MERCURY – PERSEUS 400 KV TRANSMISSION LINE

DRAFT ENVIRONMENTAL IMPACT REPORT
FOR PUBLIC COMMENT

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EXECUTIVE SUMMARY

INTRODUCTION

PD Naidoo and Associates in association with Strategic Environmental Focus (SEF), as independent environmental consultants, were appointed by Eskom Transmission to undertake the appropriate environmental process for the proposed development of a 400 kV transmission line between Vierfontein and Dealesville in the Free State. The process that was followed complies with Sections 21 and 26 of the Environment Conservation Act (Act No. 73 of 1989, as amended). This is the second stage of the EIA process, which involves a comprehensive environmental impact assessment aimed at evaluating all the significant environmental and socio-economic impacts of the proposed transmission line on the surrounding environment. This report investigated the study area, and evaluated various servitude corridors for the transmission line. A preferred corridor for the transmission line was recommended.

GENERAL PROJECT DESCRIPTION

Eskom proposes to develop a 400 kV transmission line to provide additional capacity to support the 400 kV network supplying the Greater Cape Region south of Bloemfontein. The application entails a proposal to secure the required servitude for the said transmission line in advance, prior to the actual construction of the line. The proposed servitude for the transmission line will be approximately 250 km in length and will occupy about 1375 ha. The underlying philosophy is to develop the transmission line within the selected corridor that takes into account the physical, biological and social environments. To this effect, three feasible alternative corridors within the entire study area were identified. I&APs proposed a fourth alternative during the public participation process. A team of specialists examined all **four** alternative corridors comprehensively to determine which would have the least physical, biological and socio-economic impacts. One of the proposed alternative corridors will be selected as the preferred corridor wherein the 55 m servitude can be negotiated by Eskom.

THE NEED FOR THE MERCURY - PERSEUS 400 KV TRANSMISSION LINE

The additional power is needed to electrify the proposed Coega Industrial Development Zone (IDZ), which is situated in the Eastern Cape Province, 20 km from Port Elizabeth. The Coega IDZ will include commercial and industrial activities, foremost of which is a new aluminium smelter that requires guaranteed energy supply.

The Eastern Cape has a significant unemployment rate, which is observable in terms of the rural and urban population distribution, with statistics indicating that unemployment is greater in some urban areas. There is therefore a need to promote employment-generating initiatives in the region.

To appreciate the need for the new line from a national economic viewpoint, it is necessary to briefly explain the strategic advantages of having a new transmission line to the Eastern

Cape region and the potential long-term impacts of the transmission line through the region. The positive impacts of the transmission line at a regional scale also need to be seen in view of the Coega development.

The Coega IDZ is to be implemented in a phased approach, and will 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 success of these developments proposals 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. The Nelson Mandela Metropolitan Municipality has thus approached Eskom Transmission, in consultation with the Coega Development Corporation (Pty) Ltd (CDC), to provide additional power to supply the proclaimed Coega IDZ and the associated Port of Ngurha.

Eskom as a major role player in the Coega Development Corporation (CDC) plans to electrify the Coega Industrial Zone (IDZ) and its associated port in the Eastern Cape, through the establishment of appropriate infrastructure. Aluminium Pechiney, the potential anchor tenant of the Coega IDZ, has recently confirmed its decision to proceed with the construction of a new aluminium smelter. One of the main criteria in the selection of the final site was the availability of guaranteed energy supply. The operation of an aluminium smelter within the Coega IDZ will require approximately 860 MW of electricity.

The construction of a 400 kV transmission line will not only meet the energy supply requirements of potential Coega IDZ tenants, but will also strengthen the 400 kV network supplying the Greater Cape Region south of Bloemfontein. This will in turn secure South Africa's national electricity grid, and in the long run contribute to national macro-economic growth.

PUBLIC PARTICIPATION PROCESS

A comprehensive public participation process for the EIA was a crucial mechanism that attained several goals. It informed the public and Interested and Affected Parties (I&APs) about the need for the new Transmission Line. The process was also the forum through which issues, concerns, needs and requirements of I&APs were elicited as input into the EIA.

The public participation process was aimed at allowing the public to participate meaningfully and be involved at an early phase of the environmental process right from the Scoping phase and throughout the EIA. Through a process of stakeholder identification and involvement several I&APs were identified and subsequently notified of the project by various means. A number of public focus group meetings and public meetings were held in the main towns within the study area. These meetings were informative and constructive, giving I&APs an opportunity to raise concerns in a small-group environment. These concerns are addressed within this report.

The objectives of the public participation process included:

- The development of a database of key stakeholders and I&APs;
- The facilitation of a focussed public involvement and consultation process to ensure that I&APs contribute meaningfully to the EIA process and share information;
- The investigation of the issues, concerns and corridor alternatives raised by I&APs; and
- To function as an on-going data-gathering exercise that informs the EIA, the specialist studies, as well as the development of mitigation measures.

A Website for the Mercury – Perseus EIA (www@eskom.co.za/eia) was set up and made accessible from 4 April 2003. The Website not only provided background information on the EIA process and the project, while allowing I&APs to register their interest / concerns, but also gave them an opportunity to ask questions and provide comments. Minutes of all public and focus group meetings are also available at this Website.

A Background Information Document (BID) was developed and distributed to all I&APs. The BID was made available at the Open Days, Focus and Public Meetings throughout the EIA. The document contained information regarding the EIA process, the proposed transmission line and the Team of Consultants involved.

Initial Public Meetings

The first Open Day / Public Meeting took place on Wednesday 23 April 2003 at Bultfontein, while the second was conducted on Thursday 24 April 2003 at Bothaville. These meetings were the forum for informing the public of the details of the proposed transmission line as well as giving feedback on how issues raised by members of the public would be addressed in the EIA. Invitations to public meetings were sent to all parties registered on the I&AP database.

Issues Register

Issues and concerns raised by I&APs during the scoping exercise (January to June 2003) were captured in a draft issues register, which was included in Appendix 3 of the Scoping Report (dated 25 June 2003). Comments from potentially affected parties were received from the public throughout the EIA phase of the project. The Issues Register was subsequently updated and incorporated into Appendix A5 of the Draft EIR.

Focus Group Meetings

Several meetings were held in small groups with key stakeholders throughout the EIA process. These meetings were important channels through which first hand information was gathered. They were vital to the process of recommending the final corridor of the transmission line.

Second Series of Public Meetings

A second series of public meetings were held on Wednesday 10 September 2003 in Bultfontein and Thursday 11 September 2003 in Bothaville. These meetings were primarily feedback sessions, reporting on the main findings of the EIA and proposed mitigation measures, as well as providing them with the opportunity to raise queries and / or comments on the EIA.

Public Review of the Draft EIR

The draft EIR is available for public comment for a thirty-day period lasting from the 15th January 2004 to 15 February 2004. It is available in public libraries and information centres within the study area, as well on the Website for the project. The final public meeting to give feedback on the project will be held on 27 January 2004 in Wesselsbron at 14:00, in the NG Kerk Hall

RISKS AND KEY ISSUES IDENTIFIED BY THE DRAFT EIR

Several visits to the study area were undertaken, during which the four alternative corridors were thoroughly examined in order to obtain a detailed understanding of the potential risks and key issues associated with the construction of a 400 kV transmission line. Risks and key issues associated with the construction and operational phases were identified separately, and addressed in consultation with the Interested and Affected Parties, through an internal process based on similar developments, as well as an environmental evaluation based on knowledge of the study area.

The risks and key issues identified included:

- Impacts on agricultural economics (*inter alia*, loss of high-potential arable land);
- Contamination of surface water;
- Destruction and disturbance of riverine habitat;
- Impacts on bird-life;
- Increased surface water runoff;
- Increased erosion along river banks;
- Floral destruction and disturbance;
- Faunal displacement and disturbance;
- Visual intrusion;
- Health, safety and security risks;

- Development on land with a historical value and/or heritage resources; and
- Increased ambient noise levels (during construction only).

These issues were assessed in a cursory way during a site visit conducted by a team of specialists.

IMPACT IDENTIFICATION

Issues were identified for the four proposed corridors in terms of the most important parameters applicable to environmental management. These impacts were discussed in a preliminary way to obtain an overview of the issues associated with each alternative corridor in the Scoping phase. The most suitable corridor was determined and is defined as that with the least possible cumulative impacts, or the most manageable impacts, on the environment.

Any corridor chosen for the proposed transmission line has the potential to substantially impact on the site and its adjoining land-use. The most significant negative impacts identified thus far have to do with the likely alteration of the ecology of numerous pans in the area; increased erosion and surface water runoff; demarcation of the servitude and consequent loss of arable land; visual intrusion; and impacts on bird life and the loss of flora and fauna. Other negative impacts include the loss of historical land and heritage resources. The remainder of the impacts are considered to be of low significance and not detrimental to the environment. These impacts have been assessed in sufficient detail to enable a decision on the project to be taken. Mitigation measures have been proposed, which are project-specific and effective enough to reduce the impacts.

AGRICULTURAL ECONOMIC IMPACT ASSESSMENT

Minnaar Consulting Services, Pretoria, undertook an assessment of the agricultural economic impact of erecting the 400 kV transmission line along various corridors in the study area. The terms of reference for the investigation were as follows:

To conduct an agricultural economic study of the area in order to address the following for the construction and operational phases:

- The economic impact on the farming activities,
- The economic effect on fertilization and spraying of pesticides,
- The economic impact of the access roads associated with the transmission line on farming activities,
- Safety hazards to workers on irrigation lands such as handling of movable irrigation pipes,
- Safety hazards to operators of harvesting machines and other agricultural equipment,

- Fire control near transmission lines (must correlate with information received from Eskom),
- Training needed for farmers and farm workers on all aspects regarding their approach to high currency transmission lines, and
- The potential impact of herbicides and herbicide application activities below or near the transmission lines on the production of crops and animals.

The study area consists of varying land-use patterns with divergent profit-yielding potentials. Due to the lack of formal agricultural economic parameters in South Africa for the assessment of the potential impact of a transmission line, international data was researched to obtain an overview of the key factors to be considered. A number of concepts were formulated which were used to compile a set of useful parameters that could also be used for similar assessments in South Africa in future. A number of factors were listed that should be borne in mind when the final choice of the preferred corridor is made. These factors could have a serious impact on the long-term sustainability of farming and other activities.

The four proposed corridors were evaluated based on a matrix of factors, and weights were allocated to each factor to determine the potential impact of the proposed transmission line. From an agricultural economic perspective, if Corridor 2 is modified, it could be the best of the four proposed corridors. This is because it follows existing infrastructure such as railway lines, roads and transmission lines. This alternative is proposed despite the fact that the centre of the servitude for high voltage transmission lines needs to be located 95 m away from the centre line of main roads. It is believed that following this corridor would have the least economic impact on the agricultural sector and communities in the study area. The refinement of the exact corridor should be done on a micro-scale for the whole corridor. For this purpose the satellite images prepared for this study could be a useful tool.

SOCIO-ECONOMIC IMPACT ASSESSMENT (SIA)

Prof Dirk Groenewald of University of the Free State conducted a Socio-economic impact Assessment (SIA), which sought to outline the key social impacts of erecting the 400 kV transmission line along various corridors in the study area. The terms of reference for the assessment were as follows:

Conduct a desk-top investigation of the study area in order to:

- Develop a social profile of the study area along the proposed Mercury – Perseus 400 kV transmission line by assessing its social characteristics;
- Describe the key social problems, issues and trends.
- Evaluate the planning aspects related to the proposed transmission line (e.g. current and, where possible, future ownership over surrounding land and related land uses).

- Identify and assess the potential impacts of the proposed development on the local economies along the Mercury – Perseus transmission line, e.g. loss of land use income, impact on existing tourism infrastructure and tourism potential, and economic impact if secured servitude is ultimately never developed.

- Identify socio-economic impacts on housing developments, both formal and informal, where applicable.

- Assess the potential economic impacts of construction, operation and maintenance of the proposed transmission line on the local economy (including an analysis of the potential for social upliftment, influx of job-seekers, change in level of income, job creation possibilities, etc.).

- Evaluate the social and economic impacts of locating the construction sites and camps in close proximity to existing settlements and on farm land (agricultural, cattle and sheep farming, game farming), with particular attention to issues of security, crime, poaching and spread of diseases (e.g. HIV/AIDS).

- Recommend mitigation measures to ameliorate the potential negative social and economic impacts and enhance the positive impacts.

Although the transmission line will not directly supply power to any of the small towns along the corridor, it passes through an area that contributes significantly to the agricultural sector in South Africa. In addition there are several tourism related initiatives aimed at attracting travellers to the area and its local towns. Many of the towns in the region provide both services to the surrounding agricultural population and tourism attractions such as game park visits, historical and cultural experiences and the sale of local crafts and handwork. The primary land-use is extensive crop farming, with areas in the south of the study area being used chiefly for grazing Although this area was once targeted primarily for gold mining and maize cultivation, the emphasis of the new national and provincial government includes tourism as part of the strategic planning for this region. On suitable soils crops are grown under centre pivots and other forms of irrigation.

At a local scale, the new 400 kV line Transmission will have a number of socio-economic impacts on the lives and means of livelihood of several farming communities in the Free State.

To assess the local-scale impacts, baseline socio-economic data and demographics of the study area were investigated. The activities of several dozen (at least 76) farms in the area will be affected. Approximately 2000 black adult farm workers live and obtain their livelihood from within the study area. About 2500 black children could also be affected; these children depend on close to 1000 bread-winners, female adults being about 800. The average age of these groups of workers is 34, which is considered to be the prime working age group. The transmission line will affect over 200 white adults (including farmers, landowners and their associates). This group supports 114 white children directly, and is indirectly responsible for the sustenance of all the black children who depend on the proceeds from their farms. The

average income of a black farm worker is R811. From the data, it can be expected that the proposed transmission line could have negative socio-economic impacts on the lives of numerous people in the affected communities, if caution is not exercised during the project.

The recommendations of the SIA which should be implemented during the construction phase of the development, as part of the EMP, include:

- Locating construction camps in areas that are close to townships with high unemployment rates rather than on privately owned property for reasons of safety and security;
- Landowners suggested that construction camps be erected near the townships where medical, shopping and other facilities are available;
- When employing construction workers from the nearby the townships; it is suggested that the local people be given preference;
- Construction camps must implement measures to curb the spread of sexually transmitted diseases, such as HIV/AIDS etc.;
- Security and access control during construction;
- Clearly-demarcated vehicle access corridors and
- Final compliance auditing of all aspect of the EMP relating to the social environment.

The socio-economic impacts of the line will only be observed once construction of the line commences and once it becomes fully operational. It is, however, possible to predict in general (irrespective of the chosen corridor) what the potential impacts during the construction phase could be. In practical terms, the actual impacts of the line on the daily lives of people in the study area will only be observable once the line has been built and the spin-offs (both positive and negative) begin to unfold. However, mitigation measures have been recommended, which could alleviate any negative impacts.

Few mitigation measures can be suggested as the main concern of the affected parties relates to the economic impact, specifically to the devaluation of their properties and the loss of crops, with negative economic implications, not only for the nearby future, but also in the long-term. Permanent loss of income is likely but cannot be determined now.

The SIA does not contain any fatal flaws, although further social issues of a more local nature will need to be documented and investigated by Eskom Transmission's negotiator and, if required, further social investigations may need to be undertaken. The SIA accurately reflects the concerns and key issues of stakeholders and has provided recommendations to mitigate any anticipated negative impacts, while enhancing positive impacts.

CULTURAL HERITAGE RESOURCES

Dr Johnny van Schalkwyk of the National Cultural History Museum in Pretoria compiled the report on cultural heritage impacts. The terms of reference for the assessment were as follows:

Conduct a desk-top investigation of the study area in order to:

- Identify possible archaeological, cultural and historic sites within the proposed corridors of the Mercury – Perseus 400 kV transmission line;
- Evaluate the potential impacts of construction, operation and maintenance of the proposed development on cultural, recreational and religious resources; and
- Recommend mitigation measures to ameliorate any negative impacts on areas of archaeological, cultural or religious importance.

The report deals with the cultural heritage that may be affected by the proposed Mercury-Perseus 400kV electricity transmission line. As such it covers a long period in time (c. 200 000 years), and includes a variety of cultural expressions, which gave rise to a diverse range of heritage resources.

Based on existing information, it can be shown that some areas have a higher density of archaeological sites than others: the north-eastern section of Corridor 1 and, to a lesser extent, the south-western section of Corridor 3. Based on this, it is anticipated that Corridor 1 would have the least impact, as there are no known heritage resources involved.

However, other environmental factors must also be considered. From a cultural heritage point of view, the overall impact on any of the four proposed corridors is considered to be low, in contrast, for example, to a road or a pipeline. In areas where sites do occur, it would be possible to lessen the impact by the application of suitable mitigation measures. It is therefore recommended that the proposed development can continue in any of the four corridors, on condition of acceptance of the recommendations/management measures as set out in Section 7 of this report.

TOURISM SPECIALIST STUDY

This area of the western Free State, rich in both cultural and agricultural history, has the potential to contribute to the growth of tourism in South Africa, and in particular the Free State. The tourism specialist report aimed to identify this tourism potential and key tourist attraction sites within the study area, and to investigate future tourism development plans, which will inform proposals for alignment of the transmission line through the area. Once the impacts were described, recommendations were made to minimise negative impacts on tourism.

Relevant legislation was reviewed. The trends for tourism development for the study area were identified from draft Lejweleputswa District Municipality IDP documents. Individuals involved in tourism development within the study area were interviewed. DTEEA lists of game farms, conservancies and nature reserves were verified through consultation with Department officials, and local landowners. A map depicting these protected areas was compiled using this information, and each was rated in terms of conservation value based on discussion with DTEEA officials.

Based on this information, the tourism potential of the area is described and possible impacts of the proposed development on this tourism potential are identified. Nature reserves, conservancies and game farms were delineated on a map from a list obtained from Free State DTEEA office, and in conjunction with corrections suggested by landowners during the public consultation process.

Impacts on flora and fauna, noise impacts and visual impacts have indirect impacts on tourism in the area. These impacts have been covered in the following sections: Ecological Impact Assessment, Visual Impact Assessment, Impact on Birdlife and Impacts on Aquatic Resources. It is recommended that intersection of the transmission line alignment with protected areas categories 3 and 4 (Nature Reserves and National Parks) be avoided. Categories 1 and 2 (Game Farms and Conservancies) represent locally protected areas that may be intersected by the transmission line, but only in the event that landowners are adequately consulted, and where agreements with Eskom include costs of relocating animals and infrastructure.

Bothaville is the centre of tourism in the area. It is recommended that construction within the Bothaville area not take place during the annual NAMPO Festival (18 – 21 May). This festival attracts the majority of domestic and foreign tourists, and construction of transmission line would have a significant impact on visitors. During October, Bothaville becomes the venue for the Witblits Festival, and this should be taken into consideration during construction.

VISUAL IMPACT ASSESSMENT (VIA)

The VIA was undertaken in-house by the Landscape Architecture and Graphics Unit of Strategic Environmental Focus (Pty) Ltd. The terms of reference for the assessment were as follows:

- The primary goal of this specialist study is to identify potential risk sources resulting from the project that may impact on the visual environment of the study area, to assess their significance, and to recommend a preferred corridor.

- The visual environment, the project components, the potential risk sources associated with the project components and their assessed impact on the visual environment were investigated by examining the following visual aspects:

- Genius Loci (Sense of place),
- Visual Quality (Aesthetics),
- Landscape Character,
- Surrounding Landscape Compatibility,
- Scale,
- Visual Absorption Capacity (VAC),
- Visibility (viewshed and viewing distance), and
- Critical Views.

The study area is considered to be largely homogenous in terms of visual character and can be divided into three main landscape types: “grasslands”; “cultivated lands”; and “Acacia flood plains”. These three landscape types were digitised using 1:50 000 topocadastral plans, and are illustrated in Figure 4.1 of the VIA.

The sensitivity to visual impacts for each segment of each of the proposed corridors was assessed in terms of the visual aspects listed above. The Acacia flood plain landscape type that occurs within the flood plain of the Vet and Vals rivers was highlighted as a particularly sensitive visual environment.

The proposed Mercury - Perseus 400 kV Transmission Line was divided into six project components. The assessment of the risk sources of each proposed corridor considered the projects components comprising the corridor, the phase during which certain impacts were likely to occur, as well as the linear extent of each component and of the entire corridor.

The transmission line is considered to pose the greatest potential risk of visual impact during both the construction and the operational phases due to its height and metallic, industrial aesthetic.

The clearing of vegetation either for access roads or within servitudes to manage the risk of damage due to fire presents is considered to pose a potentially great risk of visual impact during both the construction and the operational phases mainly within the river flood plains.

The establishment of construction camps, lay-down areas and housing poses a potential risk of visual impact during the construction phase in terms of critical views from main roads and places of gathering such as urban centres, schools and other public recreational and institutional areas.

An assessment of the potential visual impacts for each of the corridors was carried out by means of a rating matrix, presented in Table 6.1 & 2 of the VIA report. The basic assumption followed is that the risk associated with a project component increases in direct proportion to the linear extent in kilometres of that component. This assumption implies that for the four

proposed corridors, where all else is equal, the risk of visual impacts is greatest for the corridor with the greatest length.

Preferred Corridor from a Visual Perspective

An assessment of the potential visual impacts for the fourth proposed corridor was added to the rating matrix, see Tables 6.1 & 6.2: Impact Assessment Matrix in the main VIA report. A comparison of the three initial corridors proposed with the latest proposal shows that the new proposed corridor is the preferred option. The reasons can be summarised as follows:

- This corridor is shorter than 2 or 3 and only slightly longer than corridor 1;
- A significant portion of the corridor passes through grazing farmland away from main roads thereby greatly limiting potential critical views;
- A second significant portion follows the R59 through cultivated lands with low visual quality and landscape character along an existing disturbance corridor which offset the critical views that would be experienced along the R59; and
- The proposed Corridor 4 is redirected along an existing railway line north of Bothaville through numerous rows and stands of mature gum and pine trees, thereby reducing critical views along the length of the R59.

The results of the assessment indicate an order of preference for the proposed corridors as:

1. Proposed Corridor 4 (slightly longer than Corridor 1 passing east of Hoopstad)
2. Proposed Corridor 1 (shortest corridor passing west of Bultfontein across farmland and away from roads);
3. Proposed Corridor 2 (corridor passing to the east of Bultfontein and alongside the R719); and
4. Proposed Corridor 3 (the longest corridor extending some distance to the west of Bultfontein).

Recommended Mitigation

The potential visual impacts that may result from six project components would each require a different set of management objectives and mitigation measures due to their differing scale and nature of risk. A comprehensive list of recommended management objectives and mitigation measures for each project component are outlined in Section 7 of the VIA. Some of these measures include:

- Avoiding natural features such as elevated ridges and koppies and pans that could be considered as visual assets and therefore have the potential to be utilised for passive tourist related activities;

- Providing for a minimum buffer of 250 m or 5 times the height of the towers between the corridor and any of these natural features; a greater distance should be considered around larger locally unique features;
- Where practical, the corridor of the transmission line should run parallel to existing lanes and stands of mature gum and pine trees, which will serve either as a screen or camouflaging backdrop; and
- The flagged corridor should be investigated for potential local re-alignment to further reduce visual impacts etc.

Monitoring programs have been proposed for the construction and operational phases of the proposed transmission line.

The construction and operation of the proposed Mercury - Perseus 400 kV Transmission Line will result in visual impacts within the study area. The significance of these impacts without mitigation will be high due to the relative scale of the structures and the high visibility within the study area. These impacts will last for the entire operational life of the transmission line.

However should the mitigation measures and monitoring programs recommended in this study be implemented the significance of these impacts can be reduced to an acceptable level.

ECOLOGICAL IMPACT INVESTIGATION

CEBO Environmental Consultants CC undertook a study on the potential ecological impacts of the transmission line. The terms of reference for the investigations were as follows:

Identify possible impacts of the proposed Mercury - Perseus 400 kV transmission line will have on vegetation and fauna in the study area by:

- Identifying and mapping the habitats along the corridor of the proposed transmission line and their species composition;
- Identifying the possible presence of rare, endangered and endemic species;
- Recommending methods to salvage plant species for re-vegetation as well as economically important species, where appropriate;
- Recommending mitigation measures to ameliorate the negative impacts of the proposed development on the natural environment;
- Identifying areas proclaimed for nature reserves and mapping them, so they can be avoided by the final corridor of the transmission line, where possible;
- Evaluating the impacts of the associated transmission line infrastructure (temporary access roads, etc.) on plant and animal communities;

- Recommending mitigation and salvage procedures for identified species as well as recommendations for specific rehabilitation of particular areas to be included in the Environmental Management Plan;
- Identify what possible impacts the proposed development may have on the fauna;
- Identify and map habitats susceptible to degradation ("sensitive areas") as a result of disturbance;
- Identify and map habitats with particularly high species diversity along the proposed corridors for the transmission line;
- Identify and map ecological communities of conservation, scientific, cultural and educational value, if any; and
- Evaluate the potential impacts of the proposed developments on subterranean fauna (e.g. burrowing animals).

The vegetation along Corridor 4 cuts through a number of major plant communities. They are the Dry Sandy Highveld grassland on red sandy soils, Grassy Pan Veld clayey soils around pans, Karroid Panveld on calcrete outcrops, Floodplain grassland on deep clayey soils next to streams and rivers, *Acacia karroo* shrub on clayey soils along streams and rivers, Riparian shrub on stream and riverbanks, Seepage areas and Wetland communities, and remnants of Kimberley Thornveld.

About 60% of this corridor crosses croplands. Very few patches of natural veld remains in these cultivated areas. The remaining 40% of natural veld are also under pressure of grazing by domestic animals and game. In certain areas the vegetation is in a degraded state due to overgrazing and trampling etc.

Corridor 4 would not affect the vegetation negatively except for those areas where access roads, construction camps and the footprints of the structures will be constructed. No Red Data plants or endemics were found in the recommended corridor.

As far as the terrestrial mammals are concerned no permanent negative impacts were identified. These animals are nomadic and could easily move around.

Recommendations are made to assist in mitigating the environmental impact of the proposed development. These should be included as conditions of approval.

IMPACTS ON BIRD-LIFE

The impacts on bird-life were investigated by the Endangered Wildlife Trust. The terms of reference for the assessment were as follows:

Conduct an assessment of the environment and complete a desk-top investigation of the study area in order to:

- Identify possible effects that the transmission lines may have on the migration of birds;
- Identify the impact that the transmission lines may have on the breeding habits of birds;
- Identify any endangered bird species; and
- Recommend effective mitigation measure to reduce any negative impacts on bird-life.

Bird-transmission line interactions can either be direct interactions, in which the bird comes into physical contact with the transmission line infrastructure, or indirect in which the transmission line infrastructure in some way impacts on the bird without coming into direct contact with it. Typically, direct interactions take the form of birds colliding with or being electrocuted on the infrastructure, or using it for nesting, roosting or perching. Indirect interaction is disturbance or habitat destruction as a result of activities relating to the construction or maintenance of the transmission line. Although these activities do not necessarily kill birds, they may impact negatively on birds.

This study area overlaps substantially with six half-degree squares. The total number of bird species recorded for each square ranges from 194 to 268, with a total of 39 transmission-line-sensitive Red Data species recorded in the study area.

The potential exists for direct interaction in the form of collision of birds with the earth wire of the proposed line, as well as indirect interaction in the form of habitat destruction and disturbance. Of the eleven bird micro habitats identified, the above interactions will be most pronounced in three of the untransformed habitats, namely, the wetlands & ephemeral pans, grassland and riparian habitats, and one transformed habitat namely Lucerne fields (collisions).

Preferred Corridor from a Bird Impact Perspective

An analysis of the sensitivity of the four proposed corridors revealed that the corridor with the lowest bird sensitivity score is Corridor 4; it is the least sensitive corridor from a bird impact perspective. This means that of the four corridors, Corridor 4 is likely to have the least impact on the bird species, and it is therefore recommended as the proposed corridor.

This transmission line will have an impact on the bird species in the area. However, by selecting the proposed corridor and implementing the mitigation measures suggested in the bird impacts study, impacts can be reduced to an acceptable level.

Recommended Mitigation

Mitigation for the collision impact will involve the installation of Bird Flappers on the earth wire on sections of line traversing sensitive bird habitats. Mitigation for the disturbance and habitat destruction will involve minimising construction and maintenance activities within the

natural habitats as far as possible, and ensuring that activities along the full length of the transmission line conform to stringent environmental management principles.

Collisions

- On all sections of transmission line passing through Grassland, the earth wire should be fitted with Bird Flappers
- Every effort must be made to avoid Wetlands and Ephemeral pans. If that is not feasible, all sections of the transmission line passing through or within 500 metres of Wetlands and Ephemeral pans should be fitted with Bird Flappers on the earth wire.
- All sections of the transmission line crossing rivers and the adjacent Riparian habitat should be fitted with Bird Flappers on the earth wire.
- All sections of line passing through or within 500 metres of Lucerne fields should be fitted with Bird Flappers on the earth wire.
- If Corridor 4 is used, the section of line next to the Bloemhof Dam (about 10 km) should be monitored once a year for at least five years through physical inspection to determine if collisions are taking place.

Habitat destruction

- Destruction of grassland during construction and operation should be kept to a minimum.
- No destruction of Wetlands and Ephemeral pans during construction and operation should be allowed. In particular no vehicles should be allowed to drive through or across wetlands or pans.
- If Corridor 4 is used, destruction of sensitive shoreline or the adjacent Kalahari Thornveld must be avoided.

Disturbance

- The activities of the construction and operations staff must be restricted to the servitude and immediate surrounds. Under no circumstances must birds be exposed to more disturbance than is inevitably brought about by construction and operations activities. Potential trapping and hunting of wild birds by construction crews must be strictly forbidden.

