) to provide additional power to service the proclaimed Coega IDZ and associated Port of Ngurha.

Aluminium Pechiney, a potential tenant of the Coega IDZ, is planning to construct a new aluminium smelter to meet rising demands for aluminium internationally. In an international site selection study, the Coega IDZ was identified as one of two preferred sites for the establishment of the new smelter. One of the main criteria in the selection of the final site is the availability of a firm energy supply. The operation of the proposed aluminium smelter within the Coega IDZ will require a minimum power supply of 500 MVA for the smelter development. There exists the potential for a second potline to be constructed at a later stage, although at this stage, there is no proposal to establish a second potline (CSIR, 2002). However, if at some stage Aluminium Pechiney propose to develop a second potline, this would effectively result in the doubling of the power demand.

Eskom are required to acquire the relevant servitudes and establish the necessary Transmission infrastructure in order to accommodate the ultimate firm energy demand from potential Coega IDZ tenants, including Aluminium Pechiney. Therefore, Eskom Transmission propose the construction of nine powerlines between Grassridge Substation (located near Coega) and the proposed Coega Main Substation and the proposed Aluminium Smelter Substation for Aluminium Pechiney, located within the Coega IDZ.

Figure 1.1: Proposed land uses within the Coega IDZ (land use information provided by Coega Development Corporation (Pty) Ltd)

A number of alternative alignments between the Grassridge Substation and the Coega Main and Aluminium Pechiney Smelter Substations have been identified and evaluated (Bohlweki Environmental, 2002). From environmental, technical, social and economic perspectives, three feasible alternative powerline corridors have been identified for further investigation within environmental studies (refer to Figure 1.2 overleaf). It is these alternative corridors which have been considered in detail within this Environmental Impact Assessment (EIA).

1.2. Eskom's Planning Process and the Role of the Environmental Impact Assessment Process

Eskom Transmission's planning process is required to be based on anticipated load requirements, rather than immediate load requirements in order to timeously supply the anticipated increased demand in the Coega IDZ. This is due to the time-consuming process of acquiring permission to construct such infrastructure, servitude negotiations with landowners, and powerline design and construction. The Environmental Impact Assessment (EIA) process forms part of the initial planning process of new powerlines.

While there should be reasonable confidence in the environmental feasibility of the preferred corridor nominated, other criteria may require minor alteration to the corridor which receives environmental authorisation. These may include:

- Identification of a technical problem during the detailed design phase which will require excessive cost to resolve (e.g. unstable subsurface conditions identified by detailed geotechnical investigations).
- Request by a landowner during the course of the negotiation process that the alignment be shifted to avoid disruption of a particular activity on the property, but provide a feasible new alignment.

Provided such potential deviations to the corridor are not unreasonable, or outside the original study area, it is fair for Eskom Transmission to investigate and negotiate local adjustments to the authorised alignment.

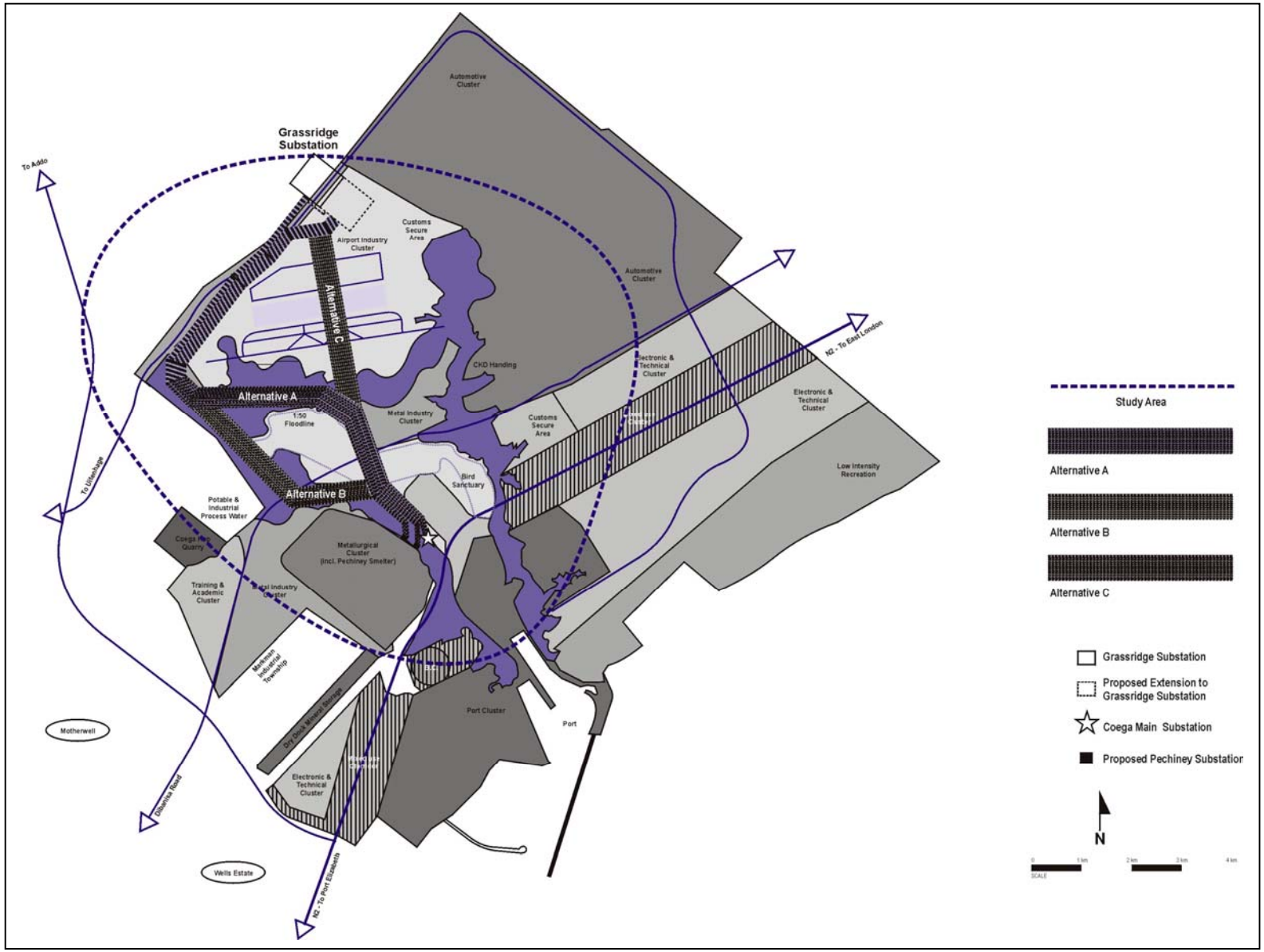

Figure 1.2: Technically feasible alternatives identified for investigations within the Environmental Impact Assessment

1.2.1. Servitude Negotiation and the EIA Process

The process of negotiating a servitude is independent of the EIA process, and it is important that the aims of the two processes are seen as separate. They share a common cause (the construction and operation of a powerline) and may share common landowner databases, but they have different aims. Appendix A provides further information on the negotiation phase.

2. DESCRIPTION OF THE PROPOSED PROJECT

2.1. Overview of the Proposed Project

The project entails the proposed establishment of nine 132 kV powerlines between Grassridge Substation and the proposed Coega Main and Aluminium Pechiney Smelter Substations in order to provide for future energy demands of the planned developments, industries and services within the Coega IDZ. For the purposes of these environmental studies, these substations are considered as fixed points. The site for the extensions to Grassridge Substation is investigated within a separate Environmental Impact Assessment Report (Bohlweki Environmental, 2002a). The distance between these substations is approximately 10 km (as the crow flies) and this area has been considered from an environmental perspective.

The proposed load requirements and thus the construction of the powerlines to supply the power are required in a phased approach as follows:

- Coega Main Substation initially requires one 132 kV line from the Grassridge Substation. This would provide unfirm supply (in that no back-up supply line would be in place to maintain the load requirements should there be a fault on the line) to customers. This one line would supply up to 500 MVA to the Coega IDZ. The Coega Main Substation would require a second 132 kV line from the Grassridge Substation if *firm* supply up to 500 MVA is required.
- Coega Main Substation would require a third 132 kV line from the Grassridge Substation to provide firm supply exceeding 500 MVA up to 1 000 MVA (i.e. as further IDZ tenants begin operation and require power).
- The proposed Aluminium Pechiney smelter would require three incoming 132 kV lines of firm supply of 500 MVA in order to ensure a constant supply to the smelter operation. Two lines will be utilised at all times, with a third spare in order to ensure no supply failures. The aluminium smelter cannot withstand a down-time period in its operation, and therefore require infrastructure to ensure constant and firm supply.
- Should Aluminium Pechiney require supply to a future second potline, an additional three 132 kV lines would be required to be constructed.

2.2. Alternate Powerline Corridors

From environmental, technical, social and economic perspectives, three feasible alternative powerline corridors have been identified (through the Environmental Scoping process) for further investigation within environmental studies (refer to Figure 1.2).

2.2.1. Alternative A

This corridor is proposed to transfer power from Grassridge Substation extension in a south-westerly direction parallel to two existing distribution lines. This alignment follows the Coega IDZ boundary to the west, and then turns in at the point where the IDZ boundary line turns south east. The corridor descends into and follows the floodplain of the Coega River (in an east-west direction), before turning south to the proposed Coega Main and Aluminium Pechiney Smelter Substation sites. The total line distance is approximately 15 km.

2.2.2. Alternative B

This alternative initially follows the same route as Alternative A, but follows a straight route across the Coega River valley in the vicinity of Coega Kop (refer to Figure 2.1), and then bends to follow the flatter terrain north of the proposed smelter site. The total line distance is approximately 16 km. With this option, the lines will encroach on the proposed future railway line servitude within the Coega IDZ in the vicinity of the existing small Distribution line.

2.2.3. Alternative C

This alternative considers the construction of overhead lines in a straighter route directly linking the Grassridge Substation extension and the proposed Coega Main and Aluminium Pechiney Smelter Substations, thereby reducing the number of bend points. The total line distance would be approximately 10 km. This alternative crosses that section of the Coega IDZ earmarked for the future construction of an airport.

2.3. Technical Details of the Tower and Powerline Designs

All components of a powerline are interdependent, but are distinct in the roles which they fulfil. These components include towers, foundations, insulators and hardware, and conductors.

Figure 2.1: Alternative B follows a straight route across the Coega River valley in the vicinity of Coega Kop

2.3.1. Servitude Requirements

A total servitude width of approximately 310 m will be required to accommodate the nine parallel powerlines. When lines are constructed in parallel, towers can be placed next to one another, effectively reducing the total servitude width required for the nine lines.

A maximum 4 m wide strip is to be cleared of all trees and shrubs down the centre of each powerline for stringing purposes only in areas which are densely vegetated. Any tree or shrub in other areas which will interfere with the operation and/or reliability of the powerline will be trimmed or completely cleared. Vegetation clearance will be kept to a minimum as far as possible.

2.3.2. Towers

The powerlines are to be constructed as 275 kV Transmission lines but are to be operated as 132 kV Distribution lines. This will allow the lines to be operated at a higher capacity if required in the future. In addition, the 275 kV tower structure provides additional stability to the powerline.

Powerline conductors are strung on in-line (suspension) towers and bend (strain) towers. Suspension towers are typically less cumbersome structures, which are less steel-intensive than bend towers. This makes them less visually intrusive, and cheaper to construct than strain towers. Therefore, powerline routes are planned with as few bends as possible.

The two basic tower constructions which are planned to be used for the proposed powerlines are:

- Self-supporting suspension/angle towers
- Cross-Rope Suspension (CRS) towers

Where feasible, the "cross-rope suspension" (CRS) tower (Figure 2.2 overleaf) will be used. This tower type consists of two masts and four anchor cables. These towers have a reduced steel-component, and are, therefore, both less expensive and less visually intrusive than conventional self-supporting tower structures. The parallel towers required for the nine powerlines will be constructed within 3 m of one another such that the support guys can be staggered to fit within a 310 m servitude.

The CRS tower has limitations in that bends greater than 3° and steep surfaces will require that more stable "strain" or self-supporting towers be used (Figure 2.3).

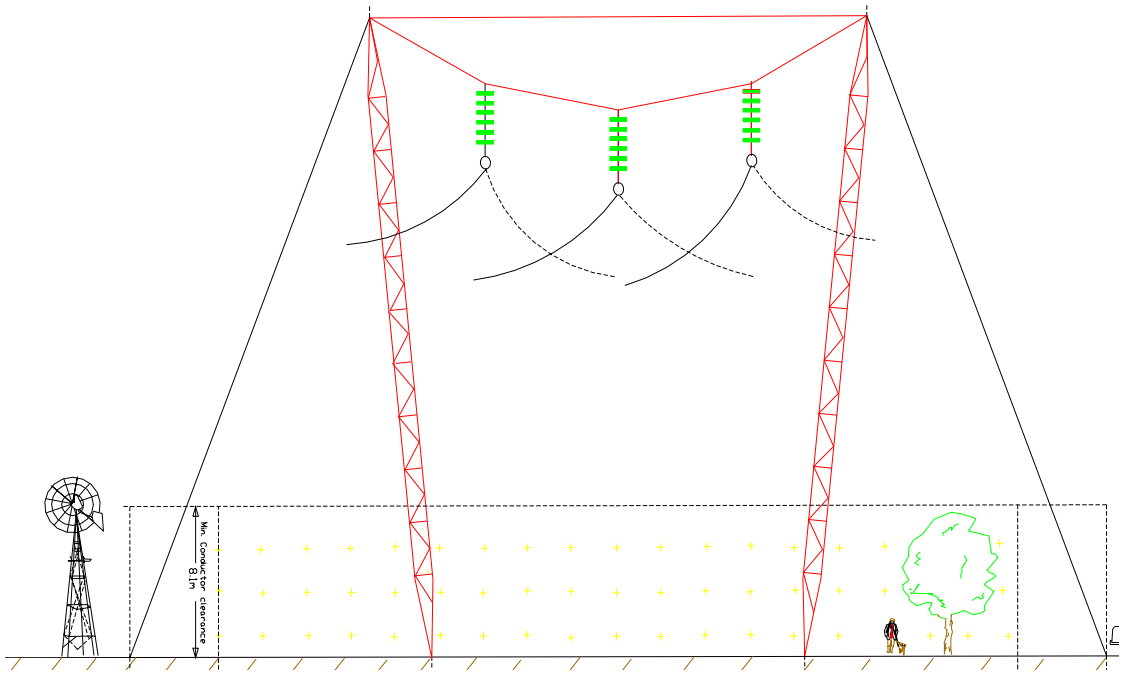

Figure 2.2: Diagrammatic representation of the cross-rope suspension tower

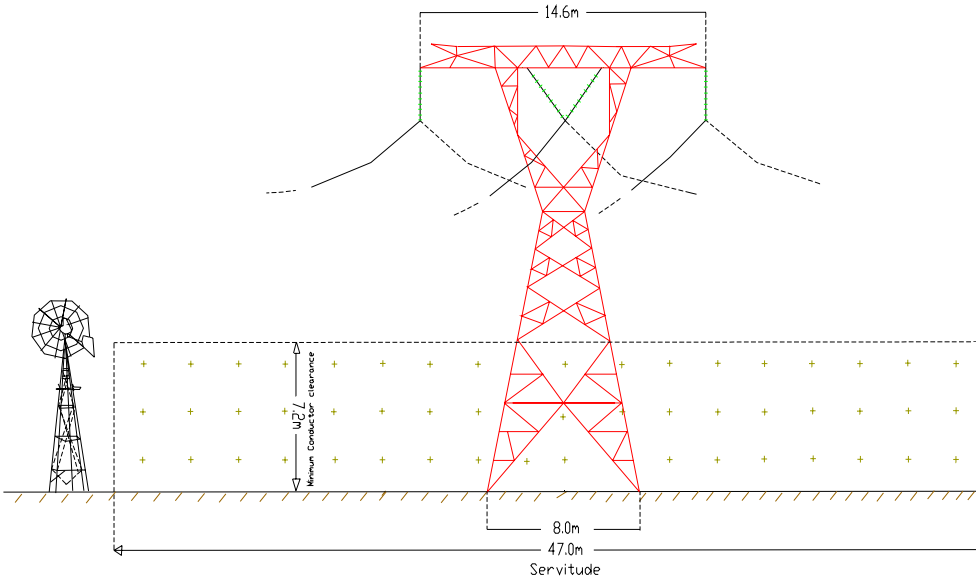

Figure 2.3: Diagrammatic representation of the 275 kV self-supporting tower type

2.3.3. Foundations

The choice of foundation is influenced by the type of terrain encountered, as well as the underlying geotechnical conditions. Geotechnical requirements for all tower types are catered for by using various foundations systems, which are designed to withstand conditions varying from hard rock to waterlogged marshes and floodplains. The actual size and type of foundation to be installed will depend on the actual sub-soil conditions.

The construction of foundations is the slowest part of the line construction, and is typically started some time ahead of tower erection. Prior to filling of the foundations and tower erection, excavated foundations are covered in order to safe-guard unsuspecting animals and people from injury. The foundations also represent the biggest unknown in the cost and construction time, since access to the tower sites is required for earth-moving machinery and concrete.

All foundations are back-filled, stabilised through compaction, and capped with concrete at ground level.

2.3.4. Insulators and Hardware

The insulators and hardware are used to connect the conductors to the towers. The main types are glass, porcelain, and composite insulators.

Glass and porcelain have been used for many years, and are the most common. They are, however, heavy and susceptible to breakage by vandals, as well as contamination by pollution. Composite insulators have a glass-fibre core with silicon sheds for insulation. The composite insulators are light-weight and resistant to both vandalism and pollution. They are, however, more expensive than the more common glass insulators.

2.3.5. Conductors

The conductors are made of aluminium with a steel core for strength. Power transfer is determined by the area of aluminium in the conductors. Conductors are used singularly, in pairs, or in bundles of three, four or six. The choice is determined by factors such as audible noise, corona, and electro-magnetic field mitigation.

Many sizes of conductor are available, the choice being based on the initial and life-cycle costs of different combinations of size and bundles.

2.3.6. Construction Process for Powerlines

Transmission lines are constructed in the following simplified sequence:

Step 1: Determination of technically feasible powerline alignment/s
Step 2: EIA and EMP input
Step 3: Negotiation of final route with affected landowners
Step 4: Survey of the route (by air)
Step 5: Determination of the conductor type
Step 6: Selection of best-suited conductor, towers, insulators, foundations
Step 7: Final design of line and placement of towers
Step 8: Issuing of tenders, and award of contract to construction companies
Step 9: Vegetation clearance and construction of access roads (where required)
Step 10: Tower pegging
Step 11: Construction of foundations
Step 12: Assembly and erection of towers
Step 13: Stringing of conductors
Step 14: Rehabilitation of disturbed area and protection of erosion sensitive areas
Step 15: Testing and commissioning
Step 16: Continued maintenance

Details of the construction process are presented for information in Appendix B.

- *Survey of the Route and Determination of Best-Suited Conductor, Towers, Insulators and Foundations:*

  After the approval of the final corridor by the environmental authorities and negotiations with landowners, the final definition of the centre line for the powerlines and co-ordinates of each bend in the line will be determined. An aerial survey will then be undertaken in order to obtain an accurate profile of the area. Based on this, optimal tower types and positions are identified, together with ground information.

- *Vegetation Clearance:*

  With the approved profiles, the vegetation clearing of the centre line and tower positions can take place, with the aid of a surveyor. Vegetation clearing will be undertaken in

accordance with the minimum standards to be used for vegetation clearing for the construction of the proposed new powerlines as listed in Table 2.1 below (Eskom, 2000). In sensitive areas, it may be necessary to implement precautionary measures in order to ensure that particular plant species are not disturbed. The precise areas in which such measures may be required will be determined upon finalisation of the powerline route.

For Alternatives A and B, a maximum strip of 4 m in width will be required to be cleared along the centre line of each of the nine powerlines for stringing purposes. This cleared area will be utilised for access purposes during the construction phase. Vegetation clearance along the centre line of the powerlines for Alternative C will only be required in areas where the vegetation cover is very dense.

Where vegetation is too dense for clearing, or will be significantly negatively impacted on by clearing (e.g. presence of Red Data flora species or sensitive vegetation type) and no clearing can be permitted, these sections may be required to be strung by air. However, this will add significantly to the cost of construction of the line.

Table 2.1: Minimum standards to be used for vegetation clearing for the construction of a new powerlines

Item	Standard	Follow up
Centre line of the proposed Transmission line	Clear to a maximum (depending on the tower type and voltage) of an 4 m wide strip of all vegetation along the centre line. Vegetation to be cut within 100 mm of the ground. Treat stumps with herbicide.	Re-growth shall be cut within 100 mm of the ground and treated with herbicide, as necessary.
Inaccessible valleys (trace line)	Clear a 1 m strip for access by foot only, for the pulling of a pilot wire by hand.	Vegetation not to be disturbed after initial clearing – vegetation to be allowed to re-grow.
Access/service roads	Clear a maximum (depending on the tower type) 4 m wide strip for vehicle access, including de-stumping/cutting stumps to ground level, treating with a herbicide and re-compaction of soil.	Re-growth to be cut at ground level and treated with herbicide as necessary.
Proposed tower position and proposed support/stay wire position	Clear all vegetation within proposed tower position and within a maximum (depending on the tower type) radius of 5 m around the position, including de-stumping/cutting stumps to ground level, treating with a herbicide and re-compaction of soil. Allow controlled agricultural practices, where feasible.	Re-growth to be cut at ground level and treated with herbicide as necessary.

Item	Standard	Follow up
Indigenous vegetation within servitude area (outside of the maximum 4 m strip)	Area outside of the maximum 4 m strip and within the servitude area, selective trimming or cutting down of those identified plants posing a threat to the integrity of the proposed powerlines.	Selective trimming
Alien species within servitude area (outside of the maximum 4 m strip)	Area outside of the maximum 4 m strip and within the servitude area, remove all vegetation within servitude area and treat with appropriate herbicide.	Cut and treat with appropriate herbicide.

Once the centre line has been cleared, the contractor's surveyor, pegs every tower position and marks the crossing point with existing fences for new gate installation. Once the tower positions have been marked, the vegetation clearing team will return to every tower position and clear four strips at the positions of the tower base for assembling and erection purposes.

- *Access/Service Roads:*

  Access/service roads will be required for the construction and maintenance phases. As far as possible, existing access/service roads will be utilised in order to minimise disturbance to the area. Where new access roads are required to be constructed, and it is feasible to do so, this will be required to be negotiated with the individual landowners concerned. Access roads 4 m in width would be established. If clearing has been undertaken, this area may be used for access purposes, thus eliminating the need for further disturbance. Where necessary for access to properties, gates are built at points where the centre line crosses any existing fence. This is undertaken in consultation with the landowners. Eskom locks are installed on such gates, and closed at all times.

- *Construction of Foundations:*

  Foundations will be mechanically excavated where access to the tower sites is readily available, and dug by hand where access is poor. The same will apply to the pouring of concrete required for the setting of the foundations. Open foundation excavations will be fenced/covered to prevent injury to people and/or animals.

- *Ongoing Maintenance:*

  The standard life-span of a powerline tower and associated components is approximately 20 – 25 years. During this period, ongoing maintenance is performed, and thus access is required to the lines.