ENGINEERING GEOLOGICAL STUDY

This Engineering-Geological study was undertaken by Knight Hall Hendry (Pty) Ltd, Pretoria. The terms of reference for the assessment were as follows:

To report on the aspects such as geology, geomorphology and soils, but more specifically on the geo-technical aspects relevant to the project such as ground stability and soil erodibility. The study entailed the following:

- Compiling the relevant information, including the geological and soil maps;
- Interpretation of stereo-pair aerial photography; and
- Interpretation and presentation of results in a report, including a final engineering-geological map which will indicate all soil zones, which may be influenced or affected by the positioning of towers, viz. unstable ground, seasonally or permanently waterlogged areas (wetlands), heaving, potential for ground water pollution.

From observations of the four proposed corridors, it appears that Corridor 3 may present a problem due to the extensive presence of salt pans from Dealesville to Hoopstad. Salt pans also occur along Corridor 1, but appear to be limited to the section between Dealesville and Bultfontein and generally of relatively small extent.

Several large salt pans were also observed along Corridor 2 between Dealesville and Wesselsbron.

From the above it appears that Corridor 2 and Corridor 3 may not be feasible due to the difficulty to avoid numerous salt pans along a major portion of the corridors, i.e. Dealesville to Wesselsbron.

Due to the limited presence of the salt pans along Corridor 4, in comparison to Corridors 1, 2 and 3, Corridor 4 appears to be a feasible option. The other geo-technical aspects, such as collapsible grain fabric, active clays and dispersive soils are common to all the corridors and do not play a significant role at this stage with regard to corridor selection.

This initial engineering geological assessment was, however, based on visual observation of the four corridors. A site walkover and a geo-technical investigation should be conducted to properly assess the feasibility of these corridors for the proposed Eskom transmission line once the final servitude has been established. Aerial photograph interpretations should form part of the next investigation phase, from which the various land forms, drainage features and distribution of pans can be indicated on a topographical map as part of the preparation of an engineering geological map of the corridors.

IMPACTS ON SOILS AND LANDFORM

Pedo Plan International Consultants undertook an assessment of the impacts on the soil-landform resources of the Mercury - Perseus Transmission Line. The terms of reference for the investigation were:

To conduct a desk-top investigation of the soils and landform in the study area in order to:

- Provide a description of the topography of the area crossed by the proposed transmission line, i. e. slopes, river crossings, valley crossings, etc. Identify impacts that the topography would have on the project;
- Identify sensitive soils along the proposed alternative transmission line corridors; and
- Evaluate the impact of the proposed transmission line on the soil types specifically with respect to stability and erodibility.

As information base, the land type maps (scale 1:250 000) and accompanying memoirs covering the survey area were used. Aspects on the soils, landform and climate were derived from the land type survey, whereas topographic and other geomorphological data were obtained from the 1:50 000 topographical maps.

It must be clearly stated that the land type information is for broad-scale assessment purposes only and that the siting of towers and construction camps, for example, will require studies at the detailed level.

In general, five broad soil-landform systems related to parent material and topography can be distinguished. These are freely drained, red and yellow-brown, fine sandy soils on level topography; fine sandy to loamy soils in plinthic catena on level topography; duplex soils with reddish subsoils on level topography; duplex and other clayey soils of mainly bottomland sites; and very shallow and rocky soils overlying calcrete and hard rock associated with steeper slopes in places. Pans are features of some of these broad systems. Since pans are regarded as unique features of the landscape, they were given special attention in this study.

The process of assessment of land suitability was conducted using the soil, slope and climatic parameters for agricultural uses, and soil and slope only for non-agricultural uses.

To rate land for agriculture, the land capability system was employed. This rating system indicates the most important attributes limiting the suitability. Class II (moderate - high) and class III (moderate) contain land with arable potential. Of these, areas associated with land types Bc and Bd and occurring solely north-east of Wesselsbron have the higher potential because of the soil pattern and climate with a higher rainfall. The area south-west of Wesselsbron contains land with a capability of III interspersed with land normally not suitable for cropping.

Suitability classes for uses such as foundations, roads and camping ground are summarised in Table 4.3 of the Soils Report. Due to the swell-shrink properties of subsoils of the duplex component and other associated clay soils, the suitability for foundations is poor. Furthermore, the fine sandy and clayey materials have a moderate suitability as roadbed support, whereas some land types, due to a flooding hazard and extreme topsoil textures limit their suitability as camp sites.

Soil erosion and soil contamination are two impacts that would be particularly noticeable in the construction phase.

The main activities that constitute risk sources arising during the construction phase include:

- Clearing of vegetation for the installation of the transmission line towers.
- Clearing of areas for camp sites.
- Construction of temporary access roads; and
- Disturbance of unstable or erosion-prone soils for founding of towers.
- Wind erosion.

The impacts identified include:

- All fine sandy soils (<15% clay) are prone to wind erosion when dry and devoid of vegetation during periods of high wind activity;
- All fine sandy soils (<15% clay) are susceptible to compaction, especially when wet
- Water erosion - clayey and duplex soils of land types Db and Dc are susceptible when exposed;
- Disturbance of steep river banks with loamy and clayey soils could lead to water erosion;
- In areas with pans, disturbance of surface materials could lead to wind erosion;
- In valley bottoms and wetlands destroying the ecological and hydrological balance could lead to water erosion. For instance, placing towers in valley bottoms and wetlands of the north-eastern portion could lead to water erosion.

Several potential impacts associated with the soil-landform resources are foreseen. Due to the flatness of the land surface, the landform has no apparent impact on the project. In reality, the few koppies in the south-western portion will most probably be of benefit by masking the visibility of towers to a limited extent. On the other hand, the fact that the principal rivers in the study area could be traversed by the proposed corridors, and the presence of only a limited number of wetlands in the northeast, implies that the significance of impact of the final servitude on the landform will generally be low.

As regards the soil component, impacts such as wind erosion, compaction, and water erosion will probably occur during the construction phase. The significance of all these impacts will be low to medium or medium without mitigation, and low with mitigation. Soil

compaction will also be evident during the operation phase (maintenance) with similar results for the construction phase.

Class II and to a lesser degree class III land may be, in a certain sense, considered as prime agricultural land, and should ideally be protected for cropping purposes. Any non-agricultural use such as the construction of transmission lines will therefore have a negative impact on the production potential of an area. The final servitude in the survey area is bound to cross arable land, the significance of the impact is regarded as low to medium without mitigation, and low with mitigation. Effective mitigation can be achieved by careful selection of the servitude at a detailed level. In summary, a transmission line will only affect very limited areas of the landscape.

The impact on the environment around pans is mainly in the form of possible disturbance of valuable sites around the margins, as well as wind erosion of pan floors. The significance of these impacts is regarded as low with and without mitigation.

Several other management/mitigation measures have been recommended which will result in a measurable reduction of impacts. These include sealing of roads to prevent wind erosion, rip compacting of areas, avoiding unnecessary flow of traffic and wetting soils to combat compaction, construct soil conservation measures to limit water erosion, and avoid construction of transmission lines across or in close proximity to pans.

With the available information, it is not possible to ascertain the best routing from a soil-landform perspective. Due to the unique distribution of the soil-landform resources, no one of the proposed corridors (1 - 4) or variations thereof (a - c) is a better corridor in comparison to impacts it may have. All corridors also cross potential arable land (classes II and III) to the same degree. Furthermore, any viable alternative would be confronted by the same spatial distribution of natural resources.

Various exercises have been recommended to monitor soil erosion during the construction phase and to see whether ripping was effective after construction and operation phases. Particularly, the monitoring of crop yield in the areas affected during the different phases is recommended.

IMPACTS ON AQUATIC RESOURCES (SURFACE WATER AND WETLANDS)

This study was undertaken in-house by the Specialist Unit of Strategic Environmental Focus (Pty) Ltd. The purpose was to assess the wetlands / surface water resources found along the alternative corridors of the Mercury - Perseus Transmission Line. The terms of reference for the assessment entailed:

- A description of the status quo of the wetlands / surface water resources;
- Identification of sensitive / unique wetlands / surface water resources;
- Identification of potential impacts on these wetlands / surface water resources;

- Identification of mitigation measures to preserve these wetlands; and
- Recommendations regarding the most feasible corridor that will result in the least impacts on the surface water resources.

This study investigated the surface water resources and wetlands that may be affected by the four alternatives corridors. The study area is characterised by various surface water resources. The following wetland types are found within the study area:

- Endorheic pans;
- Riverine wetlands;
- Palustrine wetlands;
- Man-made wetlands.

Endorheic pans are important feeding and breeding habitats for various birds, amphibians and invertebrates. These unique habitats need to be preserved, due to the important role they play in the landscape. For this reason, it is recommended that the transmission line should be located as far as possible from any pans. In the event that the transmission line is to cross a pan, this pan should be subject to a specialist aquatic and bird impact assessment.

Various rivers and streams (both permanent and ephemeral) will be crossed by the different corridors. The crossing sites range from areas with substantial floodplains and riparian zones, to areas characterised by human impacts, resulting from agricultural activities, the presence of bridges and other transmission lines. Palustrine wetlands that will be crossed are mostly found in association with rivers and streams.

Man-made wetlands, although being habitats for waterfowl, are less important than the natural wetlands in the study area. The impacts on these wetlands would therefore be the least significant.

The construction and operation of this transmission line would have definite impacts on the surface water resources found in the study area. The significance of these impacts would vary from low to medium. The most significant impacts would be related to surface water pollution, erosion, faunal and floral disturbance. Of particular importance is the possible collision of birds with the transmission line, especially in the vicinity of endorheic pans, rivers, streams and associated floodplains. These wetlands function as important feeding habitats for water birds.

All the anticipated impacts can however be effectively mitigated. These mitigating measures should be incorporated into an Environmental Management Plan (EMP), which should be made binding on the client, contractors, subcontractors and their personnel. It is also recommended that the EMP should include an auditing programme for the construction and operational phase.

An analysis of the alternative was based on the following aspects:

- Number of sensitive wetlands found in close proximity of each alternative;
- The length of the different alternatives;
- The environmental status quo associated with the different corridors.

Based on the above aspects Corridor 4 is recommended as the preferred option.

TECHNICAL SPECIFICATIONS OF THE TRANSMISSION LINE

The EMF report prepared by Trans-Africa Projects, details the predicted values for Audible Noise (AN), Radio Interference, Electric and Magnetic Fields (EF and MF respectively) predicted for the Mercury-Perseus 400 kV transmission line.

Structural details of the 400 kV transmission line, are provided in Table 1 below. The type of towers to be used will range from self-supporting to compact cross rope structures, depending on whether or not the line needs greater support, for instance at a bend point. Single monopole structures are also being developed, but these may not be available by the time the development is approved.

Table 1: Technical Specifications of the Mercury – Perseus 400 kV Transmission Line.

Type of Line	Approximate Length	Types of towers	Servitude Required (m)	Tower Spacing (m)	Tower Height (m)	Conductor Type	Conductor Attachment Height (m)	Minimum Clearance of Conductor (m)
Extra-high voltage-400 kV	250 - 300	Several types are possible (see section 3.3.3.1)	55	420	25 - 50	Not finalised	18 - 33	8.1

ELECTROMAGNETIC FIELDS (EMF)

The following is a summary of electromagnetic effects that are usually associated with high voltage transmission lines built by Eskom. These effects can be either ionising or non-ionising in nature. The specific values predicted for the Mercury – Perseus 400 kV transmission line were predicted based on knowledge of the effects of high voltage transmission. The structure used for the analyses was the Compact Cross-Rope tower and the bundle configuration was 3Xtern. For comparative purposes, references to internationally accepted limits are provided in Table 2, and the predicted values for the Compact Cross Rope tower are in Table 3.

Ionising effects (Corona)

The major effect of corona is a broadband audible noise that can vary significantly with weather conditions and altitude. The predicted limits are for both fair weather and rain for a noise level exceeding the limit 50% of the time (L50). The maximum Audible Noise (AN) allowed in international high voltage networks is 52.5 dB(A) The maximum predicted noise level for the Mercury – Perseus 400 kV transmission line is 45.3 dB(A); this value improves to 30.3 in fair weather conditions.

Non-ionising effects (Electric and Magnetic Fields)

Presently, the consensus among international bodies concerned with research on the effects of power frequency in electric and magnetic fields is that there is insufficient evidence on their harmful effects.

Most of the electric utilities in the world adhere to the limits recommend by the World Health Organisation (WHO) and by the International Radiation Protection Association (IRPA). The maximum values recommended by IRPA are shown in Table 2 below:

Table 2: International Radiation Protection Association Recommended EMF Limits

EXPOSURE CHARACTERISTICS	ELECTRIC FIELD STRENGTH	MAGNETIC FLUX DENSITY			
	(Kv/m)	mT	□T	mG	Gauss
OCCUPATIONAL					
Whole working day	10[a]	0.5	500	5000	5
Short term	5[a]	5[b]	5000	50000	50
For limbs	-------	25	25000	250000	250
GENERAL PUBLIC					
Up to 24 hours per day[c]	5	0.1	100	1000	1
Few hours per day[d]	5	1	1000	10000	10

[a] The duration of exposure of fields between 10 and 30 kV/m may be calculated from the formula t≅80/E, where t is the time of exposure in hours/work day and E is the electric field strength in kV/m.

[b] Maximum exposure is 2 hours/day.

[c] This restriction applies to open spaces in which members of the general public may reside in for a substantial part of the day.

[d] These values can be exceeded for a few minutes per day provided precautions are taken to prevent indirect coupling.

[e] Eskom adopted maximum value for any length of exposure

Table 3: Predicted EMF Values for the Compact Cross-Rope Suspension Tower Option.

	EF Prediction	**MF Prediction**	**AN Prediction L50 Dry**	**AN Prediction L50 Rain**
Maximum Values	1.701	0.00915	30.3	45.3
Servitude Edge	0.248	0.00214	26.9	41.9

The values predicted for the prospective line have been compared with the values observed by Eskom, and those recommended by international organizations (IRPA, NIRPA) for the design of High and Extra High Voltage transmission lines. Table 3 shows that the values for points of interest (edge of servitude) will be well below those observed by Eskom. It could happen that the structure and conductor selected for the analyses may differ from that used in the final design. The final selection will however be subject to the same stringent analysis in terms of environmental conditions as used for this evaluation.

From these preliminary evaluations it does not seem likely that there will be interference with the communication equipment onboard combined harvesters due to the operation of the EMF of transmission lines. The reasons provided for this assumption are:

- The dual frequency GPS technology communicates with satellites in the L-band (1,5GHz) whereas any interference likely to be generated by transmission lines is well below 1GHz – and thus out of frequency;
- These technologies typically adjust for multipathing and the physical structure is not likely to affect communication; and
- The satellites will span the sky, plus the onboard GPS will move about in the field - the transmission line will not necessarily be between the satellite and the GPS.

RECOMMENDATION

Having reviewed the possible impacts of the development for all four corridors, and after a detailed identification of potential impacts by specialists, **Corridor 4** is proposed as the most suitable corridor for the transmission line. This is because it circumvents the most sensitive areas, as well as significant risks and issues that were identified during the course of the EIA. A variety of mitigation measures have been recommended which could mitigate the

scale, intensity, duration or significance of these impacts. These measures will have to be incorporated into an Environmental Management Plan, which will function as a working document with specific guidelines to be applied during the construction and operational phases of the project.

It is strongly recommended that a Record Decision (RoD) to proceed with the construction of the new transmission line must be issued as all environmental and socio-economic constraints have been evaluated and documented in this report. Such a course of action would enable Eskom to finalise all servitude agreements, which will in turn pave the way for the construction of the new transmission line in advance of the foreseen load increase.

CONCLUSIONS

Aspects of the physical or biological environment having conservation, scientific or educational value must not be damaged or destroyed during the construction and operational phases of the proposed development. To achieve these goals preliminary studies on three alternatives: corridors 1, 2, and 3 were undertaken to obtain an overview of the likely impacts the line could have on the environment. Corridor 1 initially appeared to be the corridor that would have the least physical, biological and social impacts. However, owing to an extensive and comprehensive public participation exercise, various stakeholders in the study area suggested a fourth corridor, at the end of the scoping exercise. This corridor was subsequently investigated and found to be more preferable, in a number of respects, than the other three corridors. Building the transmission line along Corridors 1, 2 or 3 will have more significant environmental and social impacts on the environment. These impacts can be minimised, and even avoided, by choosing **Corridor 4** as the preferred corridor for the 400 kV transmission line.

The order of preference for the alternative corridors should therefore be:

1. **Proposed Corridor 4 (slightly longer than Corridor 1 passing east of Hoopstad)**
2. Proposed Corridor 1 (shortest corridor passing west of Bultfontein across farmland and away from roads);
3. Proposed Corridor 2 (corridor passing to the east of Bultfontein and alongside the R719); and
4. Proposed Corridor 3 (the longest corridor extending some distance to the west of Bultfontein).

Accordingly, the least preferred corridor of the servitude is Corridor 3.

Parts of Corridor 4 are currently being used as cultivated farmlands, grazing land, and a variety of other surrounding land-uses. The faunal and floral impacts of the transmission line along this corridor can be mitigated to an acceptable level. The ‘loss‘ of high arable land is unavoidable, as no matter where the corridor is placed in the connecting of Mercury to Perseus, these soil conditions will be encountered, but are minimised in Corridor 4.

It is thus recommended that the proposed development be permitted to proceed, since the detailed impact assessment indicates that its attendant impacts can be effectively mitigated. The final recommendation balances socio-economic imperatives at the national level with local issues such as the agricultural production in the Free State.

MERCURY – PERSEUS 400 KV TRANSMISSION LINE

ENVIRONMENTAL IMPACT REPORT - DRAFT

INVENTORY OF ANNEXURES A, B AND C

ANNEXURE A – PUBLIC PARTICIPATION

ANNEXURE B – TECHNICAL INFORMATION

ANNEXURE C – SPECIALIST REPORTS

LIST OF TABLES

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LIST OF ABBREVIATIONS

BID	Background Information Document
CONNEPP	Consultative National Environmental Policy Process
DEAT	Department of Environmental Affairs and Tourism
DTEEA	Free State Department of Tourism, Environmental and Economic Affairs
DFA	Development Facilitation Act (Act No. 65 of 1995)
DME	Department of Minerals and Energy
DWAF	Department of Water Affairs and Forestry
EIA	Environmental Impact Assessment as defined in the Environment Conservation Act (Act No. 73 of 1989)
EHV	Extra High Voltage
EIR	Environmental Impact Report
EMFs	Electromagnetic Fields
EMP	Environmental Management Plan
I&APs	Interested and Affected Parties
IEM	Integrated Environmental Management
kV	kilovolt
m	Metres
m.a.m.s.l.	Metres above mean sea level
PHRA	Provincial Heritage Resources Agency
SAHRA	South African Heritage Resources Agency
SEF	Strategic Environmental Focus
TDS	Total Dissolved Solids
VAC	Visual Absorption Capacity

SECTION 1: INTRODUCTION AND BACKGROUND INFORMATION

1.1 INTRODUCTION

P. D. Naidoo & Associates in association with Strategic Environmental Focus (SEF) were appointed by Eskom Transmission Group as Independent Environmental Consultants to undertake the environmental assessment for the construction of a 400 kV transmission line from Mercury substation (situated about 24 km south-east of Klerksdorp) to Perseus substation (situated approximately 67 km north-west of Bloemfontein, in the Free State Province).

The length of the transmission line will be approximately 250 km. A detailed identification of the most probable impacts of the development was undertaken along four proposed Corridors 1, 2, 3 and 4 (with alternatives A – C) as shown on the map of the study area (refer to the locality map in Figure 3). Table 4 shows the geographical coordinates of the two substations. The need and justification for the proposed transmission line are outlined in section 3.4.

Table 4: Geographical Positions of Mercury and Perseus Substations

SUBSTATION	LATITUDE	LONGITUDE
MERCURY	-27º 00’ 14”	26º 82’ 01”
PERSEUS	-28º 63’ 30”	25º 74’ 51”

In terms of the Environment Conservation Act (Act No. 73 of 1989), the proposed development falls within the ambit of the activities listed in Schedule 1 of Regulation 1183 and is therefore subject to an Environmental Impact Assessment (EIA). The Act identifies the proposed development as an activity which may have significant detrimental effects on the environment, *(Section 26: Listed Activity Schedule 1 cl 1(a), the construction or upgrading of facilities for commercial electricity generation and supply).* The scoping phase was completed with the submission of the Scoping Report, detailing the potential impacts and issues around the construction of the 400 kV transmission line. This marked the end of the first phase of the EIA process; the application procedure now requires that the project proceed to the second phase namely, the EIA phase.

This Environmental Impact Report (EIR) documents the entire EIA process and is submitted to the Department of Environmental Affairs and Tourism (DEAT), as the competent decision making authority. The EIR has been prepared on the strengths of the information available to the investigation team at the time of the assessment, and in accordance with the principles of Integrated Environmental Management (IEM). Care has been taken to provide an objective document, which will ensure that DEAT

will be in a position to make an informed.

1.1.1 Outline and Structure of this Report

This section outlines the structure of the EIR as follows:

Executive Summary: This is a summary of the whole report, its findings and recommendations.

Section 1: A concise introduction on Eskom Transmission, the proposed Mercury – Perseus transmission line and background information on the project.

Section 2: The relevant legislative framework and requirements are discussed.

Section 3: This section describes the project in detail. It describes the need for additional transmission capacity and the advantages of strengthening the electrical supply system by building the proposed 400 kV transmission line.

Section 4: Gives an account of the EIA process adopted for this project.

Section 5: An account of the entire public consultation process is given.

Section 6: Here the evaluation of alternative ways of meeting the ultimate goal of increasing transmission capacity and strengthening the electrical supply system are discussed. A description is provided of the entire process through which the corridor for the proposed transmission line was determined, from the initial corridors investigated in the study area (during the scoping phase) through to the final corridor chosen, by extensive consultation and stakeholder engagement (during the EIA phase).

Section 7: This section is a description of the specific environment to be affected along the recommended corridor (which is essentially a modification of the corridor recommended by the Scoping Report).

Section 8: Identifies all the potential sources of environmental impacts/risks.

Section 9: This section describes and assesses all the identified impacts. It recommends management and mitigation measures for all the significant impacts.

Section 10: Concludes the EIR and makes recommendations.

Section 11: Is a glossary of the technical terms used in this report.

1.2 TRANSMISSION AND DISTRIBUTION OF ELECTRICITY

Electricity is generated in coal-fired and hydro power stations and is transported along transmission lines to areas where it is needed. As electricity cannot be stored it must be generated and delivered over long distances at the very instant it is needed. At present, most of Eskom Transmission's long distance transmission lines are 400kV lines or less. This electricity has to be delivered at a lower voltage (220 V) in order to be used by the consumer. It cannot be transmitted over long distances at these voltages without significant losses. Thus, transformers are used at substations to increase or decrease (step-up or step-down) the voltage to the required level.

1.3 OBTAINING A SERVITUDE FOR CONSTRUCTION AND MAINTENANCE ACTIVITIES

Eskom Transmission identified the need for a transmission line to be built in an area. The location of the area, together with many other socio-economic and biophysical constraints usually defines the broader area where in the transmission line must be constructed. The final corridor for the transmission line should be determined by attaining the most suitable balance between environmental, technical and financial constraints. This is the purpose of conducting an Environmental Impact Assessment, since it aims at identifying, evaluating and minimising environmental impacts of the transmission line, while focussing on socio-economic and sustainability issues.

Once a viable servitude corridor has been established through the EIA process, an Eskom Transmission negotiator approaches each individual landowner to reach an agreement on the final position of the line and compensation. The negotiator obtains an option from the landowner to erect a transmission line. The landowner is compensated for the actual financial loss and inconvenience caused by the granting of the servitude. If the option is exercised, a servitude in favour of Eskom Transmission is registered with the Deeds Office.

This servitude gives Eskom Transmission certain defined rights for the use of the specific area of land. These are:

- Access to erect a transmission line along a specific, agreed corridor as indicated on a map, of which the landowner receives a copy;
- Reasonable access to operate and maintain the transmission line inside the servitude area; and
- The removal of trees and vegetation that will interfere with the operation of the transmission line, unless otherwise determined.

The landowner is prevented from erecting any structures or carrying out activities under the transmission line that would interfere with the safe operation of the

transmission line. However, standard farming practices such as crop cultivation, grazing and the use of farm roads may continue.

Eskom Transmission requires access to the servitude in order to maintain the transmission line. This could require traversing private property. Maintenance is carried out at regular intervals and is often undertaken by helicopter so that electricity supplies are not disrupted. The servitude will need to be cleared occasionally to ensure that vegetation does not interfere with the operation of the transmission line.

1.4 PROPOSED ACTIVITY

Eskom Transmission proposes to construct a new 400 kV transmission line between Mercury and Perseus substations in the Free State. Before a new transmission line is built a number of issues such as, the securing of a servitude, the specifications of the transmission line and towers, the access roads as well as construction camps, need to be considered. This report describes the environmental impact study undertaken in the process of securing the servitude for the transmission line, which is one of several pre-construction activities. The components discussed below play a role in the deciding the actual limits of the required servitude for the line.

1.4.1 Transmission line and Towers

Several types of supporting structures (towers) may be used in the construction of the 400 kV transmission line. These towers typically consist of two types: self-supporting structures and guyed suspension structures supported by guy wires (see example in Figure 1). The transmission lines will be suspended between the towers. Cross-rope towers use far less steel than the commonly seen self-supporting towers. The self-supporting towers will be used where the ground is unstable or where the transmission line changes direction (note that the line cannot bend more than 3 degrees at a time). The reduced steel quantity has the added benefit of being less visible and obtrusive within the landscape.

1.4.2 Access Roads and Construction Camps

Access roads will be required to transport personnel to the site and for maintenance purposes. In areas that are inaccessible materials are brought in by helicopter.

Construction camps will need to be developed in strategic positions where they provide the optimum access to as much of the construction area as possible.

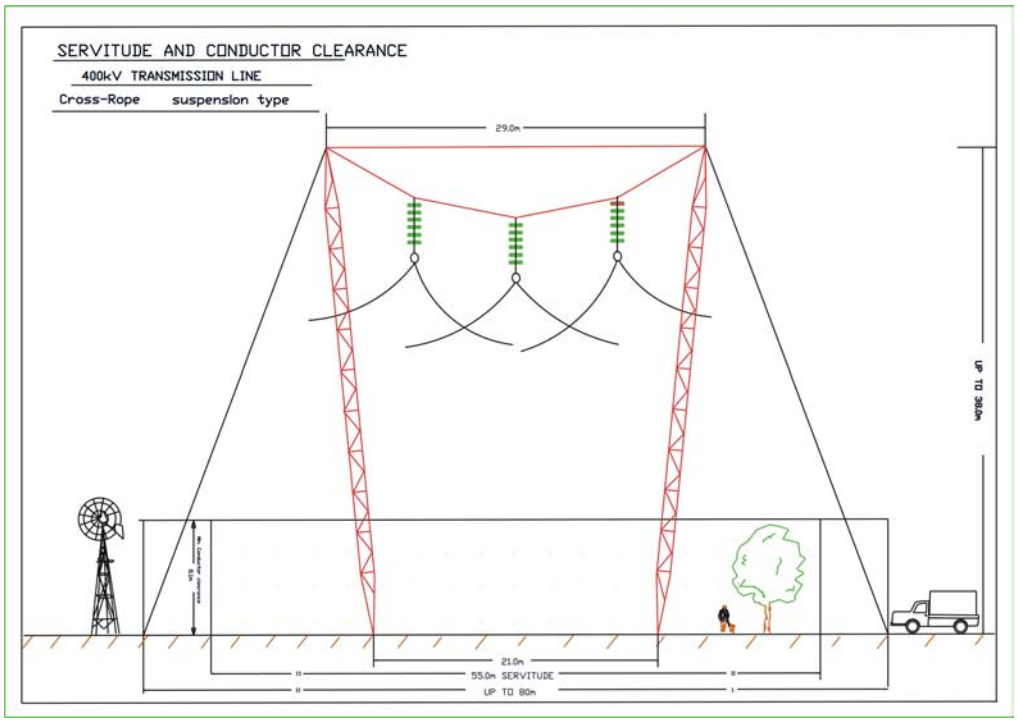

Figure 1: An example of a typical tower that could be used for the proposed 400 kV transmission line – Cross Rope Suspension Structure.

1.4.3 Construction

The construction of the transmission line involves different teams working in phases. These operations are not always continuous and each phase would involve the contractors' return to the construction site. A summary of the different teams is as follows:

- Surveyors;
- Bush-clearing team;
- Gate and fencing team;
- Foundation-laying team;
- Tower erection team; and
- Stringing team.

The construction of a transmission line occurs at a rate of approximately 30 days per kilometre. The intervention of an environmental control officer appointed by Eskom Transmission is a notable step in the construction phase. Once the contract has been awarded to the contractor, the environmental control officer will contact the landowners to discuss access, the conditions of the area and roads, and the extent of the work that is to take place. This contact will be maintained with the landowner throughout the

construction of the transmission line, to monitor any damage to crops or property. Once construction has been completed, the environmental control officer will ensure that rehabilitation of the site has been undertaken as stipulated and the landowner will be requested to sign a release form stating her/his satisfaction with the way in which the area has been rehabilitated.

Large scraper equipment will be used to establish the access roads. Backacters are generally used to excavate the foundations. All areas that will be disturbed such as construction camps, access roads and the construction area around the towers will be stripped of topsoil, which is stockpiled for later use.

The foundations are constructed first, followed by assembly of the towers on the ground, then the erection of the towers and finally the stringing and regulation of the conductors. These operations are not always continuous and each phase would involve a return to the site by the contractors.

1.4.4 General

Negotiating and securing a servitude for the transmission line is a prerequisite for the construction of the transmission line, and the construction of the line is in itself a listed activity (EIA Regulations promulgated in terms of the Environment Conservation Act, 1989, Act No. 73 1989). Therefore, Eskom Transmission is undertaking the required EIA in anticipation of the construction process for the following reasons:

- Providing the affected landowners as well as I&APs with enough lead time so they can plan their activities taking into consideration the future construction of the 400 kV transmission line;
- The economic growth in the Eastern Cape will dictate the time frames for the construction of the proposed transmission line as stated in the Section 3.4;
- There is already an existing need to provide a more reliable power supply to the Eastern Cape, and this need will be satisfied by the construction of the proposed Mercury - Perseus transmission line; and
- To strengthen Eskom's entire electricity network.

1.5 TERMS OF REFERENCE

Eskom Transmission requested that an Environmental Impact Assessment (EIA) for the proposed 400 kV transmission line be carried out. The Environmental Impact Assessment together with the public consultation has to be undertaken in accordance

with the EIA Regulations (Reg. No 1182, 1183 and 1184 of 5 September 1997, as amended) as per Sections 21, 22 and 26 of the Environment Conservation Act (Act No. 73 of 1989).

It is the intention of Eskom Transmission to secure servitude rights for the proposed line in the medium term and, in the short term, to obtain a Record of Decision (RoD) to proceed with the proposed construction of the 400 kV transmission line. Accordingly, construction of the transmission line is planned for the near future (when the need arises) and the commissioning is usually two years after construction commences). Various factors need to be considered in the execution of the environmental assessment at present:

- Firstly, the reliability of the existing power supply to the Eastern Cape is under increasing demand, which means that a new line will contribute to strengthening of this supply,
- Secondly, the prediction for the growth in demand for additional electricity in the Eastern Cape shows that the current system will not be able to cope with the predicted demands, especially when the proposed Coega development commences in near future, and
- Thirdly, Eskom Transmission aims to develop the national electricity grid in such a manner as to secure uninterrupted power supply to different parts of the country. This requires that the national grid should be based on a system whereby the supply to a specific substation comes from more than one transmission line.

These factors will also determine the timeline for construction of the proposed transmission line. If the increase in demand requires a quick solution, the proposed line would have to be constructed in the short term. If the economic growth in the Eastern Cape is not as fast as anticipated, the need for provision of additional power supply could arise in seven to fifteen year's time. In both cases it is necessary to secure the servitude in advance.

As part of the environmental process, a scoping exercise was conducted to determine the issues or concerns of the relevant authorities as well as interested and affected parties. The EIA phase then focused on evaluating the environmental impacts of the proposed development. In order to do this Strategic Environmental Focus, as independent environmental consultants, undertook to facilitate the implementation of the Integrated Environmental Management process by adopting the following terms of reference:

1. Registering the project with the relevant environmental authorities;
2. Compiling Plans of Study for the Environmental Impact Assessment (Scoping and EIA phase);
3. Undertaking a comprehensive evaluation of the study area facilitated by

several specialist studies, a review of the relevant literature and a desk top analysis;

4 Identifying possible interested and affected parties (I&APs);

5 Co-ordinating the necessary Public Participation Process in conjunction with Afrosearch, the public participation consultants. This entailed preparing the Background Information Document (BID), advertising and requesting that I&APs register their concerns; co-ordinating public and focus group meetings;

6 Identifying the key issues, impacts and investigating the alternative corridors for the line;

7 Determining specific mitigation measures along the chosen corridor to alleviate the negative impacts of the development;

8 Developing a detailed Environmental Management Plan (EMP) with specific guidelines for the construction and operational phases of the 400kV transmission line; and

9 Compiling the Environmental Impact Report (EIR).

The Environmental Impact Report includes a description of the environment as well as the possible issues and impacts that may arise from the proposed development. Consultation with I&APs and the relevant authorities made it possible to identify issues that are of particular concern. Furthermore, the experience SEF has gained through working on similar applications required that the following issues be assessed:

- Ecological impacts;
- Impacts on Avi-fauna (Birds);
- Hydrology and wetland resources;
- Social impacts;
- Visual impacts;
- Impacts on cultural and historical resources;
- Topography, pedology and geology;
- Engineering geology;
- Impacts on current land use and agricultural potential;
- Socio-economic impacts;

- Agricultural economic impacts
- Electromagnetic fields; and
- Cumulative impacts.

1.6 APPROACH TO THE STUDY

The EIA regulations stipulate that a scoping study should be undertaken as the first step in applying for authorisation to proceed with the proposed activity. The Department of Environmental Affairs and Tourism (DEAT), as the relevant environmental authority, requested that the information contained in the Scoping Report should be supplemented by an EIA report (EIR). To this effect, a Plan of Study for the EIA was submitted on the 29 August 2003. The Plan of Study was accepted by DEAT on the 16 August 2003.

1.7 PROJECT AIMS AND OBJECTIVES

1.7.1 Aims of the Environmental Impact Report

The aims of the EIR are to:

- To obtain environmental authorisation, by following the required procedure in order for the proponent to undertake the listed activity;
- To identify the most appropriate option acceptable to all interested and effected parties including Eskom Transmission;
- To summarise all the information gathered during all phases of the Environmental Impact Assessment (EIA);
- To analyse and synthesise all the information and to ensure correctness of information;
- To assess the potential significance of impacts associated with the most appropriate option;
- To make recommendations concerning the project, based on the information available;
- To comply with the IEM guidelines of the Department of Environmental Affairs and Tourism; and
- To provide an opportunity for public review of the report findings.

Issues and concerns, raised to date by the I&APs and key stakeholders

during the Public Participation Process, have been collected, processed and addressed in the Issues Register, which formed a vital part of the Scoping Report. The updated Issues Register, compiled for the scoping phase of the EIA process, has been included as Appendix A5.

The EIA process also foresees the need to develop an EMP as a working document for the construction and operational phases of the development. A generic EMP that is typically used in projects of this type has been attached as Appendix B6. This would form the basis on which the final EMP is to be developed for this specific project.

1.7.2 Project Goals

The primary goal of the development is the establishment of a 400 kV transmission line from Mercury Substation near Vierfontein to Perseus Substation near Dealesville in the Free State Province. The project is proposing the granting of a servitude within the study area, as shown on the locality map on page 31 (also refer to Appendix B1 and B2).

1.7.3 Project Objectives

The following objectives are set in support of the project goals:

1.7.3.1 Ecological objectives

To maintain the study area, in its altered form, with its associated floral and hydrological systems in a state that allows the ecological processes to function naturally.

1.7.3.2 Socio-economic objectives

To provide additional capacity to support the 400 kV network supplying the Greater Cape Region south of Bloemfontein. This would ensure that sufficient power is available for projects such as the Coega Development (see Section 3.4.1.).

1.7.3.3 Social and Safety objectives

To ensure that the development does not pose any direct or indirect threat to the health, safety and security of the community at large and the surrounding study area. This should be done through proactive planning to ensure enhanced safety and security of the affected environment and communities.

1.8 ASSUMPTIONS AND LIMITATIONS

1.8.1 Stage of Project and Availability of Baseline Information

It is important to note that this EIR has been compiled during the conceptual stages of development, with the primary focus being on securing the servitude for the transmission line. The report has considered a number of alternative corridors that were proposed. Site selection was based on a careful examination of the pros and cons of each corridor. The precise positions of the towers along the preferred corridor have however not been decided during the course of this study and thus, references to positions of these towers are only made. The technical details of the design components had been determined before this report was compiled. The majority of baseline information was therefore readily available.

1.8.2 Financial, Time and Confidentiality Constraints

Financial constraints are often inherent in many projects. However, financial constraints did not materially impact on the degree of detail of the EIA. Sufficient time has been allowed for the EIA phase. There were no confidentiality restrictions applicable to this project. The EIA was conducted in as transparent a manner as possible, with emphasis on making the EIA understandable enough for the affected communities to participate.

SECTION 2: ADMINISTRATIVE, LEGAL AND POLICY REQUIREMENTS

This component of the report provides a brief overview of the relevant policy, legal and administrative requirements which are applicable to the proposed project, as well as the various aspects of environmental law in South Africa that are pertinent to the project. Over the past few years a number of specialist laws protecting the environment, such as laws dealing with water, agricultural aspects etc., have been increasingly extended. This has been supported by a variety of overarching legislation. Such legislation has as its purpose the establishment of a structured process, in which the total impact of a project, such as the Mercury – Perseus transmission line, is investigated. To this end, overarching structures such as environmental impact assessments have been established, whereby control over many specific impacts is integrated.

The legislative framework being reviewed here essentially focuses on three aspects:

- Firstly, to ensure that all the overarching requirements are complied with. In this regard the requirements of Regulation 1183 of 5 September 1997, the environmental impact assessment conducted, the involvement of stakeholders in general, compliance with the new Constitution and similar aspects are dealt with;
- The second aspect deals with the detailed specific legislative requirements that must be met with regard to specific project proposals; and
- The third deals with more general legal aspects such as the possibility of land claims and the changes in the legislation that can affect the project.

2.1 THE BROAD LEGAL FRAMEWORK

The role of legislation in a project such as the Mercury – Perseus transmission line has changed significantly over the past few years. Previously the approach was to ignore environmental considerations during the planning stages. If it then appeared that there were certain unacceptable impacts, they were dealt with as an “end-of-the-line” problem. It has been described as a “business as usual with the treatment plant” approach. The present approach is that environmental impacts must essentially be regarded as management problems that are to be addressed in the entire management process right from the initial planning. In this regard, it is on the same footing as technical, engineering, financial, economic, safety and health, design and other relevant aspects that must be dealt with in the planning process. The intention is that all potential environmental impacts are identified at the planning stage. In order to adequately deal with them, the extent and seriousness of these impacts must be determined or quantified so that appropriate management steps are taken.

Thus it becomes increasingly difficult for specialist disciplines to fully identify the legal constraints, under which they must operate. For instance, specific legislation such as the requirement to get a permit for a river diversion is relatively easy to determine. Where a

management approach must be followed, a variety of impacts must be co-ordinated. The law applicable to such co-ordinated aspects will be dealt with in following sections of the legal investigation where holism and the cumulative effect of impacts are discussed.

These management steps can be divided into two broad categories. One category involves steps taken to prevent such an impact. For example, where an important wetland could be impacted and a road is shifted to avoid the wetland. The second management approach is to mitigate the extent of the impacts or to build in trade-offs, where they cannot be avoided. Over the past few decades, project managers increasingly applied this approach.

The decisions taken in the implementation of the project must be reasonable as meant in section 33(1) of the Constitution of the Republic of South Africa (Act No. 108 of 1996). In this section the decision-maker, which in the case of this project will be the DEAT (national environmental authorities), must take all impacts into consideration, prioritise them in a reasonable manner, and arrive at a decision that meets the objective requirements of reasonableness. This legal requirement forms a part of an effective business management process. In this regard the Proponent (Eskom) must assist the decision-maker in providing that information.

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

The Constitution of the Republic of South Africa (Act No. 108 of 1996) has significant effects on environmental management. The main effects are the protection of environmental and property rights, the drastic change brought about by the sections dealing with administrative law such as access to information, just administrative action and broadening of the *locus standi* of litigants. These aspects provide general and overarching support and are of major assistance in the effective implementation of the environmental management principles and structures of the 1989 Act and 1998 Act[1].

The Bill of Rights of the Constitution specifically states:

Everyone has the right -

(a) to an environment that is not harmful to their health or well-being; and

(b) to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that -

(i) prevent pollution and ecological degradation;

(ii) promote conservation; and

(iii) secure ecologically sustainable development and use of natural

[1] Barnard, D. 1999. Environmental law for all, A practical guide for the business community, the planning professions, environmentalists and lawyers, Impact Books CC, Pretoria.

resources while promoting justifiable economic and social development.

2.3 ENVIRONMENTAL CONSERVATION ACT, 1989 (ACT NO. 73 OF 1989)

Environmental regulations were promulgated on 5 September 1997 in the Government Regulation Gazette No 5999, Gazette Number 18261 in terms of the Environment Conservation Act 1989. The regulations contained in sections 21, 22 and 26 of the Act came into effect on or before 1 April 1998. Schedule 1 of section 21 identifies activities, which may have substantial detrimental effect on the environment, while section 26 provides regulations regarding activities identified under section 21.

The Environment Conservation Act (Act No. 73 of 1989) makes provision for the assessment of activities that are potentially detrimental to the environment. Identified activities require authorisation from the relevant authorities based on the findings of an assessment of the impact of the proposed activity on the environment.

Activities have been identified in the EIA Regulations, and include for the purposes of this project "the construction or upgrading of facilities for commercial electricity generation and supply".

The proposed activity "the construction of a 400 kV transmission line", requires the securing of a servitude for the transmission line. This is an indispensable requirement for the construction of the transmission line. Therefore, it requires authorisation from the relevant authorities, namely the National Department of Environmental Affairs and Tourism (DEAT) in co-operation with the Free State Department of Tourism, Environment and Economic Affairs (DTEEA). Any decisions made by the DEAT will be based on discussions with the relevant provincial offices.

The EIA Regulations stipulate the procedures and obligations required of the proponent (applicant) and the authorities regarding the assessment of the proposed activity. The procedures required in terms of the EIA Regulations include the appointment of an independent environmental consultant to undertake the assessment, application prescriptions, procedures and requirements as well as contents for reports. The findings of the assessment are used to inform the decision regarding authorisation of the proposed activity. The application procedure is summarised in Figure 2.

Initially, a scoping exercise is completed to determine whether there are any significant environmental issues associated with the proposed activity. In order to enable Interested and Affected Parties (I&APs) to identify issues and concerns for consideration in the Scoping Report, a public consultation process has to be undertaken. The environmental issues associated with the proposed activity are then assessed. Should the Scoping Report indicate that there are no significant issues associated with the activity or that the impacts can be effectively mitigated and the authorities are of the opinion that sufficient information has been provided, the

relevant authority will issue a Record of Decision (RoD) for the project to proceed. However, should the Scoping Report indicate that there are significant environmental impacts associated with the proposed activity and the authorities require more information, the authorities will request that a full environmental impact assessment (EIA) be undertaken.

The Environment Conservation Act also makes provision for appeals against any decision issued by the relevant authorities. In terms of the Regulations, appeals have to be lodged with the Minister, in writing, within thirty days of the issue of the RoD.

2.3.1 Legal Requirements for Eskom

The proposed activity is one of the listed activities in terms of regulations R.1182 of 5 September 1997, as amended by R.670 of 10 May 2002, namely:

- *facilities for commercial electricity generation with an output of at least 10 megawatts and infrastructure for bulk supply.*

Eskom is consequently obligated in terms of Sections 21, 22 and 26 of the Environment Conservation Act (Act No. 73 of 1989) to conform to the Environmental Regulations, and therefore to appoint an independent environmental consultant to undertake an EIA for the purpose of constructing a new transmission line.

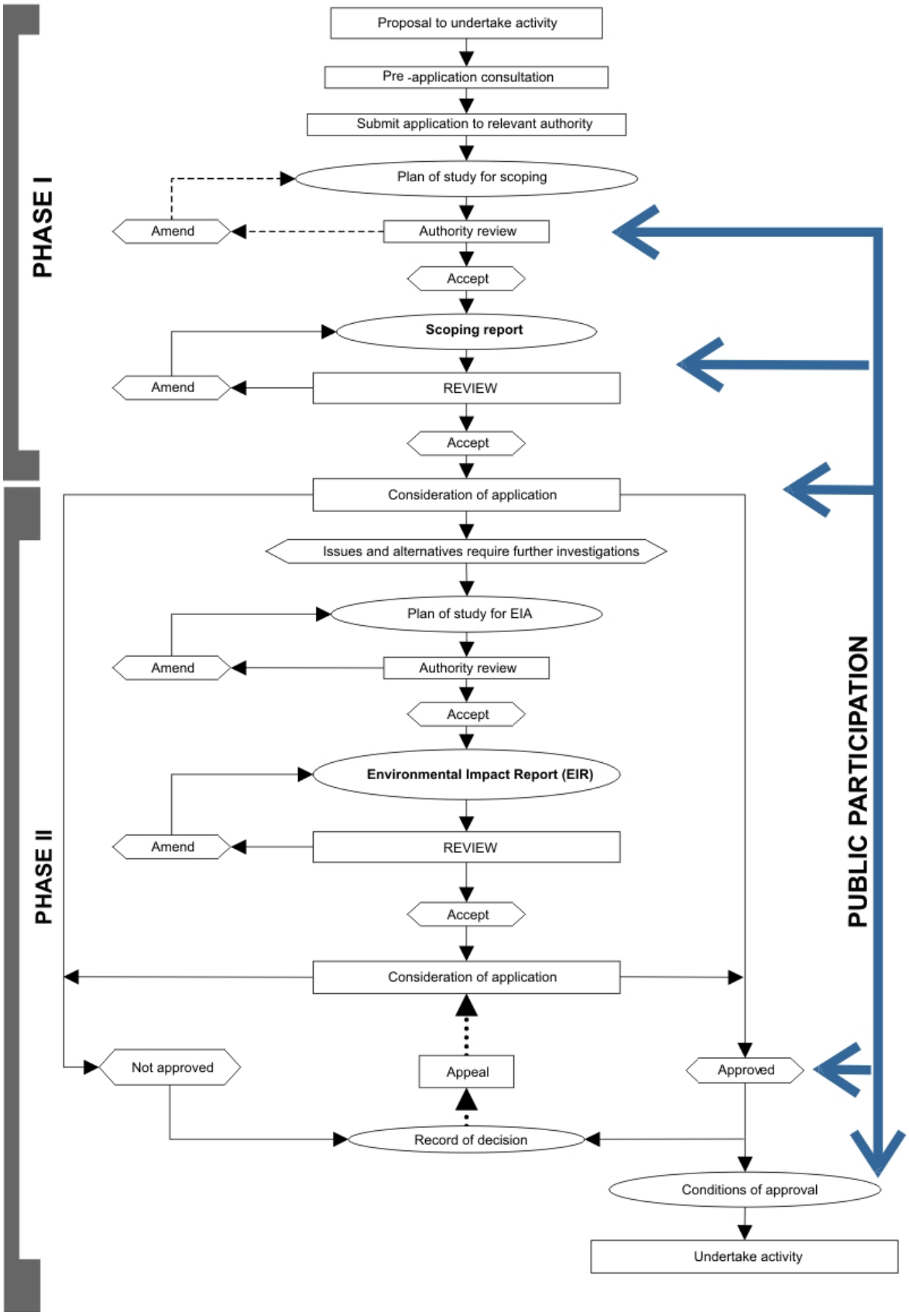

Figure 2: Application procedure as prescribed by the Department of Environmental Affairs and Tourism

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

The National Environmental Management Act (Act No. 107 of 1998) (NEMA) was enacted in November 1998. NEMA strives to legislate the National Environmental Management Policy (CONNEPP) and will repeal a number of the provisions of the Environmental Conservation Act. NEMA is focussed primarily on co-operative governance, public participation and sustainable development.

NEMA makes provisions for co-operative environmental governance by establishing principles for decision-making on matters affecting the environment, institutions that will promote co-operative governance and procedures for co-ordinating environmental functions exercised by organs of the State and to provide for matters connected therewith. Section 2 of the Act establishes a set of principles which apply to the activities of all organs of state that may significantly affect the environment. These include the following:

- Development must be sustainable;
- Pollution must be avoided or minimised and remedied;
- Waste must be avoided or minimised, reused or recycled;
- Negative impacts must be minimised and positive enhanced;
- Responsibility for the environmental health and safety consequences of a policy, project, product or service exists throughout its entire life cycle.

These principles are taken into consideration when a Government department exercises its powers, for example, during the granting of permits and the enforcement of existing legislation or conditions of approval.

Section 24 provides that all activities that may significantly affect the environment and require authorisation by law must be assessed prior to approval. In addition, it provides for the Minister of Environmental Affairs and Tourism or the relevant provincial ministers to identify:

- new activities that require approval;
- areas within which activities require approval;
- existing activities that should be assessed and reported on.

It also provides for the minister to make regulations with respect to the manner in which investigations should occur.

Section 28(1) states 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". If such pollution or degradation cannot be prevented then appropriate measures must be taken to minimise or rectify such pollution or degradation. These measures may include:

- assessing the impact on the environment;
- informing and educating employees about the environmental risks of their work and ways of minimising these risks;
- ceasing, modifying or controlling actions which cause pollution/degradation;
- containing pollutants or preventing movement of pollutants;
- eliminating the source of pollution or degradation; and
- remedying the effects of the pollution or degradation.

The authorities may direct an industry to rectify or remedy a potential or actual pollution or degradation problem. If such a directive is not complied with, the authorities may undertake the work and recover the costs from the responsible industry.

2.4.1 Legal Requirements for Eskom Transmission

- Eskom Transmission has the responsibility to ensure that the proposed activity and the EIA process conform to the principles of NEMA.
- Eskom Transmission is obliged, under section 28 to take actions to prevent pollution or degradation of the environment.

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

The National Water Act aims to manage the national water resources to achieve sustainable use of water for the benefit of all water users. This requires that the quality of water resources is protected as well as the integrated management of water resources with the delegation of powers to institutions at the regional or catchment level. The purpose of the Act is to ensure that the nation's water resources are protected, used, developed, conserved, and managed in ways, which take into account:

- Meeting the basic human needs of present and future generations;
- Promoting equitable access to water;

- Redressing the results of past racial discrimination;
- Promoting the efficient, sustainable and beneficial use of water in the public interest;
- Facilitating social and economic development;
- Providing for the growing demand for water use;
- Protecting aquatic and associated ecosystems and their biological diversity;
- Reducing and preventing pollution and degradation of water resources;
- Meeting international obligations;
- Promoting dam safety; and
- Managing floods and droughts.

2.6 INTEGRATED ENVIRONMENTAL MANAGEMENT

Integrated Environmental Management (IEM) is a principle, which prescribes a code of practice for ensuring that environmental considerations are fully integrated into all stages of the development process. This philosophy aims to achieve a desirable balance between conservation and development (Department of Environmental Affairs, 1992). The IEM guidelines intend endearing a pro-active approach to sourcing, collating and presenting information in a manner that can be interpreted at all levels.

2.7 THE TOURISM ACT, 1993 (ACT NO. 72 OF 1993)

Policy and legislation governing tourism in South Africa emphasises the concepts of responsible tourism and sustainable tourism development. Tourism in South Africa is legislated in terms of the Tourism Act (Act No. 72 of 1993), which was amended as the Tourism Amendment Act (Act No. 105 of 1996 and the Tourism Second Amendment Act no. 70 of 2000. The 1996 White Paper on Development and Promotion of Tourism in South Africa introduces the concept of “responsible tourism”; i.e. tourism with a responsibility towards the environment, through sustainable use of resources, involvement of local communities, and commitment to safety and security of all concerned. Taking this further, the drive towards “sustainable tourism” development emphasises the optimisation of benefits relating to tourism, without compromising future benefits.

SECTION 3: DEVELOPMENT PROPOSAL

3.1 PROPOSED ACTIVITY

As electricity cannot be stored it must be generated and delivered over long distances at the very instant it is needed. In South Africa, thousands of kilometres of high voltage lines transmit power, mainly from the power stations located at the coal fields in the Mpumalanga Province, to major substations at different locations in the country, where the voltage is reduced for distribution to industry, businesses, homes and farms all over the country.

The proposed development is the construction of a 400 kV transmission line, approximately 250 km long, between the Mercury and Perseus substations at Vierfontein and Dealesville respectively. Construction of the line is to take place whenever the need arises and the commissioning will be two years after construction begins. The "construction of a transmission line" is a listed activity and the negotiating and securing of a servitude for the transmission line is an integral part thereof. The EIA Regulations promulgated in terms of the Environment Conservation Act, 1989 (Act No. 73 of 1989) has to be followed since securing the servitude is indispensable for the construction or upgrading of facilities for commercial electricity generation and supply. Consequently, Eskom Transmission is undertaking an EIA at an early stage prior to construction for the following reasons:

- To Provide affected landowners as well as I&APs with enough time to plan their activities taking into consideration the future construction of the transmission line;
- The economic growth in the Eastern Cape and planned development there, dictates the time frames for the construction of the proposed transmission line as stated in section 1.5 above;
- There is already an existing need to provide more reliable power supply to the Eastern Cape, and this will be satisfied by the construction of the proposed Mercury - Perseus transmission line;
- Overall network strengthening; and
- By carrying out an EIA at this stage of the project, Eskom Transmission is complying with the law, while showing transparency and respect for the public's needs and concerns.

3.2 THE STUDY AREA

3.2.1 Four Alternative Corridors in the Study Area

The area under investigation is a region of land bounded in the north-west by the Mercury Substation near Vierfontein and in the south-west by the Perseus Substation near Dealesville. The western extreme of the study area extends to the Vaal River., although it does not reach the river itself. Land use patterns range from formal agricultural use to agro-tourism and infrastructure development. The Scoping Report submitted to DEAT (on the 25 June 2003) investigated three possible corridors (Corridors 1, 2 and 3) for the transmission line, and recommended Corridor 1 as the preferred corridor. However, as a result of detailed discussions with farmers, community groups and other stakeholders during the public participation exercise, the public proposed a fourth corridor. This new corridor lies within the initial study area. All four alternative corridors were examined in the EIA and are shown on the study area map in Appendix B1.

The servitude required for the development is an area of about 1375 Ha in extent (250 km in length and 55 m in width).

Alternative Corridors 1, 2 and 3, with their alternatives A, B, and C are in the vicinity of three major towns, Vierfontein, Wesselsbron and Dealesville, while alternative Corridor 4 follows a similar course as Corridor 1, but extends further westwards towards the Bloemhof Dam on the Vaal River. This corridor then turns eastwards again and follows a number of secondary roads until it reaches the outskirts of Dealesville.

A number of pans and rivers, as well as other wetlands are found along all four corridors. Figure 3 shows the locality of the study area as well as the location of these physical features such as rivers, pans, tows etc.

3.2.2 Property Ownership

The registered owners of the properties that will be affected in the chosen corridor will be identified once the corridor for the transmission line has been decided. Presently, a large number of landowners have been identified as property owners who will inevitably be affected by any of the four corridors proposed, since their properties lie within the study area.

3.2.3 Access and Local Context

The development will traverse about 76 farms in the area, several of which are cultivated maize and sunflower fields. The majority of lands occurring north-east of Wesselsbron have the higher agricultural potential due to the

soil pattern and a high rainfall climate. The areas south-east of Wesselsbron are of moderate arable potential, interspersed with land normally not suited for cropping. The Proponent is applying for a servitude to be granted to accommodate the transmission line. The exact location of the servitude will need to be discussed and negotiated with local landowners within the corridor proposed by the EIA.

Access to the transmission line will be required for the construction and occasional maintenance, thus access roads at agreed points within the servitude are to be established if the existing road network is insufficient.

3.3 PROJECT DESCRIPTION

3.3.1 General

Eskom Transmission Group, (the Proponent), intends to develop a 250 km 400 kV transmission line from Vierfontein (Mercury) to Dealesville (Perseus). The project involves a number of major activities that will span over a number of years. The initial activities entail pre-construction procedures such as the environmental impact study, negotiations for the servitude to determine the final servitude alignment within the proposed corridor. This stage also requires an application to be made for the granting of a servitude to accommodate the transmission line. These activities will take about two years to complete, while the construction activities will take another two years. The final inspection for the release of the Contractors' guarantee is scheduled for one year after completion of the project. The line will be in operation immediately after completion of the project and will stay operational for the lifetime of the transmission line. Subsequent maintenance and refurbishment would normally occur during the operational lifetime of the line.

3.3.2 Project Details

3.3.2.1 Construction phase

This phase refers to all construction and construction-related activities that will occur within the servitude area until the project is completed. The construction activities will take approximately 24 months to complete and will occur in two distinct phases. The first phase will involve the pre-construction activities such as:

- Negotiations for access roads to the servitude;
- Erection of campsites for the Contractors' workforce;

- Servitude gate installation to facilitate access to the servitude;
- Bush clearing to facilitate access, construction and the safe operation of the line;
- Establishing of access roads on the servitude; and
- Transportation of equipment, materials and personnel.

The following construction activities will then follow:

- Installation of foundations for the towers;
- Tower assembly and erection;
- Conductor stringing and regulation;
- Site de-establishment and clean up;
- Rehabilitation of disturbed areas;
- Final inspection of the line and taking over from Contractor;
- Signing off by landowners after all rehabilitation is complete;
- Releasing the Contractor from site; and
- Handing and taking over of the servitude from Transmission Services to the Region.

The construction phase will be treated as an integrated whole, or as two distinct phases, as dictated by the nature of the activities and impacts under discussion.

3.3.2.2 Operational phase

This phase will commence once the transmission line has been commissioned and is fully operational. All post-construction activities, including the operation and maintenance of the proposed development are included here. Such activities will require routine or planned maintenance work, emergency maintenance or repairs and servitude maintenance.

Due to the cost of damages that could be sustained in the event of power outages, as opposed to the corresponding loss of income on

Eskom's part, at times routine maintenance is done by helicopter on live lines. In the event of damage and dysfunction of the line emergency measures are in place to repair the line as soon as possible.

The servitude also needs to be cleared from time to time to ensure that vegetation does not interfere with the operation of the line. In areas of high erosion potential it may be necessary to repair access roads or carry out activities to prevent erosion. Servitude maintenance therefore goes hand in hand with the use of and maintenance of access roads.

3.3.3 Technical Details of the Transmission Line

Details of the 400 kV transmission line, including the structural information as well as the electromagnetic fields (EMF) that will be generated around the transmission line are discussed below.

3.3.3.1 Types of Towers (see detailed drawings in Appendix B3)

The following types of towers may be used on this project:

- Cross rope suspension type;
- Compact cross rope type;
- Guyed suspension type;
- Self-supporting type; and
- Self-supporting strain tower type.