3. SCOPE OF ENVIRONMENTAL INVESTIGATIONS

3.1. Approach to Undertaking the Study

An Environmental Impact Assessment (EIA) for the proposed project has been undertaken in accordance with the EIA Regulations published in Government Notice R1182 to R1184 of 5 September 1997, in terms of the Environment Conservation Act (No 73 of 1989), as well as the National Environmental Management Act (No 107 of 1998). In terms of Government Notice R1182 (schedule 1), the following listed activities are applicable:

- the construction and/or upgrading of facilities for commercial electricity generation and supply; and
- the change in land use.

The environmental studies for this proposed project were undertaken in two phases, in accordance with the EIA Regulations (refer to Figure 3.1 overleaf):

3.2. Phase 1: Environmental Scoping Study

An Environmental Scoping Study (ESS) has been undertaken for the proposed project. Existing information was used to identify potential impacts (both social and biophysical) associated with the proposed project, and highlight areas which should be avoided in order to minimise these biophysical and social impacts.

A public participation process was undertaken to identify issues and concerns of key stakeholders and interested and affected parties (I&APs). A large majority of the affected landowners were individually consulted, and a comprehensive issues trail was compiled.

An issues-based draft Environmental Scoping Report was made available to the public for review and comment for a 30-day period. This report was submitted to the National Department of Environmental Affairs and Tourism (DEAT) and the Eastern Cape Department of Economic Affairs, Environment and Tourism (EC DEAET) for review, comment and acceptance to proceed to the EIA phase of the study.

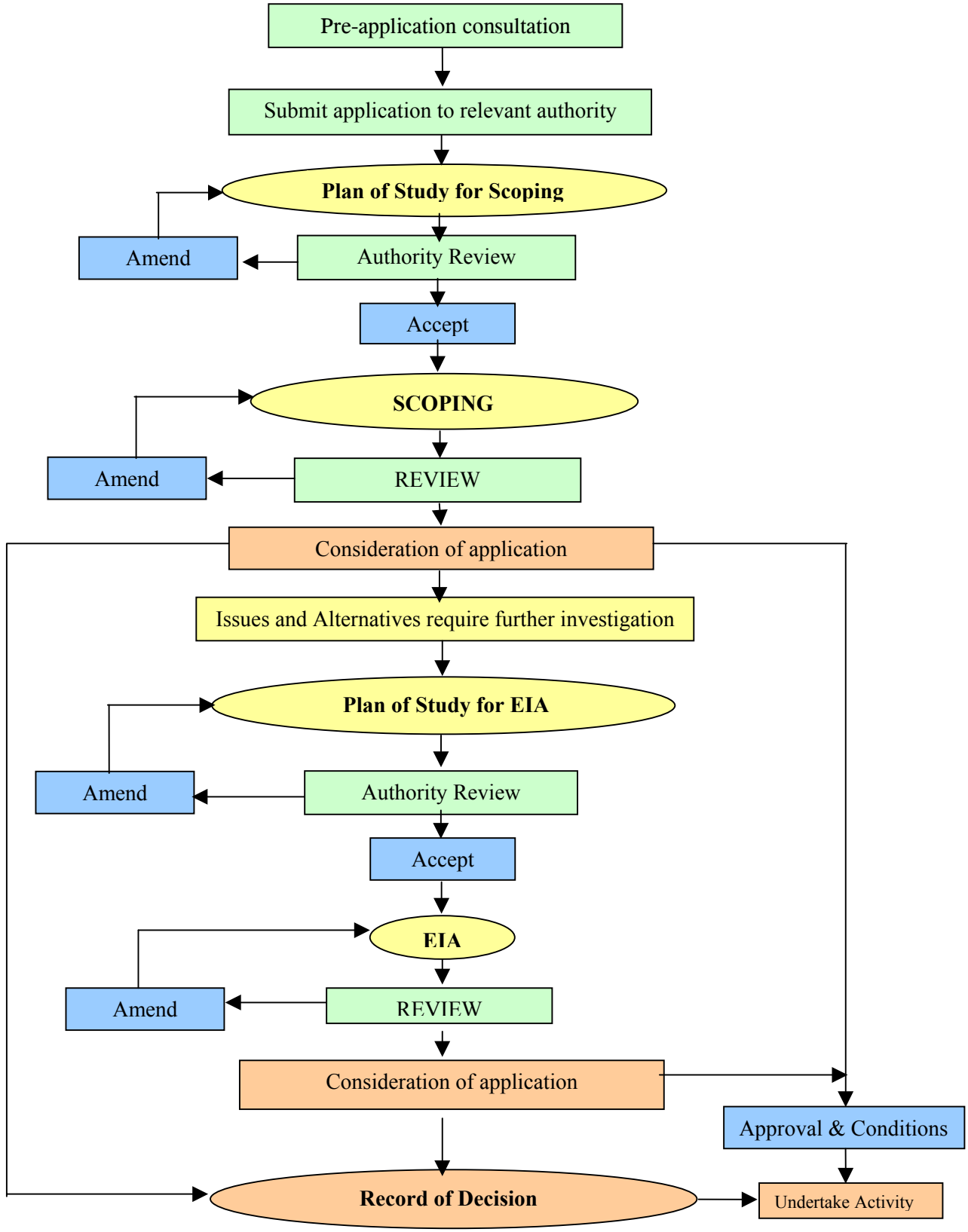

Figure 3.1: A schematic representation of the standard application procedure to be followed to obtain authorisation to commence with a listed activity (DEAT, 1998)

3.3. Phase 2: Environmental Impact Assessment

The ESS concluded that there were no environmental fatal flaws associated with the proposed project, but that a number of potentially significant issues required further investigation within an EIA. The primary aims of the EIA study were:

- to undertake a fully inclusive public participation process;
- to assess the significance of negative environmental (biophysical and social) impacts identified during the ESS for each feasible alternative powerline corridor;
- to identify possible appropriate mitigation measures for potentially negative environmental impacts, where required; and
- to nominate a preferred corridor for the construction of the proposed nine 132 kV powerlines.

3.3.1. Specialist Studies

Based on the findings of the Environmental Scoping Study, the following issues were identified as being of low significance, and therefore not requiring further investigation within the EIA:

- *Potential impacts as a result of climate and atmospheric conditions:* potential impacts of atmospheric conditions on powerline infrastructure are not anticipated to be significant. Site-specific mitigation should be addressed during the design of the powerline infrastructure, and addressed within an EMP for the maintenance phase.
- *Potential impacts on agricultural land and agricultural potential:* With the development of the Coega IDZ, previously cultivated lands will not be available for agricultural purposes in the future. Therefore, the potential impact on agricultural land and agricultural potential associated with the proposed powerlines is anticipated to be negligible.
- *Potential impacts on surface water:* potential impacts are anticipated during the construction phase, and are considered to be of low significance. Site-specific mitigation should be addressed within an EMP.

Specialist studies undertaken within the EIA included the assessment of potential impacts on:

- avifauna (bird life);

- vegetation;
- terrestrial fauna;
- archaeological, cultural and historical sites;
- aesthetics and visual quality; and
- the social environment.

3.3.2. Assessment of Impacts

In order to evaluate the significance of the identified impacts, the following characteristics of each potential impact were identified:

- the *nature*, including a description of what causes the effect, what will be affected and how it will be affected;
- the *extent*, indicating whether the impact will be local (limited to the immediate area or site of development) or regional;
- the *duration*, indicating whether the lifetime of the impact will be of a short duration (0 - 5 years), medium-term (5 - 15 years), long term (> 15 years) or permanent;
- the *probability*, describing the likelihood of the impact actually occurring, indicated as improbable (low likelihood), probable (distinct possibility), highly probable (most likely), or definite (impact will occur regardless of any preventative measures);
- the *significance*, determined through a synthesis of the characteristics described above and can be assessed as low, medium or high; and
- the *status*, which will be described as either positive, negative or neutral.

3.3.3. Assumptions and Limitations of the Study

The assumptions and limitations on which this study approach has been based include:

Assumptions:

- All information provided by Eskom Transmission and I&APs to the Environmental Team was correct and valid at the time it was provided.
- The positions of the Coega IDZ and the proposed Pechiney Aluminium smelter are fixed points as provided by the CDC.
- The Eskom Planning Team will be in a position to consider site-specific alternatives identified through the environmental studies.

- It is not always possible to involve all interested and affected parties individually. Rather, every effort has been made to involve as many broad base representatives of the stakeholders in the area. An assumption has, therefore, been made that those representatives with whom there has been consultation, are acting on behalf of the parties which they represent.
- The proposed project is for the construction of nine powerlines (to be constructed as 275 kV Transmission lines and operated as 132 kV powerlines) in a phased approach as determined by the requirements of the Coega IDZ.
- The definition of a powerline route is a strip of land approximately 310 m wide, within which a Lands and Rights negotiator will discuss and negotiate with the property owner for a final centre line.
- The definition of a centre line is the final adjustment to the above negotiated route, done by land surveyors setting it out on the ground using helicopters.
- Eskom will undergo and negotiation phase with landowners to ensure affected properties will be appropriately compensated.

Limitations and concerns:

- Digital and hard copy map data (1:50 000 maps) has not been updated with the most recent developments in the area.
- The visibility maps that have been developed are based on topography only. Therefore, what they represent is the worst case. In reality, the intervening objects, such as buildings, fences or vegetation, will at times block views of the site from external viewers.
- The proposed powerlines are to be constructed so as to conform to the requirements of the Record of Decision issued for the Coega IDZ.
- The proposed Coega IDZ framework does not provide a corridor for the proposed powerlines from Grassridge Substation to the Coega IDZ.

3.3.4. Overview of the Public Participation Process Undertaken within the EIA Phase

Public Participation plays an important role in the undertaking of environmental investigations, as I&AP input ensures all potential environmental issues (biophysical and social) associated with the proposed project are considered within the EIA. The aim of the public participation process was to establish efficient communication channels which would

provide all I&APs with the opportunity to participate meaningfully in the process. The public participation process was on-going from the ESS phase, and aimed to:

- keep I&APs fully informed about the proposed project, as well as the EIA process being followed;
- provide further opportunity to all I&APs to exchange information, and express their views and concerns;
- obtain the contributions of I&APs and to ensure that the issues and concerns raised are understood and fully documented; and
- focus the EIA on relevant issues.

In order to ensure an effective, appropriate, transparent and legitimate public participation process, the following principles were applied:

- due consideration of alternatives (especially those raised through the public participation process);
- meaningful and timeous participation of I&APs;
- consideration of "due process";
- focus on issues relevant to the project, and considered important by I&APs; and
- inclusion of the needs, interests and values expressed by I&APs in the information provided to decision-making Authorities.

- *I&AP Consultation:*

  A deeds search was conducted by Eskom in order to identify landowners along the proposed powerline corridors. I&AP information (including contact details, comments and concerns raised, etc) were included within an I&AP database. This I&AP database was updated throughout the duration of the EIA process, and is included within Appendix C.

  In order to identify issues of concern, the public participation consultant travelled the alternate routes of the proposed powerlines to meet with landowners. Where available, the landowners were personally spoken to and informed about the project and their issues and/or concerns noted. Meetings were also held with key stakeholders in the area, such as the local councils, the CDC (as the primary landowner) and farmer's associations. In addition, various telephonic discussions were held with I&APs to inform them of the proposed project and to note their initial comments.

Although the EIA process is independent of the Eskom process, a small overlap does exist between the EIA process and the landowner negotiation process (further discussed in Appendix A). The EIA process identified and recorded landowners' details within the study area, as well as issues and concerns raised.

I&APs had access to a project website throughout the duration of the project (http: www.eskom.co.za/about/environment/eia_content.html). This website allowed for new I&APs to register onto the project database online. The project database was maintained and updated throughout the duration of the project.

Issues and concerns raised during EIA process were incorporated as the core of the social impact assessment within this EIA Report.

3.3.5. Public Review of Draft Environmental Impact Assessment Report

The draft EIA Report is available for public review at the following locations:

- Main Library (Central), Port Elizabeth: Market Square, Port Elizabeth;
- Newton Park Library, Port Elizabeth: Corner of 4th Avenue and Hurd Street, Newton Park, Port Elizabeth;
- Motherwell Library, Motherwell: Corner of Ngqokweni and Umnulu Streets, Motherwell
- At the offices of Pentz Steenmakery, on the Farm Welbedachtsfontein (off R335)
- At the offices of Bohlweki Environmental, Midrand

This report will be available for review and comment until Tuesday 3 December 2002.

3.3.6. Final Environmental Impact Assessment Report

The final stage in the EIA process will entail the capturing of responses from I&APs on the draft EIA report in order to refine this report, and make final recommendations regarding the proposed project. It is this report upon which the relevant Environmental Authorities provide comment, recommendations and authorisation.

4. ASSESSMENT OF POTENTIAL IMPACTS

In terms of the CDC's development framework for the Coega IDZ and the Record of Decision issued for the rezoning of a portion of the area for the Coega IDZ, the current and future land uses of the area differ substantially. This alteration of the nature of the area is critical to bear in mind when considering the impact of such a powerline corridor development on the area.

4.1. Potential Impacts associated with Geology and Soils

The proposed Coega IDZ area is underlain by the Uitenhage Group. Three main formations occur in the Uitenhage Group: the Enon Formation, the Kirkwood Formation and the Sundays River Formation.

The Enon Conglomerate consists of reddish-brown, coarse-grained conglomerate containing pebbles cobbles and boulders, typically of quartzite and other hard rocks. The Enon Formation was deposited in the form of alluvial fans by rivers draining the Cape Fold Belt Mountains.

The Kirkwood Formation overlies the Enon Conglomerate and consists of a succession of sandstone and shale. The Kirkwood Formation was deposited in channels and on the floodplains along the lower reaches of the same Cretaceous-age rivers that deposited the Enon gravels higher upstream.

The Sundays River Formation overlies the Kirkwood formation, and consists of a thick succession of shale. The Sundays River Formation was deposited in shallow marine embayments during the Cretaceous Period.

A significant, regional normal fault, the Coega Fault, extends from approximately 120 km west of the Groendal Dam eastwards towards the coast. It is approximately 1-1,5 km wide, with a vertical displacement of approximately 1 800 m. The upthrown northern block of Table Mountain Quartzite constitutes an important regional confined and artesian aquifer, which is protected within the Uitenhage Groundwater Control Area (UGWCA).

The study area traverses a coastal plain rich in fossil marine deposits. This calcareous material has contributed to the widespread occurrence of carbonates within the soil profiles of the area (De Corte *et al.*, 1987). The soils of the study area consist of relatively deep, red, lime-rich sandy clay loams (CES, 2001) overlaying limestone. Soils within the Coega River

valley are deep undifferentiated deposits. The southern coastal belt is characterised by coastal sands, and sandy soils, lime-containing lithosols and weakly developed soils on rock.

4.1.1. Potential Impacts

The erosion risk within the study area is largely limited to slopes greater than 20°, although accelerated erosion may occur on any un-vegetated slopes. Morgan (1986) regards any slope greater than 20° as a "*...high to very high erosion hazard*". Alternatives A and B follow the Coega River valley side slopes for a portion of their length. The undifferentiated deposits within the valley could potentially be susceptible to erosion, particularly once vegetation has been removed. The risk of erosion is likely to be significant for that portion of Alternative B which traverses the high-lying area in the vicinity of Coega Kop due to the slope angles. Alternative C traverses terrain with very little relief ahead of the Coega River. The river valley is crossed at one point, and spans across a shorter section of undifferentiated deposits associated with the Coega River valley.

Any towers located on floodplains would be at risk from flood waters in flood conditions, which would scour away sediment from around the base of the towers as the founding conditions would be accounted for by the type of foundations lain. However, this is unlikely to pose any real threat to the overall stability of the powerlines. The effects of the flood waters will be of low intensity and significance, unless a tower is located close to an active channel where a real risk that the tower could be undercut and collapse exists. This can easily be avoided by ensuring that towers are erected well away from river valley floor and banks. Alternatives A and B have been aligned off the valley floor away from the Coega River channel on the valley side slopes above the 1:100 year floodline, in accordance with the Record of Decision issued for the Coega IDZ. These side slopes may, however, still be susceptible to erosion depending on the slope angle.

The removal of vegetation and subsequent vehicular movement on these areas increases the risk of erosion. As far as possible, use will be made of existing established access/service roads in the area. Alternatives A and B follow existing powerlines from Grassridge Substation for approximately 2 km. Existing access/service roads associated with these existing powerlines could be used during the construction and maintenance phases. The remainder of Alternative A has current limited access and access roads (a maximum of 4 m wide) would be required to be established through the Mesic Succulent Thicket in order to access the proposed powerline corridor. Alternative B is routed in the vicinity of an existing Distribution powerline (which has an access road) for a large portion of its remaining length. In addition, local service roads (such as the road to the old pig farm) could be utilised to some extent. The establishment of new access would

still be required for short sections of the length of the line. Alternative C occurs in close proximity to the existing Brakrivier or "white" road, which could be utilised as an access/service road during construction and maintenance should the powerlines be constructed within this corridor.

Table 4.1: Potential impacts on geology and soils associated with the construction of new powerlines between the Grassridge Substation and the Coega IDZ

Nature	Extent	Duration	Probability	Significance	Status
Erosion potential at tower positions – Alternative B	Local	Long-term	Likely	Moderate	Negative
Erosion potential at tower positions – Alternatives A and C	Local	Long-term	Unlikely	Moderate	Negative
Erosion potential along access/service roads	Local	Long-term	Likely	Moderate	Negative

4.1.2. Mitigation Measures

Construction of the proposed powerline towers is to be avoided on those sites with slopes greater than 20°. If such sites are utilised, great care should be taken that the construction site is not left denuded of vegetation for any length of time and that appropriate erosion control measures are in place. As soon as possible after erection of the towers, disturbed areas should be re-vegetated with appropriate species. In addition, sufficient supports and re-enforcement must be introduced to the site for stability.

Where new access/service roads are required to be constructed, appropriate erosion prevention measures should be implemented, where the erosion risk is considered to be high. Ideally, the steep sections of any service/access road should be paved to mitigate against the erosion hazard.

4.1.3. Recommendations

In terms of the local topography and soils, the order of preference for the establishment of the powerlines is:

- Alternative C
- Alternative A or B

4.2. Potential Impacts on Flora

The vegetation of the Eastern Cape is complex, and can be described as a zone where four major biomes converge and overlap. The proposed powerline corridors pass through three vegetation types, namely: Bontveld on the flatter terrain, Mesic Succulent Thicket in the Coega valley and Riparian Thicket. Where all three proposed corridors converge ahead of the Coega Main and Aluminium Pechiney Smelter Substations, the vegetation is largely degraded as a result of previous disturbance associated with the construction of the existing railway line and other infrastructure in this area (Figure 4.1).

- *Bontveld:*

  The Bontveld comprises a mosaic vegetation type which occurs on the raised calcareous plateau. The vegetation comprises a grassy dwarf shrubland, including grass, karoo and fynbos elements, with scattered bushclumps. The clumps are strongly associated with deeper, nutrient rich soils, with higher carbon and moisture levels than the adjacent shallow, rocky substrate. Numerous endemic taxa are found within this vegetation type. Although the conservation status of Bontveld was the subject of some debate, it is now clear that this vegetation type has important floristic components that require special conservation attention. More than 41 Eastern Cape rare, endemic and protected species have previously been found within the Coega IDZ area (CES, 2000), including *Orthopterum coegana* and *Aloe bowiea*. Recently Phillipson & Dold (2002) identified more rare taxa in the Bontveld. Although this vegetation type has limited agricultural potential due to the calcareous nature of the substratum, it has high species richness, and is of conservation value.

  Numerous endemic taxa within this vegetation type were recorded during the surveys of the proposed alternative powerline corridors (refer to Appendix D). Nine of the species recorded in the grassy dwarf shrubland are protected under the Cape Nature and Environmental Ordinance 19 of 1974. Two further species which were collected in the bushclumps are protected by this Ordinance, and one species (*Sideroxylon inerme*) is protected in the Forestry Act. Permits are required for the damage, destruction or removal of these species. No Red Data Book species were encountered.

Figure 4.1: Where all three proposed corridors converge ahead of the Coega Main and Aluminium Pechiney Smelter Substations, the vegetation is largely degraded as a result of previous disturbance associated with the construction of the existing railway line and other infrastructure in this area

The Bontveld is very limited in its distribution, covering a small remaining area around Addo and Coega. Recent surveys by the National Botanical Institute (Rutherford, 2002) and the STEP Project (Lloyd *et al*., 2002) show that Bontveld is under threat from numerous sources (principally mining, urbanisation and grazing) and should be given special conservation attention. In terms of the Record of Decision for the Coega IDZ, degradation to this vegetation type must be avoided as far as possible within the Coega IDZ area.

- *Mesic Succulent Thicket:*

  Mesic succulent thicket comprises those thicket communities associated with moderate to higher rainfall, on cooler, southern aspects. The thicket is located on the moderate to steeply sloping face of the Coega valley below the calcareous plateau. The vegetation contains three major structural classes, namely woody shrubs, succulent shrubs and numerous dwarf shrubs and grasses under the canopy. The thicket is usually 2 – 3 m in height, and forms an almost impenetrable thicket (Figure 4.2), with a closed canopy. Leaf succulent species (*Portulacaria afra* and *Aloe africanus*) are present, but rare. The woody component is dominated by *Scutia myrtina, Brachylaena ilicifolia, Euclea undulata, Rhus* spp., *Sideroxylon inerme* (milkwood) and *Buddleja saligna*. Stem succulent species are present and include *Euphorbia ledienii* and *Euphorbia mauritanica.* Fewer endemic taxa are found within this vegetation type than within the Bontveld. One Red Data Book species was recorded.

Figure 4.1: Mesic Succulent Thicket is usually 2 – 3 m in height, and forms an almost impenetrable thicket

This vegetation type is now under great threat from development (Lloyd *et al*., 2002). In terms of the Record of Decision for the Coega IDZ, degradation to this vegetation type must be avoided as far as possible within the Coega IDZ area.

- *Riparian Thicket:*

  Riparian thicket and karroid dwarf shrubland occurs along the Coega River valley. This vegetation type comprises mainly common woody shrubs (mainly *Acacia karroo, Rhus longispina*, *Maytenus polyacantha*, *Lycium oxycarpum* and *Scutia myrtina*; refer to Appendix D). The dwarf shrub component is dominated by the invasive karroid shrub *Pteronia incana,* but includes other palatable dwarf shrubs and grasses. This area is part of a disturbance zone which occurs on the flat to gently sloping land (within the Coega River floodplain) which has previously been developed for agricultural purposes. No agricultural activity has taken place in recent years. There are numerous weedy species (including *Opuntia ficus-indica, Opuntia aurantiaca* and *Agave americana*) which require specific management actions. The potential impacts on riparian thicket associated with the construction of the proposed powerlines within the study area is anticipated to be of low significance as this vegetation type is largely disturbed.

4.2.1. Potential Impacts on Sensitive Flora

Red Data and protected flora species have been recorded within the study area within the Bontveld and the Mesic Succulent Thicket. Therefore, there is the potential for impacts on those species which have been identified to potentially occur within the powerline corridors. Although this impact will be localised and confined to tower positions, it will be permanent, and is, therefore, considered to be of high significance. However, with the implementation of appropriate mitigation measures (see 4.2.4 below), this impact can be minimised.