3.3.3.2 Electromagnetic Fields of the Transmission Line

The environmental effects of the Mercury-Perseus 400 kV transmission line are linked to the possible physiological or biological effects of low frequency electric and magnetic fields produced by the transmission lines. The electric and magnetic fields involve rather abstract concepts. Two of these notions are ionising and non-ionising radiation. Electric and magnetic fields have a non-ionising effect on the surrounding environment because of their relatively low intensity. Another consequence of high-voltage transmission is the production of ions in close proximity to the phase conductor (corona discharge). The end result of this effect can be an audible noise of certain intensity and radio and television interference. The level of annoyance on the radio and TV interference depends also on the

intensity of the broadcast signal in the area. Electric power transmission can have effects on nearby industrial installations such as pipelines, telecommunication circuits, computers and visual display units and farming equipment such as combined harvesters etc.

3.3.3.2.1 General Field Concepts

Fields are defined as physical entities that can take different values of force at different points in space. As the process of measuring the magnitude and the direction of these fields is somewhat mathematically abstract, several techniques are used to visualise the fields and their variation in space. The belief that electric and magnetic fields are derived only from transmission lines is untrue. There are also naturally occurring fields. The earth has an essentially static vertically directed electric field of about 130 V/m that is caused by the separation of charges between the earth and the ionosphere. The magnetic field of the earth (known also as “geomagnetic field”) is also static and has an intensity of 50 mT (0.5 G). The geomagnetic field varies between equator and poles and is the greatest at the poles 67 mT.

Fields near overhead transmission lines have been more extensively studied and better characterised than any other electromagnetic field source because electrical energy is generally conveyed by overhead, alternating current transmission lines. Lines with voltages between 220 kV and 765 kV are extra-high voltage lines (EHV), and are the most economical and efficient means to transport the mass-electrical energy over long distances. Typical transmission lines consist of three phases. “Multiple” or “bundled conductors for each phase are used in EHV transmission lines to reduce the corona-related effects (such as audible noise); alternatively, heavily loaded lines are used. Each phase is sequentially separated from the others by 120 “electrical degrees”, which is of importance in reducing the magnitude of the electric and magnetic fields in steady-state operation of the line.

The electric field near transmission lines is measured or calculated at the height of 1.8 m above ground level. The line voltage and the height of the conductors above ground largely determine the magnitude of the field. Conducting objects such as vegetation, houses and people will

"perturb" or distort the electric field and can act as shields to reduce field levels significantly.

Electric currents flowing through transmission line phase conductors also create a magnetic Field. The magnetic field produced by a 400 kV double circuit line is about 35 mT (the geomagnetic field at the equator is 33 mT). Unlike the electric field, the magnetic field is not perturbed nor shielded by earthed objects.

Both the electric and magnetic fields produced by transmission lines, decay rapidly in magnitude with distance from the source.

Electric and Magnetic fields are produced by any use of electricity. Electric field levels in a typical home measured at 3, 30 and 100 cm. from different appliances range from 1.6 to 26 V/m, while magnetic fields produce 2 to 10 µT at a distance of 30 cm from the source (see EMF report in Appendix B4).

The field from the net current is inversely proportional to the distance from the line, while balanced currents produce a magnetic field inversely proportional to the square of the distance. Magnetic field values predicted only from balanced distribution line currents are therefore likely to underestimate measured levels. This is because the current becomes the major contributor to the magnetic field far from the line. Unfortunately, the level of imbalance of the phase currents is an uncontrollable variable of the line and depends merely on the load characteristic.

3.3.4 Design Philosophy

3.3.4.1 Road Access for Construction and Maintenance of the Transmission Line

Road access will be required as part of the servitude along the transmission line for easy access during the construction, and maintenance of the transmission line. This would need to meet specific requirements and should be registered accordingly (see Technical Specifications at Appendix B3).

Details regarding the required access roads can only be provided when the preferred corridor is chosen. These will be included in the final EMP that for the project.

3.3.4.2 Structural Details of the 400 kV Transmission Line

- Tower Spacing: 420 m (Average);
- Tower Height: 25- 50 m (Average);
- Conductor Attachment Height: 18-33 m (Average);
- Conductor Type Not finalised: Typically 3 Tern to 3 Bersfort;
- Minimum Ground Clearance: 8.1 m.

3.3.4.3 Servitude Required for Proposed Transmission Line

For the purpose of this report servitude should be understood as:

The area demarcated for the transmission line itself, including the areas required for routine maintenance activities that are carried out on it, for instance an access road.

For this project the servitude restriction is 55 m. Construction is limited to the 55 m servitude in which the line will be constructed. A 6 m strip shall be cleared to facilitate access and construction, except where tower erection and stringing require more space. Any extra space outside the servitude shall be negotiated with the relevant landowner and approved by Eskom. All areas marked as no-go areas inside the servitude shall be treated with the utmost care and responsibility.

3.4 PROJECT MOTIVATION

The motivation and acceptability of the project are to be evaluated taking into account the demographic profile, the surrounding economic centres (and their projected growth) as well as current power demand and usage patterns. Since transmission lines cost a substantial amount of money (about one to two million rand per kilometre) there has to be a very strong need for Eskom to decide to construct a new line. One reason for this hesitance to erect new lines is that the funds for such a line are usually borrowed on the open market and paid back with interest. All these issues are first considered in determining the need for the new transmission line from a strategic viewpoint.

The proposed activity must then be accepted from an environmental and social perspective, as addressed in detail in Section 9. In the meantime, this section examines the strategic need and acceptability of the proposed activity.

In terms of the need for the transmission line, studies have shown, based on a variety of sources, that the project is needed for a number of reasons, the most significant of which are:

- The need for the proposed 400 kV transmission line, to meet the future increase in power supply that will come about due to the establishment of a smelter at Port Elizabeth, as part of the Coega Initiative. Eskom is an important stakeholder and investor in the initiative and is committed to supplying the required power to the new smelter, which is proposed by a private investor;
- The advantages of building the Mercury – Perseus transmission line to strengthen the national electricity grid; and
- Future growth in the Port Elizabeth area will further stimulate the demand for more uninterrupted electrical power.

The foregoing reasons are corroborated by considering the development potential of the recipient areas of the additional power supply.

3.4.1 The Need for the Proposed 400 kV Transmission Line

Electricity needs to be transported over long distances from the few locations where it is generated. Hundreds of kilometres of 765 kV and 400 kV transmission lines feed electricity from the Mpumalanga Region, where most of the coal powered generation plants are found, to transmission substations in the Greater Eastern Cape Region.

Only two 765kV and three 400kV transmission lines feed electricity to Greater Cape Region south of Bloemfontein (see Eskom Transmission's National Grid System at the end of Appendix B5). These transmission lines are becoming heavily loaded and are already reaching their transfer capacity. It is also becoming very difficult to manage outages. This makes it problematic to carry out routine maintenance. Furthermore, the condition of these lines can deteriorate and this will result in poor line performance (faults etc.). For instance, a fault on any of the lines serving the Greater Cape Region could have a detrimental effect on supply to customers in the area.

The Coega Development Corporation is developing the Coega Deep Harbour project and the associated Coega Industrial Zone, located about 20 km from Port Elizabeth. Once the proposal is completed the anchor tenant is expected to be a Steel Smelter plant. This project will consist of three arc furnaces, steel mills and a steel beneficiary plant. When fully operational the project is expected to consume about 1 500 megawatts of electricity. Currently, only 650 MW of electricity is available in the area. Therefore, Eskom forecasts a 1.5% natural load growth in the Port Elizabeth region.

There are two 400 kV overhead transmission lines that feed electricity to Poseidon substation, close to Somerset East. Poseidon substation supplies almost all of the customer loads in the Greater Eastern Cape Region. Electricity is transmitted from Poseidon substation, via two networks consisting of 220 kV and 400 kV lines, to consumers in Port Elizabeth, East London and surrounding areas. The two 400 kV lines into Poseidon are becoming heavily loaded. The recorded peak loading is 1020 MW. It is expected that the firm capacity of 1200 MW will be exceeded within the next five years. The primary constraint on the amount of power that can be delivered at Poseidon substation is the loss of any one of the Hydra-Poseidon 400 kV lines. Hydra substation at De Aar is the main point of supply to the Eastern, Southern and Western Cape (Appendix B5).

The existing lines feeding into Poseidon substation do not have sufficient firm capacity to supply this additional load, without shedding a large portion of the other loads in the Greater Eastern Cape region, supplied from Poseidon substation. The economic cost to the region as a whole could amount to millions of rands should there be deterioration in the quality and reliability of the electricity supply. Eskom intends to provide more reliable power supply to the Eastern Cape by providing an alternative transmission line to the province. To satisfy the long-term electricity requirements and improve the reliability of supply to electricity consumers it is necessary to construct a 400 kV line between Mercury and Perseus substations.

Furthermore, studies have shown a steady 2% per annum average load growth for the area to Greater Cape Region south of Bloemfontein. The load forecasters predict that this load growth of 2% will continue. In addition, an increase in load demand of between 700 and 1000 megawatts is expected. Eskom has taken measures to optimise the existing transmission system so that the construction of the new 400 kV line will occur only when needed. These measures include:

- Re-calculation of the thermal loading capability of the transmission lines into to Greater Cape Region south of Bloemfontein (Perseus substation) based on the measured ambient temperatures in the area. The lines can now be loaded more heavily during cold days when the lines cool down and they do not sag as much; and

- When reinforcement options were looked at, the best option was chosen to ensure that an optimised mix of cost, technical benefit and environmental impact was achieved.

3.4.2 The Advantages of Building the Mercury – Perseus Transmission Line

Eskom has chosen the construction of the Mercury - Perseus 400 kV line over and above a number of alternatives (see motivational document in Appendix B5) because it offers several advantages from a techno-economic point of view:

- The proposed line will reduce the current load carried by the Grootvlei-Hydra power corridor, thereby reducing the reliance on Grootvlei as the single source feeding the 400 kV network to the south, and thus delaying the need for future reinforcement thereof.

- With the existing network configuration, a bottleneck exists at Hydra substation since all of the electricity supplied to the south of the Bloemfontein Region flows through this substation. The new 400 kV line will provide an alternative source of electricity from Mercury substation. The risk of losing load due to the loss of the Hydra substation is therefore greatly reduced.

- This option (Mercury – Perseus) proposes a new line of approximately 250 km. The optimised line length and sufficient power transfer capability make this option attractive. Moreover, the economic and reduced environmental effects of this option support the choice of this alternative.

- System losses due to electrical resistance of the lines will be significantly reduced.

- On considering reinforcement options, the best option was chosen to ensure that an optimised mix of cost, technical benefit and environmental impact is achieved.

From the foregoing discussion it is clear that a new transmission line will be needed as all options for optimisation of the existing infrastructure have already been studied. The new transmission line will be brought into operation at the time when the load growth and demand requires it. It is however necessary to secure the servitude before hand, to ensure that this will be possible.

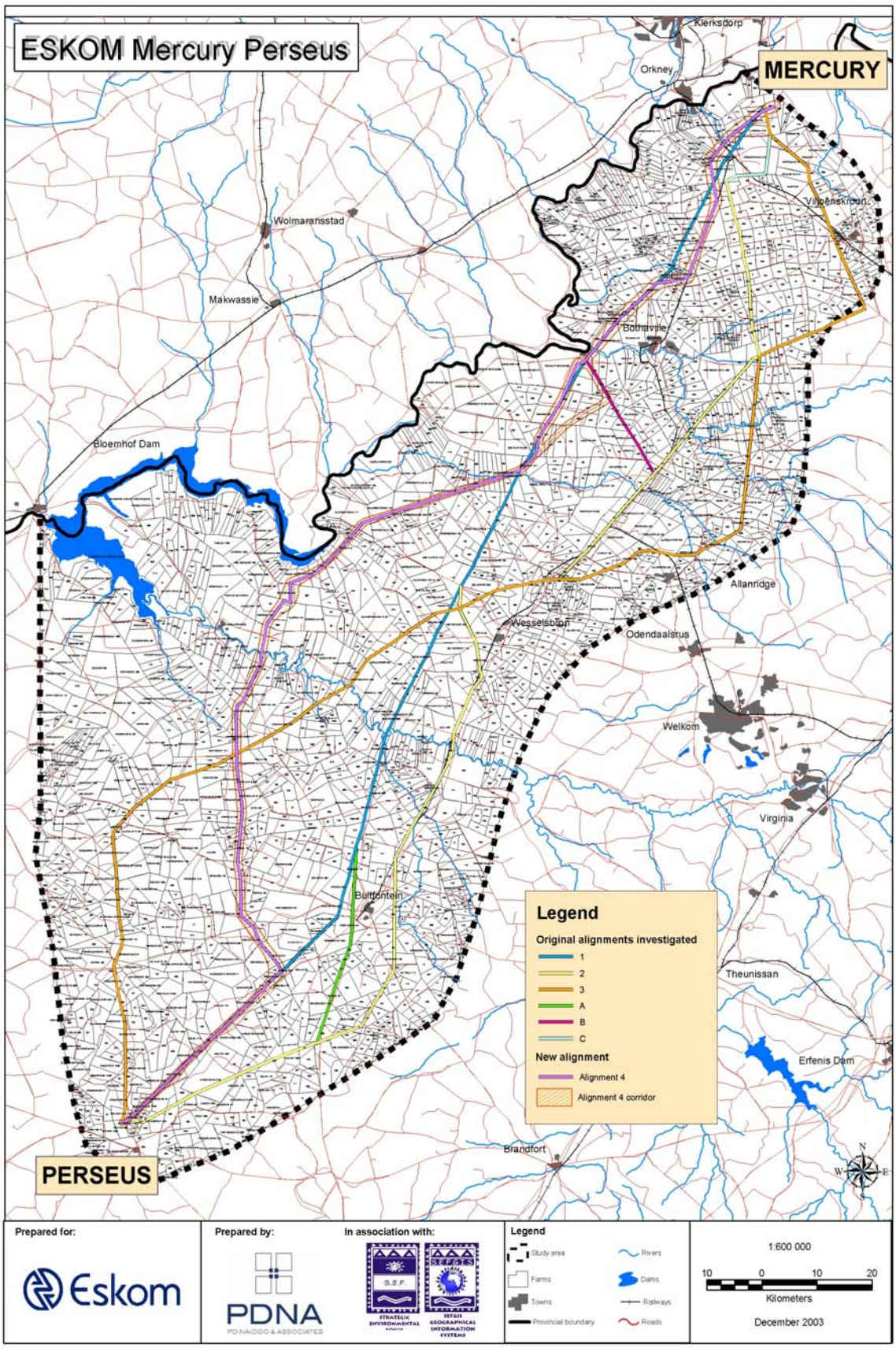

Figure 3: Locality map showing proposed corridors for the transmission line

SECTION 4: THE EIA PROCESS ADOPTED FOR THIS STUDY

This section describes the process followed during the EIA for the Mercury – Perseus 400 kV transmission line. SEF followed the Integrated Environmental Management (IEM) procedure as advocated by the Department of Environmental Affairs and Tourism (1992). The EIA was a combination of background research on the affected area, consultation with landowners, key stakeholders and the specialists. A concerted effort was made to identify and address the concerns of the I&APs. All these issues are included in this report. Positive and negative impacts were studied and ways to mitigate negative impacts and enhance positive impacts were addressed. SEF were appointed to:

- Oversee the public participation programme conducted by Afrosearch for the duration of the project;
- Review all the documentation prepared by Eskom Transmission and the specialists before it is disseminated to the public;
- Prepare the Scoping Report for Eskom Transmission based on the concerns of the I&APs, receive and process all comments generated by the Scoping Report, and amend it as may be necessary;
- Prepare the terms of reference for all Specialist Consultants appointed during the course of the environmental process;
- Review all Specialist Reports to ensure that the terms of reference have been satisfied; and
- Prepare the Environmental Impact Report based on the issues raised in the Scoping Report, incorporating and synthesizing all the findings of the specialist studies, as well as issued raised by I&APs.

4.1 GUIDELINES FOR THE IMPACT ASSESSMENT PHASE

The focus of the EIR is on issues identified by the Scoping Report that required further attention in the Impact Assessment phase of the project as well as the compilation of a detailed Environmental Management Plan (EMP). Other aspects relating to practical and technical limitations of the project (for instance a cost-benefit analysis) were also considered.

4.2 IDENTIFICATION AND CATEGORISATION OF I&APS

The issues and concerns raised by I&APs are addressed in this report. In some instances, e.g. issues related to archaeology and palaeontological sites, geo-technical conditions etc., more detailed investigations can only be conducted once the final corridor of the transmission line has been decided and when the co-

ordinates of each tower have been determined. Afrosearch, as the independent Public Participation consultant, developed a database with contact details of all I&APs, and kept a record of interactions with approximately 900 I&APs, who have been grouped into the following categories:

- National Government
- Provincial Government
- Local Government
- Industry
- Landowners
- Non-governmental Organisations (Trusts etc.)
- Transport (e.g. Aviation authorities)
- Media
- Agriculture
- Organised Business
- Unclassified

4.3 SCOPING PHASE

The key environmental issues identified by the scoping phase were determined through an internal process of identifying potential environmental impacts, based on similar developments, and a public participation process. Potential risk sources/impacts were identified by a team of specialists, who conducted a site visit to appraise the environment and cursorily determine the potential impacts of the development. All specialists were required to recommend the most suitable corridor for the development at this stage of the process. The consensus was that Corridor 1 was the preferred option, which was a very significant outcome of the scoping exercise. The specialists' reports also outlined, evaluated and highlighted the most significant issues that require further investigation during the EIA.

For the EIA, the Environmental Investigation Team focused on discipline-specific problems, seeking to examine each issue in further detail through the relevant specialist studies. These studies focussed on Corridor 1 initially, and were later extended to incorporate another alternative, Corridor 4, proposed by I&APs. Therefore, the EIA has been conducted on all four alternative corridors, (Refer to section 4.4. for more detail).

Other issues that were identified through consultation with I&APs and key stakeholders during the scoping phase were incorporated with the specialists' input. This enabled SEF to decide which issues require further investigation during the EIA phase.

Issues relevant to the environmental investigation[2] were included in the list of key environmental issues and documented in the Draft Comments and Response Document, which formed a vital part of the Scoping Report. This EIR examines each issue and, based on the findings of the specialist studies, quantifies the likely impacts of the development. Suitable mitigation measures for all identified impacts were provided by all specialist studies, presented in the impact tables in Section 9.

The issues were grouped into three broad categories as follows:

a) Key issue 1: The physical and biological environment;

b) Key issue 2: The social environment, and

c) Key issue 3: Economic impacts.

This first stage of the process aimed at identifying the most likely impacts of the proposed development on the surrounding environment, while the EIA was focused on a comprehensive impact assessment along all four corridors.

On completion of the scoping exercise, guidelines for the execution of an impact assessment and the compilation of an Environmental Impact Report were developed. In this regard, a Plan of Study for the EIA was submitted to DEAT on the 29 August 2003 and subsequently approved on the 11 September 2003. The Plan of Study for the EIA described these guidelines.

4.3.1 Environmental Issues identified during Scoping

Issues raised by I&APs and key stakeholders were dealt with by the relevant specialist studies. The findings from the scoping exercise were as follows.

4.3.1.1 The physical and biological environment

Based on an overview of the entire study area that was obtained from a site visit, a cursory assessment by the team of specialists identified a number of issues to be further studied during the EIA.

[2] Non-project related issues such as problems with local distribution and tariffs were recorded in the issues register and forwarded to a senior official of Eskom Distribution in the study area.

4.3.1.1.1 Wind erosion

All fine sandy soils (<15% clay) are prone to wind erosion when dry and devoid of vegetation during windy periods. Soil erosion caused by dispersive soils in association with disturbances of the vegetation/topsoil cover and poor ground management practises were some of the risks identified for moderately sloping areas. Other risks included the collapsible grain structure of transported sandy soils and active clays associated with residual soils. These risks will affect both the construction and operation phases. The extent of these risk sources along the proposed corridors was further assessed and quantified in a detailed geo-technical investigation.

4.3.1.1.2 Soil compaction

Sandy soils are easily compacted by vehicle movement, at all soil moisture levels, especially when wet. Soil compaction will be evident mainly during the operational (maintenance) phase of the project, with similar results for the construction phase. Several mitigation measures to reduce the impacts on soils and landform were required from the soils investigation.

4.3.1.1.3 Water erosion

Clayey and duplex soils of some of the land types identified are susceptible to water erosion when exposed. Other identified risk sources, though of limited extent, are disturbance of steep riverbanks leading to water erosion, disturbance of pan floor materials leading to wind erosion, and positioning of towers in valley bottoms and wetlands in the north-eastern portion, which can lead to water erosion. Effective measures to curb water erosion were investigated.

4.3.1.1.4 Loss of high potential arable land

A concern that was raised by the soils and landform specialist was the likelihood that some sections of the proposed transmission line could traverse high potential arable land, some of which is currently cultivated. During the stakeholder workshops, farmers also complained that

some types of towers could be quite obstructive to normal farming practices (e.g. Suspension Cross Rope). This issue was further addressed by the EIA, which examined various cost-effective towers structures that could be used on arable farmland, causing the least impact on farming practises.

Other issues that were noted for further attention include the destruction of farm fences, destruction of farming infrastructure, and damage to crops, game or farm animals. The timing of construction activities, and the likely negative impacts on adjacent cultivated land or game farms was also mentioned.

4.3.1.1.5 Visual intrusion

The visual impact of the line on the surrounding environment was identified as a highly significant issue requiring further quantification in terms of specific impacts that would occur if the line were built along any of the four corridors. The significance of these visual impacts without mitigation would be high due to the relative scale of the structures and the high visibility within the (mostly flat) study area. These impacts would last throughout the operational lifetime of the transmission line.

The visual intrusion could be significant especially where the line traverses tourist attractions such as game farms etc. Any proposed corridor, must take into account the existing tourism infrastructure.

4.3.1.1.6 Habitat destruction and disturbance

The initial ecological assessment identified nine major plant communities, which show varying degrees of degradation due to human impacts such as overgrazing, trampling, crop production, road construction, etc.

Any impacts on sensitive environments would depend largely on the type of equipment used for erecting towers and transmission lines. Few negative environmental impacts are expected along Corridors 1 and 4. The former corridor cuts through natural veld and large maize and Lucerne fields. Corridor 4, on the other hand, skirts these habitat types, since it runs parallel to the R59 road for quite

a few kilometres. The specialist ecological report suggested specific mitigation to avoid destruction and/or undue disturbance of the habitat where access roads, construction camps and towers will be located.

Among these mitigation measures were tangible actions to control alien infestation resulting from imported soils and the clearing of vegetation for the servitude.

The need for a detailed investigation and confirmation of the initial comment that no Red Data fauna and flora occur within the study area was highlighted during the scoping phase.

Pans

Wetlands found within the study area included endorheic pans, riverine wetlands, palustrine wetlands and man-made wetlands. The most important of these were the endorheic pans, which are important feeding and breeding habitats for various birds, amphibians and invertebrates. These unique habitats need to be preserved due to their significant role in the functioning of the ecosystem. The most significant impacts of the development will be related to surface water pollution, erosion, faunal as well as floral disturbance. Therefore, specific mitigation to address these impacts was found to be essential for the EIA phase.

4.3.1.1.7 Veld fires

In the past, problems have been experienced with local distribution lines causing fires. The need for Eskom's policy regarding the management of firebreaks and clearing the servitude to avoid fire outbreaks to be implemented was stated as an important commitment that should be made binding in the Environmental Management Plan.

In the follow-up study the Ecological specialist, qualified the likelihood of this problem occurring by noting that the construction camps could be a possible source of veld fires.

4.3.1.1.8 Faunal displacement and disturbance

As far as terrestrial mammals were concerned no permanent negative impacts were expected to occur. There were no Red Data terrestrial mammals or signs of their

presence (burrows etc.) in the study area. These issues were further studied and confirmed in the final ecological report.

Bird Impacts

The most significant impact of the 400 kV transmission line on fauna would be the high risks of bird impacts such as electrocutions, collisions, habitat destruction and disturbance.

Numerous bird species were identified and listed by the initial bird impact survey. A significant number of these birds are known to be transmission line sensitive species. An earlier analysis of the sensitivity of the proposed corridors revealed that Corridor 1 was likely to have the least impact on the Red Data species present in the study area.

Due to the nature of bird-transmission line interactions, a follow-up study on bird impacts was conducted for the EIA. This study was more specific, and determined what line sections needed specific mitigation devices, such as bird diverters, bird flappers, etc. This issue was a concern raised in the comments from of the Free State Department of Tourism, Environment and Economic Affairs (DTEEA).

4.3.1.2 The social environment

Most issues were raised by I&APs at the Public Open Days, during discussions with local authorities and by key stakeholders at the Focus Group Meetings. These issues have been documented in the Draft Comments and Response Document attached to the Scoping Report (Appendix 3 of the Scoping Report). A summary of each of these issues is provided below.

It must be ensured that the environment surrounding the development is safe and secure, and in all respects acceptable to the affected communities within the study area. In this regard social issues flagged during the site visit, (including the tourism issues) as well as the concerns raised in the public consultation process the must be taken into account. These issues have been grouped as follows:

- Health, safety and security;

- Destruction of heritage/historical sites; and
- Impact on tourism.

4.3.1.2.1 Destruction of heritage/historical sites

From the initial cultural heritage assessment, it was found that some areas have a higher density of cultural, historical, or archaeological sites than others: the north eastern section of Corridor 1 and, to a lesser extent, the south western section of Corridor 3. From a cultural heritage viewpoint, the overall impact on Corridor 1 is considered to be low. In areas where sites do occur, it would be possible to lessen the impact by the application of suitable mitigation measures. The final cultural heritage report therefore recommended suitable management measures to ensure the conservation of these cultural resources.

Historical sites – The initial study reported that some Boer War Sites occur within the study area. The requirements from the South African Heritage Resources Agency (SAHRA), as outlined in the letter received on 25 July 2003, will need to be adhered to. Effectively, all structures and sites of architectural, cultural or historic significance, possible sites of archaeological or palaeontological significance, sites of religious or spiritual significance along the final corridor should be identified by an Archaeologist (SAHRA comments on the EIA for Mercury-Perseus 400 kV line, dated 25 July 2003).

4.3.1.2.2 Impact on tourism

Tourism potential of the study area could be directly impacted, should tourism infrastructure be destroyed or relocated, or indirectly, through impacts on bird life, aquatic resources, vegetation and fauna. These impacts have been detailed in the relevant specialist studies. The visual impact of the transmission line is detailed in the Visual Impact Assessment, but it is noted that the transmission line could have a significant negative impact on the visual character and ambience of the area, and thus negatively impact on the numbers of eco-tourists visiting the area.

A detailed list of all game farms, conservancies and nature reserves was compiled. This list was verified through

consultation with landowners and a comparison with current lists obtained from Free State DTEEA. This list requires further verification, as DTEEA officials are updating their lists. In many cases, landowners have sold their game farms or conservancies, and this information is yet to be captured by Free State DTEEA.

Statistics of tourist visitors were obtained from SATOUR website and other internet sources, listed in the Tourism Specialist Report (Appendix C9).

4.3.1.2.3 Health, safety and security

Some health concerns, such as the possibility of contract workers exacerbating the spread of the HIV/AIDS in local communities such as Dealesville, have been raised by I&APs. Residents of Dealesville admitted that prostitution is a current poverty-related problem fuelled by the fact that Dealesville is located on a transport route. Particularly, stakeholders have noted that high unemployment in certain areas is the primary cause for the increase in HIV/AIDS. Anecdotal evidence would suggest that to financially support their families, women become involved in prostitution.

The Social impact report discussed the status of, and risks related to safety and security (during construction) within the study area. The following issues featured prominently among the concerns of landowners and I&APs:

- Precautionary measures to ensure the safety of workers during construction;
- Theft of livestock and an increase in other criminal activities often associated with construction camps;
- Precautionary measures for construction workers when working on game farms; especially during the hunting (winter) season.
- Safety and security during operation and maintenance – Trespassing, if Eskom Transmission employees do not keep within the servitude, there is a concern that

landowners could feel a security risk in terms of personal safety and a potential increase in theft of equipment and livestock;

- Loss of residence - transmission lines and towers could negatively impact on homesteads, labour tenants' homes and external buildings;
- Compensation policy - Eskom Transmission's compensation policy and negotiation process regarding loss of residence and agricultural land must be clearly spelled out to affected landowners;
- Eskom Transmission's policy regarding the servitude negotiation process and the registration of the servitude should be clearly explained to affected landowners.
- The management of the servitude needs to be clearly explained and documented.

Access roads:

- Existing infrastructure should be used as far as possible when identifying new access corridors to avoid additional impacts to crops and surrounding veld.
- Neighbouring landowners affected by access roads should also be consulted as part of the negotiating process.

Finally, an understanding of the effect of Electromagnetic Fields on human health and the natural environment (specifically birds) should be provided by means of an Electromagnetic Fields Report (Refer to Appendix B4).

<u>Other social issues identified during the scoping phase</u>

In terms of national socio-economic needs, I&APs understand that the proposed 400 kV transmission line will contribute to the overall strengthening of Eskom's national grid, with the resultant increase in the potential for economic growth. However, questions about alternative

power generation options, and the need to consider alternative corridors, were voiced at some workshops.

As regards regional benefits, I&APs are of the opinion that although the proposed 400 kV transmission line is aimed at ensuring sustainable supply to the Eastern Cape, the towns along the corridor will indirectly benefit from future developments in the Eastern Cape, which are dependent on reliable electricity supply.

High unemployment prevails within the entire study area and local residents could carry out unskilled work such as bush clearing and fencing. Stakeholders understand that the construction of transmission lines is highly specialised.

Albeit limited, there will be economic spin-offs during construction with the influx of limited labour force to the area. This could be limited to the purchasing of food and clothing as well as accommodation.

Reliability of supply to numerous towns within the study area has been identified as a persistent problem. The proposed transmission line will strengthen the national electricity grid, bringing little indirect benefits to these towns by improving the overall reliability of the network. However, all complaints related to distribution of power will be brought to the notice of a senior Eskom Distribution official in the area who will look into the issue of maintenance on the local distribution lines.

4.3.1.3 Economic impacts on agricultural production

An important finding of the scoping phase was that most of the northern sections of the three corridors investigated at this stage traverse high potential arable land. This necessitated a comprehensive specialist assessment of the likely impacts the project could have on agricultural production.

4.4 THE EIA PHASE

The scoping phase was conducted on three alternative corridors. By the end of the scoping study, Corridor 1 was thought to be the preferred option from an environmental and social viewpoint. A plan of study was therefore submitted for a full EIA to be undertaken along Corridor 1. This plan of study was approved by DEAT, who recommended that the project continue to the EIA phase, focussing on this

corridor. However, as a result of extensive discussions and consultation with landowners and other stakeholders, the I&APs suggested that a fourth alternative be considered. Since this recommendation only emerged towards the later stages of the EIA phase, the re-evaluation of all the previous alternatives, including the fourth corridor had to be undertaken.

The four alternatives were examined in detail by the environmental project team to determine which of the alternative corridors would have the least physical, biological and social impacts. During the EIA phase, the width of each corridor was narrowed to approximately 5000 m band for investigation. Within the proposed corridor, the 55 m servitude required for the transmission line can be negotiated.

The specialist studies were based on the assessment procedure outlined below.

The general procedure that was followed for the EIA phase was to investigate in detail all significant impacts identified during the scoping exercise. This was done either by means of specialist studies or internal investigations by SEF. Although, the scoping exercise was specifically aimed at selecting the most feasible corridor for the transmission line, it became imperative in the EIA to review the initial proposal, which suggested that Corridor 1 should be chosen. All impacts and issues identified in a preliminary way were then further assessed in the EIA phase. The procedure by which this detailed impact assessment of important environmental issues was undertaken is outlined in the following sections.

4.4.1 Study Team

The table below contains contact details of professionals who were responsible for the Environmental Assessment for the proposed Mercury - Perseus 400 kV transmission line.

Table 5: Study Team

Team member	Company / Contact details	Responsibility
Dave Rudolph	Strategic Environmental Focus (Pty) Ltd PO Box 74785 Lynwood Ridge 0040	Project Leader - Environmental Investigation
Dr Dawid De Waal	Afrosearch (Pty) Ltd PO Box 13540 Hatfield 0028	Public Participation Programme (Public Liaison Officer)
Dawid Mouton	Knight Hall Hendry (Pty) Ltd PO Box 72292 Lynwood Ridge 0040	Engineering Geological Assessment

Team member	Company / Contact details	Responsibility
Dr Johnny van Schalkwyk	Natural Cultural History Museum P O Box 28088 Sunnyside 0132	Heritage study
Ilse Blignaut and Natalie Way-Jones	Strategic Environmental Focus (Pty) Ltd PO Box 74785 Lynwood Ridge 0040	Tourism Impact study
Prof Dirk Groenewald	University of the Free State PO Box 30204 Pellissier 9322	Socio-economic impact study
Gerhard Cilliers	Strategic Environmental Focus (Pty) Ltd PO Box 74785 Lynwood Ridge 0040	Aquatic study
Eamonn O'Rourke	Strategic Environmental Focus (Pty) Ltd PO Box 74785 Lynwood Ridge 0040	Visual Impact Assessment
Chris van Rooyen	Endangered Wildlife Trust Private Bag X11 Parkview 2122	Avi-fauna (Ornithologist)
Prof Eben Verster	Pedo Plan International Consultants 247 Knysna Avenue 0182 Sinoville	Geology, sols, land types and agricultural potential
Dr Johann du Preez	Cebo Environmental Consultants cc PO Box 11945 Universitas, Bloemfontein 9231	Ecological study (floral and faunal impacts)
Henry Minnaar	Minnaar Consulting Services PO Box 74235, Lynwood Ridge, 0040	Agricultural Economic Impact (Agricultural Economist)

4.4.2 Description of the Affected Environment

A description of the affected environment was provided. The focus of this description had to be relevant to the specialist's field of expertise. The specialists were expected to provide an indication of the sensitivity of the affected environment. The reader is reminded that sensitivity, in the context of the EIR, refers to the "ability" of an affected environment to tolerate disturbance. For example, if disturbance of the natural habitat results in the permanent loss of its biodiversity. The affected environment could be categorised as having a "low tolerance" to disturbance and is, therefore,

termed a highly sensitive habitat. If, on the other hand, a habitat is able to withstand significant disturbance without a marked impact on its biodiversity the affected environment could be categorised as having a high tolerance to disturbance (i. e. "low sensitivity" habitat).

4.4.3 Approach of the Specialists Studies

Each specialist provided an outline of the approach used in his / her field of expertise. Assumptions and sources of information were clearly stated. The knowledge of local people was, where possible, incorporated in the study. The description of the study approach included a short discussion of the appropriateness of the methods used in the specialist study in terms of local and international trends and specific practice.

4.4.4 Identification of Possible Risk Sources

The specialists were expected to identify the potential sources of risk to the environment posed by the construction, operation and maintenance of the proposed Mercury - Perseus 400 kV transmission line. Risks were identified for the construction and operational phases of the project.

4.4.5 Integration of Specialist Findings

Once the site investigation phase of the specialist studies was complete, an Integration workshop with all the core specialists and the Proponent (Eskom Transmission) was held. At the workshop the attendees endeavoured to provide multi-disciplinary solutions to the environmental issues and areas of concern. These solutions are reflected in the addendums to the specialist study reports and in this Environmental Impact Report. Refer to section 6.2.2 for detailed discussion.

4.4.6 Impact Identification and Assessment

The specialists clearly stated the environmental impacts of the construction, operation and maintenance of the proposed Mercury – Perseus 400 kV transmission line. As far as possible, the specialists were required to quantify the suite of potential environmental impacts identified in their study and assess the significance of the impacts according to the criteria set out below. Each impact was assessed and rated. For the purposes of the EIR, the term "assessment" refers to "the process of collecting, organising, analysing, interpreting and communicating data relevant to some decisions" (Stauth *et al*., 1993). The assessment of the data was, where possible, based on accepted scientific techniques, failing which the specialists were to make judgements based on their professional expertise and experience.

4.4.7 Impact Assessment Procedure

The terms of reference for the specialist studies included criteria for the description and assessment of environmental impacts. These criteria were drawn from the EIA Regulations, published by the Department of Environmental Affairs and Tourism (April 1998) in terms of the Environmental Conservation Act No. 73 of 1989. These criteria included:

- Nature of the impact;
- Extent of the impact;
- Duration of the impact;
- Intensity;
- Probability of occurrence;
- Status of the impact; and
- Degree of confidence in predictions.

Section 9 provides details on each of these criteria.

4.4.8 Recommending Mitigation Measures

Mitigation measures were recommended in order to enhance benefits and minimise negative impacts and they addressed the following:

4.4.8.1 Mitigation objectives: what level of mitigation must be aimed for?

For each identified impact, the specialist provided mitigation objectives (tolerance limits), which would result in a measurable reduction in impact. Where there was limited knowledge or expertise on such tolerance limits, the specialist made a recommendation based on his / her professional experience.

4.4.8.2 Recommended mitigation measures

For each impact the specialist had to recommend practically attainable and feasible mitigation actions, which could measurably affect the significance rating. Each specialist was also required to identify management actions, which could enhance the condition of the environment. Where no mitigation is considered feasible, this was stated and reasons provided

4.4.8.3 Effectiveness of mitigation measures

Each specialist provided quantifiable standards (performance criteria) for reviewing or tracking the effectiveness of the proposed mitigation actions.

4.4.8.4 Recommended monitoring and evaluation programme

Each specialist was required to recommend an appropriate monitoring and review programme, which could track the achievement of the mitigation objectives.

Each environmental impact was assessed before and after mitigation measures have been implemented.

The management objectives, design standards etc., which, if achieved, can eliminate, minimise or enhance potential impacts or benefits must, wherever possible, be expressed as measurable targets. National standards or criteria are examples, which can be stated as mitigation objectives.

Once the above objectives have been stated, practically management actions, which can be applied as mitigation, must be provided.

If the proposed mitigation is to be of any consequences, it should result in a measurable reduction of impacts (or, where relevant, a measurable benefit).

SECTION 5: OVERVIEW OF THE PUBLIC PARTICIPATION PROCESS

5.1 INTRODUCTION

Public participation plays an important role in the EIA process and the planning, design and implementation of any development. Afrosearch (Pty) Ltd. conducted the public participation activities involving as many potentially interested and affected parties (I&APs) as possible. The comments received and the issues arising from the public participation process have been used extensively in this EIR.

Issues gathered during the Scoping Phase, assisted SEF in determining sensitive areas, as well as the preferred alternative. This information was also used to decide which specialist studies had to be conducted during the EIA phase. During the Environmental Impact Assessment Phase, issues raised by I&APs include the proposal for a new alternative corridor and mitigation measures. I&AP's also contributed extensively to the Environmental Management Plan (EMP).

5.2 AIM AND STRUCTURE OF THIS CHAPTER

Afrosearch was appointed by Strategic Environmental Focus (SEF) as the Public Participation Consultant to conduct the Public Participation Process (PPP). This Section endeavours to provide a detailed account of the PPP conducted for both the Environmental Scoping and EIA phases for the proposed Mercury - Perseus 400 kV transmission line, which in turn will enable the DEAT and I&APs to assess the process followed in terms of its:

- Effectiveness,
- Appropriateness and transparency, and
- Compliance with the environmental legislation.

The aim of this chapter is two-fold:

- to provide a description of the public participation process conducted; and
- to provide a list of issues recorded during the process and aims to clarify these issues either by providing a cross-reference to sections of the reports or supporting documentation where the issue is addressed, or giving an answer in the "Cross-reference / Response" column of the issues register. Where relevant, statements were recorded to give the reader a feel for the sentiments of I&APs (Appendix A5 in Annexure A).

5.3 THE PUBLIC PARTICIPATION PROCESS FOLLOWED

Public participation can be defined as "… a process leading to a joint effort by stakeholders, technical specialists, the authorities and the proponent who work together to produce better decisions than if they had acted independently" (Greyling, 1999). The Public Participation Process (PPP) attempts to maximise the relevance of the final product for stakeholders. Therefore stakeholders must be consulted and afforded the opportunity to participate. In so doing, ownership of the project is vested in both the project proponent and the community.

A PPP should achieve the following:

- Provide a vehicle for public input and the facilitation of negotiated outcomes;
- Create trust and partnerships;
- Minimise negative impacts and maximise positive impacts; and
- Provide an up-front indication of issues which may prevent project continuation, resulting in costly delays, or which may result in enhanced and shared benefits.

The main objective of the Public Participation Process during the Scoping Phase was to provide I&APs with an opportunity to participate meaningfully and get involved at an early phase of the environmental investigation. Issues raised and requests made by I&APs were collated in an Issues Register. During the EIA phase, further in-depth consultation took place with potentially affected landowners, with the aim of informing them of the following:

- The proposed preferred corridor;
- Terms of Reference for specialist studies;
- Sensitive areas and issues; and the
- Environmental Management Plan (EMP).

During the EIA phase I&APs suggested that a new corridor be investigated; SEF conducted a study to determine the feasibility of assessing a new alternative. As part of the feasibility study I&APs where consulted and their issues were incorporated into the issues register. Issues raised by I&APs were fed into the EIA process that informed the environmental studies for the new proposed corridor.

The issues / questions / comments received during both phases were combined into a single Issues Register (please refer to Appendix A5 in Annexure A). The

environmental team responded to each issue / question / comment recorded to date by either providing a cross-reference or a response in the Issues Register.

In keeping with the spirit of Integrated Environmental Management and environmental legislation, the Public Participation Process has attempted to provide the majority of I&APs with the opportunity to participate actively in the environmental investigation.

5.3.1 Approach and Methodology

The broader framework in which the environmental investigations are conducted is Integrated Environmental Management (IEM). A definition provided by DEAT (1998) for IEM reads as follows:

> "*IEM is a combination of proactive and preventative processes and procedures that maintain the environment in a good condition for a variety of short and long range sustainable uses.*"

In order to ensure that IEM is incorporated into a development process, it is necessary to identify issues, understand associated impacts and allow I&AP's to influence the outcome of the study. Thus, it is important that the process is conducted in the public domain, allowing I&AP's the opportunity to participate in this process.

5.3.1.1 Approach

As the Public Participation Programme is an integral part of the Integrated Environmental Management (IEM), the same IEM principles should be applied. IEM principles, listed by the DEAT (1998) and which are the most relevant to the Public Participation Programme include:

- Meaningful and timely participation of I&APs,
- Focus on important issues,
- Due consideration of alternatives,
- Accountability for information used in decision-making,
- Encouragement of co-regulation, shared responsibility and a sense of ownership,
- Application of "due process" particularly with regard to public participation in environmental governance as provided for in the Constitution, and

- Inclusivity: the needs, interests and values of I&APs must be considered in the decision-making process.

The core environmental project team interacted with representatives of both the National and Provincial authorities (DEAT & DTEEA respectively) during the site visit conducted in February 2003. Part of the discussions revolved around the Public Participation Process and the acceptance of the proposed approach.

5.3.1.2 Methodology

The approach towards any public participation process is dependent upon the details of the project, the reason being that each project has a particular geographic and technical nature and hence the public participation process should be structured accordingly. Where possible and within the required statutory frameworks, it is also desirable to structure such a process to address the process needs of the I&APs. The following methods were used during this PPP.

5.3.1.2.1 Identification and Registration of Stakeholders on a Database (Scoping and EIA phases)

<u>Scoping Phase</u>

Through advertisements (refer to the section below) and networking, stakeholders were identified and registered on a database (Appendix A4 is a list of all registered I&APs).

Both an institutional and a geographical approach were used to achieve this. Institutions, organisations or individuals that might be affected by, or could make a contribution to, the project but who are not necessarily in its direct sphere of impact were identified. This included Farmers' Unions, Government Departments and national environmental organisations. Geographically, stakeholders (e.g. residents, community groupings and businesses) located in and immediately around the proposed alternatives were targeted (see Appendix A6).

<u>EIA phase</u>

The registration period did not expire at the end of the Scoping phase and I&APs continued to register during the EIA phase (refer to Appendix A7 for details).

5.3.1.2.2 Identification and registration of potentially affected landowners (EIA phase)

Once the preferred corridor was identified and the EIA phase commenced, all farms within a band of approximately 2 km of the preferred corridors were identified. A search at the Deeds Office provided the subdivisions as well as the names and identity numbers of the registered owners of the land (see Appendix A4).

A variety of methods were used to obtain contact details for landowners in an effort to include potentially affected landowners in the process, these included:

- the local telephone book;
- neighbours;
- word of mouth;
- the Landbank;
- local attorneys; and
- Searches to find the names and contact details of trusts, closed corporations and companies.

5.3.1.2.3 Creating awareness (Scoping and EIA phases)

Scoping phase

To create an awareness of the project, use was made of newspapers, flyers, posters and personal correspondence with pre-identified I&APs. (A copy of the advertisement sent out is depicted in Figures 1A and 1B of Appendix A1, while Appendix A2 contains a copy of the flyers and site notices used). Except in the newspapers, where only one language per newspaper was used, all notifications were in Afrikaans and English.

EIA phase

During the EIA phase, a newspaper advertisement noting that the EIA phase had commenced was placed. The notice also reminded the public of forthcoming Public Meetings.

(Please refer to Figures 2A and 2B of Appendix A1 in this instance.)

No flyers and posters were used during this phase, but a letter containing the information of the newspaper advertisement as well as a short background was sent out to all registered I&APs, including the newly-identified landowners.

Media

Scoping phase

Newspaper advertisements appeared in the following newspapers:

- Die Volksblad (07 April 2003),
- Bloemnuus (10 April 2003),
- Vista (10 April 2003),
- Klerksdorp Rekord (11 April 2003),
- Noord-Vrystaatse Gazette (11 April 2003), and the
- GoldNet News (11 April 2003).

EIA phase

Reminder notices were placed in newspapers to remind I&APs of Public Meetings. These advertisements appeared as followed:

- Die Volksblad (03 September 2003),
- Bloemnuus (04 September 2003),
- Vista (04 September 2003),
- Klerksdorp Rekord (05 September 2003),
- Noord-Vrystaatse Gazette (05 September 2003), and the
- GoldNet News (05 September 2003).

Notices were placed in newspapers to remind I&APs of the Public Meeting and availability of the draft EIA Report for public comment. These advertisements appeared as followed:

- Die Volksblad (14 January 2004),
- Bloemnuus (16 January 2004),
- Vista (15 January 2004),
- Klerksdorp Rekord (16 January 2004),
- Noord-Vrystaatse Gazette (16 January 2004), and the
- GoldNet News (16 January 2004).

Flyers (Scoping Phase)

A total of 4 895 flyers (bilingual) were put in the post boxes of the following towns during the Scoping Phase:

- Bothaville (1 500 flyers),
- Allanridge (210 flyers),
- Dealesville (250 flyers),
- Bultfontein (603 flyers),
- Hertzogville (350 flyers),
- Wesselsbron (550 flyers),
- Viljoenskroon (802 flyers), and
- Hoopstad (380 flyers).

Posters (Scoping Phase)

A total of 215 posters were erected in the towns of the study area during the Scoping phase. The distribution was as follows:

- Bothaville (50 posters),

- Bultfontein (30 posters),
- Wesselsbron (30 posters),
- Viljoenskroon (30 posters),
- Dealesville (15 posters),
- Hertzogville (15 posters),
- Vierfontein (15 posters),
- Allanridge (15 posters), and
- Hoopstad (15 posters).

Posters were put up at municipal offices, libraries, the Post Office, liquor stores, cafés, video shops, the local Spar, the Senwes Co-operatative and along the main streets. (If required a list where all the posters were erected, as well as a photograph of each poster can be provided.)

Letters / faxes and e-mails (see Appendix A10)

Scoping Phase

Communication was also sent to the persons / organisations that were pre-identified by the consultants and Eskom: Transmission. In total, 58 faxes, 49 e-mails and 27 letters were sent.

EIA Phase

The first events during the EIA phase were the two Landowner Workshops. Letters, containing a Background Information Document (see below for more information), a short background to the study, a list of the potentially affected farm portions and an invitation to the Landowner Workshops were sent to those landowners identified during the deeds search. In total 233 letters were sent. As some of the landowners were only identified very late, 61 of these landowners were invited telephonically.

Communication, containing a short background of the study to date and an invitation to the Public Meetings were sent to the entire database of registered I&APs. At this stage, the database grew as a result of including attendants at the

Public Meetings, persons registering by contacting Afrosearch, persons registering by word of mouth and persons identified during the deeds search. At this stage 53 faxes, 68 e-mails and 369 letters were sent out. Ten (10) persons were invited telephonically.

The feasibility study to determine if a new alternative corridor should be investigated included focus group and individual meetings. The meetings where held on 16 October 2003, a total of 13 key I&APs participated in the meetings.

The PPP for the environmental assessment of the proposed alternative corridor included the organisation of three Focus Group Meetings that were held on 25 and 26 November 2003. Some 215 I&APs where further informed of the project and invited to the meetings.

5.3.1.2.4 Disseminating information and noting comments

Information was disseminated to I&APs in a number of ways. Each will be discussed briefly:

Background Information Document (BID) (see Appendix A3)

The BID was produced and distributed from March 2003. This document:

- Explained the background to the project (including the need for the proposed 400 kV transmission line),
- Gave an overview of the project,
- Introduced the EIA process that will be followed,
- Explained the PPP and provided I&APs with a registration form and the contact details of the Public Participation Consultant,
- Provided a map of the study area,
- A list of the specialists and their areas of study for this project, and
- Informed I&APs of the Open Days and

Public Meetings scheduled for April and September 2003.

Copies of the BID were:

- Disseminated to identified I&APs,
- Provided at Public Open Days, Public and Focus Group Meetings,
- Mailed to people on the initial I&AP list.
- Mailed to all potentially affected landowners identified during the deeds search, and
- Mailed to I&APs on request.

Mobile Display (Appendix A12)

A set of posters was produced to form part of a mobile display at Public Open Days and Public Meetings. The posters provided further details of the project .

Focus Group Meetings

A Focus Group is a group of persons / organisations that share similar characteristics and objectives, e.g. farmers' unions or environmental organisations. During Focus Group Meetings, the consultants for the technical and participatory processes make detailed presentations (Appendix A13). The objectives of these presentations are to identify suggestions, concerns and perceptions as well as to inform and educate.

The aim of these meetings was to inform attendants of the proposed project and the EIA underway, identify issues, questions and concerns, as well as identify further I&APs.

Four Focus Group Meetings were held on 15 and 16 April 2003. Invited to these meetings were:

- Provincial departments (Tuesday 15 April 2003 at 10:00):
    - Free State Department of Tourism, Environmental and Economic Affairs,

- Free State Department of Public Works, Roads and Transport,
- Free State Department of Health,
- Free State Provincial Museum Services, and
- the Office of the Premier.

Other Focus Group Meetings were:

- Air Force Base: Bloemspruit (Tuesday 15 April at 13:45)
- Representatives from SA Agric (Wednesday 16 April 2003 at 08:00),
- Representatives from the District Farmers' Union (Wednesday 16 April 2003 at 11:00), and
- Civil Aviation Authority (CAA) and members of the SANDF Air Force, Directorate of Aviation Safety (Wednesday 14 May 2003 at 11:00),
- SandVet Water Scheme and National Department of Agriculture (07 August 2003 at 10:00),
- National and Free State Provincial Departments of Agriculture (Tuesday 09 September 2003 at 11:00),
- Landowner meeting on the farm Helpmekaar (Thursday 16 October 2003 at 11:00)
- Sandveld Nature Reserve Meeting (Thursday 16 October 2003 at 16:00)

Minutes were kept at each meeting (Appendix A9) and the issues, concerns, questions and statements collected were fed into the PPP and the Issues Register.

Additional individual meetings were held with a number of I&APs at their request. These individuals were:

- Mr SJ Gouws (Farms Magdala and Driehoek) on 23 April 2003,
- Mr H Smith (Farm Klein Driefontein and his parents' farm – Aangekocht) on 23 April 2003,
- Dr JA Pienaar (Farm Die Denne) on 23 April 2003, and
- Mr J Grobler (Farm Karookom) on 24 April 2003, and
- Mr Nic Opperman of SA Agric (National) on 29 August 2003,
- Ms. S. Helm (Farm Zaaibult) on 05 September 2003
- Mr. D. G. P. Mienie (Farm Middelplaats) on 05 September 2003,
- Mr. P. J. van Biljon (Farm Vierfontein) on 05 September 2003;
- Mr. H. Pienaar (Farm Bospan) on 16 October 2003; and
- Mr W. Badenhorst (Farm Alabama) on 26 November 2003.

As stated previously Focus Group Meetings were held as part of the environmental investigation for the alternative corridor proposed by I&APs. These meetings were held on:

- 25 November 2003, at the Bulfontein public library. 26 I&APs attended the meeting;
- 25 November 2003, at the NG Kerk in Hoopstad. 24 I&APs attended the meeting; and
- 26 November 2003, at the Bothaville Kommando Saal, 22 I&APs attended the meeting.

During these meetings a short background was given of the EIA and PPP, the reasons for investigating a new alternative corridor and the way forward for the project was outlined. A presentation was delivered at the meetings, which outlined Eskom's transmission line construction practices. The attendees were afforded the opportunity to study a map of the proposed corridors and give their input; issues were recorded and incorporated into the Issues Register.

Landowner Workshops

Two Landowner Workshops were held on 06 and 07 August 2003. All the potentially affected landowners identified through the deeds search were invited to these workshops. The workshops took the form of a formal meeting with an informal discussion around the series of 1:50 000 topographic maps that showed the alternative corridors.

The purpose of these workshops were:

- Introduce the project and the process,
- Explain the need for the project,
- Explain the process to date,
- Indicate the preferred corridor,
- Indicate the issues already identified through the public participation and bio-physical studies,
- Note specific issues, concerns and questions that pertain to the preferred corridor, and
- Answer questions and explain concepts.

At the Landowner Workshops it became clear that there were a number of pertinent issues that had to be dealt with. In particular, landowners felt that the agricultural land in question was of particular importance to the country due to its high yield potential. It was felt that the negative impacts that the line would have would be compounded and that a new corridor should be sought in an area where grazing

was prevalent and the yield potential of agricultural land less.

During the Public Meetings in September 2003, this suggestion was explored in collaboration with I&APs. This resulted in the feasibility and later environmental investigation of the new alternative corridor as discussed in the previous sections.

Open Days and Public Meetings

Due to the size of the study area, it was deemed necessary to hold meetings in two locations each time (April, August and September 2003), namely Bultfontein in the south and Bothaville in the north of the study area.

Scoping Phase

The first Open Day / Public Meeting took place on Wednesday 23 April 2003 at Bultfontein, while the second was conducted on Thursday 24 April 2003 at Bothaville.

- Open Days

  The purpose of an open day is to register new I&APs, to inform and educate as well as to identify issues and concerns. An open day also serves to initiate the further consultation process.

- Public Meetings

  The main objective of a public meeting is to give the public an opportunity to become involved in the project and provide their input.

  Moreover, public meetings are an important platform by which information assimilated during the consultation process can be verified and new issues recorded and debated. As is the case with the Focus Group Meetings, detailed presentations are made regarding the technical aspects and the results of the PPP to date. The broader public is once again given the opportunity to participate in the discussion.

Minutes were kept (Appendix A8) and the issues / questions and comments identified were fed into the Scoping Process.

EIA phase

During the EIA Phase, Public Meetings were held on Wednesday 10 September 2003 in Bultfontein and Thursday 11 September 2003 in Bothaville.

A feedback public meeting has been scheduled for Tuesday 27 January 2004 at 10:00 in the NG Kerk Hall, in Wesslesbron. The preferred corridor and the draft Environmental Impact Report (EIR) will be presented at the public meeting. All registered I&APs will be invited to the public meeting by way of personal invitations, newspaper advertisements and radio announcements.

Ongoing Communication

Afrosearch's contact details were provided on all communication and media releases. Many I&APs phoned to register, obtain information and to raise issues. These issues were also taken up in the Issues Register (Refer to Appendix A5).

Availability of the Draft Scoping Report for public comment

The Draft Scoping Report was made available for public perusal and comment for a period of two weeks (26 May to 12 June 2003). Registered I&APs were informed of this via fax, letter, e-mail or telephonically.

Hard copies of the report were placed at the following venues:

- Dealesville Library,
- Bultfontein Library,
- Hoopstad Library,
- Hertzogville Library,
- Wesselsbron Library,
- Bothaville Library,

- Viljoenskroon Library, and
- Vierfontein Police Station.

Additionally, the report was made available on the Eskom website (www.eskom.co.za/eia). I&APs were also afforded the opportunity of obtaining the document on CD-Rom.

Availability of the Draft EIR for public comment

All registered I&AP will be informed of the availability of the draft EIR, the draft EIR will be placed in various public libraries (as stated above) and on the Internet for public comment for a period of thirty days (15 of January 2004 to 15 February 2004).

5.3.1.3 Consultation with Environmental Authorities

SEF and the proponent were in regular communication with the representatives of DEAT and DTEEA (the responsible authorities in the Free State) regarding the development.

5.3.2 Identification of Environmental Issues and Concerns

The Issues Register for the Scoping and EIA phases have been combined in one Issues Register, which is provided under Appendix A5 of Annexure A. This document contains the issues/questions/comments raised during the public participation programme and also provides a response or cross-reference to parts of the EIR, where these issues are addressed.

5.3.3 Key Concerns Raised by I&APs

Most of the issues raised by I&APs are related to the potential disturbance of farming activities during construction and the loss of production on high potential soils. To an extent, such issues can be mitigated through a thorough environmental process and the strict implementation of an Environmental Management Plan (EMP).

There were, however, a number of issues that I&APs felt strongly about; which resulted in a petition being drawn up on the 26 August 2003. The issues mentioned in the petition are as follows (Refer to Appendix A11):

- The preferred (Corridor 1), as chosen by the environmental consultants, crossed agricultural land with a high agricultural

yield potential and there would be an immense adverse effect on the landowners;

- There would be considerably less of an impact in areas with grazing as opposed to agricultural land;
- There could be an adverse effect on precision agriculture, thus creating higher costs;
- Crop spraying will become extremely dangerous, as will flights from NAMPO Air Strip;
- Production of necessary staple foods will be negatively influenced;
- The proposed area is an extremely high maize, wheat, sunflower and groundnuts area; and
- Much higher than average amount of farms will be affected.

As a result of the petition, a fourth corridor was investigated in order to address the issues raised in the petition.

5.3.4 Conclusion

The Scoping Phase provided a good overview of the issues in general. During the EIA phase, Afrosearch endeavoured to make contact with every landowner that may be affected by the proposed transmission line in order to ensure that he/she understands the implications of having a transmission line on his/her land.

During this phase, the emphasis was on identifying issues and concerns that would inform the technical process, with a view to developing measures for successful mitigation. Various stakeholders participated in the EIA phase, these included landowners, government department (Free State Department of Nature Conservation), farmers' unions and interested parties. The stakeholders where afforded the opportunity to raise issues and concerns, which the EIR endeavoured to address.

SECTION 6: EVALUATION OF ALTERNATIVES

6.1 INTRODUCTION

The IEM procedure stipulates that an environmental investigation needs to consider feasible alternatives for any proposed development. Therefore, DEAT requires that a number of possible proposals or alternatives for accomplishing the same objectives be considered. For the purposes of this EIA the environmental project team evaluated four alternative corridors. Other alternatives evaluated include, the No-Go option and Timing alternatives.