This potential impact is anticipated to be most significant within Alternative B, as a population of the critically endangered *Aloe bowiea* has previously been located in the vicinity of Coega Kop (A. Dold, personal communication). This impact cannot be successfully mitigated due to the sensitivity of this species to translocation, and therefore, this route is not recommended from a botanical perspective.

Although the Bontveld is considered to be a sensitive vegetation type, it is known to recover from disturbance with time and appropriate management. Efforts must, however, be made to conserve this vegetation type as far as possible. Therefore, although there will be a localised impact on this vegetation type (associated with all three alternatives), this impact is

anticipated to be short-term in nature and, therefore, of moderate to low significance. In addition, due to the building restrictions which are required to be implemented within a powerline servitude, the construction of the proposed powerlines over this vegetation type will effectively conserve a minimum of 310 m of Bontveld as no development will be permitted below these lines. This could have a positive impact in the long-term.

Vegetation clearance within the Mesic Succulent Thicket which is crossed by all three alternative corridors is anticipated to be of high significance as this vegetation type is considered to be important in terms of the ecological functioning of the broader area. The impact on this vegetation type is anticipated to be more significant as a result of Alternatives A or B than Alternative C, as these alternatives would be required to pass through a broader band of this vegetation type, and would require the construction of access/service roads within the section of the route which passes through this vegetation type. However, with the adoption of the standard practices for vegetation clearance (as discussed in Section 2 of this report), the limiting of vegetation clearance in sensitive areas, and the use of existing access/service roads as far as possible, this impact can be minimised, although there will always be a loss of vegetation at tower footings.

4.2.2. Potential Impacts on the Occurrence of Alien Species

The minimum standards implemented by Eskom during the construction of a new powerline include the clearance of all alien vegetation species within the servitude area. This is achieved through the use of appropriate cutting and treatment with herbicides. During the operation and maintenance of the powerline, re-growth is cut and treated with an appropriate herbicide in order to prevent re-colonisation of the area by these species. Therefore, the potential impact associated with the construction of the proposed powerlines in terms of alien vegetation species is anticipated to be positive and of a long-term nature, particularly with regards to the control of *Acacia cyclops*.

Table 4.2: Potential impacts on flora associated with the construction of new powerlines between the Grassridge Substation and the Coega IDZ

Nature	Extent	Duration	Probability	Significance	Status
Red Data and protected flora species (Bontveld and Mesic Succulent Thicket) – Alternative A	Local	Permanent	Likely	High	Negative

Nature	Extent	Duration	Probability	Significance	Status
Red Data and protected flora species (Bontveld and Mesic Succulent Thicket (Aloe bowiea)) – Alternative B	Local	Permanent	Highly probable	High	Negative
Red Data and protected flora species (Bontveld and Mesic Succulent Thicket) – Alternative C	Local	Permanent	Likely	High	Negative
Mesic Succulent Thicket – Alternative A	Local	Permanent	Likely	High	Negative
Mesic Succulent Thicket – Alternative B	Local	Permanent	Likely	High	Negative
Mesic Succulent Thicket – Alternative C	Local	Permanent	Likely	Moderate	Negative
Occurrence of alien vegetation	Regional	Long-term	Definite	High	Positive

4.2.3. Mitigation Measures

- *Endangered, Rare and Threatened Species:*
  As it is likely that rare and endangered plant species may occur within the area along which the proposed powerlines are to be constructed, a detailed survey of the final tower positions, as well as all access roads and other structures should be undertaken by a qualified vegetation specialist prior to the commencement of construction activities.

  Where rare or endangered plants are identified within the proposed construction area, various mitigation measures can be implemented:

  * Many sensitive plant species can be successfully relocated to similar habitats. This should be undertaken in the winter months as far as possible. This has proved to be successful during the current plant relocation exercise being undertaken within the Coega IDZ. Any plants which require relocation as a result of the construction of the proposed powerlines could be incorporated into those areas already established by the CDC.
  * Protected species can be successfully relocated to a nursery with the possibility of using them to rehabilitate mining and other disturbance sites in future. This has been a positive feature of the rehabilitation programme of PPC, who have funded research (Watson *et al*., 1999) to rehabilitate mine sites in the Bontveld. Establishing and maintaining a nursery will provide plants for this purpose. The

feasibility of such a nursery is currently being investigated by the CDC, to be operated on a concession basis.

* Where it is not desirable, or possible to successfully relocate sensitive plant species to other habitats or to a nursery (e.g. low-growing endemic geophytes such as *Euphorbia* and *Gasteria* species) due to sensitivities of the species with regards to habitat preferences, the specific location of each disturbance (tower construction, access road construction, clearing of servitude) should be undertaken under the supervision of a suitably qualified vegetation specialist. This will result in the avoidance of unnecessary disturbance to sensitive habitats.
* In addition, where feasible, a slight shift in the position of the tower to avoid disturbance of rare or endangered species will result in an impact of low to no significance.
* Standard practices implemented by Eskom (and included as part of all contracts) include a number of mitigation measures which will limit the clearance of vegetation and construction of access roads in sensitive areas.

- *Mitigation Factors to Eliminate Re-colonisation of Alien Vegetation:*
  * Standard mitigation measures already adopted by Eskom (as discussed above) must be implemented to ensure that the potential impacts associated with alien invasive vegetation is ameliorated.
  * An appropriate fire management plan must be compiled and implemented.
  * Post-fire herbicide treatment should be implemented, particularly for woody species.

Appropriate site-specific management measures should be detailed within an Environmental Management Plan (EMP) for construction, operation and maintenance of the powerlines.

4.2.4. Recommendations

In terms of the botanical specialist study undertaken, the order of preference for the establishment of the powerlines is:

- Alternative C
- Alternative A
- Alternative B

4.3. Potential Impacts on Terrestrial Fauna

- *Mammals:*

  Based on a literature review and reconnaissance field survey, the area earmarked for the establishment of the proposed powerlines appears to support a relatively low diversity of mammals. Medium- to large-sized mammals such as kudu are probably present only in low numbers or as vagrants passing through the area. The largest mammals likely to be found in this habitat are kudu (*Tragelaphus strepsiceros*) and bushbuck (*Tragelaphus scriptus*). Grysbok (*Raphicerus melanotis*) and the common duiker (*Sylvicapra grimmia*), both small antelope, should be more common throughout the study area (refer to Appendix E).

  The following Red Data Book small mammal species potentially occur within the study area:

  * The Spectacled Dormouse (*Graphiurus ocularis*); and
  * The African Striped Weasel (*Poecilogale albinucha*)

  Both species are listed as Rare in the South African Red Data Book - Terrestrial Mammals (Smithers 1986). The Spectacled Dormouse inhabits krantzes, rocky areas and trees, whereas the African Striped Weasel occurs in open savanna woodland and open grassland areas.

- *Reptiles:*

  It is envisaged that the study area supports a wide range of reptilian species. The study area falls within the Port Elizabeth-Grahamstown-King Williams Town corridor, which is known to have a high diversity of reptiles and amphibians (Branch 1988a, 1988b).

  The Tasman's Girdled Lizard (*Cordylus tasmani*) and the Cape Legless Burrowing Skink (*Scelotes anguina*), which are endemic to the Eastern Cape, occur within the Addo Elephant National Park. Due to the proximity of the Park to the study area, these species are likely to occur within the proposed Coega IDZ in areas where suitable habitat occurs.

  The Eastern Cape has the most diverse land tortoise fauna in the world (Branch 1988a). Five species occur or potentially occur, in the study area, namely:

- The Mountain Tortoise (*Geochelone pardalis*);
- The Angulate Tortoise (*Chersina angulata*);
- The Tent Tortoise (*Psammobates tentorius tentorius*);
- The Common Padloper (*Homopus areolatus*); and
- The Karoo Padloper (*Homopus boulengeri*).

The Albany Adder (*Bitis albanica*) is very rare and is endemic to the Eastern Cape Province. This species distribution range is restricted to in the vicinity of Algoa Bay, and from Port Elizabeth to near Committees (25 km east-north-east of Grahamstown; Branch 1999). The Albany Adder has been found occurring within the Mesic Succulent Thicket and bontveld vegetation types. Recently (1985, 1995 and 1997) specimens were collected from the area to be covered by the Coega IDZ. The Albany Adder occurs in very low numbers and has been subjected to severe threats due to extensive habitat destruction. The species is of Priority Conservation importance, and current knowledge indicates that it is worthy of inclusion in the Endangered category of both International and National red data books. The construction of the proposed powerlines may pose a threat to the Albany Adder through direct mortalities related to vehicle movement, killing by humans working in the area, as well as loss of suitable habitat.

- *Amphibians:*

  A survey of the literature (Branch 1988; 1990 1997; Branch and Braack 1987, Passmore and Carruthers 1995) indicated that 13 amphibian species may occur in the Coega region.

  The general absence of permanent water with vegetated margins within the areas west of the Sundays River, either as small dams or perennial streams, severely constrains the presence of breeding amphibians, and the aquatic species *Xenopus laevis*. Most species require standing water for a minimum of 6 - 10 weeks for successful breeding to occur. Only the rain frog (*Breviceps adspersus pentheri*) is a terrestrial breeder, whose breeding does not require standing water even for short periods (Branch 1988b). A number of poorly drained areas may form temporary ponds following heavy rain and may be suitable for breeding by *Tomopterna delanadei,* both *Bufo* species, *Strongylopus grayii, Cacosternum boettgeri* and *C. nanum* (Branch 1988c).

  No species endemic to the Eastern Cape are known to occur within this region.

- *Invertebrates:*

  As a whole, information on the diversity, biology, ecology and conservation status of the invertebrates in the study area is severely lacking.

  The butterfly species *Aloeides clarki* and *Lepidochrysops bacchus* are considered to be threatened and could potentially be impacted on through the proposed development. These butterfly species are habitat specific and any alteration to their habitat could result in local extinction (Henning and Henning, 1989). Both species are rare, and *Aloeides clarki* is endemic to the lower Coega and Sundays River valleys. The exact location of the population requires detailed investigation, but are not anticipated to be traversed by the alternative corridors.

4.3.1. Potential Impacts on Mammals

- *Electrocution:*

  It is unlikely that the medium- to large-sized mammals occurring within the study area will be able to reach the electrical conductors associated with the powerlines. The possibility of electrocution is unlikely. However, vervet monkeys and baboons are able to climb the tower members. While mitigating measures can be implemented by Eskom to prevent mast climbing, these are not always successful (e.g. fires on the Suikerbosrand Nature Reserve, Gauteng have been attributed to baboons being electrocuted on powerlines). Therefore, an impact of low significance is anticipated to occur as a result of electrocutions.

- *Erosion:*

  The manipulation of vegetation under the powerlines and service roads will make large areas under the powerlines susceptible to erosion. A strip of 4 m will be required to be cleared under each line, giving a cleared area of approximately 54 hectare over the length of the line. Many of the grazers which occur within the study area will potentially seek succulent vegetation on the disturbed areas. Trampling by these grazers may cause ruts in the cleared areas and this can ultimately lead to erosion.

- *Animal movements:*

  The construction and clearing of access roads and servitudes will open up the habitat and this is likely to attract grazers to these areas. A probable consequence of this will be over-utilisation of the vegetation under the powerlines, leading to further vegetation degradation and associated erosion.

Due to the extent of the proposed powerline development (approximately 15 km long and 310 m wide – an area of approximately 465 hectare) the impact could potentially be widespread and is, therefore, considered to be of moderate significance. While alternative C is somewhat shorter than Alternatives A and B, the impact is still considered to of a high significance.

- *Behavioural impacts:*

  It is anticipated that there will be no significant behavioural impacts as a result of the construction of the proposed powerlines. It is predicted that animals occurring within the area of the proposed development site will vacate the site during the construction phase and will likely return to the area after the construction has been completed and the area has been rehabilitated. It is, however, likely that with future development plans of the Coega IDZ, open areas such as that under the powerlines and the open space management areas would be the only areas for animals to reside. This could potentially be a positive impact of high significance in the long-term

- *Fragmentation of habitats:*

  The clearing of vegetation required for stringing purposed and for access/service roads associated with the proposed powerlines is anticipated to result in the large-scale habitat fragmentation. If clearing is required for stringing, the clearing will result in a loss of habitat area, as well as increased isolation of indigenous vegetation patches resulting in the fragmentation of ranges of specialised species. In addition, clearing and disturbance associated with the proposed establishment of the powerline servitude will increase the potential for invasion by alien vegetation, thereby further degrading the natural habitat.

  It is expected that the impacts associated with the fragmentation of the natural vegetation occurring will influence the vertebrate diversity of the area and have a particularly negative effect of habitat-specific species with large home ranges. This impact is anticipated to be of high significance.

- *Opening up of habitats and increased predation levels:*

  The construction of the proposed powerlines will require the clearing of vegetation to accommodate the towers and access/service roads. It has been estimated that the servitude required is approximately 15 km in length, and 310 m wide with a 4 m strip of vegetation being cleared under each line for the purposes of stringing the lines. The clearance of vegetation will potentially result in the opening up of the natural vegetation cover, creating

open corridors, especially in the short-term ahead of rehabilitation of the area or regrowth. This may result in increased predation levels on small mammals (and other fauna), by predators such as the black-backed jackal (*Canis mesomelas*) and the caracal (*Felis caracal*), as well as from smaller species such as the genets, mongooses, and raptors (birds of prey).

Due to the large area that will be cleared to accommodate the proposed powerlines the impacts associated with opening up of the habitat are considered to be of high significance. However, this impact will be of short-term duration as disturbed areas will be rehabilitated and re-vegetated.

Table 4.3: Potential impacts on mammals associated with the construction of the proposed powerlines between Grassridge Substation and the Coega IDZ

Nature	Extent	Duration	Probability	Significance	Status
Electrocutions	Local	Permanent	Unlikely	Low	Negative
Erosion due to trampling by grazers in disturbed areas	Local	Long-term	Probable	High	Negative
Animal movements	Local	Long-term	Probable	Moderate	Negative
Behavioural impacts	Local	Long-term	Likely	High	Positive
Habitat fragmentation	Local	Long-term	Probable	High	Negative
Opening up of habitats and increased predation levels	Local	Short-term	Probable	High	Negative

4.3.2. Potential Impacts on Reptiles

- *Increased predation levels:*

  As with small mammals, all reptiles occurring within the area of the proposed powerlines are at risk from increased predator densities (avian and mammalian predators) through the opening up of the vegetation, creation of corridors and the provision of superior perch substrates.

  Due to the large area that will potentially be cleared during construction of the proposed powerlines, the impacts associated with opening up of the habitat are considered to be of high significance. However, this impact will be of short-term duration as disturbed areas will be rehabilitated and re-vegetated.

- *Habitat disturbance and destruction:*

  Excessive habitat disturbance and/or destruction during construction of the proposed powerlines will reduce the amount of habitat available for a large number of reptile species

occurring within the area. Of particular importance is the reduction in habitat for the rare Albany Adder.

The vegetation has the potential to re-establish and regenerate once the construction phase has been completed. However, due to the length and width of the proposed powerline development and the importance of the area for reptiles, the impacts are considered to be of high significance.

Table 4.4: Potential impacts on reptiles associated with the construction of the proposed powerlines between Grassridge Substation and the Coega IDZ

Nature	Extent	Duration	Probability	Significance	Status
Increased predation levels	Local	Short-term	Probable	High	Negative
Habitat disturbance and/or destruction	Local	Short-term	Probable	High	Negative

4.3.3. Potential Impacts on Amphibians

Amphibians are considered to be particularly sensitive to habitat fragmentation and negative impacts have been recorded on frogs (Marsh and Pearman, 1997). However, no permanent wetland areas occur in the area to be traversed by the proposed powerlines, and the impacts are considered to be of a low significance.

Table 4.5: Potential impacts on amphibians associated with the construction of the proposed powerlines between Grassridge Substation and the Coega IDZ

Nature	Extent	Duration	Probability	Significance	Status
Habitat disturbance	Local	Short-term	Unlikely	Low	Negative

4.3.4. Potential Impacts on Invertebrates

- *Habitat modification, disturbance and destruction*

  The required vegetation clearing associated with the proposed development may modify, damage or destroy portions of the habitat wherein the two rare butterflies are likely to occur. The exact location of the butterfly populations has not be established at this stage, and the final routing of the powerline must be checked by a lepidopterist familiar with the area.

  Due to the large area to be affected by the proposed powerlines, and the status of the potentially occurring butterflies, the impacts associated with habitat destruction are considered to be of moderate significance.

Table 4.6: Potential impacts on invertebrates associated with the construction of the proposed powerlines between Grassridge Substation and the Coega IDZ

Nature	Extent	Duration	Probability	Significance	Status
Habitat modification, disturbance and/or destruction*	Local	Short-term	Definite	Moderate	Negative

* Ratings are based on the assumption that the lines will cross and disturb a portion of the butterfly population habitats.

4.3.5. Mitigation Measures

The following mitigation measures are recommended:

- Effective climbing barriers should be constructed on all towers in areas where vervet monkeys and baboons are known to occur.
- Careful planning of service road, limiting disturbance to vegetation and regular maintenance of the areas around towers will effectively mitigate impacts associated with erosion.
- Existing access/service roads should be used as far as possible in order to reduce the need for vegetation clearance, cut lines, and the need for additional access roads.
- Vegetation clearance should be limited in sensitive areas, and the stringing of the powerlines should be undertaken by air in these areas as far as possible.
- Rehabilitation of disturbed areas should be undertaken as soon as possible after construction activities are completed within an area.

Appropriate site-specific management measures should be detailed within an EMP for construction, operation and maintenance of the powerlines.

4.3.6. Recommendations

The impacts on the fauna of the study area will remain the same for all of the alternatives with Alternative C, the shortest and most direct route being the most acceptable. This route does not cut through prime habitat for any of the key species found or likely to be found in the area, although it does pass in close proximity to an area which is anticipated to provide habitat to the butterfly species which occur in the area. Alternatives A and B will cut through habitats of higher diversity, and should be avoided where possible.

Therefore, in terms of the fauna specialist study undertaken, the order of preference for the establishment of the powerlines is:

- Alternative C
- Alternative A or B

4.4. Potential Impacts on Avifauna

As a result of the varied habitat within the Coega region, a diverse avifauna is present, with over 150 species being resident or common visitors to the region (CES, 2001). Threatened and near-threatened species have been recorded within the study area, including the martial eagle, Stanley's bustard, the African marsh harrier, the secretary bird, and the blue crane. No breeding populations of these species are known from the Coega region. In addition, with the exception of Stanley's bustard, all are reported as uncommon visitors to the region.

4.4.1. Potential Impacts during the Construction Phase

Short-term impacts on the breeding and foraging behaviour of many avifauna species are anticipated during the construction phase of the proposed project due to the disturbance of construction activities. This impact is potentially significant, and appropriate mitigation measures will be required to be implemented in order to minimise this impact.

4.4.2. Potential Impacts during the Operation Phase

The proposed powerlines are anticipated to pose a long-term to permanent impact on bird populations in the area (especially species larger in size, e.g. Stanleys bustard, Martial eagle, etc.) as a result of collisions with the earthwire of the powerline or electrocutions.

- *Impacts as a result of electrocutions:*

  Large birds of prey are the most commonly electrocuted by powerlines. Bird species which occur within the study area that could be influenced by the proposed powerlines are indicated in Appendix F. Some of these species will be prone to roosting on the powerline structures, which in turn will increase insulator pollution by their defecation (grey and blackheaded herons, white stork, Cape vulture and martial eagle).

The large Transmission line tower structures (i.e. from 275 kV to the 765 kV) are generally not a threat to large raptors, as the towers are designed in such a manner that the birds cannot perch in close proximity to the high-voltage line conductors. In fact, these powerlines have proved to be beneficial to certain large bird species by providing safe nesting and roosting sites in areas where suitable natural alternatives are scarce. Electrocutions on large powerline structures are rare, although it may occasionally happen, presumably *via* the bird streamer mechanism (i.e. bird excreta effectively forming a "streamer" and, therefore, a connection between the bird and un-insulated portions of the powerline infrastructure). In areas where the streamer effect could pose a threat to the reliable operation of the powerline, bird guards should be implemented (Figure 4.3).

Figure 4.3: Bird guards should be implemented in areas where the streamer effect could pose a threat to the reliable operation of the powerline

- *Impacts as a result of collisions:*

  During the operation phase many bird species which occur within the study area (refer to Appendix F) are likely to be at risk of collision with the powerlines. Of these, the grey and blackheaded herons, white stork, lesser and greater flamingos, secretary bird, Cape vulture, martial eagle, blue crane, Stanley's bustard and black korhaan could be more prone to the risk of collision with conductors or earth-wires due of their larger physical size. This potential impact is anticipated to occur on all the alternative routes proposed.

  Flamingos are likely to cross the powerlines to reach their foraging grounds, west of the Coega IDZ, in the river estuary and salt pans. All three alternatives are likely to have a

minimal impact on the flamingos' movements, although Alternatives A and B could pose a higher risk of collision interaction because of their location next to the Coega River. These movements are likely to occur during the night and this could increase their risk of collision, as the lines would be less visible to these birds.

The habitats within the areas of all three of the alternative routes are likely to vary in prey or food availability, and therefore there will be a variation in bird abundance, especially with regards to the larger species. This variation in prey availability is likely to change with climatic changes or weather conditions (e.g. rainfall), and therefore the likelihood of an interaction with the powerlines could also vary. The three alternative routes, because of their different habitats, will also vary in attracting different species. Therefore, the conservation status of the species using or foraging within the habitats of the three alternative routes will also differ (Barkhuysen, 2002).

Weather conditions (e.g. good rainfall) are likely to change the habitat selection of the birds in the area. Storm conditions (gale force winds and rain) are likely to influence the bird flight and visibility of powerline conductors and earth-wires, which could increase the possibility of collisions. Therefore, many collision incidents occur in poor light conditions while many bird movements occur during low light periods (dusk and dawn) of the day (Hejinis, 1980).

* *Alternatives A and B:*

  These alternatives follow an existing powerline corridor for the first portion of the route, and therefore it is unlikely that they will have an additional impact on the habitat and avifauna in this area. Furthermore, the additional conductors and earth-wires of the nine powerlines are likely to be more visible to birds using this flight path, which could possibly reduce collision incidents. However, the latter half of the routes follows the Coega River, which could effect or impact on birds crossing or using the habitats in the river. These habitats are, however, unlikely to be used by those birds of high conservation status (Barkhuysen, 2002). In addition, the east-west orientation of the section of the corridor following the Coega River valley assists in reducing the number of possible collisions, as Barkhuysen (1999) reports that powerlines running in a north-south direction are more likely to cause bird collisions.

  The route for Alternatives A and B is lengthy, which could increase the probability of powerline interactions. In addition, due to the circular nature of these routes,

flight paths of certain bird species could cross the powerlines twice and therefore, increase the probability of an interaction, or possible collision.