6.2 EVALUATION OF ALTERNATIVE CORRIDORS

A detailed location alternative analysis was undertaken for the development, with obvious limitations being placed by the location of the region where additional power is needed. The project investigation team considered four possible corridors within the study area, namely Corridors 1, 2, 3 and 4 (see Study Area Map in Appendix B1). A number of plausible modifications of these main corridors are shown as alternatives on the study area map. The first three options were initially selected since they were considered as the best alternatives that would minimise the environmental impact of the proposed transmission line. Stakeholders proposed the fourth corridor, at end of the scoping phase, when it had already been suggested that Corridor 1 was the preferred corridor. The final corridor was determined based on:

- environmental characteristics:
- specialists' recommendations;
- the opinion of the public, ascertained through the public consultation process; and
- techno-economic cost-benefit analyses.

During the scoping exercise, based on a preliminary identification of physical, biological and social constraints of the plausible options several criteria supported the selection of Corridor 1 as the preferred corridor. It was mentioned in the Scoping Report that the comprehensive environmental impact assessment phase would specifically assess the likely impacts of this corridor. Furthermore, it should be noted that only at the end of the negotiation would the exact route of the servitude be determined; however, the EIA would be concluded by suggesting a corridor wherein the servitude can be negotiated.

As noted earlier, the end of the scoping phase was marked by an increased awareness and response from the public. This led to the suggestion that an alternative corridor be considered, as Corridor 1 was not supported by stakeholders,

who felt that there was sufficient motivation to warrant the investigation of an alternative corridor.

6.2.1 Investigation of the Fourth Corridor

As the alternative corridor proposed by stakeholders was still within the broader study area, it was only necessary for key aspects of the corridor, which determine its viability as an option to be investigated. These were the Visual Impacts and the impacts on Bird-Life. Information pertaining to all other aspects was considered as having been documented in the previous specialist studies. Furthermore, stakeholder workshops were held as a continuation of the public participation process for this alternative corridor. Thus, the public also contributed to the information gathering for the fourth corridor. Other aspects of the fourth corridor were evaluated at an integration workshop of the investigation team.

6.2.2 Integration Workshop – The Modified Delphi Method

An integration workshop, involving the key specialists who took part in the investigation of the various alternatives was held on the 28 November 2003. The purpose of the meeting was to give each specialist an opportunity to state a case for his or her choice of the preferred corridor for the transmission line. This was done according to a modified Delphi Method.

6.2.2.1 The Modified Delphi Approach

The method used to evaluate the various alternatives was the Delphi, jury of expert opinion method, which is one of the most commonly used qualitative methods in decision-making (Decision Support Tools, 2001).

The Delphi, named after the oracle of ancient Greece, is an iterative process of interrogating a panel of experts. The panel members are (either) kept separate or instructed not to communicate with each other. The objective is to achieve consensus in the final analysis.

An important feature of the Delphi method is the elimination of the bandwagon effect of the majority opinion, which is one of the problems associated with a jury of expert opinions. Group dynamics ensures that any meeting to decide on a number of alternatives will develop leaders and followers. If the leaders are not expert at bringing out the opinions of less forceful members of the group, valuable insights may be lost. Another feature of group meetings is the natural tendency to be positive and optimistic.

By avoiding this effect the Delphi method allows opinions, which do not fit the general consensus to be highlighted. The experts holding these opinions can then be asked to justify them in the light of a different consensus view. This may be the most valuable part of the whole exercise, as a dissenting expert may be the only one privy to new knowledge, which makes the consensus obsolete. This may be especially important in fields subject to rapid technological change.

At the integration meeting, a summary of the salient features and characteristics of each alternative were presented. Specialists were then given a period of time to evaluate the alternatives based on their experience and expertise, as well as their first-hand knowledge of the study area. Specialists were required to evaluate the alternatives solely from the viewpoint of their field of expertise. Thereafter, each specialist explained and justified the basis of their evaluation and choice of the preferred corridor. A discussion then ensued to achieve the consensus opinion regarding the preferred corridor.

6.2.3 The Preferred Corridor

Each segment of the proposed corridors was labelled alphabetically for easy identification of alternative sections along each alternative. These sections were then rated on a scale indicating the most preferred and least preferred sections.

Table 6 shows the scores of the various corridors, as evaluated by each specialist who took part in the integration workshop. These scores are based on a rating scale ranging from of 0 to 6, where 0 represents a section of the corridor that is the least desirable and 6 represents the best option. Based on these results each specialist was given an opportunity not only to explain his choice, but also to hear the opinions of other experts. The ensuing discussion enabled a consensus on the final corridor to be reached. Since most specialists were of the view that Corridor 4 was the option that would have the least overall impacts on the various aspects of the environment, Corridor 4 was unanimously chosen as the most preferred corridor for the transmission line. Refer to Table 7 for the comparative analysis of the various corridors, which is based on the discussion and specialist reports.

After considering the impact of the various alignments on the birds, the bird specialist concluded independently of the above process that the Corridor 4 is preferred. It should be noted that the view of the Soils expert is due to the fact that any of the four corridors would invariably traverse high potential arable soils. The Agricultural Economic specialist concurs with this opinion.

Table 6: The Evaluation of the various corridors using the Modified Delphi Approach.

Soils	**Rating of Alternatives (1 – 4)**				**Ecology**	**Rating of Alternatives (1 - 4)**			
Corridor section	**1**	**2**	**3**	**4**	**Corridor section**	**1**	**2**	**3**	**4**
a	5	5	4	3	a	3	2	6	6
b	3	5	3	3	b	3	2	6	6
c	3	3	2	2	c	5	2	3	6
d	2	2	2	2	d	4	2	3	6
e	2	2	2		e	4	2	4	
f	2	2			f	6	3		
g	2	2			g	4	4		
h	2	2			h	6	3		
I		2			I		3		
j		2			j		3		
k		2			k		3		
	21	29	13	10		35	29	22	24
Total (%)	43.8	**43.9**	43.3	41.7	Total (%)	72.9	43.9	73.3	**100.0**
Social					**Aquatic**				
Corridor section	**1**	**2**	**3**	**4**	**Corridor section**	**1**	**2**	**3**	**4**
a	6	2	4	6	a	4	4	3	4
b	6	2	2	6	b	4	5	3	4
c	2	2	2	3	c	3	2	2	6
d	2	2	3	3	d	5	2	3	5
e	4	2	3		e	5	3	3	
f	6	2			f	4	3		
g	4	2			g	5	4		
h	6	2			h	5	3		
I		2			I		4		
j		2			j		4		
k		2			k		5		
	36	22	14	18		35	39	14	19
Total (%)	**75.0**	33.3	46.7	**75.0**	Total (%)	72.9	59.1	46.7	**79.2**
Visual					**Public**				
Corridor section	**1**	**2**	**3**	**4**	**Corridor section**	**1**	**2**	**3**	**4**
a	4	3	2	4	a	5	3	2	5
b	5	3	4	4	b	4	3	2	4
c	4	5	2	4	c	3	3	2	5
d	4	2	2	5	d	2	4	2	6
e	4	2	2		e	3	2	2	
f	4	5			f	3	2		
g	3	4			g	3	3		
h	5	3			h	6	2		
I		4			I		2		
j		3			j		2		
k		3					2		
	33	37	12	17		29	28	10	20
Total (%)	68.8	56.1	40.0	**70.8**	Total (%)	60.4	42.4	33.3	**83.3**

Table 7: Comparative Analysis of the various corridors.

Assessment Criteria	Corridor 1	Corridor 2	Corridor 3	Corridor 4
Length (approximate)	**215 km**	**245 km**	**265 km**	**240 km**
Socio-Economic & Public Participation	From this perspective the social impact is significant as it crosses areas of high agricultural potential. This overrides the fact that it is the shortest alternative. Has an effect as it cuts across the farms and does not optimise on following existing infrastructure, farm boundaries or headlands.	Corridor 2 follows the most existing infrastructure. This corridor passes in close proximity to various towns (Bothaville, Wesselsbron, and Bultfontein). It follows existing infrastructure where possible.	Corridor 3 has a lower impact in terms of the socio-economic impact as it traverses more pastureland. Does not follow a significant amount of existing infrastructure. Access to portions of this corridor may be problematic.	From this perspective the social impact is significant, however less land with a high agricultural potential is traversed. The corridor optimises following existing infrastructure and where possible traversing pasture land. The corridor strives to follow farm boundaries or headlands. As a result of the above factor, access to the servitude is improved. Therefore this is the preferred Corridor.
Agricultural Economic	This is the shortest corridor but it affects the Sand Vet irrigation scheme and has the potential to interfere with numerous centre pivot irrigation areas.	If Corridor 2 would be modified slightly it would be the most favourable alternative as it follows the most existing infrastructure.	The length of Corridor 3 makes it uneconomical.	This is the second shortest corridor it does not affects the Sand Vet irrigation scheme, however interferes with centre pivot irrigation areas.
Visual Impact	The 4 corridors each traverse the 3 landscape types resulting in much the same impacts on the visual environment. It is the length of the proposed corridors and the extent of the landscape impacted on that is the chief factor determining the preference. Refer to Appendix C3 for the details of the Visual Impact Assessment Report			
	Corridor 1 is the shortest therefore according to what is stated above has the least impact.	Corridor 2 is the second longest therefore according to what is stated above the impact is noticeable. This corridor also follows existing infrastructure.	Corridor 3 is the longest, therefore according to what is stated above it has the most significant impact of all the proposed corridors.	Corridor 4 is the second shortest. From a visual impact assessment it is more favourable than Corridor 1 as it follows a more disturbed corridor i.e. roads, railway lines etc.
Ecological Impact	Was originally the preferred corridor, however, corridor 4 has even less number of pans that this corridor. Does not impact on the Kimberly Thorn Bushveld.	Has a substantial number of pans. Traverses the Kimberly Thorn Bushveld, which is a sensitive habitat for fauna and flora.	Has the most number of pans. Has a significant effect on the Kimberly Thorn Bushveld.	The distance between this corridor and lare pans as well as the lower concentrations of pans makes this corridor the most suitable one. Lower percentage of natural veld is affected. Has a limited impact on the Kimberly Thorn Bushveld.
Bird Impact	The sensitivity of the corridor was determined by the specialist and is given as 3.92. Refer to Appendix C6, Supplementary Report 2.	The sensitivity of the corridor was determined by the specialist and is given as 5.13. Refer to Appendix C6, Supplementary Report 2. Highest due to the number of pans and	The sensitivity of the corridor was determined by the specialist and is given as 4.48. Refer to Appendix C6, Supplementary Report 2.	The sensitivity of the corridor was determined by the specialist and is given as 3.27. Refer to Appendix C6, Supplementary Report 2. Lowest due to the fact that this corridor

Assessment Criteria	Corridor 1	Corridor 2	Corridor 3	Corridor 4
		sensitive habitats along the corridor.		impacts on the least number of pans.
Cultural and Heritage Impact	From the perspective of the specialist the overall impact of any of the four proposed corridors is considered to be low, and therefore the proposed development can continue in any of the four corridors, on condition that the management measures stipulated are adhered to.			
Geology	The geology along the proposed corridors is underlain in most portions by near-horizontally layered rocks of the Karoo supergroup. Other geo-technical aspects such as collapsible grain fabric, active clays and dispersive soils are common			
	Several salt pans occur along this corridor. .	A large number of salt pans occur along this corridor, which may be problematic.	The most salt pans occur along this corridor, which may be problematic. .	Of all 4 alternatives this corridor has the least number of salt pans occurring along this corridor.
Soil and landform	Due to the unique distribution of the soil-landform resources, no one of the proposed corridors is a better corridor in comparison to the impacts it may have.			
Hydrology and surface water resources	The corridor is already impacted on by human influences. Larger pans are not situated in such close proximity to this alignment. This is the shortest route, which will entail the least disturbance due to a shorter footprint.	This corridor is longer than 1 and 4. It crosses more pans and sensitive areas. Limited human induced activities occur along this corridor.	This corridor is longest. It traverses the most number of pans. Crossing points at the rivers are in fairly good condition. Limited human activities have an influence on the water resources.	This corridor has the least number of pans that will be impacted upon. The corridor is already impacted on by human influences.

6.3 STRATEGIC ALTERNATIVES TO THE PROPOSED TRANSMISSION LINE

6.3.1 Introduction

Electrical supply constitutes a complex system of generation facilities, substations and transmission lines. The system operates on a demand-supply structure. Power is generated and transmitted at the moment it is needed. Sufficient spare generation capacity is currently available on the Eskom system to supply the expected increases in load demand in the Region south of Bloemfontein. It is therefore not necessary to increase generating capacity to cater for the forecasted load growth.

The transmission system must, however, be reinforced to meet the following criteria:

- Meet expected future increases in load demand;
- Satisfy the firm supply requirements of any future industrial development projects in the region;

- Maintain existing levels of reliability and quality of supply;
- Minimise cost; and
- Minimise any adverse environmental impacts.

6.3.2 Alternatives for Satisfying the Need for More Reliable Power Supply

Eskom investigated the alternatives, listed below, for satisfying the need for more reliable and / or increased power supply to the Eastern Cape. These alternatives are to be examined in conjunction with the national grid system.

6.3.2.1 The do-nothing option

This is discussed in section 6.4 below.

6.3.2.2 Demand-side Management

Demand Side Management (DSM) can generally be defined as the activities performed by the electricity supply utility, which are designed to encourage the reduction of the amount of electricity used during peak time by influencing customer usage of electricity and to reduce overall demand by more efficient use. These efforts are intended to produce a flat load duration curve to ensure the most efficient use of installed network capacity. By reducing peak demand and shifting load from high load to low load periods, reductions in capital expenditure (for network capacity expansion) and operating costs can be achieved. One of the basic tools is the price differentiation (such as time of use tariffs) between peak demand time and low demand time. This option is practiced to a certain extent, but is currently not considered feasible for expansion in this particular region. However, the large concentration of industrial users in this area makes this a very difficult option to pursue.

6.3.2.3 New generation systems

A new coal fired or nuclear generation plant could be commissioned close to the load centres. This option is not considered feasible since Eskom has surplus generating capacity and is therefore reluctant to commit to new capacity while existing power stations are "mothballed" and not yielding a return on investment. Even if the new plant enhanced generating capacity, the increase would have to be large enough (<200 MW) to make it economically feasible for Eskom to invest in such a plant. Additional transmission lines would

still have to be built to connect the power station to the electricity grid and to transmit the electricity onwards.

Another alternative is to establish a number of nuclear pebble-bed modular reactors close to the load centres. These units are small enough to be able to supply the required local load demand without the need to transmit excess electricity to other geographic locations. This technology, however, is still in the early stages of development. A project is currently underway to establish a demonstration plant in the Western Cape Province, close to Koeberg Power Station. It is expected that it will take a number of years before this technology can be made commercially available at a competitive cost. The option of a nuclear pebble-bed reactor can therefore not meet the short to medium term load requirements in the Greater Eastern Cape Region.

6.3.2.4 Upgrade existing transmission lines by using bigger conductors

If this option was pursued the physical load on the existing towers would increase substantially and the towers would be inadequate. Furthermore, it would not be possible to remove one 400 kV line from service to perform the upgrading work, as the remaining lines would not be able to supply the electrical loads in the region. This option would not optimise the existing infrastructure.

6.3.2.5 Construct a 765 kV transmission line between Alpha – Beta substations

This option proposes a new 765 kV line from Alpha-Beta substations. Although it is plausible it has economic and technical short falls. The line length is approximately 450 km and the 765 kV line costs are double the project cost of a 400 kV line. In addition further network capacity strengthening will be required north of Alpha. The economic and environmental aspects of this project reduces its current viability compared to the other options.

6.3.2.6 Construct a second 400 kV transmission line between Grootvlei – Perseus substations

This option proposes a second 400 kV line from Grootvlei to Perseus. Although technically plausible, this option has economic and environmental short falls. The line length would be approximately 360 km, which is 44% longer than the preferred option (6.3.2.7). This negatively affects the economic viability of the project and increases the negative environmental effects of the project. All

the current 400 kV lines feeding the south are supplied from Grootvlei, a forth line out of Grootvlei would increase the dependence on the Grootvlei substation.

6.3.2.7 Construction of a 400 kV transmission line between Mercury – Perseus substations

This option proposes a new 400 kV line from Mercury to Perseus. The line length is approximately 250 km. The reduced line length and sufficient power transfer capability makes this option attractive. In addition this option reduces the reliance on Grootvlei as the single source feeding the 400 kV network south. The economic and reduced environmental effects of this option makes it the preferred option.

6.4 NO-GO ALTERNATIVE

DEAT stresses that the no-go option should be considered in cases where the proposed development will have a significant negative impact that cannot be effectively or satisfactorily mitigated.

If the Mercury - Perseus 400 kV line is not constructed, or if an alternative solution to strengthening the national grid is not found, Eskom will be unable to meet load demand requirements or maintain existing reliability and quality of supply. In addition, it will not be possible to meet the expected load demand if the predicted 2% increase in electricity demand occurs in the region south of Bloemfontein. Specific development goals in the area, such as the Coega Industrial Development Zone will be jeopardised as a result and this could lead to continuing stunted economic growth in the Eastern Cape.

Most impacts of the development can be effectively mitigated to reduce their significance to acceptable levels and in view of the need for more power supply to support economic growth in the benefiting region, these impacts are not of sufficient import to thwart the approval of the development.

6.5 TIMING ALTERNATIVES

There is a definite need to overcome the current and future problems on the existing transmission lines. The forecasted growth in demand over the next few years urgently requires Eskom to plan and execute goals well in advance. It is therefore necessary to ensure extra supply capacity into the Port Elizabeth area in the medium to long-term. This means that a Record Decision (RoD) to proceed with the construction of the new line must be issued once all environmental and socio-economic constraints have been evaluated and documented in the EIR. Such a course of action would allow Eskom's negotiator to finalise all servitude agreements,

which will in turn pave the way for the construction of the new transmission line in advance of the foreseen load increase.

The new transmission line will be brought into operation at the time when the load growth and demand require it. It is however necessary to secure the necessary servitudes before hand, to ensure that the region's long-term needs can be met.

SECTION 7: DESCRIPTION OF THE AFFECTED ENVIRONMENT

7.1 PHYSICAL ENVIRONMENT

7.1.1 Geology

The geology along the four corridors proposed is underlain in major portions by near-horizontally layered sedimentary rocks of the Karoo Supergroup. These rocks have been extensively intruded by dolerite sills and dykes. Shales and subordinate sandstone of the Volksrust formation (Ecca Group) underlie the southern section from Dealesville to Wesselsbron. The younger sandstone, shale and coal of the Vryheid Formation occur to the north of Wesselsbron (see the full Engineering Geology Report in Appendix C7).

The far northern portion of the corridor, in the vicinity of Viljoenskroon, is underlain by rocks belonging to the much older Transvaal Supergroup, notably andesitic lava of the Pretoria Group. Dolomite and chert of the Malmani Subgroup may also be encountered over relatively short sections of the study area in the vicinity of Viljoenskroon.

7.1.1.1 Corridor 1

The first corridor traverses a flat-lying area of very gentle slopes, with tall grasses and cultivated lands mainly of maize, peanuts and sunflower. Several salt pans occur from Dealesville to Bultfontein with occasional salt pans near Wesselsbron. This corridor is close to a landing strip near Bultfontein, as seen on a 1:50 000 topographical map.

7.1.1.2 Corridor 2

Like Corridor 1, this course passes through flat-lying areas that are mostly cultivated. There are also a number of large salt pans along the corridor. The corridor cuts across the Vet River between Diel Kuil and Tierfontein.

7.1.1.3 Corridor 3

Numerous small and large pans are found along the third corridor proposed for the transmission line. Save for a stream occurring at co-ordinates 28° 33’ 31” S 25° 45’ 26” E, this path is similar to Corridors 1 and 2.

7.1.1.4 Corridor 4

The topography and geology of Corridor 4 are similar to that of Corridor 1, with the same prevailing conditions as outlined for Corridor 1. Corridor 4 crosses a number of perennial and non-perennial rivers, and pans associated with inundation. The most prominent rivers include the Sandspruit River south of Bothaville and the Vet River directly east of Hoopstad.

7.1.1.5 Geo-technical Evaluation

From observations of the four proposed corridors, Corridors 2 and 3 may be problematic due to the presence of large salt pans from Dealesville to Wesselsbron. The salt pans occurring along Corridor 1 appear to be scattered along the corridor between Dealesville and Bultfontein.

Based on a preliminary visual assessment, Corridor 4 appears to be the most feasible corridor, as it has fewer pans than Corridors 2 and 3. Other geo-technical aspects, such as collapsible grain fabric, active clays and dispersive soils are common to all four corridors and as such do not play a significant role in corridor selection at this stage. This geological assessment, however, is limited and will need to be buttressed by corridor transect walks, aerial photograph interpretations etc. in the preparation of an engineering geological map of the corridors.

7.1.1.6 Potential Risk Sources

The potential risk sources related to engineering geology are limited to the following:

- Subsidence caused by dolomitic ground, which is limited to the far northern portion of the study area, generally to the north of Viljoenskroon;
- Subsidence caused by undermining associated with the gold mining areas;
- Soil erosion caused by dispersive soils in association with disturbances of the vegetation/topsoil cover and poor ground management practices; this risk is limited to moderately sloping ground only;

- Soil heave caused by thick active clay horizons, associated with fluctuated soil moisture, generally seasonally;
- Collapse of soil structure below foundations due to collapsible soils, associated with drastic increase in soil moisture content; and
- Seasonally, the surface water of pans may be aggressive due to high salt concentrations.

These risks will affect both the construction and operation phases.

7.1.2 Soils

Generally, five broad soil-landform systems related to parent material and topography can be distinguished. These are:

1. freely drained, red and yellow-brown, fine sandy soils on level topography;
2. fine sandy to loamy soils in plinthic catena on level topography;
3. duplex soils with reddish subsoils on level topography;
4. duplex and other clayey soils of mainly bottomland sites; and
5. very shallow and rocky soils overlying calcrete and hard rock associated with steeper slopes in places.

Regarding parent materials, the fine sandy soils owe their origin to the incursion of aeolian sands from the direction of the Kalahari during arid periods of the Quaternary era, while the loamy and clayey soils of floodplains have been derived from alluvial deposits. For the formation of calcrete and red, duplex soils, the significant influence of weathered doleritic material is apparent.

As shown above, soils determine, amongst others, the agricultural production potential of land. Attributes that can result in soil degradation are the vulnerability of the fine sandy soils to wind erosion, their tendency to compact when traversed by heavy machinery and their poor support for roadbeds. Similarly, the duplex soils are susceptible to water erosion when disturbed, while the clayey soils of land types Db and Dc show swell-shrink properties and are therefore poor support for roadbeds and foundations.

With the aid of the land type maps, the soil-landform resources along the proposed corridors can be ascertained. Due to the unique distribution of

these resources, all the proposed corridors cross the plinthic catena soils north-east of Wesselsbron; the freely drained, red and yellow-brown, fine sandy soils south-west of Wesselsbron; duplex soils of land types D; and very shallow soils of land type Fc in almost equal amounts.

7.1.2.1 Pans

Pans are unique features of the landscape in some of these broad systems. The importance of pans is ascribed to their aesthetic appearance, their ability to store run-off water, and the unique ecosystems they support (see Flora and Fauna in section 7.2 below). Pan soils and the associated materials that go with pan ecosystems are also regarded as useful archives from which Quaternary History can be reconstructed and past climatic changes unravelled. They were preferential habitation for Stone and Iron Age people possibly due to all the above factors as well as the occurrence of economic deposits such as table salt.

Land types Ah20, Da1, Dc9 and Fc13 contain the highest percentage of pans. The soils are mainly dark coloured, loamy to clayey, calcareous, strongly alkaline and exhibiting moderate to strong swell-shrink potential.

7.1.2.2 Land Evaluation

To rate land for agriculture, the land capability system of Scotney *et al*. (1987) was employed.

7.1.2.2.1 Agricultural uses

This assessment is of a general nature only due to the broad-scale approach of the land type data. Class II (moderate - high) and class III (moderate) contain land with arable potential. Of these, areas associated with land types Bc and Bd and occurring solely north-east of Wesselsbron possess the higher potential because of soil pattern and climate with a higher rainfall efficiency.

Class II and to a lesser degree class III may be considered as prime agricultural land, and should ideally be protected for cropping purposes. Any non-agricultural use such as the construction of transmission lines would therefore have a negative impact on the production potential of an area.

7.1.2.2.2 Non-agricultural uses

Evaluation for uses such as foundations, roads and camping ground is based on the soil-landform factor alone. Since all these given uses are site-specific and the fact that the land type information is of a general nature, the rating can only be generalised.

7.1.3 Hydrological Systems

There are a number of wetlands (Pans, rivers and earth dams) within the entire study area. These wetlands will be influenced to varying degrees by the different corridors of the proposed transmission line. Each wetland is briefly discussed, in order of importance, in view of the most probable impacts of the project.

7.1.3.1 Pans

Pans are typical of many of the world's arid regions, including South Africa. They are best represented locally in the Western, Southern and Eastern Plateau wetland regions (Cowan, 1995), with their highest concentration being found in the area with a mean annual rainfall of less than 500 mm and an average net evaporation loss of 1000 mm per annum (Shaw, 1988). Endorheic pans are typically circular to oval in shape, shallow (<3 m deep) even when fully inundated; they have a closed drainage system[3].

In excess of 150 pans occur in the general study area between Dealesville and Vierfontein. The size, permanence of water and level of human impact on these pans varies considerably. The pan size varies between approximately 300 m^2 and 400 000 m^2. Most of the pans are temporary (often drying up before the end of the rainy season), although some of the larger pans like the Bultfontein Pan seem to hold water on a more permanent basis. It is anticipated that this pan would be completely dry during droughts and dry spells. In addition Salt pans, Grass pans and Reed pans are also found in the study area. These pans are exposed to various degrees of human impacts including the presence of towns in close proximity to pans (Bultfontein and Wesselsbron), salt mining, agricultural activity, transmission lines and roads.

These pans act as an important wildlife habitat, especially for birds, mammal species and invertebrates. The invertebrate component,

[3] Cowan, G. I. and van Riet, W. 1998. *A Directory of South African Wetlands.* Department of Environmental Affairs and Tourism, Pretoria.

especially branchiopods like tadpole shrimps, clam shrimps, fairy shrimps etc. found in the endorheic pans, have evolved as a result of the extreme conditions in which they have to survive. These extreme conditions can change from complete desiccation in one instance to completely flooded conditions. These conditions have resulted in evolution of very unique animals. The uniqueness of biotic and abiotic components is the main reason for the conservation of these aquatic ecosystems.

In addition amphibians like the giant bullfrog (*Pixycephalus adspersus*) occur in temporary pans in the central and western Free State. This specie has been recorded in the pans situated in the study area and is particular conservation importance since it has red data status.

7.1.3.2 Rivers

Riverine wetlands include perennial rivers and streams, inland deltas, seasonal rivers and streams and riverine floodplains (Cowan and Van Riet, 1998). Rivers are exposed to anthropogenic impacts, including water abstraction, pollution, flow reduction due to dams etc. All four alternative corridors cross the Vet and the Vals Rivers (the main rivers in the study area) as well as a limited number of smaller tributaries and drainage lines. All four crossing points, on the Vet and Vals Rivers, are characterised by the presence of a riparian zone and floodplain area. The palustrine wetlands include, but are not limited to, these riparian zones and floodplains. The level of existing impacts on the riparian zones and floodplains at the alternative crossing points differ. The physico–chemical water quality parameters indicate that rivers of the western Free State are characterised by high silt loads and subsequently high turbidities. The high silt loads also resulted in relative high conductivity and Total Dissolved Solids (TDS) levels.

Limited bio-monitoring results indicated that the Vet River at the sampling site is in poor condition, based on the SASS 5 results. The habitat integrity is also poor, based on the IHAS results. On the other hand, the Vals River has fair conditions based on the SASS 5 results and the IHAS results. At both sites major erosion has occurred, resulting in exposed stream banks, with limited vegetation. The level of erosion decreases as one moves further into the riparian zone and its associated floodplain. However, these results were obtained at sites that have been impacted on by human activities in the form of bridges, railway lines and agricultural activities. The sampling

habitats were also not ideal as no stone biotopes were available at both sites. Only sand, mud and marginal vegetation were sampled.

7.1.3.3 Earth Dams (Man-made Wetlands)

Man-made wetlands in the form of dams have had a profound impact on wetlands in South Africa. Dams change flow patterns in rivers and inundate natural wetland systems.

Earth dams occur in close proximity to the four alternative corridors. Although the dams have primarily been constructed as a result of agricultural activities, they now play a role as a wildlife habitat, especially for birds. These dams are all earth dams, usually constructed within a stream or drainage line.

7.1.3.4 Alternative corridors proposed

The alternative corridors were examined in view of the broad-scale impacts the transmission line could have on aquatic resources as well as specific impacts on distinct aquatic systems such as pans, rivers and wetlands. These systems support unique ecosystems and will respond differently to the impacts arising from the project.

<u>Corridor 1</u>

This is the most viable option due to the following:

- The area is already impacted by various human influences, especially at the crossing point of the Vet River and the Vals River. At the Vet River crossing a road and rail bridge are found; and at the Vals River crossing there is an existing transmission line and agricultural activities are taking place;
- The larger pans, that act as important wildlife habitats are not situated in close proximity to this alternative; and
- This is the shortest corridor, which will entail the least disturbance due to a shorter footprint, less towers and a shorter construction time. This will also result in less construction camps and associated impacts.

Corridor 2

- This alternative will be longer, resulting in a longer footprint area and construction time;
- It will traverse more pans, which are sensitive areas. Some of the pans that will be found in close proximity to this alternative are important habitats, especially for birds. It could therefore have negative impacts on birds as they approach these pans;
- The crossing points on the rivers are in fairly good condition; and
- Limited anthropogenic activities are found along this corridor.