* *Alternative C:*

  The area just south of Grassridge Substation is relatively flat and level, and this is likely to have an effect on available prey during and after good rainfall. This area will be transformed into many small seasonal marshy pans, which will attract many birds and additional species to the area. Therefore, this would increase the probability of interactions with the powerlines during these periods. Furthermore, the route followed by Alternative C is proposed to follow a north-south orientation between Grassridge Substation and the Coega Main and Aluminium Pechiney Smelter Substations, which could potentially increase the probability of bird collisions (Barkhuysen, 1999). The Brakrivier road dividing this area is not used regularly enough to impact on large birds using the areas adjacent to the road. In addition, the habitats within this area are typical of those likely to be used by species with high conservation status, such as flamingos, African marsh harrier and the Secretary bird (Barkhuysen 2002). Therefore, Alternative C is likely to pose the highest risk for collision of large birds and birds of special concern with the powerlines.

Table 4.7: Potential impacts on avifauna associated with the construction and operation of the proposed powerlines between Grassridge Substation and the Coega IDZ

Nature	Extent	Duration	Probability	Significance	Status
Impacts on breeding and foraging behaviour during the construction phase	Local	Short-term	Probable	High	Negative
Impacts as a result of electrocutions	Local	Permanent	Unlikely	High	Negative
Impacts as a result of collisions – Alternative A	Local	Permanent	Probable	Moderate - High	Negative
Impacts as a result of collisions – Alternative B	Local	Permanent	Probable	Moderate - High	Negative
Impacts as a result of collisions – Alternative C	Local	Permanent	Highly probable	High	Negative

4.4.3. Mitigation Measures

Eskom have identified bird collisions as a major impact on both the environment and the operation and reliability of the powerlines. Therefore, appropriate mitigation measures have been developed in the form of different types of bird diverters (e.g. flappers). Investigations regarding the effectiveness of these diverters have indicated an approximate 80% reduction in bird collisions with lines fitted with these diverters (Mail and Guardian, June 2000). In addition, different types of bird guards have been developed in order to prevent roosting on towers, and have been shown to effectively reduce the incidents of bird-induced line faults. It is recommended that areas in which potentially sensitive bird species are located should be identified and mapped prior to construction, and appropriate mitigation measures implemented in order to minimise the potential impact associated with collisions.

Appropriate site-specific management measures should be detailed within an EMP for construction, operation and maintenance of the powerlines.

4.4.4. Recommendations

Prior to construction, the powerline route should be surveyed in detail by an avifauna specialist, and recommendations regarding areas for the implementation of durable or permanent markers (preferably, non-corrosive metals) on the earth-wires should be made. This is necessary to minimise the permanent effect of the powerlines and the industrial development on bird habitats and their populations. Because of this development, reduction in available habitat and bird population sizes is likely, therefore further losses due to collision incidents could decrease bird numbers and their sustainable populations within the local region. All impacts should be minimised during construction while independent supervisors should be permitted inspection during the construction phase.

In terms of the avifauna specialist study undertaken, the order of preference for the establishment of the powerlines is:

- Alternative A or B
- Alternative C

4.5. Potential Impacts on Land Use

The land to be traversed by the powerlines falls within the proposed Coega IDZ. The terrestrial part of the Coega IDZ is being designated for multiple uses focusing on a mix of the following proposed land uses (refer to Figure 4.2):

- existing businesses;
- back-of-port area;
- light industrial areas;
- commercial service industrial areas;
- bulk mineral import/export facilities;
- service areas;
- metallurgical areas;
- Coega water reclamation works;
- undetermined use areas;
- Coega Kop Quarry;
- open spaces;
- centralised gas facility; and
- airport facilities.

The above land uses are proposed to be grouped into a number of synergistic clusters within the boundaries of the Coega IDZ, and will be implemented in a phased approach. Therefore, portions of land falling within the demarcated Coega IDZ area have not yet been acquired by the Coega Development Corporation. Private landowners are, therefore, currently potentially affected by the developments within the IDZ.

A narrow band within the IDZ framework has been dedicated as an "open space" in fulfilment of the requirements of the Record of Decision issued for the rezoning of the land. This open space area includes the valley slopes of the Coega River and the area in the vicinity of Coega Kop (refer to Figure 4.4). This open space area will be the remnant of the current land use once the future land use plans have been implemented.

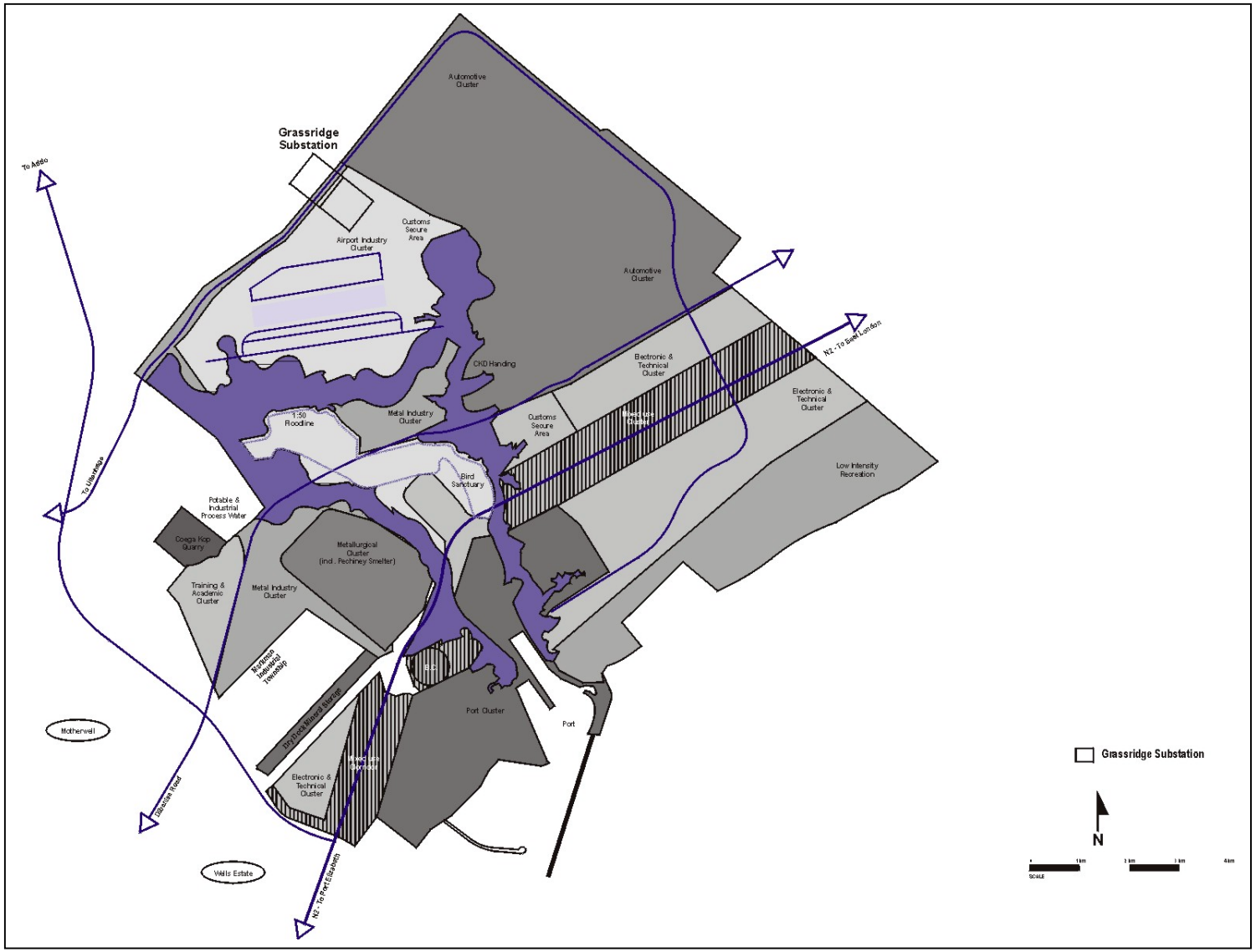

Figure 4.4: Proposed land uses within the Coega IDZ (land use information provided by Coega Development Corporation (Pty) Ltd)

4.5.1. Potential Impacts

As the proposed powerlines cross the area demarcated for the Coega IDZ, potential impacts on land use occur where there is a potential conflict with the proposed future land use of the Coega IDZ. These are discussed below.

- *Impacts associated with Alternative A:*

  The construction of the proposed powerlines within Alternative A would result in a conflict with the designated open space area for a large portion of this proposed route. Although this is not seen as a fatal flaw to the designation of this area as an open space area, it is considered undesirable, particularly where the proposed lines would impact on Mesic Succulent Thicket as the open spaces including this vegetation type are considered to be important in terms of ecological processes (CES, personal communication). However, a potentially significant impact is anticipated from a social perspective, particularly in areas where this open space area is to be used for recreational purposes. Impacts in these planned recreational areas include visual impacts associated with the powerlines, as well as health and safety impacts associated with the electric and magnetic fields (EMFs) experienced below overhead lines.

  The social environment does not perceive the powerline servitude as an open space, albeit a feasible mechanism for conservation of the local vegetation.

  An additional impact associated with the construction of the powerlines within Alternative A is the potential conflict with the proposed airport cluster in terms of the required distance of tall structures such as powerline towers from the airport infrastructure. An airport transportation report undertaken for the CDC (Khuthele Projects, 2000)indicated the potential for conflict with the existing Distribution lines exiting Grassridge Substation, and the obstacle limitation surfaces at the airport. Alternative A would result in additional lines being constructed closer to the proposed airport cluster (i.e. inside the IDZ boundary). An essential criterion to consider is the height above sea level of these tower structures in relation to the aerodrome reference height above sea level, as well as the status of the aerodrome. The Civil Aviation Authority (CAA) have specifications in terms of dimensions and slopes of approach runways.

  The permissible distance and height of an obstacle is determined by its relative position to the aerodrome and height in relation to the aerodrome. The distance between the start of the approach slope and the obstacle is required to be considered. The approach slope widens as it

increases in height at a rate of 2% (i.e. 1,8° or a slope of 1:50). Nothing is allowed to penetrate this surface, and is declared obstacle free surface (CAA, personal communication, 2002).

It is, therefore, necessary for a specific aeronautical study to be undertaken to investigate the viability of powerline towers and an airport development being constructed in close proximity (CAA, personal communication, 2002).

- *Impacts associated with Alternative B:*

  The construction of the proposed powerlines within Alternative B would potentially conflict with the proposed open space area and airport cluster of the Coega IDZ as with Alternative A (as discussed above).

  This proposed alternative traverses the high-lying area in the vicinity of Coega Kop, and may pass in close proximity to the existing Coega Kop Quarry. Due to the 500 m (as a minimum) distance restriction of powerlines to rock blasting operations, future expansion of the quarrying activities could conflict with the new powerline servitude.

  In addition, the areas of Coega Kop which are currently undisturbed are considered to be of high conservation importance due to the unique vegetation and habitat types which occur there. This area is demarcated to form an important component of the Coega IDZ open space area. The construction of the proposed powerlines over this area is not recommended and conflicts with the proposed future land uses.

- *Impacts associated with Alternative C:*

  The construction of the proposed powerlines within Alternative C would potentially conflict with the proposed future airport cluster identified as a key land use for the Coega IDZ, as this alternative traverses the area demarcated for this purpose. Rezoning of the farm portion on which this airport cluster development is proposed is, however, yet to be obtained.

Table 4.8: Potential land use impacts associated with the construction and operation of the proposed powerlines between Grassridge Substation and the Coega IDZ

Nature	Extent	Duration	Probability	Significance	Status
Conflict with future land use – Alternative A	Local	Permanent	Definite	High	Negative
Conflict with future land use – Alternative B	Local	Permanent	Definite	High	Negative
Conflict with future land use – Alternative C	Local	Permanent	Definite	High	Negative

4.5.2. Mitigation Measures

As far as possible, impacts on natural areas should be avoided.

4.5.3. Recommendations

- In terms of land use, all alternatives have potential conflicts with the future land use of the area, and no one corridor can be recommended.

4.6. Potential Visual Impacts

Any change in a local view through the introduction of a new development in the line-of-sight can be considered as a visual impact. The significance of this visual impact is influenced by the nature or "quality" of the affected landscape, the degree of change in the landscape which occurs as a result of the development, as well as by the landscape's capacity to absorb the impact. The assessment of a visual impact is highly subjective, and depends largely on the views of the individual and the aesthetic value of the view. Visual impacts are usually considered most significant when the development conflicts with, or is not of a similar nature to other developments in the area, or is readily viewed from areas of public access, paths, roads and view points, or in areas which are characterised by significant natural features.

4.6.1. Landscape Characteristics of the Study Area

The Coega IDZ is located within a landscape of low relief between two significantly different large-scale land uses, i.e. the City of Port Elizabeth to the south and the proposed Greater Addo National Park to the north (Cave Klapwijk & Associates, 2002).

Critical areas within the study area in terms of views and visibility include the Coega valley, Coega Kop (the only prominent landform of the Coega IDZ, with an elevation of 145 m), public routes (including the R335 to Addo and the N2 to Colchester and Grahamstown), and residences located in close proximity to the proposed corridors.

4.6.2. Development Feature Characteristics of the Study Area

- *Land use:*

  As discussed in Section 4.5 above, the land to be traversed by the proposed powerlines falls within the proposed Coega IDZ area, within which the land use is largely to be for

industrial use although some areas have been demarcated for inclusion within an Open Space Management Plan (in accordance with the requirements of the Record of Decision for the rezoning of the land for portions of the Coega IDZ). The proposed future land use of this area differs substantially from the current peri-urban setting and rural quality. However, the Coega IDZ area currently abuts Wells Estates, Markman, and the township of Motherwell, and is in a state of transition towards the planned Industrial Development Zone.

- *Existing development within the study area:*
  Existing infrastructure within the study area includes the existing Grassridge Substation, existing powerlines from the Grassridge Substation, and transport routes including an existing railway line (and associated traction line), the N2 highway to Colchester and Grahamstown, the R102 and the R335. In addition, the Coega IDZ area is proposed to be developed into an area mainly for industrial use associated with the Port of Ngqura. The degree of visibility in this relatively flat landscape is influenced largely by distance as well as atmospheric conditions at the coast. The visual impact associated with this industrial development and all associated infrastructure will be most noticeable from the surrounding higher lying landscape, as well as from within the Coega IDZ area itself (Cave Klapwijk & Associates, 2002). It is not anticipated that the proposed powerlines would be visible from the proposed Greater Addo Elephant National Park.

  Existing linear infrastructure within the study area imposes an existing visual impact on the study area. In addition, the proposed industrial activities within the Coega IDZ area is anticipated to have a visual impact on the local area.

4.6.3. Assessment Methodology

Maps indicating the visibility of the proposed powerline corridor have been calculated from a digital elevation model (DEM) and provide an indication of positions within the study area from which the feature is visible (viewsheds). In using a DEM the maps are based on topography alone. They, therefore, represent the worst-case scenario as they do not account for buildings, vegetation or other man-made structures which may obscure views of the development from viewers. The extent of the visibility of an object in the landscape diminishes at an exponential rate as the distance between the observer and the object increases (Hull and Bishop, 1988).

Viewsheds indicate positions within a study area from which a development feature is visible. They are useful for analysing the visual impact of point features, such as the towers associated with

the linear powerline feature. The approach followed was to calculate viewsheds at intervals along the line representing tower positions, and then to combine these to provide a graduated scale of potential visibility. The graduated scale reflects the number of points along the feature which are visible from any specific location within the study area.

In order to assess the potential visual impact of the proposed powerline corridor, the following criteria were used in addition to the viewshed analysis:

- Character quality or value of the existing view or viewpoint – as determined by existing land use, topographic features, vegetation, etc.
- Visibility of development/visual intrusiveness – visibility of the powerlines based on sight and distance of critical viewpoints, as well as the design and extent of the development feature .
- Visual absorption capacity – the potential of the landscape to absorb the proposed development.
- Compatibility with surrounding land uses.
- Scale of the development relative to local elements.
- Critical views.

Impacts associated with each proposed corridor were evaluated using the set of criteria described in Table 4.9 below.

Table 4.9: Visual assessment criteria ratings

Criteria	High Impact	Moderate Impact	Low Impact
Character, quality or value of the existing view or viewpoint	The development is set within a very attractive setting, which is largely uninfluenced by other developments of a similar nature.	The development is set within an area which has some aesthetic and visual merit, which is partially influenced by other developments of a similar nature.	The development is set in an area which has little or no aesthetic value and is largely influenced by other developments of a similar nature.
Visual intrusiveness of the proposed development	The development is visible from many places beyond 1 km.	The development is visible from within 1 km, but is partially obscured by intervening objects.	The development is only partly visible or not visible at all from within 1 km.
Visual absorption capacity	The development is not visually accepted by the surrounding landscape due to the landscape being of uniform texture, flat slope and having limited vegetation cover.	The development is visually accepted into the surrounding landscape less easily due to the landscape being less diverse in terms of landform, texture and vegetation.	The development is visually easily accepted into the landscape due to the landscape being diverse in terms of landform, texture and vegetation.

Criteria	High Impact	Moderate Impact	Low Impact
Compatibility with surrounding land uses	The development appears totally out of place with regards to the surrounding area.	The development can be accommodated within the surrounding area to some degree.	The development can easily be accommodated within the surrounding area.
Scale of development relative to local elements	Vertical variation of the landscape is limited and most elements are related to the human and horizontal scale.	A landscape with some horizontal and vertical elements in some contrast to the human scale.	A landscape which has horizontal and vertical elements in high contrast to the human scale.
Critical views	Views of the development detract from the natural views from private properties or natural areas.	Views of the development partially detract from the natural views from private properties or natural areas.	Views of the development do not detract from the natural views of private properties or natural areas.

4.6.4. Potential Impacts

The proposed powerline project will cover a distance of approximately 15 km (depending on the alternative selected) and have a width of approximately 310 m. Therefore, the visual aspects associated with the project are considered to potentially be of a high significance. However, with the construction of the proposed powerlines in parallel, the towers can be constructed directly adjacent to one another, with equal spans. This allows for a reduction in the width of the required servitude (as conductors cannot swing into one another), and will potentially reduce the visual impact associated with the lines from certain angles. Potential impacts associated with each proposed alternative are discussed below.

In terms of the scale of the development relative to local elements, the visual impacts associated with the proposed powerlines will be of low significance regardless of which alternative powerline corridor is selected, as this development forms part of the greater Coega IDZ development. Regardless, the overall effect of the proposed tower structures on the overall environment could potentially be negative. However, in comparison to other proposed structures such as the Aluminium Pechiney smelter, the significance of the visual impact associated with powerline corridor is considered to be of low significance.

In terms of the structures proposed to be used for the construction of the powerlines, use will be made of the cross-rope suspension tower, which are smaller, less steel-intensive and less visually intrusive than the self-supporting tower. The use of this tower type will reduce the visual impact associated with the proposed powerlines. In addition, the construction of the nine powerlines in

parallel will assist in minimising the potential visual impact associated with these powerlines from certain angles.

As far as possible, use will be made of existing access/service roads within the area, regardless of the alternative powerline corridor selected. Where new access/service roads are required to be constructed, the visual impact associated with these is anticipated to be of low significance due to the visual absorption capacity of the vegetation characteristic of the area (refer to Figure 4.5).

Figure 4.5: Photograph illustrating existing road through Mesic Succulent Thicket, indicating high visual absorption capacity of this vegetation type

Visibility of the proposed powerlines from roads which pass through the area (i.e. the R102, R335 and N2) is anticipated to be only from strategic points along these roads, and the potential for the structures to be masked from these roads is high, thus resulting in the impacts on views from these roads being negligible.

- *Alternative A:*

  Areas of high visibility associated with the construction of the powerlines within this alternative corridor are anticipated to be mainly within 500 m of the proposed lines and restricted to the Coega IDZ area, although short sections of the proposed powerlines will potentially be visible up to approximately 2 km from the powerlines (refer to Figure 4.6). This impact is due to the low relief of the area surrounding the proposed powerlines. However, a combination of the distance from the structures, the vegetation in the area, the proposed industrial development within the Coega IDZ, and the atmospheric haze characteristic of the area will result in the visibility of the powerlines being of low

significance within critical viewpoint areas, such as the settlement area of Motherwell and the roads which pass through the area (i.e. the N2 and the R335). Where the proposed powerlines pass over the R102, the visibility will be high, resulting in an impact of high significance.

Due to future development within the IDZ, as well as screening of structures to some extent by vegetation, and where this alternative follows the Coega River valley side slopes, the visual absorption capacity of the landscape is considered to be high, resulting in a low visual impact on critical viewpoints. The visual intrusiveness of the proposed development can be considered to be low due to its compatibility with future surrounding land uses. Therefore, the character, quality and value of the existing view may be considered to be negative and of a high impact, but with future development in the area, this impact would be reduced to a moderate to low impact.

- *Alternative B:*

  The visibility associated with the construction of the proposed powerlines within this alternative corridor are similar to those discussed for Alternative A above (refer to Figure 4.7).

  Due to future development within the IDZ, as well as screening of structures to some extent by vegetation, and where this alternative follows the Coega River valley side slopes, the visual absorption capacity of the landscape is considered to be high, resulting in a low visual impact on critical viewpoints. This proposed corridor does, however, pass in close proximity to Coega Kop, which is the highest point within the Coega IDZ area, and is considered to be a critical viewpoint. The visual intrusiveness of the majority of the proposed development can be considered to be low due to its compatibility with future surrounding land uses. In passing over the higher-lying area in the vicinity of Coega Kop, the proposed powerlines would intrude on the skyline, resulting in higher visual intrusiveness. Therefore, the character, quality and value of the existing view may be considered to be negative and of a high impact, but with future development in the area, this impact would be reduced to a moderate to low impact.

- *Alternative C:*

  Areas of high visibility associated with the construction of the powerlines within this alternative corridor are anticipated to be mainly within 500 m of the proposed lines and restricted to the Coega IDZ area (refer to Figure 4.8).