Corridor 3

- This alternative will be the longest option, resulting in a longer footprint area and construction time;
- It will cross more pans, which are sensitive areas. Some of the pans that will be found in close proximity to this alternative are important habitats, especially for birds. It could therefore have negative impacts on birds as they approach these pans;
- The crossing points on the rivers are in fairly good condition; and
- Limited human induced activities are found along this.

Corridor 4

- This alternative will impact on the least impacts on the surface water resources; and
- Crosses fewer surface water bodies than any of the other corridors.

7.1.4 Climate

Climate data for Bloemfontein, which is about 67 km from the Perseus substation were obtained from the information desk of the South African Weather Service (see Table 8). The Bloemfontein weather station

(29° 06' S 26° 18' E) is the closest station to the study area. Its altitude is 1351 m. The data have been recorded over the past 28 years.

7.1.4.1 Temperature

The average daily maximum, minimum and mean temperatures are detailed in Table 8 below. The highest recorded temperature is 39°C in the summer months of January and February, while the lowest is minus 10°C in July and August. On average, the daily minimum temperature varies between –2°C in winter and 15°C in summer.

Table 8: Mean Climate Data for Bloemfontein (1962 to 1990).

	Temperature (°C)				Precipitation (mm)		
Month	Highest Recorded	Average Daily Maximum	Average Daily Minimum	Lowest Recorded	Average Monthly	Average Number of days with ≥1mm	Highest 24 Hour Rainfall
January	39	31	15	6	83	11	62
February	39	29	15	4	111	11	142
March	35	27	12	1	72	11	56
April	33	23	8	-3	56	9	45
May	30	20	3	-9	17	4	32
June	25	17	-2	-9	12	3	26
July	24	17	-2	-10	8	2	37
August	29	20	1	-10	15	3	54
September	34	24	5	-7	24	4	46
October	35	26	9	-3	43	7	48
November	37	28	12	0	58	9	46
December	38	30	14	3	60	10	48
Year	39	24	8	-10	559	84	142

7.1.4.2 Precipitation

Monthly daily rainfall data for the Bloemfontein area south-east of Dealesville were obtained. The annual precipitation regime for the period the 28-year period (1962-1990) shows that the mean annual rainfall is about 559 mm, with about 86% of this amount occurring between October and April. This rainfall is predominantly in the form of violent thunderstorms with lightning and strong winds.

7.1.5 Topography

The area between Dealesville and Viljoenskroon is generally characterised by flat to gentle undulating topography, associated with the widespread

distribution of surface soils. Large dolerite sills generally give topographic relief, characterised by surface dolerite boulders and scattered outcrops.

7.1.6 Land Use

The primary land use within the proposed servitude is extensive crop farming, with sheep and cattle rearing. However, there is a trend whereby many farmers are turning to game and tourism enterprises. There are also areas of irrigated agriculture that may be impacted.

The Free State focuses on agricultural activities and crops include maize, sunflower, wheat and peanuts. It appears from the outset that the farming communities are well established and that there is little available land for expanding the dry-land irrigation activities, as the best soils have already been cultivated. Directly affected landowners expressed concerns regarding the negotiation of and compensation for the servitude.

7.2 BIOLOGICAL ENVIRONMENT

7.2.1 Flora

The study area falls within the Grassland and Savanna Biomes. These two Biomes account for a large amount of South Africa's biodiversity. Grasslands are dominated by a single layer of grasses, with the amount of cover determined by the amount of rainfall and the degree of grazing. Frosts, fire and grazing maintain the grass dominance and prevent the establishment of trees. The Savanna Biome is the largest Biome in southern Africa, occupying one-third of the area of South Africa. It is well developed over the lowveld and Kalahari region of South Africa[4]. Savannas are characterised by a grassy ground layer and a distinct upper layer of woody plants. Where this upper layer is near the ground the vegetation may be referred to as Shrubveld, where it is dense as Woodland, and the intermediate stages are locally known as Bushveld.

More specifically, the vegetation of the study area can broadly be classified as the Dry Sandy Highveld Grassland and the Kimberley Thorn Bushveld, which together occupy the greater part of the Free State Province. Vast expanses of these vegetation types have been cleared for maize, wheat and sunflower cultivation. Based on the degree of establishment of trees, soils and parent geology these vegetation units can be further subdivided into a number of plant communities.

[4] Low, A. B. & Rebelo, A. G. (eds). 1996. *Vegetation of South Africa, Lesotho and Swaziland*, Department of Environmental Affairs and Tourism, Pretoria.

The corridors proposed cross nine major plant communities as listed below:

- The Dry Sandy Highveld grassland on red sandy soils;
- Grassy Panveld clayey soils around pans;
- Karroid Panveld on calcrete soils along streams and rivers;
- Floodplain grassland on deep clayey soils next to streams and rivers;
- *Acacia karoo* shrub on clayey soils along streams and rivers;
- Riparian shrub on streams and riverbanks;
- Seepage areas and Wetland communities;
- Kimberley Thorn Bushveld on deep aeolian sands; and
- Ghaap-plateau shrub communities on dolerite.

Overgrazing, trampling, crop production and road construction are some of the visible human impacts notable in all nine communities and are the major threats to their conservation. No rare, endangered and endemic species (Red Data plants) were found in the study area during the study. However a number of protected plants species are known to occur in the study area. Specifically, it should be noted that Corridor 3 cuts through stands of Camel Thorn (*Acacia erioloba*) in the Kimberley Thorn Bushveld. In terms of the Forest Act (Act No. 122, of 1988) the Camel Thorn Tree is protected. A permit to fell or remove any Camel Thorns must be obtained before any construction starts.

7.2.2 Fauna

The faunal assemblages typically associated with Grassland and Bushveld vegetation are expected to occur within the study area. However, faunal diversity is low due to the anthropogenic pressures mentioned above.

A list of terrestrial mammals of Red Data status that could occur in the area indicates that most of these animals are free-roaming and not very habitat-restricted. They could therefore be found in any of the nine ecological units. However, the riparian shrub is usually frequented as it provides shelter as well as more food resources, being always associated with water.

The sensitive habitats identified were:

7.2.2.1 Riparian shrub communities

The availability of shelter and a variety of food resources in the riparian shrub communities attracts a high diversity of terrestrial mammals as well as bird species. This makes the riparian shrub community a sensitive ecosystem as far as the fauna is concerned. It acts as a habitat for birds and mammals such as the Vervet Monkey to migrate up and down river systems. Moreover, the floodplain grassland, *Acacia karroo* shrub and riparian shrub communities are usually situated on soils which erode easily once the vegetation cover has been removed.

7.2.2.2 Pan communities

Pans are seasonally inundated. During these periods they attract large numbers of waterfowl, waders and flamingoes. The endoreic pans occur down-stream of the catchment and thus receive nutrient-rich water from up-stream sources. As evaporation is the primary means of water loss, they are saline and usually rich in nutrients, with seasonal algal blooms that provide food for the aforementioned birds.

7.2.2.3 Wetlands communities

During wet periods wetlands attract large numbers of waterfowl, waders and sometimes flamingoes. Wetlands are also rich in nutrients; the sedges and hydrophytes provide food for birds.

7.2.2.3.1 Bird Impacts

Due to the nature of the proposal and the degree of interaction between the transmission line and birds, the impacts on birds needs further attention.

Several bird micro-habitats were identified during a site visit, these are described below.

<u>Riparian</u>

This consists of thornveld or bushveld, along the edge of a watercourse or wetland

Wetlands and Ephemeral pans

This consists of either permanent relatively long and thin wetlands, or roughly circular ephemeral pans. Whilst the wetlands receive their water supply from the ground water, the ephemeral pans are rain driven and only contain water after periods of good rain.

Grassland

Two types of grassland exist, the pan turf veld and the *Cymbopogon-Themeda* veld. In the study area as a whole, apart from in 2825D, natural grassland only exists in small patches in between the extensive arable land. From a bird perspective these two types of grassland are treated as one habitat.

Exotic stands

These are stands of predominantly Eucalyptus species, presumably originally planted as windbreaks. They may be significant for birds in terms of roosting or nesting as few indigenous tall trees exist in the landscape.

Arable land

This comprises most of the study area. Since the different crop types in their different stages can represent very different bird habitats, arable land is discussed in sub categories below:

Maize: The predominant land use in the study area. When past the seedling stage, this habitat is of little importance to most birds until harvested.

Sunflowers: Probably the second most common crop. Important to birds just prior to and post harvesting.

Fallow land: All arable land, whatever the usual crop, must at some time lie fallow. This relatively bare ground can attract certain species if old seed or weeds are present.

Newly ploughed land: Although simply bare soil, this habitat can represent an important feeding area to many birds, as old seed, weeds and insects abound.

Lucerne: Although not in much evidence in the study area, this is an important habitat for birds such as White Storks, particularly when being cut for use.

Irrigated land: Very little irrigated land exists in the study area, however these lands are highly attractive to birds, particularly in this dry landscape, and in particular the White Stork.

Cultivated grassland: A fairly extensive land use in the study area. Represents important feeding areas for seedeaters at certain times of the year.

Examples of all of the above habitats can be seen in APPENDIX D. of the Bird Impact Report (Appendix C6 in this EIR).

According to Table 2 of the above report the bird species that are most sensitive to transmission lines are Bittern, White Pelican, Yellowbilled Stork, Greater Flamingo, Lesser Flamingo, Secretarybird, Black Harrier, Peregrine Falcon, Lanner Falcon, Blue Korhaan, Melodious Lark, Black Stork Marabou Stork, Pallid Harrier, Chestnutbanded Plover Painted Snipe Shortclawed Lark and Blackwinged Pratincole. The first named bird species is Critically Endangered, while all the others are in the Neat Threatened category.

Some of these birds occur in the several grid squares, but the grid square 2825D is the square with the highest total score for all the species, which indicates that it is the most sensitive in terms of Red Data species.

Bird-transmission line interactions can either be direct interactions, in which the bird comes into physical contact with the transmission line infrastructure, or indirect in which the transmission line infrastructure in some way impacts on the bird without coming into direct contact with it. Typically, direct interactions take the form of birds colliding with or being electrocuted on the infrastructure, or using it for nesting, roosting or perching. Indirect interaction is disturbance or habitat destruction as a result of activities relating to the construction or maintenance of the transmission line. Although these activities do not necessarily kill birds, they may impact negatively on birds.

The particular design of the transmission line also has a bearing on the inherent risks for birds. The earth wire is the biggest risk, since it is much thinner and could be unseen by a bird in flight. Electrical faults caused by bird excreta being deposited on electricity infrastructure show that birds could also have negative impacts on transmission lines.

Direct interaction occurs in the form of collision of birds with the earth wire of the proposed line, while indirect interaction takes the form of habitat destruction and disturbance. Eleven bird micro-habitats were identified; the foregoing interactions will be most pronounced in three of the untransformed habitats, namely, the wetlands and ephemeral pans; grasslands and riparian habitats and one transformed habitat namely the Lucerne fields (collisions).

From the Bird-Impact perspective, an analysis of the sensitivity of the four proposed corridors revealed that the least sensitive from a bird impact perspective would be Corridor 4. This means that of the four corridors, Corridor 4 is likely to have the least impact on the Red Data species present, and it is therefore recommended as the proposed servitude.

7.2.3 Motivation for the Preferred Corridor

All four corridors will have various impacts on the vegetation and subsequently the habitats of animals. Many of the impacts to the vegetation would be of medium-term status. Among other mitigation measures, succession and active rehabilitation would help to restore the vegetation.

As far as the terrestrial mammals are concerned many of the species would move away during the construction phase but after construction has stopped and the habitat has restored itself, they would return.

Corridors 2 and 3 are not suitable from a biological perspective because they traverse a number of large pans and the Kimberley Thorn Bushveld; both of these habitats are sensitive. Corridor 4 is the best of the four options for the following reasons:

- The distance between this corridor and large pans as well as the lower concentrations of pans makes this corridor the most suitable one;

- Crop farming, mainly maize production has already destroyed large areas of natural vegetation in the study area. A lower percentage of natural veld would be affected;
- This corridor only cuts through remnants of the Kimberley Thorn Bushveld, which is a relatively sensitive vegetation type (White-backed Vultures use Camel Thorns to breed); and
- Bird impacts will be least along this corridor.

A more detailed study could reveal more relevant information once the suitable corridor was selected and the surveyors had demarcated the positions of the footprints and contractor's camps.

7.3 VISUAL QUALITY

The study area is considered to be largely homogenous in terms of visual character and can be divided into three main landscape types: "grasslands"; "cultivated lands"; and "Acacia flood plains".

The assessment of the risk sources of each proposed corridor considers the projects components comprising the corridor as well as the linear extent of each component and of the entire corridor. The basic assumption followed is that the risk associated with a project component increases in direct proportion to the linear extent in kilometres of that component. This assumption implies that for the four proposed corridors, where all else is equal, the risk of visual impacts is greatest for the corridor with the greatest length.

The four proposed corridors each traverse the three landscape types resulting in much the same impacts on the visual environment. It is the length of the proposed corridors and the extent of the landscapes impacted on that is the chief factor determining preference. The proposed Corridor 3 follows by far the longest corridor thereby increasing the significance of the visual impacts.

The proposed Corridor 2 runs in close proximity to and in places alongside main distributor roads thereby greatly increasing the impact of high visibility of the study area. The close proximity of critical view sources to the corridor results in a much greater significance of visual impacts resulting from the transmission line and associated infrastructure and activities. This proposed corridor runs close to a large number of pans and the few elevated natural features, ridges and koppies, in the study area thereby impacting on and reducing the value of visual assets.

Corridor 4 is the preferred corridor as it keeps with existing infrastructure such as roads and railway lines and has fewer impacts on pans and elevated natural features. Although this corridor will potentially result in visual impacts, these can be mitigated against through careful placing of the final servitude. The final servitude should take

advantage of the lanes and stands of existing mature trees and the topography to reduce the silhouette of the transmission line avoid the visual assets, the pans and ridges by allowing at least a 100 m buffer around them.

7.3.1 Overall study area from a Visual Impact Viewpoint

The sense of place (Genius Loci) of the study area is that of vastness, of a single uninterrupted space that is defined by the flat to slightly undulating terrain. The sensitivity of the study area to impacts on sense of place is considered to be moderate.

The visual quality of the study area is that of a homogenous and uncluttered landscape consisting mainly of flat grasslands or cultivated fields and few vertical features. Due to the uncluttered nature of the landscape, with limited features of unique aesthetic value, the sensitivity of the study area to impacts on visual quality is considered to be moderate.

The overall landscape character of the study area is defined by the vast, flat terrain and the predominant agricultural features and activities, such as livestock, fields of maize or sunflower, grain silos and farmsteads encompassed by mature blue gum and pine trees. Due to the dominant agricultural character the sensitivity of the study area to non–agricultural impacts on landscape character is considered to be high.

The uninterrupted flat terrain that extends full circle defines the dominant horizontal scale of the study area. There are few natural features that define the vertical scale resulting in an overall lack of vertical scale. Vertical features associated with human activities define the vertical scale at a local level. These vertical features include large stands of blue gum and pine trees associated with farmsteads, the existing network of transmission lines, and silos. Due to the dominant horizontal scale and overall limited to non-existent vertical scale, the sensitivity of the study area to impacts on vertical scale is considered to be high.

The very flat terrain with limited changes in elevation and scattered vertical features indicates that the sensitivity of the study area to impacts in terms visibility would be high. The results of visibility analyses for eleven points along the proposed corridors confirms that any development of vertical structures would be highly visible for distances up to and exceeding five kilometres throughout the study area. Figures 4.3 (in Appendix C3) of the VIA indicate the degree of visibility at the eleven selected viewpoints.

The sensitivity of the overall study area in terms of critical views is considered to be moderate due to the dispersed nature of the typical agricultural road network yet high visibility of the region. In areas where the

road network converges towards towns, the sensitivity to impacts in terms of critical views is considered to be high.

The visual absorption capacity (VAC) of the overall study area is considered to be low. The vegetation height in the three landscape types is typically low and largely uniform therefore providing limited capacity to absorb intrusions to the visual environment. The vegetation height of the grasslands landscape is typically less than one metre while the cultivated lands consists mainly of maize and sunflower fields where the vegetation height ranges from zero to two metres depending on season and fertility of the soil. The vegetation height within the Acacia flood plains varies from low growing wetland plants to small trees, mainly Acacia species, of up to five metres in height.

The VAC in terms of slope is considered to be low due to the very flat terrain of the study area. A map dividing the area into three slope categories with varying gradients was generated through the analysis of the elevation grid with a horizontal resolution of 200 metres (see Figure 4.2 of the VIA). The three slope categories include slopes with gradients of (1) 0%-3%, (2) 3%-7% and (3) greater than 7%.

The VAC in terms of pattern/diversity is considered to be low due to the homogenous landscape character and flat terrain.

Where the sensitivity values of the six segments of the study area differ from the overall values, the different values are discussed in Section 9.3.1.1 according to the respective segment.

7.4 HERITAGE RESOURCES

The Archaeological Data Recording Centre (ADRC), housed at the National Cultural History Museum, Pretoria, was consulted. The information obtained was used to draw up a preliminary map to indicate the existence of known sites of cultural significance, indicating potential problem areas (see Cultural and Heritage Resources Report, Appendix C10).

This preliminary study was followed by a short field trip, from which an overview of the area was gained and an idea of the potential problems and expected heritage sites could be formulated. Currently, most of the area is either under cultivation (e.g. maize/sunflower/ground nuts) or used for grazing. In the former case, these activities would have impacted drastically upon any cultural resources that might have occurred in the area.

7.4.1 Stone Age

The Vaal River and its tributaries are well known for its river gravels, which, in some places contain large amounts of Early Stone Age tools as well as

faunal material. These are located in the vicinity of the river courses, but are now fortunately mostly covered by alluvial soils. The original identification and dating (e.g. Söhnge, P.G., Visser, D.J.L. & Lowe, C. van Riet 1937; Archaeological Survey 1948) of these were later proved to be wrong, archaeologically speaking (Partridge & Brink 1967). However, it is advisable to be on the lookout for these gravels when construction of the transmission line starts, and to have an archaeologist present to investigate particular sites if necessary.

During Middle Stone Age (MSA) times, people became more mobile, occupying areas formerly avoided. As a result, Middle Stone Age tools are usually found all over. Open sites were still preferred near watercourses or even around the pans found all over on the interior highveld areas. As a result, tools belonging to this period mostly occur in the open or in erosion dongas. In these cases the artefacts usually are disturbed completely out of context due to natural erosion, agricultural and other activities and are viewed to have little or no significance.

Late Stone Age people had more advance technology than the MSA people and therefore succeeded in occupying even more diverse habitats. However, they preferred rock shelters and caves to live in. These are found close to rivers and the various rock outcrops. In the latter case, this also presented a suitable 'canvass' for them to produce their art on, in this case rock engravings are associated with their complex religious believes.

7.4.2 Iron Age

Iron Age people started to settle in southern Africa c. AD 300, but the occupation of the larger geographical area (including the study area) did not start much before the 1500s. However, this does not detract from the scale of the settlements found and the number of potential inhabitants. Because of their specific technology and economy, Iron Age people preferred to settle on the alluvial soils near rivers (for agricultural purposes), but also for firewood and water. As already indicated, these areas also have outcrops (dolerite and sandstone) that could be used for building purposes.

The layout of these settlements usually consists of a group of large primary stone walled enclosures, with associated bilobial dwellings linked to it. The latter usually occur in groups of four to five units, facing the associated livestock pens to the centre of the settlement.

Apart from stonewalls, remains such as occupational debris (potsherds, bone, metal artefacts and charcoal) and human burials are found on these sites.

7.4.3 Historical Period

The historical period in this area starts with the arrival of early missionaries, hunters and traders, followed later by the Voortrekkers, who settled permanently and started to farm in the area. However, much of this heritage was destroyed during the Second Anglo-Boer War (1899-1902), when the British, following their 'scorched earth' policy, burned down all the farmsteads.

During the Second Anglo-Boer War a few battles and a number of smaller skirmishes took place in the larger area.

7.4.3.1 Bothaville:

Lord Methuen, the British commander moved from Hoopstad past Wesselsbron in the direction of Bothaville on 24th May 1900. Some time later, from September 1900, Gen. C R de Wet and Commandant Fourie camped in the vicinity of Bothaville.

Two months later, in November 1900, the British under Colonel Le Gallias ambushed a section of Gen. C R de Wet's commando south of the Vals River. During this time, the British forces camped on the dorpsplein in Bothaville. The next day, 6 November 1900, the battle of Bothaville or Doornkraal (south of the town, where the Boers were camped) took place. During this battle 97 Boers were caught, 17 were killed; 38 British soldiers were killed. A small monument was erected on this spot to commemorate the event and those killed.

7.4.3.2 Bultfontein

On 8 April 1902, Gen. C C J Badenhorst captured 200 British soldiers under Colonel Terman on the farm Hartenbosch near Bultfonttein.

A section of lord Methuen's forces moved on 13 April 1900 from Boshof in an eastern direction past Bultfontein to Brandfort in the hope of outflanking Gen. De la Rey. Veldkornet Diedericks then attacked the British between Bultfontein and Brandfort. Although totally outnumbered by the British, the Boers apparently carried the day and succeed to stop the flanking manoeuvre.

7.4.3.3 Viljoenskroon

The Earl of Munster, Lord Tewkesbury, was killed at the Lace Mine, located between Viljoenskroon and Kroonstad on 1 February 1902.

7.4.3.4 Vals Rivier

The Irish Brigade, under Colonel Blake, blew up the bridge over the Vals River on 12 May 1900. (However, it is not clear which particular bridge it was – in all probability it would be the one closer to Kroonstad and not Bothaville).

7.5 SOCIO-ECONOMIC ENVIRONMENT

Situated between the Vaal and Orange Rivers, the Free State is one of the largest provinces in the country. With a surface area of 129 480 km^2 it is the third largest province – the Northern Cape (361 830 km^2) has the largest surface area, followed by the Eastern Cape (169 580 km^2). The Free State covers 10.6% of the total surface area of the Republic of South Africa (1 219 090 km^2). It is located in the centre of the country, with Lesotho sharing one of its boundaries, and is bordered by all the provinces except the Northern Province and the Western Cape.

7.5.1 Demographic, Socio-economic and Economic Profile of the Free State

Of the total population of South Africa, 6.7% reside in the Free State. This province has the second smallest population of all the provinces (2 782 470). Only the population of the Northern Cape is smaller with 742 030 inhabitants. The Black population group comprises the majority (83.8%) of the total Free State population, whilst only 0.3% of all Asians and 2.1% of all Coloureds in the country live here.

Urbanisation is not very high in the province, with only 54.4% of the population living in urban areas (i.e. area with some form of local authority). Mining and agriculture contribute significantly to the Gross Geographic Product (GGP) of the province. Free State contributes 6.2% to the national GDP, with mining and quarrying (20%) and manufacturing (14.6%) being the largest contributors.

The life expectancy (61.9 years) of the population in the province is just below that of the country as a whole (62.8 years), as reflected by the Human Development Index (HDI). This index is a measure of people's ability to live a long and healthy life, to be able to communicate, to participate in the life of the community and to have sufficient means to afford a decent living. On the relative ranking of the HDI, the Free State compares well with countries such as Sri Lanka and China. This index also indicates an adult literacy rate of 84.4% for this province in 1991, compared with 82.2% for the Republic. Adult literacy refers to persons who are 15 years and older who can read, write and speak their home language. The total unemployment rate (expanded definition) in the Free State was 24.4% in 1995. 16.7% of economically active men and 33.8% of economically active women are unemployed. For urban Blacks unemployment rate was as high as 36.9%.

In the context of the study area unemployment seems to be prevalent, and remains a strong interest amongst I&APs regarding potential job creation and economic spin-

offs that the project might bring about. Local-scale socio-economic data for the study area are presented in section 9.2.1.1.

Although official figures were not available at the time this report was compiled, the occurrence of HIV in the study area appeared to be rampant and I&APs have expressed concerns about the potential risk of exposure that could result from the presence of construction camps.

Landowners directly affected by the development raised concerns regarding the negotiation and compensation for land and infrastructure, as well as the impact of the transmission line on the future development of land-based enterprises, such as game and tourism operations.

Every community, irrespective of where the proposed transmission line is erected, will be affected by the planned development. Elements of the socio-economic environment that will be affected are economic, demographic and social elements, as briefly summarised below.

- Economic elements: increased local employment, higher wages, increased business sales, increased competition for labour, possible economic losses after the project is completed, increased or decreased land values, changes in land use etc.

- Demographic elements: increased population due to the influx of new workers and families; changes in the age, income, and educational profile of the population etc.

- Community services: demand for more services, demand for better service quality and accessibility, demand for more and specially trained workers, increased demand for housing etc.

- Social impacts: perceived changes in quality of life, increased social problems, value conflict between new and long-time residents etc.

A detailed assessment of the specific socio-economic impacts of the project will only be possible once the final corridor has been chosen. However, an attempt at a prediction of the likely impacts, based on knowledge of the socio-economic profile, suggests that major employment activities such as large scale farming, agro-tourism and eco-tourism, could be impacted. Hence, the need for careful planning and positioning of the line cannot be overemphasised.

7.5.2 Tourism Initiatives in the Study Area

The study area includes various types of protected areas, ranging from private game farms to state-owned nature reserves. Free State DTEEA

manages each of the types of protected areas differently, and each type is rated accordingly, in terms of its conservation value.

Where owners of game farms have approached Free State DTEEA for listing as a conservancy, DTEEA sets certain conditions, including the erection of suitable game fences and introduction of indigenous plants and animals. Should the owner fulfil these conditions and be listed as a private nature reserve, he is then able to obtain game at a cheaper price, which is an incentive for game farm owners. In some cases, DTEEA will approach the owners directly for inclusion as private nature reserves. State-owned nature reserves also occur in the area.

Within the study area, there are both rural and urban conservancies, which for the most part, are areas maintained and managed by local communities, with some help and guidance from the Free State DTEEA. Many of the original conservancies have been in existence for a long period, and have recently been verified by Free State DTEEA. According to Mr Christo de Meyer, few of these original conservancies remain, as farmers have sold most of these properties. DTEEA encourages the establishment of conservancies, as they represent a form of co-operative management of the environment. Free State DTEEA connects conservancies in the area, in order to facilitate the exchange of information. Conservancies are reliant on the voluntary participation and support of the local communities.

The categories used for mapping and impact significance ratings are:

- Category 1 Game Farms;
- Category 2 Conservancies;
- Category 3 Nature Reserves; and
- Category 4 National Parks.

The National Environmental Management Protected Areas Bill is set to change the definitions and status of conserved areas in South Africa. This Bill is relevant to this study as this could give new status to protected areas along the planned route.

There are to be 4 categories of protected areas, given in order of priority:

- Special Nature Reserves;
- National Parks;
- Nature Reserves; and

- Protected Environments.

Each of these categories of protected areas exists for specific purposes, which will be briefly outlined. The future protected area status in the study area will impact on future developments. The Bill has currently reached the 1st phase of the parliamentary process, and the Act is to be promulgated early in 2004. For the purposes of rating sensitivity of protected areas within the scope of this project, DTEEA's categories will be used.

In the 2003 DTEEA Economic Strategy, there is a focus on specific target markets, including bird watching, hiking and those wishing to enjoy the scenic beauty, four by four trails and fishing. The Free State DTEEA Strategic Plan for 2003/4 and 2005/6 states that between R12-13 million is to be invested in marketing the province and in tourism development in the Free State before 2006.

Relevant local municipalities include Nala Local Municipality (including the districts of Bothaville, Wesselsbron), Tswelopele Local Municipality (Bultfontein, Hoopstad) and Tokologo Local Municipality (Boshof, Hertzogville, Dealesville).

The Lejweleputswa District Municipality Planning, Implementation and Management Support System Centre (PMISS-Centre) complied the following list of goals for the area:

- To develop and implement the District tourism strategy;
- Provide entrepreneurship advice and training;
- To have a tourism awareness campaign;
- To host an African Eve Cultural Festival;
- To have tourist exhibitions;
- Twinning of cities;
- Tourism signage; and
- Promotion of mining agri-eco for tourism

The business plans related to specific tourism development projects will be drawn up by Lejweleputswa District Municipality.

Bothaville is regarded as the centre of the Free State Maize Route, and is the venue for the annual NAMPO Harvest Farm Festival held in May annually. The NAMPO festival is currently the 2nd largest agricultural show centre in

the world. Bothaville also plays host to the annual Food and Witblits Festival in October.

Within the Lejewleputswa area there are arts, craft and tavern tours, the Goldfields Tourism Route, Game and Nature Reserve Tours, the Friendship Tavern Crawling Tour, underground wine cellar and mine tours, and the Phakisa Freeway Tour.

Landowners who could be directly affected will need to be negotiated with regarding compensation for land and infrastructure, including the impact of the transmission line on the future development of land-based enterprises, such as game and tourism operations.

SECTION 8: IDENTIFICATION OF ENVIRONMENTAL IMPACT / RISK SOURCES

8.1 INTRODUCTION

Previous experience has shown that it is often not feasible or practical to only identify and address possible impacts. The rating and ranking of impacts is often a controversial aspect because of the subjectivity involved in attaching values to impacts.

It was therefore decided that the assessment would concentrate on addressing key issues. The methodology employed in this report involves a cyclical process, which allows for the evaluation of the efficiency of the process itself. The assessment of actions in each phase was conducted in the following order:

a) Identification of key issues;

b) Analysis of the activities relating to the proposed development;

c) Assessment of the potential impacts arising from the activities and issues identified, without mitigation measures; and

d) Investigation and recommendation of the relevant mitigation measures for the activities and issues identified above.

8.2 KEY ISSUES

8.2.1 Introduction

The key issues listed in the following section have been determined through an internal process based on similar developments, an environmental impact assessment, a Scoping and public participation process as well as a site visit, conducted by a team of specialists.