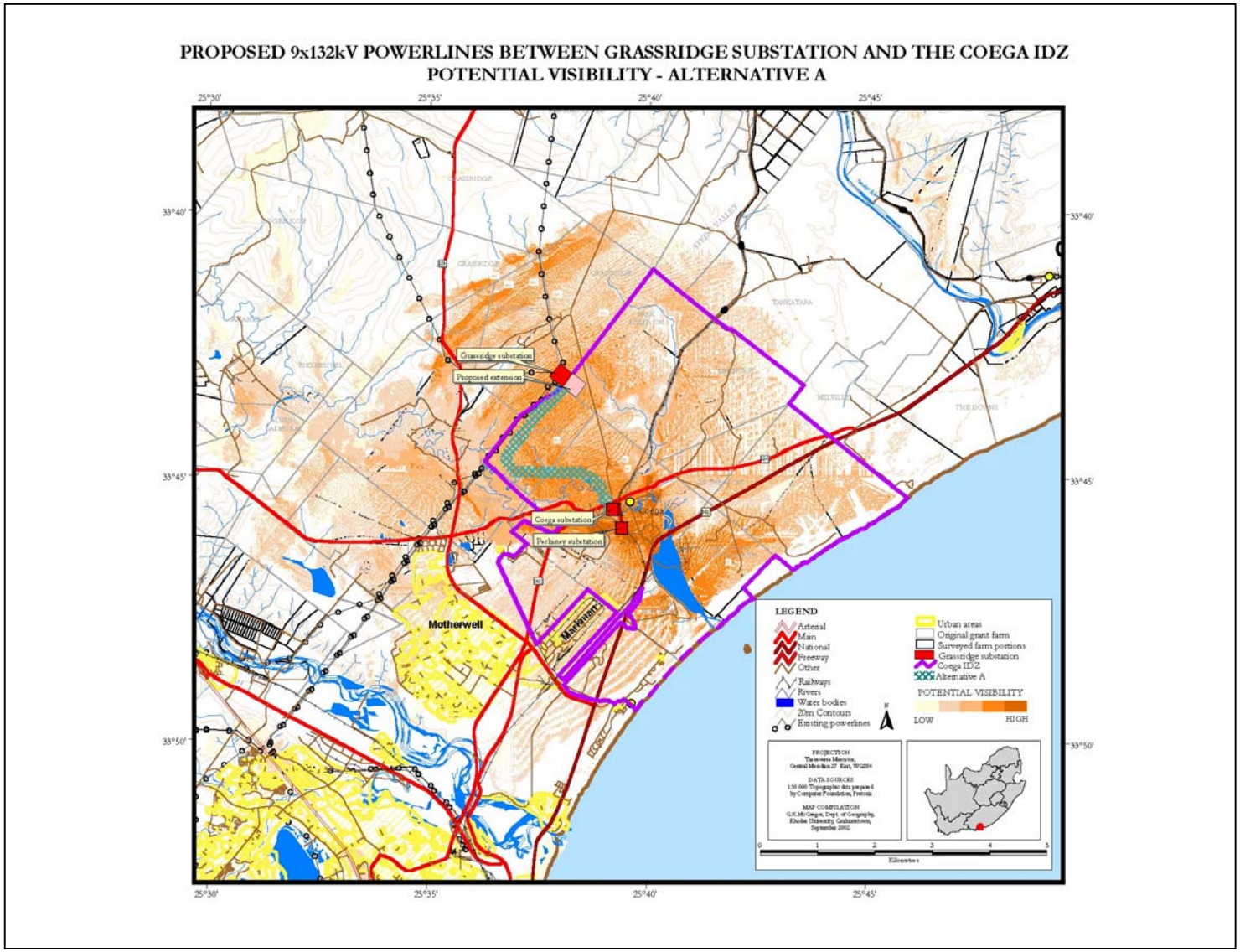

Figure 4.6: Potential visibility associated with the construction of powerlines within powerline corridor Alternative A

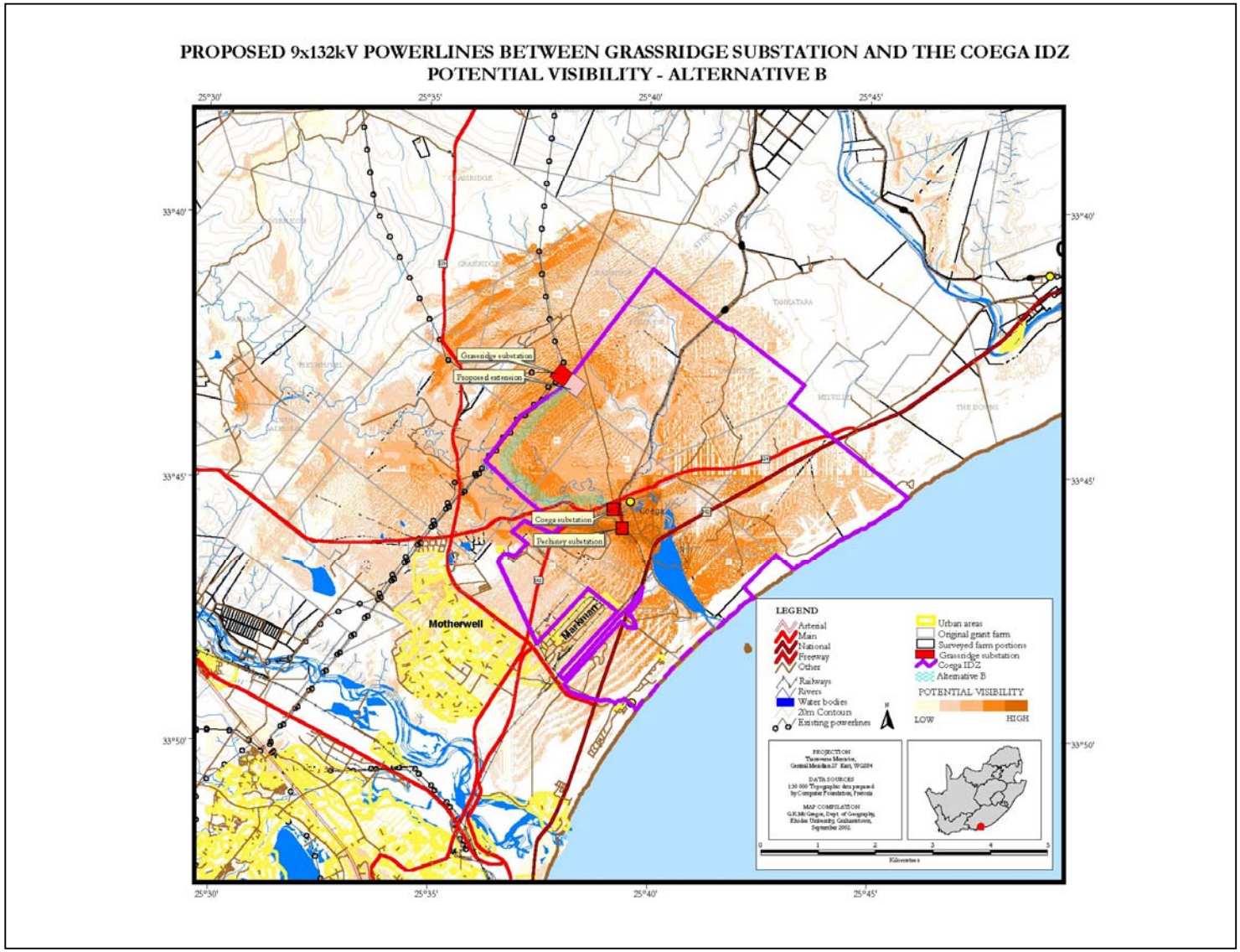

Figure 4.7: Potential visibility associated with the construction of powerlines within powerline corridor Alternative B

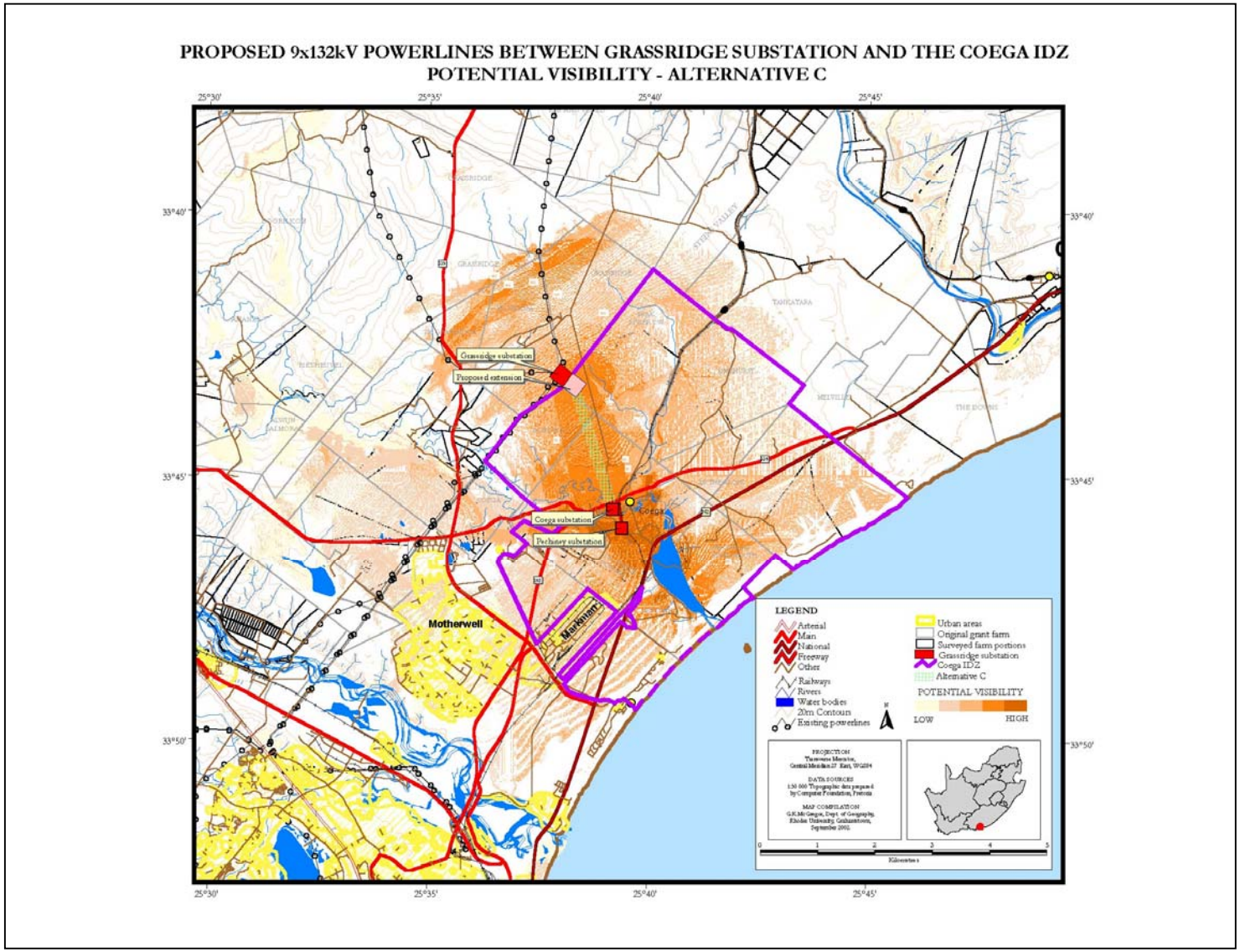

Figure 4.8: Potential visibility associated with the construction of powerlines within powerline corridor Alternative C

Although some the proposed powerlines will potentially be visible up to approximately 2 km from the powerlines, the potential impacts on the surrounding areas is anticipated to be greatly reduced for this option in the north-western and western areas adjacent to north and north-western boundaries of the Coega IDZ when compared to that associated with Alternatives A and B. Where the proposed powerlines pass over the R102, the visibility will be high, resulting in an impact of high significance.

This alternative is located on a flat plateau, and therefore visibility decreases rapidly with distance. In addition, due to future development within the IDZ, as well as screening of structures to some extent by vegetation, the visual absorption capacity of the landscape is considered to be high, resulting in a low visual impact on critical viewpoints. The visual intrusiveness of the proposed development can be considered to be low due to its compatibility with future surrounding land uses. Therefore, the character, quality and value of the existing view may be considered to be negative and of a high impact, but with future development in the area, this impact would be reduced to a moderate to low impact.

Table 4.10: Potential visual impacts associated with the construction of the proposed powerlines between Grassridge Substation and the Coega IDZ

Nature	Extent	Duration	Probability	Significance	Status
Visual impact associated with Alternative A	Local	Long-term	Probable	Moderate - Low	Negative
Visual impact associated with Alternative B	Local	Long-term	Probable	Moderate - Low	Negative
Visual impact associated with Alternative C	Local	Long-term	Probable	Moderate - Low	Negative

The significance of the visual impacts for the powerline corridor would be high in the absence of the planned Coega IDZ. However, once the Coega IDZ is developed in the near future, the impact can be rated as moderate to low.

4.6.5. Mitigation Measures

The Visual Guidelines for Development (Cave Klapwijk Associated, 2002) have been prepared for the Coega IDZ. These guidelines are aimed at reducing the visual impact of the Coega IDZ from the surrounding areas, and are required to be incorporated into final design.

Cross-rope suspension towers should be used wherever practical to reduce potential visual impacts.

Once the final tower positions have been determined, appropriate site-specific mitigation measures (e.g. the use of topography and the lie of the land where possible) should be detailed within an EMP for construction, operation and maintenance of the powerlines.

4.6.6. Recommendations

The factors which have been identified in this study as influencing the degree of visual impact of the powerline development are:

- distance from viewer;
- difference in elevation between viewer and feature;
- the degree of view obstruction by other features;
- nature of the backdrop to the feature;
- the existing value/character of the view; and
- the occurrence of similar development-types.

In addition, it is evident that visual impacts can be reduced through:

- The consolidation of infrastructure along a greater corridor, rather than dispersing the impact across a greater area. This effectively limits the impact to one direction/view angle. Negative visual impacts can be mitigated against by other surrounding sensitive developments through their orientation.
- The use of a corridor which lies within a landscape with a high capacity to absorb visual impacts (e.g. one which has topographical constraints such that the viewpoints are restricted), or a previously disturbed area.
- The avoidance of intersecting the skyline/horizon.
- The use of the natural topography and vegetation cover as a natural backdrop to reduce visibility.
- Ensuring that the placement of towers is carefully considered in order for them to be as inconspicuous as feasible, i.e. towers are not to be placed on hill-tops, but rather on lower-lying land. Also, they must be placed in-line with other existing tower structures.

In terms of the visual specialist study undertaken, the order of preference for the establishment of the powerlines is:

- Alternative C
- Alternative A
- Alternative B

4.7. Potential Impacts on Archaeological, Cultural and Historical Sites

4.7.1. Archaeological Sites

The following archaeological remains are known to occur within the area and may be found:

1. Several reports referred to Earlier Stone Age (approximately 250 000 million years old) stone artefacts in (i) primary and (ii) secondary contexts in the vicinity of Grassridge. The extensive gravel terraces exposed by streams and rivers contain large numbers of flaked cobbles and other debris of stone tool production.

   (i) One of South Africa's most important Earlier Stone Age finds and excavations was conducted just west of Grassridge, at Amanzi Springs. In a series of spring deposits a large number of stone tools were found *in situ* to a depth of 3-4 metres. Remarkably wood and seed material preserved in the spring deposits, possibly dating to between 250 000 to 800 000 years old.

   (ii) Early Stone tools and handaxes were reported from Coega Kop and also collected previously from the banks of the Coega River and Sundays River (Albany Museum collections). These stone artefacts are in secondary context, and like the river gravels been exposed to large scale disturbance, i.e. roads, farming activities and other human development.

2. Occurrences of fossil bone remains and Middle Stone Age stone tools (120 000 - 25 000 years ago) were reported south of Coega Kop. During excavations the remains were found in the surface limestone, but the bulk of the bone remains were found some 1 - 1,5 m below the surface. The excavations exposed a large number and variety of bones, teeth and horn corns of warthog, leopard, hyena, rhinoceros and ten different antelope species. A radiocarbon date of greater than 37 000 years was obtained for the site.

3. Later Stone Age sites (last 20 000 years) of San (Bushmen) hunter-gatherer and Khoekhoen (Khoikhoi) pastoralist origins.The former contain stone tools and food waste which are typical of San hunter-gatherer way of life and the latter contains similar material as well as pottery. These sites may also contain large frequencies of freshwater mussel.

4. Human remains may also be found in the area, either prehistoric or historical.

4.7.2. Historical Sites

The region has witnessed much activity in historical times, but little material evidence probably survived, except in cases where people were living for a number of years. The remains may include remnants of indigenous kraal settlements, military camps and foundations of buildings and scatters of artefacts, although none of these have been recorded to date.

The following historical activities are known to have occurred in the area:

Dutch hunters who passed through the area in 1702 reported a Khoekhoen settlement in the vicinity of Grassridge/Brakrivier. In November 1776, Anders Sparrman found a community of Cochoqua Khoekhoen (remnants of the Cochoqua who had fled the Cape after their defeat in the second Khoekhoen-Dutch War one hundred years previously) and a group of Gonaqua Khoekhoen living on the Coega River. By this date there were already farms in the area.

A map of 1851 indicated that the original road between Port Elizabeth and Grahamstown closely followed the present National road across the Coega River. This map also indicates the presence of a "Junction Post" on the crossing. While Coetzee's (1995) definitive book on the forts of the Eastern Cape failed to indicate the presence of this military post, it is likely to represent one of Cradock/Somerset's temporary earthern fortifications established between 1812 and 1819 to protect the eastern frontier. This post, in all likelihood, "no longer exists".

The salt pan behind Coega Kop (not the present locality of the salt works at the river estuary) was being mined for its salt as early as 1820. However, this salt pan is likely to have been destroyed with developments in the area.

There are historical structures in the planned Coega IDZ which are older than 50 years. However, most of the old buildings have been badly maintained or vandalised by squatters

and the Eastern Cape branch of the Southern African Heritage Resources Agency has confirmed that there are no conservation-worthy buildings in the area.

4.7.3. Potential Impacts

It is anticipated that archaeological/historical sites will consist of small scatters of material. The construction of the proposed powerlines (placement of the towers, etc.) should have little effect and impact on heritage sites. However, activities such as new access roads and camp sites which are associated with the project could potentially have a significant impact on heritage sites and remains. It is anticipated that these impacts will be both positive and negative.

A positive impact is that sites previously not known of/identified will be discovered (before or during construction activities), primarily through excavation activities associated with development. Artefacts can be retrieved, and these sites can then be recorded/reported, which will enlarge site records and assist in managing and conserving the region's heritage resources and provide insights for future research.

As cultural heritage resources are non-renewable and economic values cannot be placed on these resources, should damage or loss of these resources occur, potential destruction of the sites is considered as a significant negative impact. Care should, therefore, be taken such that minimal damage occurs to these sites during the construction of access roads, camps, tower sites and during other worker activities. No historical artefacts should be removed by unqualified personnel at any time.

Table 4.11: Potential impacts on archaeological, cultural and historical sites associated with the construction of the proposed powerlines between Grassridge Substation and the Coega IDZ

Nature	Extent	Duration	Probability	Significance	Status
Impacts on heritage sites and remains at tower positions	Local	Permanent	Likely	Low - Moderate	Negative
Impacts on heritage sites and remains along new access roads and at camp sites	Local	Permanent	Likely	Moderate	Negative

4.7.4. Mitigation Measures

All archaeological remains, artificial features and structures older than 100 years, and historic structures older than 60 years are protected by the National Heritage Resources Act (No 25 of

1999). In order to remove, disturb or demolish these, a permit is required from the South African Heritage Resource Agency (SAHRA) and in certain cases, permission from the local communities (e.g. the removal or disturbance of human remains) must be negotiated.

The following is required to be considered and incorporated into an EMP prior to construction activities being initiated.

1. Plans of construction infrastructure, i.e. access roads, camps and tower positions should be made available to archaeologists/historians to inspect and visit. Archaeologists/historians should inspect a number of identified tower and other construction sites to investigate and assess the nature and density of possible heritage sites and cultural material on and around them. From this it would be possible to make recommendations and to motivate for the removal of material before construction starts.
2. Following the inspections, archaeologists and historians should then inform construction managers, prior to construction activities commencing, of what heritage sites and cultural material may be encountered, and the procedures to follow in the event of such sites being encountered.
3. All construction workers should be informed not to disturb historic sites, make any collections of material (i.e. medallions, cartridges or other artefacts), and not to disturb (dig, camp or make fires within) cave or shelter deposits.
4. If heritage sites and/or cultural material are found, work should be stopped at that site, and archaeologists/historians immediately informed. Sufficient time should be allowed for the excavation, removal or collection of material from the site, should it be deemed necessary.

4.7.5. Recommendations

It is anticipated that the potential impacts on heritage sites will be of low significance for all three proposed powerline corridors, as the occurrence of remains is anticipated to be low, and any impacts on these sites can be successfully mitigated.

4.8. Potential Impacts on the Social Environment

Port Elizabeth is the nearest city to the Coega area. The highest concentrations of people in the Province occur in the magisterial districts of Port Elizabeth and Uitenhage, which comprises the NMMM. This metropolitan area houses approximately 1 166 345 people, with 78% living in the Port Elizabeth area and 22% in Uitenhage (CES, 2000). Residential areas in

close proximity to the study area include Markman and Motherwell. The land to be traversed by the proposed powerlines falls within the proposed Coega IDZ area.

The Coega area is serviced by the N2 National road, secondary roads and gravel roads. The N2 provides the major link along the coast, facilitating the movement of commercial, industrial, tourist and commuter traffic within the Eastern Cape. The old Grahamstown road (R435) within the Coega area mainly serves the rural communities of the area. The Addo road (R450) is the main access road from Addo and Kirkwood to Port Elizabeth (CES, 2001).

4.8.1. Employment Opportunities

Typical of a project of this nature, where highly specialised personnel are required for the construction of powerlines, it is expected that no long-term direct employment opportunities would be created for the local labour force. However, limited short-term job opportunities for low-skilled local labourers (for the digging of foundations, erection of gates, etc) may exist. This is anticipated to have a positive impact of low significance.

During the operational phase, Eskom employees would most probably be responsible for the management and maintenance of the lines and, therefore, no long-term employment opportunities will be created as a direct result of the construction of the proposed powerlines.

The proposed industrial activities within the Coega IDZ is reliant on the power supply from these proposed lines, and therefore the implementation of this project will indirectly result in many employment opportunities within these industries. This impact is anticipated to be positive and of high significance.

Table 4.12: Employment opportunities associated with the construction and operation of the proposed powerlines between Grassridge Substation and the Coega IDZ

Nature	Extent	Duration	Probability	Significance	Status
Direct employment opportunities associated with the construction phase (low-skilled labour)	Local	Short-term	Likely	Low	Positive
Direct employment opportunities associated with the operation phase	Local	Short-term	Unlikely	Low	Positive
Indirect employment opportunities associated with the proposed project	Regional	Long-term	Likely	High	Positive

- *Mitigation Measures:*

  The implementation of the following mitigation measures may enhance the potentially positive impact associated with the creation of short-term employment opportunities:

  * Where possible (e.g. digging, installation of gates etc.), manual local labour should be used due to the desperate need for local employment opportunities in the area.
  * Where there is a lack of the necessary skills, locals should be provided with on-site training.

4.8.2. Influx of Workers and Job Seekers

Due to the limited number of the highly specialised workers expected to take part in the construction activities and due to the "phased approach" undertaken in the construction of powerlines, it is not anticipated that there would be an influx of large numbers of job seekers to the area for this specific project. It should, however, be noted that not all people seeking employment through planned activities at the Coega IDZ will be accommodated by this development. Therefore, job seekers that can not be accommodated could, therefore, place an additional demand on jobs to be created by the proposed project, as well as on infrastructure requirements. This could lead to informal dwellings being erected and the existing infrastructure e.g. shops, police and health services might not be able to deal with the increased pressure.

The main social and environmental sources of concerns related to the influx of workers are the construction camps and the activities connected to these camps. Disruptive behaviour (e.g. noise creation) could occur with a subsequent negative impact if the proposed construction camp is situated close to other communities and/or residences. Environmental problems could also occur e.g. pollution of water due to insufficient sanitation facilities. The camps could also create an increased risk for veld fires.

Maintenance on the lines would in all probability be undertaken by Eskom personnel. It is, therefore, not expected that there would be an influx of workers to the area during the operational phases of the project. Therefore, it is not anticipated that the maintenance and management of the lines will lead to severe negative social impacts.

Table 4.13: Impacts associated with influx of workers and job seekers as a result of the construction and operation of the proposed powerlines between Grassridge Substation and the Coega IDZ

Nature	Extent	Duration	Probability	Significance	Status
Influx of workers associated with the construction phase	Local	Short-term	Probable	Moderate	Negative
Influx of workers associated with the construction phase	Local	Long-term	Unlikely	Low	Negative

- *Mitigation Measures:*

  Proposed mitigation measures, include:

  - Use of local labour where possible to avoid an influx of "outside" workers and job seekers to the area.
  - Management of the construction camps is critical, especially to avoid any environmental pollution.
  - Construction workers should have the necessary water, sanitation, waste disposal and housing facilities and infrastructure.
  - Develop a fire management and emergency plan.
  - Eskom personnel should not access private properties without notification of the property owners.

4.8.3. Disruption in Daily Living and Movement Patterns

Disruptions in daily living and movement patterns could occur as a result of:

- construction related activities;
- increase in vehicular movement;
- intrusion impacts;
- entry of private properties for maintenance on the lines; and
- the alteration to the visual environment.

During the construction phase it is anticipated that there would be an increase in heavy vehicles and machinery traversing private properties to access the various construction sites and making use of the local roads (e.g. Addo road (R335)) resulting in intrusion and noise impacts. Construction workers would potentially be required to enter private properties during the construction phase. Should Alternative A or Alternative B be implemented, it

would be probable that the various properties on the farm Welbedachtsfontein would have to be accessed to reach the construction site. The construction of the proposed powerlines within Alternative C would require access from CDC-owned land. It is, however, not expected that the construction activities of the powerlines would have a negative impact on the phased implementation of the construction activities in the Coega IDZ area.

Adjacent property owners have noted that Eskom workers responsible for the upgrading and maintenance of the existing lines have previously been negligent by leaving waste materials on one of the properties. Some cattle died after eating these waste materials. Although Eskom would compensate property owners for damage to their properties or belongings, care is required to be taken to avoid these accidents from happening in future.

Property owners also noted that the existing powerlines negatively impact on the farmers' radio signals as it disturbs the quality of the signal. Communication between the farmers is critical due to all the security problems experienced in the area and due to the fact that there is also no or very little cellular telephone coverage in the area. It is expected that, if this is the case, the situation would worsen with additional lines in the area.

Main disruptions associated with daily living patterns are, however, attributed to the change in the visual environment as a result of the nine powerlines proposed. This could influence the property owner's perception of their environment, although it is not expected that they would move elsewhere solely as a result of the visual impact associated with the proposed powerlines.

Table 4.14: Impacts associated with disruption in daily living and movement patterns as a result of the construction and operation of the proposed powerlines between Grassridge Substation and the Coega IDZ

Nature	Extent	Duration	Probability	Significance	Status
Disruption in daily living and movement patterns during the construction phase	Local	Short-term	Probable	High	Negative
Disruption in daily living and movement patterns during the operation phase	Local	Medium-term	Unlikely	Moderate - Low	Negative

- *Mitigation Measures:*

  The following mitigation is proposed:

- Eskom workers should not be negligent.
- Heavy vehicles and machinery should make use of existing roads and limit their entry to private properties.
- Heavy vehicles should adhere to the speed limits.
- An increase in heavy vehicles travelling past the school (R335) should be avoided at times when the children make use of this road to travel to and from school.
- Eskom should attend to the issue relating to the impact on the farmers' communication network due to their powerlines.
- Eskom should communicate and discuss the proposed construction schedule with the property owners.
- Eskom should discuss the construction schedule with the CDC to synchronise the various construction timeframes to ensure the least impact on the daily living and movement patterns as well as other construction activities undertaken in the Coega IDZ.

4.8.4. Impact on Economic Activities

Development pressures, as well as safety and security concerns, in the area have led to numerous farms being sold and farming families moving elsewhere. It is, however, not expected that the proposed powerlines would have a negative impact on the businesses (mainly brickworks and PPCs activities) in the area as long as the proposed alternative powerline corridors do not cross these properties.

The construction of the proposed powerlines within Alternative C will impact on the proposed airport planned within the Coega IDZ. This could potentially impact on the economic activities of the IDZ.

The proposed powerlines would, however, have a positive impact on the activities planned in the Coega IDZ as these are dependent on the power to be supplied. The proposed project can therefore be seen as an injection to the economic standard of the area as it would result in development which in turn can create other economic spin-offs benefiting the entire region.

Table 4.15: Impacts on economic activities as a result of the construction and operation of the proposed powerlines between Grassridge Substation and the Coega IDZ

Nature	Extent	Duration	Probability	Significance	Status
Impact on economic activities during the construction phase	Local	Short-term	Probable	High	Negative
Impact on economic activities during the operation phase	Local	Long-term	Highly probable	High	Positive

4.8.5. Change in Commercial/Industrial Focus of the Community

The proposed powerlines would not result in a change in the land use focus of the community, although the proposed industrial activities within the Coega IDZ (including the Aluminium Pechiney Smelter) for which the power is required to be supplied would lead to a change in the traditional land use of the area (e.g. brickworks, salt works, etc.). The shift would take place from a farming community with some industrial focus to a more specific commercial and industrial focus. This change in focus towards the industrial zone, as well as the impact of nine powerlines traversing the area may affect the resident's lifestyle and especially their perception of their community. Based on inputs received during the public participation process, it can be concluded that the change of focus to an IDZ has been accepted by the majority of residents in the area.

It is expected that the nine powerlines would not have a negative impact on the land use focus of the Coega IDZ. This area would be characterised by industrial buildings and factories, roads and associated infrastructure. The powerlines would, therefore, form part of the surface infrastructure associated with the industrial area, and would not impact on the land use focus of the specific area.

Table 4.16: Impacts associated with the change in commercial/industrial focus of the community as a result of the operation of the proposed powerlines between Grassridge Substation and the Coega IDZ

Nature	Extent	Duration	Probability	Significance	Status
Impacts associated with the change in commercial/ industrial focus of the community during the operation phase	Local	Long-term	Probable	Low	Negative

4.8.6. Impact on the Local Economy

Although of a short duration, it is not expected that a large number of local people would be employed during the construction phases of the project. The local economy would, therefore, not directly benefit from the proposed project in terms of contributing to the monthly household income generation.

The Coega IDZ is dependent on the generation of power to the area for the successful implementation of the industrial zone. The proposed powerlines would directly benefit and are critical for the Coega IDZ industrial development. The proposed powerline project would, therefore, have a positive impact on the economic development of the area.

Table 4.17: Impacts on the local economy as a result of the construction and operation of the proposed powerlines between Grassridge Substation and the Coega IDZ

Nature	Extent	Duration	Probability	Significance	Status
Impacts on the local economy during the construction phase	Local	Short-term	Unlikely	Low	Positive
Impacts on the local economy during the operation phase (indirectly through the Coega IDZ)	Regional	Long-term	Probable	High	Positive

- *Mitigation Measures:*

  It is recommended that local labour be used as far as possible so that the construction phase could result in a limited positive impact on the local economy.

4.8.7. Health Impacts

The main concern in terms of public health is the spread of sexually transmitted diseases with specific emphasis on HIV/AIDS through the introduction of people into the area, specifically during the construction phase of the proposed project. People movement (workers and job seekers) associated with construction activities could increase the risk of spreading this disease. Specific concerns relate to possible promiscuous activities at the construction camps.

Concerns have been raised regarding the health and specific carcinogenic risks associated with living in close proximity to powerlines and substations as a result of electric and magnetic fields (EMFs) from powerlines. However, studies have shown that EMFs reduce in magnitude with increasing distance from the source. The intensity of EMFs can be reduced

by increasing the height of towers, and thus the height of the conductors above the ground. The government maximum allowable continuous exposure to EMP is 100 mT (microTefla). EMFs recorded are highest at the centre of the powerline servitude (approximately 6 mT) and rapidly decrease in intensity from this centre line, such that the impact of EMFs from a powerline is negligible beyond the servitude (1 – 2 mT).

In order to ensure that health impacts are minimised, structures are not permitted to be constructed underneath the conductors of a Transmission line (i.e. within the servitude). In addition, this fulfils safety requirements, ensuring that no person is able to have physical contact with a line conductor (e.g. by standing on the roof of a building under the conductors).

Table 4.18: Health impacts associated with the construction and operation of the proposed powerlines between Grassridge Substation and the Coega IDZ

Nature	Extent	Duration	Probability	Significance	Status
Health impacts during the construction phase	Local	Short-term	Probable	High	Negative
Health impacts during the operation phase	Local	Long-term	Improbable	High	Negative

- *Mitigation Measures:*

  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.
  * Ensure that there are local health care facilities available to cater for the needs of the workforce.
  * The powerlines should be situated as far as possible from residential and other dwellings, where feasible.
  * The restrictions within the servitude should be strictly adhered to.

4.8.8. Safety and Security

People and animals could be in danger if entering construction sites or in cases where there is a significant increase in heavy vehicles making use of local roads. Nevertheless, it is

expected that the construction activities in itself would not increase the safety and security risk if mitigation measures related to contract workers and construction machinery are implemented.

The increasing crime levels in the area are of grave concern to the property owners, and impacts on the productivity of the businesses and farms in the area. An increase in crime is perceived to be associated with an influx of outsiders (workers and job seekers) to an area. Mention has been made that criminals make use of the existing Eskom roads to access properties, to steal livestock and to escape crime scenes. Moreover, it was stated that Eskom do not usually make use of the servitude and their access routes, but rather make use of private gates to access the powerlines. These "open" servitude areas are, therefore, creating a security risk. This is a serious issue that needs immediate attention as nine powerlines with additional access roads could worsen the situation. This impact is anticipated to be of higher significance for Alternatives A and B where access to the powerline servitude will potentially be required from private properties. Access to the powerline servitude for Alternative C will be from land which will form part of the Coega IDZ in the future.

Table 4.19: Safety and security impacts associated with the construction and operation of the proposed powerlines between Grassridge Substation and the Coega IDZ

Nature	Extent	Duration	Probability	Significance	Status
Health impacts during the construction phase	Local	Short-term	Probable	High	Negative
Health impacts during the operation phase	Local	Long-term	Probable	High	Negative

- *Mitigation Measures:*
  The following mitigation measures are proposed:

  * Develop safety management plans which should be discussed with construction workers prior to construction.
  * Comply with the relevant safety regulations (The Occupational Health and Safety Act).
  * Construction sites should be fenced off to avoid unauthorised entry.
  * Heavy vehicles should not make use of local roads during peak traffic (including pedestrians) hours.
  * Local labour should be used as far as possible to limit the influx of an outside work force and job seekers.

- Safety and security measures should be discussed with the property owners and local safety and security structures e.g. Community Policing Forum.
- Construction camps should be properly managed and should preferably not be situated close to private residences.
- Eskom vehicles should be marked to guarantee that property owners know who is accessing their properties.
- Eskom workers must notify property owners before entering the properties. If they are unable to do so, they should have some proof of identification.

4.8.9. Disruption of Infrastructure and Potential Stock Losses

Construction and operation activities might disrupt the property owners' existing infrastructure (e.g. gates, fences, roads etc.) as it would lead to an increase in vehicles and machinery used on the private roads. In areas where erosion is already taking place this would be problematic, especially if workers do not keep to the roads. Furthermore, for Alternatives A and B, if workers do not close gates it could result in stock losses.

Table 4.20: Disruption of infrastructure and potential stock losses associated with the construction and operation of the proposed powerlines between Grassridge Substation and the Coega IDZ

Nature	Extent	Duration	Probability	Significance	Status
Health impacts during the construction phase	Local	Short-term	Probable	Moderate	Negative
Health impacts during the operation phase	Local	Long-term	Probable	Moderate	Negative

- *Mitigation Measures:*

  The following mitigation measures should be implemented:

  - The construction schedule should be communicated with the property owners.
  - Negotiations with property owners should further investigate the possibility of disrupting any individual infrastructure and mitigation measures to deal with these issues should be identified in consultation with the affected property owners.
  - The use of private roads during the construction period should be limited. Where it is necessary to use the private roads, Eskom should consult with the relevant property owners prior to construction.

- Eskom workers should contact property owners before entering properties to undertake maintenance of the powerlines.
- Gates should be closed and locked to prevent any stock losses.
- Eskom workers/contractors should keep to the dedicated roads to limit any erosion.

4.8.10. Attitude Formation

Although select property owners indicated that they would receive no benefits from the project, the I&APs are in general not opposed to the proposed project. Some concerns have, however, been raised regarding the following:

- construction related impacts;
- visual impact;
- possible health impacts;
- safety and security concerns;
- the fact that the Eskom power is reliable, although property owners in the area experience power outages on a constant basis; and
- impact of the proposed powerlines on the demarcated open space area in the Coega IDZ.

The impact of the proposed powerlines on the demarcated open space area in the Coega IDZ relates to the fact that people would negatively perceive and experience an "open space system" with powerlines traversing this area.

Table 4.21: Attitude formation associated with the construction and operation of the proposed powerlines between Grassridge Substation and the Coega IDZ

Nature	Extent	Duration	Probability	Significance	Status
Health impacts during the construction phase	Local	Short-term	Probable	Moderate	Negative
Health impacts during the operation phase	Local	Long-term	Probable	High	Negative

- *Mitigation Measures:*

  The following mitigation measures should be implemented:

  - It is strongly recommended that the proposed powerlines do not traverse the open space area as far as possible.
  - Concerns and issues raised by I&APs should be sensitively dealt with.

* Eskom should enter into dialogue with concerned parties to discuss and address their concerns.

4.8.11. Tourism Related Impacts

It is not expected that the construction period would have any major negative impact on tourism, as the construction activities would not be undertaken directly next to major tourist facilities. However, the proposed powerlines will be visible from the R334 (the main road to the Addo Elephant National Park) and portions of the N2 (the main route to the Garden Route) if constructed within Alternatives A or B. This will impact on the views of tourists utilising these routes. However, these powerlines will form part of the greater Coega IDZ development, which will be visible from these transportation routes. The proposed powerlines are not anticipated to add significantly to the visual impacts associated with the Coega IDZ area.

The limited numbers of contract workers expected to partake in the construction of the powerlines is not anticipated to result in a major contribution to the local tourism industry (accommodation and entertainment facilities).

Table 4.22: Tourism related impacts associated with the construction and operation of the proposed powerlines between Grassridge Substation and the Coega IDZ

Nature	Extent	Duration	Probability	Significance	Status
Tourism impacts during the construction phase	Local	Short-term	Unlikely	Low	Negative
Tourism impacts during the operation phase (visual)	Local	Long-term	Probable	Moderate	Negative

- *Mitigation Measures:*

  The following mitigation measures are proposed:

  * Eskom should aim to keep to areas of lower elevation as far as possible, in order to minimise the visual impacts associated with the proposed powerlines.

4.8.12. Intrusion Impacts

Potential intrusion impacts associated with the proposed project include:

- visual impacts associated with the proposed powerlines;
- noise impacts during the construction phase;

- air/dust pollution during the construction phase; and
- potential water pollution during the construction phase.

- *Visual impact:*

  Existing infrastructure in the area include roads, powerlines, buildings and a substation. Continued visible environmental impacts due to the brickworks and alterations to the landscape due to the Coega IDZ project (including the proposed powerlines) are also anticipated in future. These planned developments will definitely be viewed as an intrusion on the landscape of the area. A specific area of impact associated with the proposed powerlines is where the lines would be in very close proximity and clearly visible from some of the property owner's houses and brickworks on the farm Welbedachtsfontein (if Alternative A or B were to be implemented).

- *Noise impact:*

  Noise impacts associated with the construction phase and construction camps are anticipated. The proximity of residences, communities and businesses to the construction sites and camps would determine the intensity of this impact. This impact could be rated to only have a temporary irritation impact.

- *Air/Dust pollution:*

  Vehicular movement on gravel roads could lead to dust pollution. This impact would be of a short duration with some construction intervals.

  Dust pollution could also take place during maintenance and inspection of the lines, although this impact could be rated as insignificant.

- *Water pollution:*

  A lack of proper water and sanitation facilities at the construction camps could result in water pollution. Eskom, however, have requirements which are required to be adhered to by contractors, including the handling of waste, water usage, etc. These guidelines will be stipulated in the Environmental Management Plan (EMP).

Table 4.23: Intrusion impacts associated with the construction and operation of the proposed powerlines between Grassridge Substation and the Coega IDZ

Nature	Extent	Duration	Probability	Significance	Status
Visual impacts associated with the proposed powerlines	Local	Long-term	Unlikely	Moderate	Negative

Nature	Extent	Duration	Probability	Significance	Status
Noise impacts during the construction phase	Local	Short-term	Probable	Moderate	Negative
Air/dust pollution during the construction phase	Local	Short-term	Probable	Moderate	Negative
Water pollution during the construction phase	Local	Short-term	Probable	Moderate	Negative

- *Mitigation Measures:*

  The following mitigation measures are recommended:

  - Eskom should aim to keep to areas of lower elevation as far as possible, in order to minimise the visual impacts associated with the proposed powerlines.
  - Routing of the lines should preferably not be in close proximity to residential dwellings.
  - Where other towers are present, Eskom should aim for consistency in terms of the design.
  - Noise-generating construction activities (especially those associated with vehicles and heavy machinery) should be restricted to working hours.
  - Construction equipment and vehicles should be maintained in a good working condition so as to minimise the noise generated by these.
  - The conduct of workers residing in the construction camps should be monitored.
  - The construction schedule should be communicated with potentially affected parties.
  - Construction timeframes should be discussed with property owners which roads would be used.
  - Gravel roads should be watered during windy conditions to limit the creation of dust.
  - Adequate water and sanitation facilities are to be supplied at construction camps.
  - Fuels and chemicals must be stored in appropriate constainers where these are kept on-site.
  - An EMP for construction should be compiled outlining management measures which must be implemented in order to minimise intrusion impacts.

4.8.13. Conclusions

In respect of the above discussions, the following conclusions can be drawn:

- There are positive and negative social impacts associated with the proposed project, although the negative impacts are not of such a severe nature that they present a fatal flaw to the proposed project.
- The proposed powerlines are critical for the Coega IDZ development which would lead to a positive impact on the local economy, although the powerlines in itself would have limited benefits for the local communities.
- The negative impacts are mainly associated with the visual impact of powerlines on the characteristics of the area, and specifically with regard to the impact on the Open Space Management Plan of the Coega IDZ. Other negative impacts relate to construction related activities which would be temporary in nature and which could be effectively mitigated.
- The majority of I&APs consulted did not oppose the proposed project.
- In terms of Alternative A or B, similar social impacts are anticipated (i.e. disruption in daily living and movement patterns, impact on economic activities, potential health impacts, safety and security issues, disruption in infrastructure and potential stock losses, tourism related impacts (visual impacts), and intrusion impacts), and therefore no preference is given to one of these routes.
- From a social point of view a more direct route alignment between the Grassridge Substation and the Coega IDZ (i.e. Alternative C) would be preferable due to:
  - fewer cost implications due to the length of the line;
  - limited negative impact on the surrounding properties and activities due to the location and length of the line; and
  - a lower visual impact on the adjacent properties and limited visibility from the main tourist routes in the area (i.e. the R335 and the N2).

  A direct route alignment would, however, conflict with the proposed Airport Industry Cluster proposed as part of the Coega IDZ development.

4.8.14. Recommendations

From a social perspective, the following recommendations are made:

- The construction programme should be discussed with affected property owners and specifically with the CDC.
- Local benefits of the proposed project should accrue to local communities, where possible.

In terms of the Social Impact Assessment undertaken, the order of preference for the establishment of the powerlines is:

- Alternative C
- Alternative A or B

5. CONCLUSIONS AND RECOMMENDATIONS

This Environmental Impact Assessment (EIA) process for the proposed nine 132 kV powerlines between the Grassridge Substation and the Coega Main and Aluminium Pechiney Smelter Substations has been undertaken in accordance with the EIA Regulations published in Government Notice R1182 to R1184 of 5 September 1997, in terms of the Environment Conservation Act (No 73 of 1989), as well as the National Environmental Management Act (NEMA; No 107 of 1998). This EIA process has played a key role in identifying a preferred route alignment between the Grassridge Substation and the Coega IDZ. The determination of a preferred alignment has taken cognisance of aspects considered to be limiting constraints to both the environment (social and biophysical) and the overall project success (e.g. economics, technical feasibility, etc).

The essence of any EIA process is aimed at ensuring informed decision-making and environmental accountability, and to assist in achieving environmentally sound and sustainable development. In terms of NEMA (No 107 of 1998), the commitment to sustainable development is evident in the provision that *"development must be socially, environmentally and economically sustainable…and requires the consideration of all relevant factors…."*. In addition, the preventative principle is required to be applied, i.e. that the disturbance of ecosystems and loss of biological diversity are to be *"... avoided, or ... minimised and remedied"* and *"disturbance of the landscape and the nation's cultural heritage is avoided and where it cannot be altogether avoided is minimised and remedied"*.

Therefore, negative impacts on the environment and on people's environmental rights (in terms of the Constitution (Act 108 of 1996) should be anticipated and prevented, and where they cannot be altogether prevented, they must be minimised and remedied in terms of "reasonable measures". "Reasonable measures" implies that *"every person who causes, has caused or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring, or, in so far as such harm to the environment is authorised by law or cannot reasonably be avoided or stopped, to minimise and rectify such pollution or degradation of the environment"*.

In assessing the environmental feasibility of the proposed nine 132 kV powerlines, as well as determining reasonable mitigation measures which are required to be implemented in order to minimise potential impacts associated with the project, the requirements of all relevant environmental legislation has been considered, including, *inter alia*, those of:

- the Environment Conservation Act (No 73 of 1989);
- the National Water Act (No 36 of 1998);
- the Conservation of Agricultural Resources Act (No 43 of 1983); and
- the National Heritage Resources Act (No 25 of 1999).

5.1. Environmental Impacts Associated with the Proposed Development

It is acknowledged that any development will impact on the environment. The construction of the proposed powerlines will have impacts on the biophysical and the social environment. This EIA investigated and assessed these impacts as a result of project actions. The significance of the impact is predominately determined by the final alignment, the final design, the final construction activities, and how achievable the mitigation measures to minimise such impacts are. Therefore, once a final alignment has been determined and approved, and tower positions have been determined, a detailed survey of this route will be required to be undertaken in terms of botanical, avifaunal and heritage aspects in order to determine site-specific impacts and mitigation measures. These site-specific mitigation measures, together with the mitigation measures recommended within this EIA should be included within an Environmental Management Plan for construction, operation and maintenance.

Table 5.1 overleaf provides a summary of the recommendations made within the specialist studies regarding the proposed powerline between the Grassridge Substation and the Coega Main and Aluminium Pechiney Smelter Substations. Considering the findings of all the detailed studies undertaken (refer to Table 5.1), the order of preference for the corridor for the construction of the powerlines is as follows:

- Alternative C (or a minor realignment of this alternative to follow the Brakrivier road; refer to Figures 5.1 and 5.2) is recommended as the best practicable option in terms of environmental considerations.
- Alternative A is recommended as the second option.
- Alternative B is the least preferred option, as it is anticipated to have an impact of high significance on both the biophysical and social environment.

Table 5.1: Summary of findings of detailed specialist studies undertaken regarding the proposed 132 kV powerlines between the Grassridge Substation and the Coega IDZ

Issue	Alternative A	Alternative B	Alternative C
	Biophysical Environment		
Geology and soils	Follows the Coega River valley side slopes for a portion of its length. The undifferentiated soils within the valley could potentially be susceptible to erosion, particularly once vegetation has been removed. New access/service roads would be required to be constructed for a portion of the route length. Option 2	Follows the Coega River valley side slopes for a portion of its length. The undifferentiated soils within the valley could potentially be susceptible to erosion, particularly once vegetation has been removed. Risk of erosion likely to be significant for that portion which traverses the high-lying area in the vicinity of Coega Kop. New access/service roads would be required to be constructed for a portion of the route length. Option 2	Traverses terrain with very little relief ahead of the Coega River valley. The river valley is crossed at one point, and spans across a shorter section of undifferentiated deposits associated with the Coega River valley. The existing Brakrivier road could be utilised as an access/service road. Option 1

Issue	Alternative A	Alternative B	Alternative C
Flora	Potential impacts on sensitive flora at tower positions and along new access/service roads. Positive impacts in terms of the management of alien vegetation within the servitude. There is the potential for the conservation of flora within the servitude in the long-term as development will not be permitted below the lines. Option 2	Potential impacts on sensitive flora at tower positions and along new access/service roads. Potential impacts on *Aloe boweiea* (critically endangered). Positive impacts in terms of the management of alien vegetation within the servitude. There is the potential for the conservation of flora within the servitude in the long-term as development will not be permitted below the lines. Option 3	Potential impacts on sensitive flora at tower positions. The existing Brakrivier road could be utilised as an access/service road. Positive impacts in terms of the management of alien vegetation within the servitude. There is the potential for the conservation of flora within the servitude in the long-term as development will not be permitted below the lines. Option 1
Terrestrial fauna	Sensitive habitats in which key species are found or are likely to be found occur within this alternative corridor. Option 2	Sensitive habitats in which key species are found or are likely to be found occur within this alternative corridor. Option 2	This route does not cut through prime habitat for any of the key species found or likely to be found in the area, although it does pass in close proximity to an area which is anticipated to provide habitat to the butterfly species which occur in the area. Option 1

Issue	Alternative A	Alternative B	Alternative C
Avifauna	Follow an existing powerline corridor for the first portion of the route, and therefore it is unlikely that they will have an additional impact on the habitat and avifauna in this area. The east-west orientation of the section of the corridor following the Coega River valley assists in reducing the number of possible collisions, as powerlines running in a north-south direction are more likely to cause bird collisions. Option 1	Follow an existing powerline corridor for the first portion of the route, and therefore it is unlikely that they will have an additional impact on the habitat and avifauna in this area. The east-west orientation of the section of the corridor following the Coega River valley assists in reducing the number of possible collisions, as powerlines running in a north-south direction are more likely to cause bird collisions. Option 1	The area just south of Grassridge Substation is likely to be transformed into many small seasonal marshy pans, which will attract many birds and additional species to the area. This would increase the probability of interactions with the powerlines during these periods. The route followed by this alternative is proposed to follow a north-south orientation between Grassridge Substation and the Coega Main and Aluminium Pechiney Smelter Substations, which could potentially increase the probability of bird collisions. Option 2
Social Environment			
Land use	Potential conflicts with proposed future land use, particularly: • Open space management area • Airport cluster of the Coega IDZ	Potential conflicts with proposed future land use, particularly: • Open space management area • Airport cluster of the Coega IDZ • Coega Kop Quarry • Conservation area over Coega Kop	Potential conflicts with proposed future land use, particularly: • Airport cluster of the Coega IDZ

Issue	Alternative A	Alternative B	Alternative C
Visual impacts	Visual absorption capacity of the landscape is considered to be high, resulting in a low visual impact on critical viewpoints. The visual intrusiveness of the proposed development can be considered to be low due to its compatibility with future surrounding land uses. Option 2	Visual absorption capacity of the landscape is considered to be high, resulting in a low visual impact on critical viewpoints. This proposed corridor does, however, pass in close proximity to Coega Kop, which is the highest point within the Coega IDZ area, and is considered to be a critical viewpoint. The visual intrusiveness of the majority of the proposed development can be considered to be low due to its compatibility with future surrounding land uses. In passing over the higher-lying area in the vicinity of Coega Kop, the proposed powerlines would intrude on the skyline, resulting in higher visual intrusiveness. Option 3	Located on a flat plateau, and therefore visibility decreases rapidly with distance. In addition, due to future development within the IDZ, as well as screening of structures to some extent by vegetation, the visual absorption capacity of the landscape is considered to be high, resulting in a low visual impact on critical viewpoints. The visual intrusiveness of the proposed development can be considered to be low due to its compatibility with future surrounding land uses. Option 1
Archaeological, Cultural and Historical Sites	No significant sites identified.	No significant sites identified.	No significant sites identified.

Issue	Alternative A	Alternative B	Alternative C
Social environment	Social impacts associated with this alternative include: • Visual impacts • Impacts on the open space area of the Coega IDZ • Impacts on landowners on the Farm Welbedachtsfontein • Intrusion impacts during construction Option 2	Social impacts associated with this alternative include: • Visual impacts • Impacts on the open space area of the Coega IDZ • Impacts on landowners on the Farm Welbedachtsfontein • Intrusion impacts during construction Option 2	Social impacts associated with this alternative include: • Visual impacts • Intrusion impacts during construction Option 1

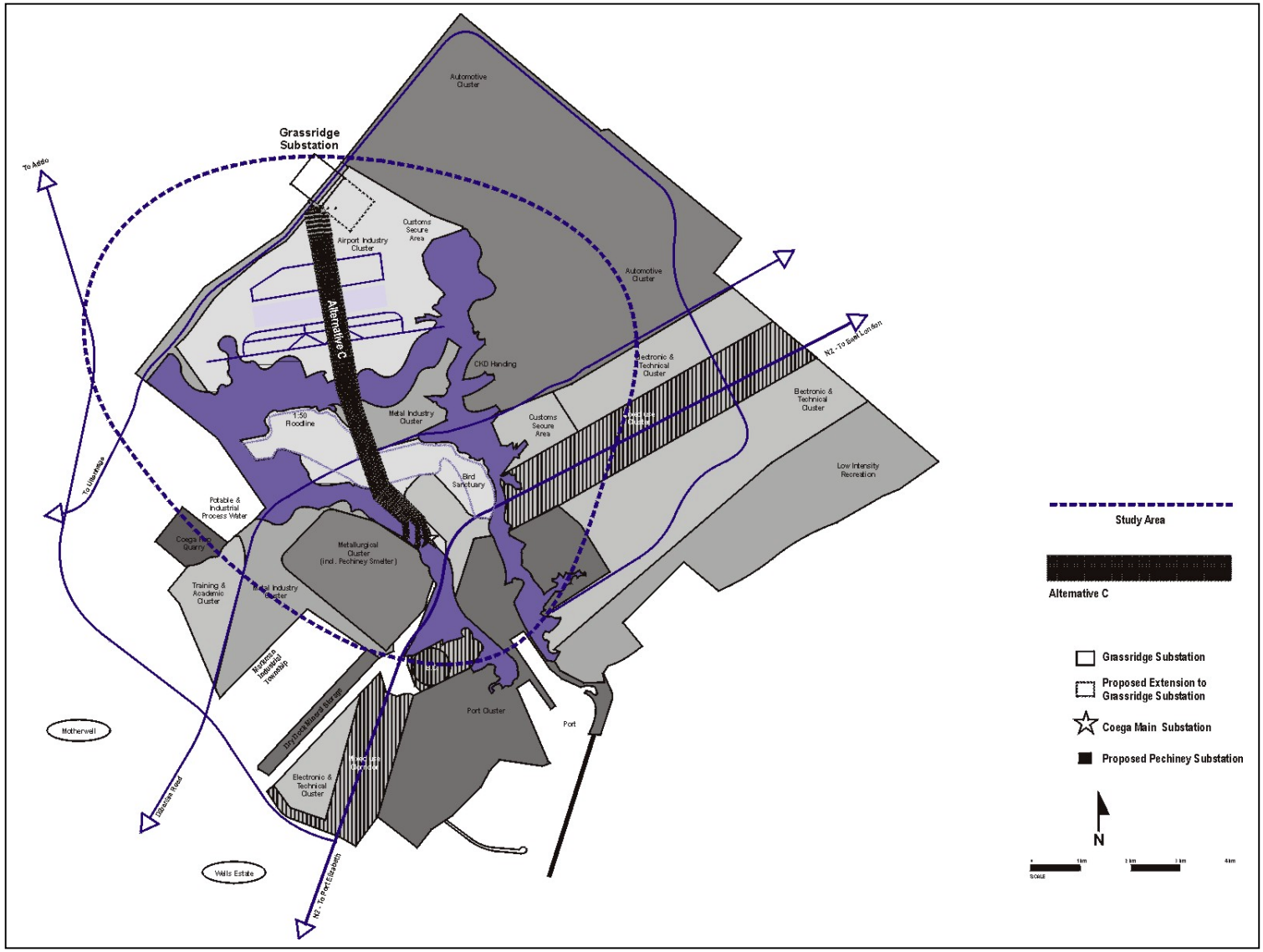

Figure 5.1: The results of this EIA indicate that Alternative C is the best practicable environmental option for the construction of the planned powerlines

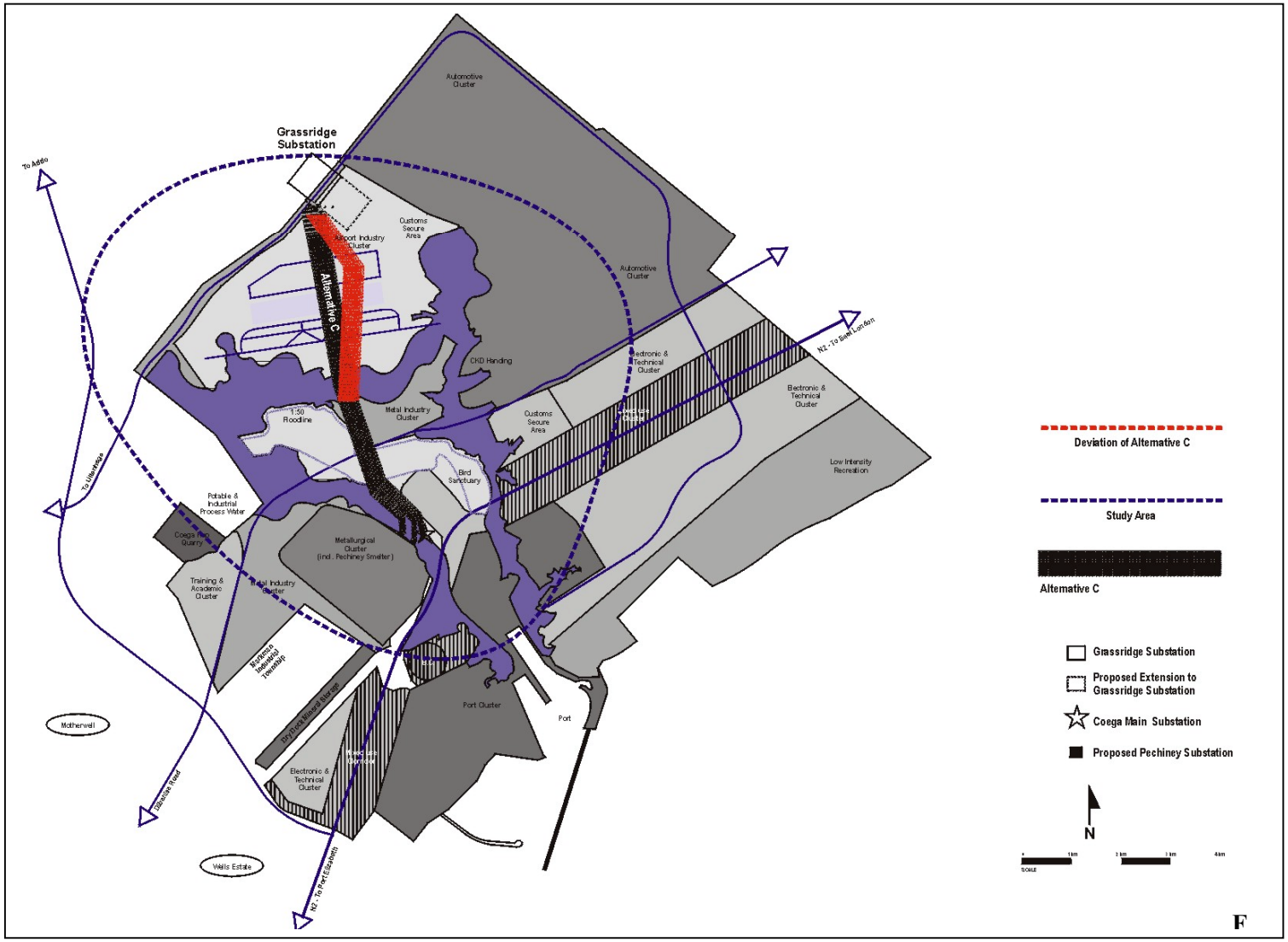

Figure 5.2: A minor realignment of Alternative C to follow the Brakrivier road is considered to be a practicable environmental option for the construction of the planned powerlines

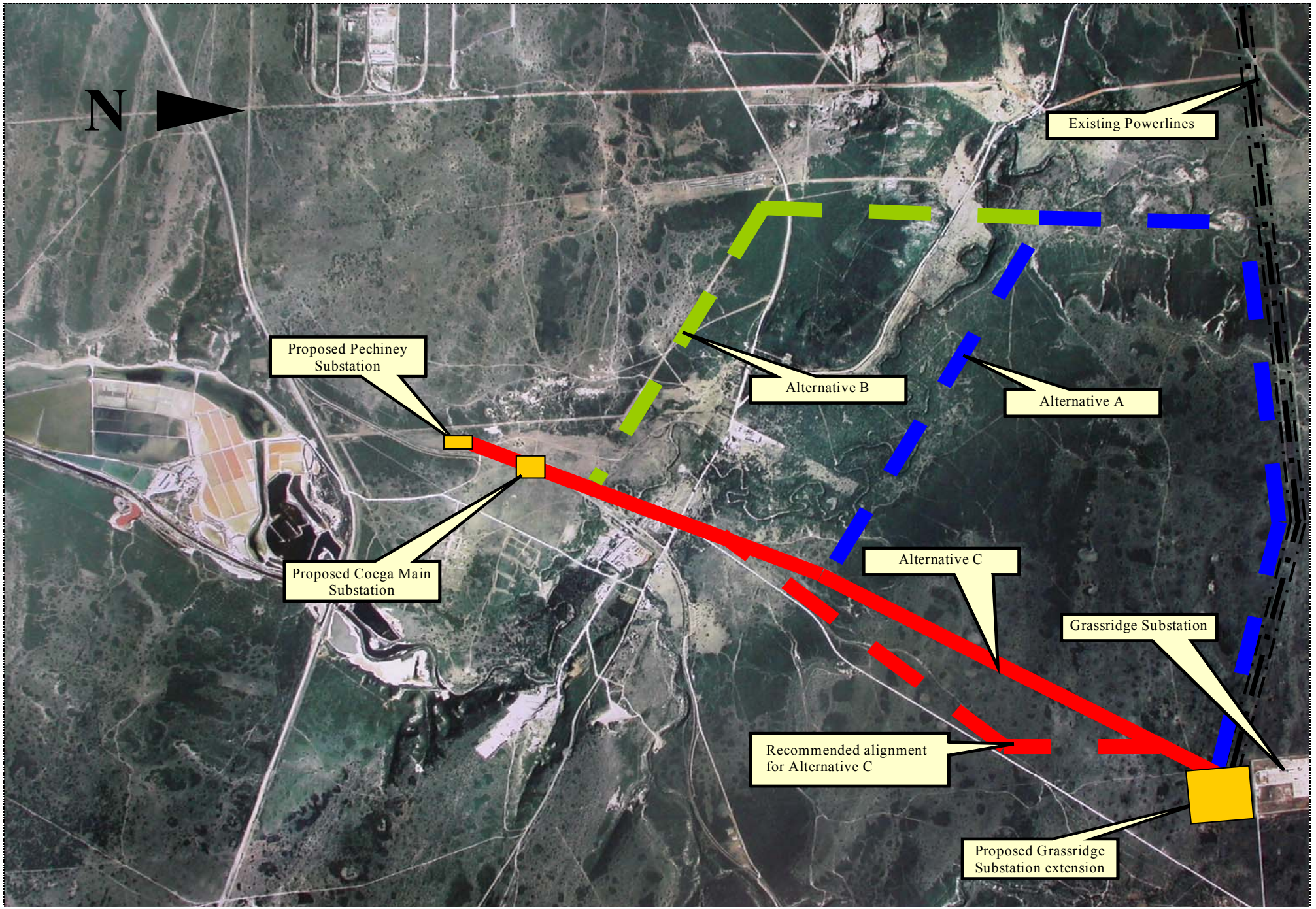

Figure 5.3: Aerial photograph of the study area showing the preferred alternative (Alternative C), identified from investigations undertaken within the EIA, in red

In order to confirm the result, the identified alternative powerline corridors have been weighted against one another using an unbiased mathematical model.

The objective of the model is to calculate an unbiased percentage-based score, built on mathematical formulas reliant on a set of environmental issues (characteristics) which have been identified for a hypothesis test. The mathematical formulas have been set-up to ensure that the existence of more potential impacts for one alternative than the other is not biased in favour of the option which contains more variables. To ensure a uniform score between the three corridor alternative models, the model assumes a defined set of environmental issues that apply to both options subjected to the model. These environmental issues are ranked in order of importance, relevant to the project. Potential impacts are defined for each of the environmental issues. However, in some instances, one alternative may have more potential impacts than the other options for a particular environmental issue. It is in these situations that the model calculates an unbiased percentage score as one corridor cannot be unfairly biased against if it has less impact than another site option. The end result produces a percentage score that is effectively used to rank various route alternatives. The option with the highest percentage score is considered to be the most favourable alternative.

The result obtained from the model (refer to Appendix G) indicates that Alternative C is the most favourable of the 3 alternatives identified for development of the powerline corridor.

5.2. Overall Conclusion and Recommendations

The results of this EIA indicate that Alternative C is the best practicable environmental option for the construction of the planned powerlines.

The detailed investigations which have been undertaken as part of this EIA have not identified any issues of high significance which could not be mitigated, such that the proposed project can not be accepted from an environmental perspective. However, the potential conflict of land use on the Farm Bontrug (i.e. the proposed site for the airport development cluster) has been identified and flagged as a critical issue requiring resolution outside of this EIA process. All the potentially negative impacts identified for the preferred corridor alternative can potentially be mitigated through controls in the construction and rehabilitation phases in order to reduce their severity and significance to acceptable levels. In addition, a number of potentially positive impacts have been highlighted which will result in benefits to the region.

The conclusions of this EIA are the result of specialist assessments, based on issues identified within the Scoping Phase, as well as the parallel process of public participation. The public consultation process has been extensive and every effort has been made to include representatives of all stakeholders in the study area.

The finalisation of these conclusions and detailed input into the EMP will be informed by final comment from key stakeholders, the public and the relevant environmental authorities on this draft EIA report.

The issuing of an authorisation for this project EIA by the National Department of Environmental Affairs and Tourism (DEAT) in consultation with the relevant provincial department will permit the negotiation for the servitudes and the final design of the powerlines to be undertaken. At this stage, details in terms of final placement of towers and access roads will be determined and the technical aspects of the powerline will be finalised.

APPENDIX A:
SERVITUDE NEGOTIATION AND THE EIA PROCESS

SERVITUDE NEGOTIATION AND THE EIA PROCESS

Powerlines are constructed and operated within a servitude that is established along the entire length of the line. A 310 m wide servitude will be required for the nine 132 kV lines between the Grassridge Substation and the Coega IDZ. Within this servitude, Eskom Transmission have certain rights and controls that support the safe and effective operation of the line.

The process of achieving the servitude agreement is referred to as the Servitude Negotiation Process, or just the negotiation process. The negotiation process is undertaken directly by Eskom Transmission. The following important points relating to the negotiation process should be noted:

- Servitude negotiation is a private matter between Eskom Transmission and the appropriate landowner.
- The negotiation process involves a number of stages (see below), and culminates in the "signing" of a servitude. Here Eskom Transmission enters into a legal agreement with the landowner.
- The agreements will detail such aspects as the exact location and extent of the servitude, and access arrangements and maintenance responsibilities, as well as any specific landowner requirements.
- Compensation measures are agreed in each case.
- The negotiation process may take place at any time in the planning of a new line.
- This process must be completed (i.e. the agreement must be signed) with the relevant landowner before construction starts on that property.
- The negotiation process is independent of the EIA process.

The EIA process has become important in the initial planning and route selection of new Transmission lines. For this reason, it is usually preferable that the negotiation process begins after the EIA has been completed. At this stage there is greater confidence in the route to be adopted, and it would be supported by environmental authorisation. However, it may be required that the negotiation process begins earlier, and may begin before, or run in parallel with the EIA process. This may be due to tight timeframes for the commissioning of the new line, knowledge of local conditions and constraints, etc. Eskom Transmission has a right to engage with any landowner at any time, though they do so at risk if environmental authorisation has not been awarded.

1. The Negotiation Process

The national Eskom Transmission office is responsible for the negotiation process for all new Transmission lines. The negotiation process can be extensive, often running into years on the longer lines. It is, therefore, critical that the process is correctly programmed and incorporated into the planning of a new line. The negotiation process involves the following steps:

i. Initial meeting with the landowner.
ii. The signing of an "option" to secure a servitude (this indicates that the owner will accept that the line will cross his property, subject to conditions to be finalised in the negotiation of the servitude agreement). An option is valid for one year.
iii. Once the route is confirmed (i.e. options are signed with the upstream and downstream landowners), the servitude agreement will be finalised with the individual landowners. This agreement will set out the conditions for the establishment and operation of the servitude, and will be site-specific (as different landowners may have different requirements). Compensation payments are made when the servitude is registered at the Deeds office.
iv. Once construction is complete and the land rehabilitated to the landowners satisfaction, the landowner signs a "Final Release" certificate. Until the "Final Release" certificate has been signed, Eskom Transmission remains liable for the condition of the land.
v. Once the clearance certificate is signed, the responsibility for the line and servitude is handed over to the regional Eskom Transmission office.

2. Servitude Maintenance Responsibilities

The management of a Transmission line servitude is dependent on the details and conditions of the agreement between the landowner and Eskom Transmission, and are therefore site-specific. These may, therefore, vary from location to location. However, it is common that there is a dual responsibility for the maintenance of the servitude:

- Eskom Transmission will be responsible for the tower structures, access roads (including erosion and rutting), watercourse crossings, and gates and fences relating to servitude access.
- The landowner will retain responsibility for the maintenance of the land and land use within the servitude (e.g. cropping activities, veld management, etc.).

Exceptions to the above may arise where, for example:

- Dual use is made of the access roads and gates.
- Specific land use limitations are set by Eskom Transmission within the servitude which directly affect the landowner (e.g. forestry).

Notwithstanding initial compensation for such circumstances, different maintenance agreements may be entered into between the landowner and Eskom Transmission. For example, responsibilities for access road maintenance may rest with the landowner (instead of Eskom Transmission), or vegetation control responsibilities may rest with Eskom Transmission in the second instance. Maintenance responsibilities are, ultimately, clearly set out in the servitude agreement.

3.

APPENDIX B:
CONSTRUCTION PROCESS FOR POWERLINES

CONSTRUCTION PROCESS FOR TRANSMISSION LINES

1. Construction Camps

The entire construction workforce is usually accommodated on a "construction camp" that will be situated at some point along the powerline route (refer to Photographs B1 and B2). The location is selected by the contractor who will take into account such aspects as access to the construction site, access to services, access to materials, etc. The contractor will enter into an agreement with a landowner for the establishment of the construction camp. The various teams will travel from the camp to the construction site each day. The site moves continuously with the progression of the line, so the teams will perhaps travel a greater distance to the site each time. All materials are stored at the construction camp with the exception of the steel towers (which may come direct from the factory) and concrete (unless the site is very remote, when concrete may be mixed on site). As a rule, there is usually one construction camp per 100 km of powerline.

2. Construction Process for PowerLines

The following construction process will be followed for the entire route of the new powerlines. Each activity will follow the previous one, such that at any one point an observer will see a chain of events with different working teams involved. At any one time, some or all of the different teams may be working at different points along the line.

Activity	Approx team size	Approx duration of activity at a point
1. Survey of the route	By air	-
2. Determination of the conductor type and Selection of best-suited conductor, towers, insulators, foundations • Define final centre line • Determine co-ordinates of each bend in the line • Undertake aerial survey to obtain an accurate profile of the area • Identify optimal tower sizes and positions	-	-
3. Final design of line and placement of towers	-	-
4. Issuing of tenders, and award of contract to construction companies	-	-
5. Vegetation clearance -centre line (light vehicle access required) • Clear vegetation along centre line, with the aid of a surveyor • Undertake vegetation clearing in accordance with the minimum standards to be used for vegetation clearing for the construction of the proposed new Transmission lines (Eskom, 2000)	5 - 15	1 - 2 days depending on local site conditions

Activity	Approx team size	Approx duration of activity at a point
6. Centre line pegging and identification of requirements and locations for new gate (light vehicle access required)	3	1 day
7. Access negotiations (light vehicle access required) • Develop and agree on an access plan (Eskom, contractor and landowner) • Agree to rehabilitation measures • Take photographs of pre-construction conditions of site • Establish access roads (where required)	1	1 day
8. New gate installation (light vehicle access required)	5	1 day
9. Vegetation clearance (tower positions) • Clear four strips (40 m x 40 m square for CRS towers and 20 m x 20 m for the self-supporting towers) for assembling and erection purposes at each tower position marked	5 - 15	1 - 2 days depending on local site conditions
10. Foundation nominations for main structure and anchors (heavy vehicle access required) • Check soil types to determine foundation requirements • Dig trial pits at main foundation points (usually using mechanical back-actor/auger method, although manual labour may be used)	5	2 days
11. Excavation of foundations (heavy vehicle access required) • Excavate foundations of up to 4 m x 4 m square and up to 4 m deep depending on soil conditions (mechanically where access to tower sites is readily available (refer to Photograph B3), and dug by hand where access is poor) • Cover or fence off foundation pit until foundation is poured (refer to Photograph B4)	15	2 days
12. Foundation steelwork –reinforcing (heavy vehicle access required) • Make up steelwork at base camp and transport to site by truck • Undertake fitting and wiring on site (limited welding on site)	10	2 days
13. Foundation (concrete) pouring (heavy vehicle access required) • Shuttering • Use of standard concrete truck • Where access problems exist, mix concrete on site • 28 day period required after concrete has been laid • Heavy usage of access/service roads during this stage	20	2 days
14. Delivery of tower steelwork (heavy vehicle access; extra long trucks used) • Deliver steelwork in sections and assemble on site (refer to Photograph B5)	5	1 day

Activity	Approx team size	Approx duration of activity at a point
• Mark access roads clearly to ensure the correct tower is delivered to each site (as towers are individually designed for each location)		
15. Assembly team/punching and painting (light vehicle access required) • Assemble steelwork on the ground • Punch nuts and paint with non-corrosive paint	10	3 days
16. Erection (abnormal load vehicle access required) • Final assembly of towers by cranes (minimum of 50 tons; refer to Photograph B6)	20	2 days
17. Stringing (abnormal load vehicle access required) • Place cable drums within servitude (refer to Photograph A6) • Undertake stringing in both directions (5 – 10 km can be strung from one station) • Working are at each drum will be as long as 130 m, but will be within the servitude area • Intensive vehicle activity is likely within the working area • Pilot tractor cable will place cable on the ground • Pull up cable through use of a pulley • Ensure conductors never tough the ground	50	7 days
18. Sag and tension (heavy vehicle access required) • Tension the line from each station to ensure that minimum ground clearance heights are achieved (i.e. 8,4 m for 400 kV lines)	10	3 days
19. Rehabilitation (heavy and light vehicle access required) • Continuous process throughout the construction phase • Will typically only commence after the first 100 towers are constructed • There is a one year guarantee on the contractors work during which rehabilitation must be concluded	5 - 15	2 – 10 days depending on local site conditions

Photograph B1: Typical construction camp

Photograph B2: Typical construction camp

Photograph B3: Drilling of foundations

Photograph B4: Cover over foundations

Photograph B5: Towers are erected on site

Photograph B6: Erection of towers by crane

APPENDIX C:
I&AP DATABASE

Title	Name	Surname	Organisation
Mr.	Bill	Emslie	Nelson Mandela Metropolitan Council: Engineering Department
Mr.	Mike	Xego	Nelson Mandela Metropolitan Council: Constitutional Co-ordinator
Mr.	Brendon	Hindes	Nelson Mandela Metropolitan Council: Town Planning Division of the City Engineer
Mr.	Mike	Roote	Nelson Mandela Metropolitan Council: City Electrical Engineer's Department: Planning Engineer
Dr.	Paul	Martin	Nelson Mandela Metropolitan Council: Parks Department: Manager Nature Conservation
Mr.	Andries	Struwig	Department of Economic, Finance and Environmental Affairs
Mr.	Tom	Smith	Eskom: Distribution, Land and Rights
Mr.	Rob	Stone	Eskom: Sales and Customer Services Manager
Mr.	Danie	van der Westhuizen	Eskom: PE
Mr.	Gerrit	Venter	Eskom District Manager PE
Mr.	Brian	Vockerodt	Eskom: Line and Servitude Manager PE
Mr.	Paul	Connachan	Eskom TX PE Maintenance (Grassridge Substation)
Mr.	Willie	de Beer	Eskom Distribution: Engineering
Ms.	Brenda	Ngamlane	Eskom Tx: Environmental
Ms.	Stephanie	Mabogoane	Eskom Tx: Environmental Advisor
Mr.	Collin	Reddy	Eskom Tx: HV Plant
Mr.	Harish	Mahibeer	Eskom: Tx Regional Manager
	Pool	Mahadeo	Eskom: Dx Customer Services Manager
Mr.	James	Bredenkamp	Spoornet: Assistant Manager Estates
Mr.	Jeff	Scrooby	Petronet: Crossing & Estate Manager
Mr.	Rory P.	O'Moore	Agri-Eastern Cape
Mr.	J.J.	Hendriksz	Agri-Eastern Cape
Dr.	Peter	Inman	Coega Development Corporation (Pty) Ltd.
Mr.	John	Ramondo	CDC: Environmental Manager
Mr.	Jeremy	Blood	CES
Mr.	Ted	Avis	CES
Mrs.	Armanda	Rossouw	Metroplan
Mr.	Warrick	Stewart	Wildlife and Environment Society of SA: Environmental Officer
Mr.	Brian	Reeves	Wildlife and Environment Society of SA: Environmental Officer
Mr.	Paul	Lochner	CSIR: Environmentek: Environmental Engineer
Mr.	Jean-Luc	Faudou	Pechiney: Technical Director
Mr.	Warren	Brooks	Tomago Aluminium: Manager Safety, Health and Environment
Ms.	Frauke	Munster	CSIR Environmentek: Environmental Scientist
Mr.	Jo	van Heerden: PPC Cement: Quarry Manager	Grassridge 225 Portion 0, Portion 1, Portion 2 ; Grassridge 227; Geluksdal 590 Portion 0, Portion 1; Oliphantskop 201 Portion 1; Limehurst 221 Portion 0; Portion 1 (Remaining extent); Portion 2 Portion 3, Portion 4; Brakriver SW 224 Portion 0; The Aloes 220 Portion 0

Title	Name	Surname	Organisation
Mr.	Jakkie	Erasmus: PPC: Manager of properties	Grassridge 225 Portion 0, Portion 1, Portion 2 ; Grassridge 227; Geluksdal 590 Portion 0, Portion 1; Oliphantskop 201 Portion 1; Limehurst 221 Portion 0; Portion 1 (Remaining extent); Portion 2 Portion 3, Portion 4; Brakriver SW 224 Portion 0; The Aloes 220 Portion 0
Mr.	Dave	Scott	PPC: Technical Director
		No deed search	Bontrug 301
Mr	Thobile	Golimpi: Assistant Manager -	Transnet Ltd.: Brakriver SW 224 Portion 1; Portion 4; Portion 5
See above		Coega Development Corporation	Brakriver SW 224 Portion 2
		No owner (previously Eskom)	Brakriver SW 224 Portion 3
Ms.	Ellener. L.	Beyleveld	Coega 313 Portion 0
		No owner	Coega 313 Portion 1
Mr.	Warrick	Ofsowitz	Offit Farming Enterprises: Swartekoppen 302 Portion 46
Mr.	Len	Chandler	National Salt Ltd. (Cerebos) Swartekoppen 302
		Labuschagnes Brick Works Pty Ltd.	Welbedachtsfontein 300 Portion 6
Mr.	Jordan	Mann	Nu Way Housing Developments Pty. Ltd Welbedachtsfontein 300 Portion 0; Portion 1; Portion 2; Portion 3; Portion 5; Portion 7; Portion 8; Portion 15
Mr.	Jannie	Tait	Bastia Pty. Ltd. - Welbedachtsfontein Portion 1 (Remaining Extent)
		Quad Inv. Pty. Ltd	Welbedachtsfontein Portion 4 (Remaining extent)
Mr.	H.W.	Lloyd	Owner of Lloyds Brickworks Prop. Trust - Welbedachtsfontein 300 Portion 9
Mr.	Gerhard M.	Pentz	Pentz steenmakery Welbedachtsfontein 300 Portion 10
Mrs.	Estelle	Pentz	Pentz steenmakery Welbedachtsfontein 300 Portion 10
Mr.	Immanuel S.	Wilken	Welbedachtsfontein 300 Portion 12 (Nooitgedachtsfontein)
Mrs.	I.C.	Wilken	Welbedachtsfontein 300 Portion 12 (Nooitgedachtsfontein)
Mr and Mrs.	E. & Wilna P.	Marais	Welbedachtsfontein 300 Portion 13
Mr.	Hendrik L.M.	Roets	Welbedachtsfontein 300 Portion 14
Mr.	Lukas J.J.	du Piesanie	DW Steenmakery - Welbedachtsfontein 300 Portion 16, Portion 17
Mr.	T.J.	du Piesanie	DW Steenmakery - Welbedachtsfontein 300 Portion 16, Portion 17

Title	Name	Surname	Organisation
Mr.	George and Nick	Venter	Master Brickworks trading as Airedale Brickworks: Welbedachtsfontein
Mr.		Robberts	
Mr	Rod des Fountain: Business Unit Manager	Lafarge South Africa (Pty) Ltd.	Property next to Coega Kop on farm Coega
Mr.	Francois	Roux	Swartekoppen 302
Mr.	B.	Bain	Bontrug 301
Ms.	Linda	Redfern	Airdale farm: ECCLES Landscaping & Environmental Services
Mr.	Harold	Coetzee	Interested Party

APPENDIX D:
PLANT SPECIES RECORDED WITHIN THE PROPOSED ALTERNATIVE POWERLINE CORRIDORS

Table D1: Species collected and identified below the existing powerlines in the Bontveld between Grassridge Substation along Alternative A. These species will probably not be cleared during the construction of the new powerline, except immediately under the tower. Those species listed as Protected will require special conservation attention.

Taxon	Family	Status
Aspalathus spinosa	Fabaceae	
Berkheya heterophylla	Asteraceae	
Freesia corymbosa	Iridaceae	Protected under Cape Nature and Environmental Ordinance 19 of 1974
Gladiolus permeabilis	Iridaceae	Protected under Cape Nature and Environmental Ordinance 19 of 1974
Helichrysum anomalum	Asteraceae	
Heliophila subulata	Brassicaceae	
Hertia kraussii	Asteraceae	
Hyobanche sanguinea	Scrophulariaceae	
Lightfootia albens	Campanulaceae	
Lycium sp.	Solanaceae	

Table D2: Species collected and identified in the Mesic Succulent Thicket on the south facing slope overlooking the Coega River, immediately below the existing powerlines along Alternative A. These species may be cleared along the servitude. If clearing does occur, those species listed as Protected will require special conservation attention e.g. transferring to a nursery.

Taxon	Family	Status
Aloe africana	Asphodelaceae	Protected under Cape Nature and Environmental Ordinance 19 of 1974
Asparagus sp.	Asparagaceae	
Azima tetracantha	Salvadoraceae	
Brachylaena ilicifolia	Asteraceae	
Capparis sepiaria var. *citrifolia*	Capparaceae	
Cassine tetragona	Celastraceae	
Clutia daphnoides	Euphorbiaceae	
Colpoon compressum	Santalaceae	
Cotyledon campanulata	Crassulaceae	
Crassula ericoides subsp. *ericoides*	Crassulaceae	
Cussonia spicata	Araliaceae	
Cyrtanthus spiralis	Amaryllidaceae	Protected under Cape Nature and Environmental Ordinance 19 of 1974
Ehretia rigida (Thunb.)	Boraginaceae	
Euclea undulata	Ebenaceae	

Taxon	Family	Status
Euphorbia ledienii	Euphorbiaceae	
Euphorbia mauritanica	Euphorbiaceae	
Felicia filifolia	Asteraceae	
Fockea edulis	Asclepiadaceae	Protected under Cape Nature and Environmental Ordinance 19 of 1974
Maerua cafra	Capparaceae	
Panicum sp.	Poaceae	
Pappea capensis	Sapindaceae	
Portulacaria afra	Portulacaceae	
Putterlickia pyracantha	Celastraceae	
Schotia afra var. *afra*	Fabaceae	
Senecio linifolius	Asteraceae	
Sideroxylon inerme subsp. *inerme*	Sapotaceae	Protected under the National Forests Act 84 of 1998

Table D3: Species collected and identified in the Riparian Thicket along Alternative A. These species will be cleared for the erection of powerline towers and for the preparation of fire breaks.

Taxon	Family	Status
Acacia karroo	Fabaceae	
Albuca nelsonii	Hyacinthaceae	
Eragrostis sp.	Poaceae	
Euclea undulata	Ebenaceae	
Felicia filifolia	Asteraceae	
Gazania krebsiana	Asteraceae	
Helichrysum sp.	Asteraceae	
Hermannia sp.	Sterculiaceae	
Leucas capensis	Lamiaceae	
Lycium oxycarpum	Solanaceae	
Maytenus polyacantha	Celastraceae	
Oxalis sp.	Oxalidaceae	
Pentzia incana	Asteraceae	
Pteronia incana	Asteraceae	
Rhus longispina	Anacardiaceae	
Secamone alpini	Asclepiadaceae	Protected under Cape Nature and Environmental Ordinance 19 of 1974
Sutera sp.	Scrophulariaceae	
Teucrium trifidum	Lamiaceae	

APPENDIX E:
FAUNA SPECIES WHICH ARE LIKELY TO OCCUR WITHIN THE STUDY AREA

Table E1: Large- and medium-sized mammal species which are likely to occur within the study area

Species	Red Data Book status (Smithers 1986)	Notes
Mountain reedbuck (*Redunca fulvorufula*)		Status unknown
Grey rhebok (*Pelea capreolus*)		Has undergone a general decline in numbers in the Eastern Cape (Boshoff & Jennings 1990).
Common duiker (*Sylvicapra grimmia*)		Status unknown, possibly satisfactory
Grysbok (*Raphicerus melanotus*)		Status presently satisfactory
Steenbok (*Raphicerus campestris*)		Status presently satisfactory
Bushbuck (*Tragelaphus scriptus*)		Status probably satisfactory
Kudu (*Tragelaphus strepsiceros*)		Status presently satisfactory
Aardvark (*Orycteropus afer*)	Vulnerable	Status unknown, survey required
Aardwolf (*Proteles cristatus*)	Rare	Status unknown, survey required
Caracal (*Felis caracal*)		Status unknown, possibly satisfactory
African wild-cat (*Felis lybica*)	Vulnerable	Status unknown, survey required
Black-backed jackal (*Canis mesomelas*)		Status unknown, probably satisfactory
Chacma baboon (*Papio capensis*)		Common
Vervet monkey (*Cercopithecus aethiops*)		Common

APPENDIX F:
AVIFAUNA OCCURRING WITHIN THE STUDY AREA WHICH MAY BE IMPACTED BY THE PROPOSED POWERLINES

Table F1: Bird species likely to be impacted on by the permanent powerline installations during operation

Species	Nature	Extent	Duration	Probability	Significance	Status
Grey heron	roosting/pollution	local	permanent	probable	low	not listed
Blackheaded heron	roosting/pollution	local	permanent	highly probable	low	not listed
Black stork	roosting/pollution	regional	permanent	probable	high	near-threatened
White stork	collision	global/migratory	permanent	highly probable	high	near-threatened
Greater flamingo	collision	national	permanent	probable	medium	near-threatened
Lesser flamingo	collision	national	permanent	probable	medium	near-threatened
Secretary bird	collision	regional	permanent	probable	medium	near-threatened
Cape vulture	roosting/pollution	national	permanent	probable	high	vulnerable
Martial eagle	perching/handling	regional	permanent	probable	high	vulnerable
Peregrine falcon	collision	regional	permanent	improbable	medium	near-threatened
Lanner falcon	collision	regional	permanent	improbable	medium	near-threatened
Lesser kestrel	collision	global/migratory	permanent	improbable	medium	vulnerable
Black harrier	collision	regional	permanent	improbable	low	near-threatened
African marsh harrier	collision	national	permanent	improbable	medium	vulnerable
Blue crane	collision	national	permanent	highly probable	high	vulnerable
Stanley's bustard	collision	national	permanent	highly probable	high	vulnerable
Black korhaan	collision	local	permanent	highly probable	low	not listed
Roseate tern	collision	national	permanent	improbable	high	endangered
Damara tern	collision	national	permanent	improbable	high	endangered
Caspian tern	collision	regional	permanent	improbable	high	near-threatened

APPENDIX G:
RESULTS OF MATHEMATICAL MODEL COMPARING THE THREE ALTERNATIVE CORRIDORS

ALTERNATIVE A

Ranking	**2**		**7**		**3**		**4**		**5**		**6**		**1**		**5**							
Environmental Issue	Geology and soils		Flora		Terrestrial fauna		Avifauna		Land use		Visual		Archaeology /historical		Social							
Potential impacts																						
1	2		1		3		1		1		3		2		3							
2	2		1		1		1				3		3		5							
3			5		2		2				3				2							
4					5						2				3							
5					1						2				1							
6					1									1	2							
7					1									1	1							
8					1									1	1							
9					3									1	3							
10					2										3							
11															1							
12															1							
13															1							
14															1							
15															1							
16															2							
17															2							
18															2							
19															1							
20															3							
21															2							
22															2							
23															2							
24															2							
25		1		1		1		1		1		1		1	2							
	4		7		20		4		1		13		5		49							

Questions	2	3	10	3	1	5	2	25
Not app	23	22	15	22	24	20	23	0
Not ans	23	22	15	22	24	20	23	0
N/A	0	0	0	0	0	0	0	0
Total Questions Answered	**2**	**3**	**10**	**3**	**1**	**5**	**2**	**25**
Sum of results	4	7	20	4	1	13	5	49
Rate per area	50.0	58.3	50.0	33.3	25.0	65.0	62.5	49.0
Final business area rate	100.0	408.3	150.0	133.3	125.0	390.0	62.5	245.0

Total alternative score	1,614.2
Percentage score	24%

Worst possible score	**825**
Best possible score	**4125**

ALTERNATIVE B

Ranking	**2**		**7**		**3**		**4**		**5**		**6**		**1**		**5**	
Environmental Issue	Geology and soils		Flora		Terrestrial fauna		Avifauna		Land use		Visual		Archaeology /historical		Social	
Potential impacts																
1	2		1		3		1		1		3		2		3	
2	2		1		1		1				3		3		5	
3			5		2		2				2				2	
4					5						2				3	
5					1						2				1	
6					1										2	
7					1										1	
8					1										1	
9					3										3	
10					2										3	
11															1	
12															1	
13															1	
14															1	
15															1	
16															2	
17															2	
18															2	
19															1	
20															3	
21															2	
22															2	
23															2	
24															2	
25															2	

	4	7	20	4	1	12	5	49
Questions	2	3	10	3	1	5	2	25
Not app	23	22	15	22	24	20	23	0
Not ans	23	22	15	22	24	20	23	0
N/A	0	0	0	0	0	0	0	0
Total Questions Answered	**2**	**3**	**10**	**3**	**1**	**5**	**2**	**25**
Sum of results	4	7	20	4	1	12	5	49
Rate per area	50.0	58.3	50.0	33.3	25.0	60.0	62.5	49.0
Final business area rate	100.0	408.3	150.0	133.3	125.0	360.0	62.5	245.0

Total alternative score	1,584.2
Percentage score	23%
Worst possible score	**825**
Best possible score	**4125**

ALTERNATIVE C

Ranking	**2**		**7**		**3**		**4**		**5**		**6**		**1**		**5**			
Environmental Issue	Geology and soils		Flora		Terrestrial fauna		Avifauna		Land use		Visual		Archaeology /historical		Social			
Potential impacts																		
1	2		1		3		1		1		3		2		3			
2	2		2		1		1				3		3		5			
3			5		2		1				3				2			
4					5						2				3			
5					1						3				1			
6					1										2			
7					1										1			
8					1										1			
9					3										3			
10					2										3			
11															1			
12															1			
13															1			
14															1			
15															1			
16															2			
17															2			
18															2			
19															1			
20															3			
21															2			
22															3			
23															3			
24															3			
25															3			

	4	8	20	3	1	14	5	53
Questions	2	3	10	3	1	5	2	25
Not app	23	22	15	22	24	20	23	0
Not ans	23	22	15	22	24	20	23	0
N/A	0	0	0	0	0	0	0	0
Total Questions Answered	**2**	**3**	**10**	**3**	**1**	**5**	**2**	**25**
Sum of results	4	8	20	3	1	14	5	53
Rate per area	50.0	66.7	50.0	25.0	25.0	70.0	62.5	53.0
Final business area rate	100.0	466.7	150.0	100.0	125.0	420.0	62.5	265.0

Total alternative score	1,689.2
Percentage score	26%
Worst possible score	**825**
Best possible score	**4125**

Ratings

1=Impact of high significance (negative)

2=Impact of

Percentage score

The Alternative with the highest percentage score is the most favourab

moderate significance (negative)

3=Impact of low significance (negative)

4=No impact

5=Positive impact

le alternative