8.2.2 List of Key Issues

It must be ensured that no aspect of the physical / biological and social environments, especially those of special economic, conservation, scientific or educational value will be destroyed or damaged during the construction, and operational phases of the proposed development to the point that they cease to function. This is to ensure that optimum use is made of the chosen corridor without detrimentally and significantly changing the nature of the area. It is noted here that the impacts arising from the operation of the transmission line are limited mainly to routine maintenance activities. The list of key issues is as follows:

8.2.2.1 Key issue 1: The physical and biological environment

The issues identified here are based on an overview of the entire study area that was obtained from the site visit. This entailed a cursory assessment by a team of specialists that were commissioned to assess the environment and the likely impacts that the transmission line could have on it. In this regard, the chosen corridor will need to bear in mind key impacts such as:

- Wind erosion;
- Soil compaction;
- Water erosion;
- Loss of high potential arable land;
- Visual intrusion;
- Destruction and disturbance of flora
- Habitat destruction and disturbance;
- Veld fires;
- Faunal impacts, the most significant being Bird impacts such as, electrocutions, collisions, habitat destruction and disturbance; and
- Destruction of heritage/historical sites.

8.2.2.2 Key issue 2: The social environment

It must be ensured that the environment surrounding the development is safe and secure, and in all respects acceptable to the affected I&APs. In this regard the social issues flagged during the site visit, (including the tourism issues) as well as the concerns raised in the public consultation process must be taken into account.

SECTION 9: IMPACT DESCRIPTION AND ASSESSMENT OF IMPACTS

INTRODUCTION

Having identified the risk sources in the previous section, a succinct description of the potential impacts of these risks, and an assessment of the impacts of the proposed transmission line was undertaken. As far as possible, this section is based on the specialists' findings. All specialists quantified the suite of potential environmental impacts identified in their study and assessed the significance of the impacts according to clearly defined criteria. Each impact was assessed and rated. For the purposes of the EIR, the term "assessment" refers to "the process of collecting, organising, analysing, interpreting and communicating data relevant to some decisions" (Strauth *et al.,* 1993). The assessment of the data, was where possible, based on accepted scientific techniques, failing which the specialists made judgements based on their professional expertise and experience.

The assessment of the impacts has been conducted according to a synthesis of criteria required by the integrated environmental management procedure (DEAT, 1992). The issues are analysed and discussed in detail as demanded by the scope of an EIA. All impacts were assessed with and without the necessary mitigation and the results presented in impact tables, which form the core of the impact assessment. Mitigation and management actions are recommended, with the aim of enhancing positive impacts and minimising negative impacts.

Activities within the framework of the proposed development, and their respective construction and operational phases, give rise to certain impacts. In order to assess these impacts, the project has been divided into three phases for which impacting activities can be identified, namely:

CONSTRUCTION PHASE

This refers to all construction and construction-related activities that will occur within the study area until the contractor leaves the area. The construction activities will take approximately twenty four months to complete and will occur in two distinct phases. The first phase will involve the pre-construction activities. The construction phase will be treated as an integrated whole, as dictated by the nature of the activities and impacts under discussion.

OPERATIONAL PHASE

All post-construction activities, including the operation and maintenance of the transmission line are included in this phase.

DECOMMISSIONING PHASE

Being permanent electricity infrastructure, it is not envisaged that the transmission line will be decommissioned in the foreseeable future.

The activities arising from each of these phases were assessed and included in the impact assessment tables under headings that summarised the main issues or impacts. The assessment endeavours to identify activities, which require precise environmental management interventions to mitigate the impacts arising from them. The criteria against which these activities were assessed are discussed here below.

IMPACT ASSESSMENT CRITERIA

Nature of the impact

This was an appraisal of the type of effect the construction, operation and maintenance of the proposed Mercury - Perseus 400 kV transmission line would have on the affected environment. This description included what would be affected and how.

Extent of the impact

The specialist described whether the impact will be: local - extending only as far as the transmission line servitude; or limited to the site and its immediate surroundings; or will have an impact on the region; or will have an impact on a national scale.

Duration of the impact

The specialist indicated whether the lifespan of the impact would be short term (0-5 years), medium term (6-10 years), long term (>10 years) or permanent.

Intensity

The specialist established whether the impact would be destructive or benign; this was qualified as low, medium or high. The specialist study quantified the magnitude of the impacts and outline the rationale used.

Probability of occurrence

Each specialist described the probability of the impact actually occurring and rated this data as improbable (low likelihood), probable (distinct possibility), highly probable (most likely) or definite (impact will occur regardless of any prevention measures).

Status of the impact

Each specialist determined the negative, positive or neutral aspects of the impacts ("cost – benefit" analysis). The impacts were assessed in terms of their effect on the project and the

environment. For example, an impact that was positive for the proposed transmission line could be negative for the environment. It was important that this distinction was made in the analysis.

Degree of confidence in predictions

Each specialist stated the degree of confidence (low, medium or high) for his / her predictions based on the available information and level of knowledge and expertise.

Based on a synthesis of the information contained in the procedure described above, the specialist was then required to assess the potential impacts in terms of the following significance criteria:

- No significance – the impact does not influence the proposed Mercury - Perseus 400 kV transmission line and / or environment in any way;
- Low significance – the impacts will have a minor influence on the proposed transmission line and / or the environment. These impacts do not require modification of the project design or alternatives modification.
- Moderate significance – the impacts will have a moderate influence on the proposed transmission line and / or the environment. The impacts can be ameliorated by modification in the project design or implementation of effective mitigation measures.
- High significance – the impacts will have a major influence on the proposed transmission line and / or the environment. These impacts could make it necessary to apply the "No-go" option on portions of the proposed development regardless of any mitigation measures that could be implemented.

In order to assess impacts that relate to more than one element of the environment (e.g. visual quality and land use), certain specialists required information obtained from other specialists or from the lead consultants. A study team workshop was held to ensure that all specialists and the Proponent had a common understanding of the environment. This ensured that issues relating to the project were addressed in a synergistic manner.

For each of the two main project phases (construction and operation), the existing and potential future impacts and benefits (associated only with the proposed development) were described using the criteria listed above – for example: extent (spatial scale), duration, intensity, etc. The impacts were then assessed in terms of their significance (low, medium, or high) etc., and the degree of confidence for the assessment was stated.

For the sake of consistency in the impact assessment it was suggested that all potential impacts to the environment (or component of the environment under review) be listed in tables. The assessment parameters used in the tables were applied to all of the impacts

and a brief descriptive review of the impacts and their significance was also provided in the text of the specialist reports and subsequently in the EIR.

9.1 SOCIO-ECONOMIC IMPACT ASSESSMENT

Activity:	Construction and operation of the transmission line along any one of the four corridors
Impact:	Reliable power supply ensures continued industrial and economic growth in the Eastern Cape and job creation, with possible spin-offs for towns along the corridor. Possible temporary disruption of agricultural economy and social make up of affected communities in the Free State, with impacts like the further spreading of HIV/AIDS, safety and security risks, value conflict etc.

9.1.1 Assessment of Socio-economic impacts of the Transmission line

9.1.1.1 Status Quo

The social impact assessment provided the baseline social profile of the study area. Baseline projections, with a description of the potential social impacts etc. were also provided. As much of the demographic data reflects the agricultural occupation of the study area these data are discussed under the section dealing with agricultural-economic impacts.

The primary purpose for the development of the Mercury – Perseus 400 kV transmission line is to provide reliable power supply to the Eastern Cape to meet the anticipated increase in demand with the planned development of the Coega Industrial Development Zone.

Furthermore, Eskom plans to provide reliable and constant electricity supply through a circular supply system that is not dependent on a single channel for transmission. At present however, the electricity supply to the entire Eastern Cape is transported through a single channel of transmission lines via the Poseidon substation.

The success of the Coega Industrial Zone is not the only important factor to be considered in determining the socio-economic impact of this transmission line, since Eskom also has to meet demand increases to ensure a reliable power supply network is available for future industrial development in the Eastern Cape.

transmission lines impact negatively upon future land-use and development options since their visual aspect poses a threat to the tourism potential of an area. This could lead to a reduction in current economic potential and options. At present there are several transmission lines and substations of similar magnitude crossing the Free State. Thus, it is not surprising that major concerns raised revolve around the social implications of having yet another transmission line in the 'food basket' of the nation.

9.1.1.1.1 Social implications of the development

The transmission line will traverse several provincial towns in the northwest of the Free State, although its ultimate supply region is in the Eastern Cape. The Free State Province is one of the smallest provinces in South Africa in terms of population. Both the Free State and the Eastern Cape, the latter in particular, have significant unemployment levels and this difference is also noteworthy in terms of the distribution of the rural and urban population, with statistics indicating that unemployment is greater in urban areas. The climate of the region is one of generally low rainfall and moderate temperatures with the terrain dominated by vast grassland areas.

Many of the towns in the region provide both services to the surrounding agricultural population and tourism attractions such as game parks, historical and cultural experiences and the sale of local crafts and handiwork. The primary land-use is crop farming and extensive livestock farming with sheep and cattle. However, quite a number of these farms are trying to convert to game and tourism enterprises. On less suitable soils crops are grown under centre pivots and other forms of irrigation.

To understand the social impacts both at a regional and local level, it is necessary to briefly explain the nature of the project and related activities. Electricity is generated in power stations and then transported immediately to the area of use via transmission lines. It is transported at high voltages and is then stepped-down to the voltage required for end consumption. Various teams are involved in the construction of a transmission line, these include: surveyors, bush clearing teams, fencing teams, foundation laying teams, tower erection teams and stringing teams. Maintenance is carried out at regular intervals and may be done by helicopters. Servitudes need to be cleared occasionally to prevent vegetation interfering with the transmission lines.

At a regional level the socio-economic advantages of this transmission line to the Eastern Cape region and its potential long-term impacts through the region were identified. It is important to ensure that the Eastern Cape receives reliable supplies of electricity, thus, regardless of the exact timing of the need, it is sensible to secure the servitude prior to further development occurring in the region and the demand rising. This impact has a high positive significance. However, important as the transmission line may be for future development, it is also important that the negative social impacts of the transmission line (e.g. routing it through land-based enterprises) do not hinder any future development options. For this reason, it is important to select a corridor that minimises the impact on current developing areas, regardless of whether the transmission line is ever constructed or not.

Local socio-economic issues that must be assessed include concerns regarding relocation of homes, negotiation and compensation for farmland and access to the servitude for maintenance; health, safety and security risks that may be associated with the construction and operation of the transmission line; and how the corridor selected could least impact the local agricultural economy.

There are positive aspects such as job creation and the sub-contracting of local firms, even if only for a short period, that should be maximised during construction. However, if not managed properly there can also be minor social disturbances in the current labour force in the area.

Landowners expressed concerns regarding negotiation and compensation for land and houses and wished to have clarification on the process and how objections would be dealt with. Access to private property is required both during construction and maintenance. This issue could lead to conflict, and problems such as theft could arise; hence there must be a specific procedure to curtail or deal with these disturbances.

Some concerns regarding health and security risks are the further spread of HIV/AIDS (see table with estimates below), petty theft and poaching, especially if camp sites are located near farms. The transmission of HIV/AIDS can be fuelled by poverty related conditions and, although a high infection rate already exists in the area, there is a potential for construction workers to contribute to further transmission of the virus along the corridor. Practical mitigation measures have to be recommended for each of these issues.

Table 9: Mid-year population estimates for 2002 without (normal case) and with (bold case) additional deaths due to HIV/AIDS*.

Province	Female	Male	Total
Eastern Cape	3 825 199	3 333 644	7 158 843
	3 810 171	**3 321 970**	**7 132 141**
Free State	1 463 851	1 415 142	2 878 993
	1 452 496	**1 406 585**	**2 859 081**

*Source: Business Blue Book, 2003

Social issues along each of the alternatives may differ due to the varying land-use patterns. For instance, in the southern parts of the study area, most of the land is used for livestock grazing rather than for crop cultivation. Alternatives such as minor corridor alterations etc. may be required for the final corridor.

Professor Dirk C Groenewald of the University of the Free State undertook a Socio-economic Impact Assessment as part of the EIA for the proposed 400 kV transmission line. However, it is important that social issues of a more local nature are documented and investigated by Eskom Transmission's negotiator and, if required, further social investigations undertaken. Any decision on the final corridor of the line must accurately reflect the concerns raised by stakeholders.

9.1.1.2 Construction Phases

The construction of a transmission line and the entry of a construction team into an area could impact both positively and negatively on the local labour and local employers in an area (Table 10).

The specific areas through which the transmission line will run consist predominately of agricultural enterprises. Most of the labour used appears to be seasonal and statistics indicate a lower level of unemployment in these areas in comparison to the urban centres. Nevertheless, considering the current economic climate of South Africa, and the economy of the Free State, a relatively high unemployment level should be expected throughout the study area.

Much of the labour used in the construction of a transmission line is specialised and thus, large-scale employment of temporary unskilled labour is not anticipated. However, employment of casual unskilled labour could occur, for short-term contracts or for the entire construction phase. This could result in a positive spin-off during the construction phase as any level of employment in this region of high

unemployment and low wage levels will have a beneficial social spin-off.

Various methods of information gathering (site visits, surveys, interviews with public participants and participant observation) revealed that all four corridors will have various socio-economic impacts on the affected communities. At the local scale, most negative impacts will occur in the medium term, while others could be more lasting. However, if suitable mitigation measures are implemented, negative impacts can be reduced to acceptable levels. On the other hand, there would probably be some positive impacts in form of long-lasting economic benefits in the Eastern Cape.

9.1.1.3 Operational Phase

A concern that emerged during stakeholder workshops was that Eskom's maintenance team should undertake maintenance activities in an acceptable manner. Landowners were particularly concerned about the possibility of maintenance crews not keeping to the servitude, but trespassing farmer's properties to access the servitude. It must be noted that due to practical constraints, the teams will often need to move across private land to access the transmission line, as this may be the most sensible access corridor. There needs to be consultation with and prior notification of the landowner in such instances.

Maintenance procedures could also interfere with game farming operations and other tourist activities in the area. For instance, helicopter operations could be considered a noisy and intrusive event for which a tourist site should normally receive advance warning.

Table 10: Socio-economic Impact Table

	Activity	Nature of Impact	Extent of impact	Duration of impact	Intensity of impact	Probability of impact	Significance	
							WOM$^{\Delta}$	WM*
Construction and Operational Phases	Use of local labour from surrounding townships	Positive – increased employment levels in the area	Regional	Short-term	Low	Improbable	Low	Positive
	Use of local labour from surrounding townships	Positive – higher wages in the area	Regional	Short term	Low	Improbable	Low	Positive
	Use of existing and/or foreign labour for construction	Positive – increased business sales	Regional	Short term	Low	Improbable	Positive	Positive
	Use of foreign labour for construction	Negative – value conflict between new and long-time residents	Regional	Short-term	Low	Improbable	Medium	Low
	Use of foreign labour for construction	Negative – increased pressure on local amenities, clinics etc. due to higher population	Regional	Short term	Low	Improbable	Medium	Low
	Construction of the line on high-potential arable land	Negative - economic losses due to crop damage or poor yield	Regional	Long-term	Medium	Probable	High	Medium
	Construction of the line on high-potential arable land or adjacent to potential or existing eco-tourism sites	Negative – devaluation of land due to its proximity to the line	Regional	Permanent	High	Highly Probable	High	High
	Operation of the line on high-potential arable land	Negative - economic losses due to crop damage or poor yield	Regional	Permanent-term	Low	Probable	Medium	Low
	Operation of the 400 kV line that traverses cultivated land	Negative – safety hazards for agricultural aviation (aircraft sprayers etc.)	Regional	Permanent	Medium	Highly Probable	Medium	Low
		Negative - electromagnetic interference with the functioning of high-technology farming equipment	Regional	Permanent	Low	Improbable	Medium	Low

* With Mitigation $^{\Delta}$ Without Mitigation

9.1.2 Mitigation

9.1.2.1 Construction and Operation Phase

Very limited mitigation measures can be suggested as the main concern of the affected parties relates to the economic impact, specifically to the devaluation of their properties and the loss of crops, with negative economic implications, not only in the near future, but also in the long-term. Permanent loss of income is highly likely but cannot be recorded now. However, to ameliorate the potential negative social impacts, the following measures are suggested:

- That construction camps be erected close to the nearby townships and not on the properties of the landowners.
- If the construction camps are going to be erected near the townships, it is suggested that people from the local workforce be employed.
- Prior notification of the intention to access private land should be given in advance to the landowner and approval requested for access to the farmland. The request must give details of the purpose of the access, the contact person and number of people to be involved, time frames and machinery that will be used.
- Vehicle access to the corridor from the district must be identified with the assistance and approval of the landowner.
- Where the access road passes through farms, all existing farm gates must be closed and locked immediately after use or in accordance with the specific conditions laid down by the landowner and agreed to by all parties. The movements of Eskom Transmission's teams must be known to the landowner. In particular, movement of vehicles during the hours of darkness is strictly limited to emergencies alone. At all times, vehicles are to travel with caution due to the risk of collision with cattle and game.

9.2 AGRICULTURAL ECONOMIC IMPACT ASSESSMENT

Activity:	Constructing the transmission line along any one of the four corridors
Impact:	Depreciation of property values, interference with agricultural equipment, visual impacts on eco-tourism venues, and a decrease in agricultural production potential.

9.2.1 Assessment of Agricultural Economic Impacts of the Transmission line

9.2.1.1 Status Quo

Ideally, the assessment of the impact of the line on agricultural economics in the area should entail discussions and interviews with individual farm owners along the proposed corridors. This would enable the investigator to gather as much information as possible on all activities of an agricultural nature that could be affected by the development. However, in this case extensive use of detailed maps and high-resolution satellite images were used, together with evaluation methods based on land-use patterns and knowledge of the agricultural industry in South Africa. The information gathered was also coupled with baseline data obtained from the Socio-economic impact study as well as concerns captured in the Issues Register.

The Free State probably has some of the best conditions for crop farming outside the Western Cape. Due to the high-agricultural potential of the soils, in parts of the study area agricultural land reaches prices of about R 8 000 per hectare. Hence new transmission lines are particularly undesirable in the area. Large expanses of the northern section of the study area have land with high arable potential, with different crops being cultivated in large scale (maize, sunflower, Lucerne etc.). The transmission line could affect the activities of approximately seventy six (76) farms in the study area. Local-scale socio-economic and demographic data relevant to agricultural economics are as follows (see the Socio-economic Impact Report Appendix C2):

- Average number of black adults (farm workers and their wives) per farm = 25 (total = 1900)
- Average number of black children per farm = 31 (total = 2356)

- Average number of black farm workers per farm = 14 (total = 1064)
- Average number of adult black females per farm = 11 (total = 836)
- Average age of the (black) adults (farm workers) = 34 years
- Average number of white adults per farm = 3 (total = 228)
- Average number of white children per farm = 1.5 (total = 114)
- Average age of the landowners and their spouses (the majority of them are whites) = 56 years
- Estimated racial distribution: Blacks = 88.6%; Coloureds = 4%; Whites = 7.4%
- Estimated ethnic composition of the black population: Sotho = 95%; other (Xhosa, Zulu and Tswana) = 5%
- Average monthly income per farm worker = R811
- Level of poverty of black population on the farms:
    - low (not considered as a serious problem by the landowners) = 70%;
    - medium (considered as somewhat of a problem) = 15%;
    - high (considered as a serious problem) = 15%
- Level of poverty of black population in the surrounding townships (Bultfontein, Wesselsbron, Bothaville, Hoopstad, Orkney): high (considered as a serious problem by the landowners) = 100%

Unemployment levels on farms have recently dropped (close to zero) since the law on minimum wages came into effect and with mechanisation on farms, farmers only allow people who work for them on their farms. However, in the townships unemployment is considered a serious problem and is estimated to be as high as

35 – 45 % (interview with Mr. Japie Grobler conducted by Dirk Groenewald on 14 September 2003).

It should also be noted that the number of farm workers has decreased by an estimated 60 – 70% as the result of the minimum wage law and mechanization. This partly explains the high incidence of unemployment in the nearby townships and the high level of poverty.

There is also a growing trend of farmers employing technology based on Precision Agriculture, whereby large farming implements fitted with devices such as Global Positioning Systems (GPS), are connected to computers via radio signals and satellites. These types of implements are used over vast expanses of land.

Therefore, any impact of the line that curtails farming and other agricultural activities in the study area could have detrimental effects reverberating onto the welfare and means of livelihood of numerous people and their families.

9.2.1.2 Construction and Operation Phases

A number of factors that could impact negatively on the agricultural economics of the study area were identified in the assessment of the agricultural economic impact of the line (see Appendix C1). Table 11 summarises the significance of these potential impacts, which are discussed below.

<u>Decrease in agricultural production potential:</u> The production potential of various categories of agricultural activities is stated in the Agricultural Economic report[5]. For higher income activities, the net income per hectare ranges from R35 000 to R55 000; these values are for irrigated vegetable crops and irrigated fruit exports respectively. The study indicated that although maize was the most common crop cultivated, the yields for other crops were fairly similar. Development capital is also expected to be readily available for agro-tourism developments in future, thus an increase in capital investment in these projects could be expected. Therefore, any property lost or devalued due to the construction of the transmission line could decrease the potential for capital investment in the agricultural industry. It is also important to mention that the negative impacts could only become apparent many years after the line is

[5] Minnaar Consulting 2003. An agricultural economic assessment of the potential impact of the planned Mercury – Perseus 400 kV Transmission Line. Conducted by Minnaar Consulting Services in conjunction with Strategic Environmental Focus. October 2003 p.28 (Appendix C1).

constructed, as for example in the case of re-development of farmland for agro-tourism rather than purely agricultural production.

Decrease in land values: To assess the potential impact of the transmission line on land value, the value of farmland was assessed, based on land-use patterns in the study area. The presence of high production potential soils, irrigated lands, permanent crops under irrigation and dry cultivation land, green houses, farm infrastructure like silos, etc. all make the potential devaluation of land a significant impact.

Increase in security risks: Farmers in the study area are unwilling to host construction camps due to a general perception that crime levels could rise, with construction activities. In view of the persistent incidence of farm attacks, this should be seen a real problem. The perceived safety and security risk can negatively affect farmland values.

Increase in soil erosion by water and wind: The fine sandy soils that dominate the study area are especially prone to erosion and erosion control can have a cost implication. Where the transmission line cuts through a row of trees acting as a windbreak, it could add to the already prevalent seasonal wind erosion problem. If Eskom neglects its responsibility to keep erosion under control, in the vicinity of the line, it could lead to a loss of production or additional costs to farmers. This also applies to sloping areas near watercourses, even where only natural grazing is practiced.

Safety risks to agricultural aviation: Pilots involved in aerial spraying of cultivated land often find it difficult to see transmission and distribution lines. This could result in collisions and loss of lives. Crop spraying pilots often charge higher tariffs for areas with transmission lines. This implies higher operational costs for farmers. Some farmers also own their own aircrafts. The risk associated with flying is increased, with the transmission line, having a further negative effect on the value of the property.

Decrease in the agro-tourism potential of the area: there is a trend is South Africa to convert farms into tourist destinations. The success of ventures such as wineries, biltong, mampoer and ostrich corridors, farm holidays, game farms, bush retreats, guest houses hiking trails, bird hunting, conservancies, camp sites etc. in local farming areas all attest to the huge potential of agro-tourism. The construction of the transmission line could have detrimental effects on farmland with agro-tourism potential, even if these operations do not yet exist on a significant number of farms.

Decrease in future commercial development potentia: The construction of the transmission line can negatively impact on the suitability of farmland for future redevelopment into non-farming activities such as golf courses, high-security townships etc. Real estate traversed by transmission lines has a lower value than pristine land. However, strictly speaking these impacts should be seen as general property devaluation, due rather to the proximity of the line to the property than to a disruption of agricultural productivity *per se*.

Table 11: Agricultural Economic Impact Table

	Activity	Nature of Impact	Extent of impact	Duration of impact	Intensity of impact	Probability of impact	Significance	
							WOM$^{\Delta}$	WM*
Construction Phases	Construction of the transmission line on high potential arable land	Negative – decreased agricultural production potential	Regional	Short-term	High	Definite	High	High
		Negative – Decreased market value of land	Local	Short-term	Medium	Definite	High	High
	Construction of the transmission line on local farmland	Negative – Increased security risk due to contractors' camps and access	Local	Short-term	Medium	Probable	High	Medium
	Construction of the transmission line	Negative – Increased soil erosion by water and wind	Local	Short-term	Low	Probable	Medium	Low
Operational Phase	Operation of the transmission line	Negative – Increased safety risk for agricultural aviation	Regional	Permanent	High	Probable	High	Medium
		Negative. – Decrease in agro-tourism potential of the area	Regional	Permanent	Medium	Probable	High	Medium
		Negative – impact on the operation of local airstrips	Regional	Permanent	High	Probable	Medium	Low

	Activity	Nature of Impact	Extent of impact	Duration of impact	Intensity of impact	Probability of impact	Significance	
							WOM$^{\Delta}$	WM*
		Negative – problem with Aeolian sand deposits around towers and loss of valuable topsoil	Local	Permanent	Medium	Probable	Medium	Low
		Negative – difficulty of manoeuvring around towers	Local	Permanent	Medium	Definite	Medium	Low
Operational Phase	Operation of the transmission line	Negative – Risk of farming implements damaging towers during farming and vice versa	Local	Permanent	Medium	Probable	Medium	Low
	Maintenance	Negative – proliferation of weeds around towers	Local	Permanent	Low	Definite	Medium	Low

* With Mitigation $^{\Delta}$ Without Mitigation

9.2.2 Mitigation

9.2.2.1 Construction and Operation Phases

- The final corridor chosen should be one that follows an existing disturbance corridor, where farming activities have already been impacted, e.g. the road to Wesselsbron; in this way negative agricultural economic impacts could be minimised.
- Apart from the servitude areas that have to be bought out, the farmers should be compensated for potential loss in revenue and reduction in future development potential. Compensation should be agreed between Eskom and the landowner.
- Careful placing of the towers to avoid activities or buildings, and using the most appropriate design of towers, could limit the effect of the proposed transmission line on land use and property significantly.

- Construction should start after harvesting has occurred to limit interference with the farming activities. All disturbed land should be rehabilitated (see soils report for storage of topsoil).

- Care should be taken to avoid placing towers on game farms and smallholdings. Any residential building that might be located in the way of the proposed transmission line should be moved and compensation agreed upon.

9.3 VISUAL IMPACT ASSESSMENT

Activity:	Constructing the transmission line along any one of the four corridors, with components such as the actual line, access roads, a cleared servitude, sub-stations, construction camps and campsite for crew housing.
Impact:	Visual intrusion of pristine and or sensitive environments with low visual absorption capacity, a large viewshed or in areas with critical views.

9.3.1 Assessment of the Visual Impacts of the Transmission line

9.3.1.1 Status Quo

The study area is considered to be largely homogenous in terms of visual character and can be divided into three main landscape types: “grasslands”; “cultivated lands”; and “Acacia flood plains”. These three landscape types were digitised using 1:50 000 topocadastral plans and are illustrated in Figure 4.1 of the Visual Impact Assessment (VIA).

In analysing the sensitivity of the overall study area to visual impacts, the study area was divided into six segments as discussed below. Sensitivity ratings for each segment of the proposed corridors is provided in Table 4.1 of the VIA.

9.3.1.1.1 Bultfontein

The sensitivity of this segment of the study area to impacts on sense of place is considered to be low due to the numerous vertical features associated with human activities that in themselves do not add to the sense of place in the area surrounding Bultfontein.

The sensitivity of this segment of the study area to impacts on visual quality is considered to be low due to the increased clutter in the area surrounding Bultfontein.

The sensitivity of this segment of the study area to impacts on landscape character is considered to be low due to the transition between agricultural and urban activities with no consistent character of its own.

9.3.1.1.2 R708 (Bultfontein) to Vet River

The sensitivity of this segment of the study area to impacts on landscape character is considered to be low due to the monotonous nature of the cultivated lands.

The greater density of farmsteads, with their associated blue gum trees, within this segment reduces the sensitivity of the study area to impacts on scale to moderate.

9.3.1.1.3 Vet River

The sensitivity of this segment of the study area to impacts on sense of place is considered to be high due to the presence of the Vet River and the adjacent Acacia flood plain vegetation.

The sensitivity of this segment of the study area to impacts on visual quality is considered to be high due to the presence of the Vet River which has a unique aesthetic in the context of the overall study area.

The sensitivity of this segment of the study area to impacts on landscape character is considered to be high due to the added richness of the Vet River and the surrounding Acacia thickets that add diversity to the local landscape.

The sensitivity of this segment of the study area to impacts in terms visibility is considered to be moderate due to the greater vegetation height and relatively depressed elevation values along the flood plain of the Vet River.

The sensitivity of this segment of the study area, in terms of critical views, is considered to be moderate since the point at which the corridor crosses the Vet River is far removed from main distributor roads.

The Visual absorption capacity (VAC) in terms of the vegetation height is considered to be moderate due to the greater height of the Acacia thickets.

The VAC in terms of the pattern/diversity is considered to be moderate due to the added complexity of the Acacia vegetation and the presence of the Vet River.

9.3.1.1.4 Vet River to Wesselsbron

The sensitivity of this segment of the study area to impacts on landscape character is considered to be low due to the monotonous nature of the cultivated lands.

The sensitivity of this segment of the study area in terms of critical views is considered to be moderate since the point at which the corridor crosses the Vet River is far removed from main distributor roads.

9.3.1.1.5 Wesselsbron to Perseus

The sensitivity of this segment of the study area to impacts on landscape character is considered to be low due to the monotonous nature of the cultivated lands.

The greater density of farmsteads, with their associated blue gum trees, within this segment reduces the sensitivity of the study area to impacts on scale to moderate.

The VAC in terms of the pattern/diversity is considered to be moderate due to the added complexity of the non-agricultural activities that take place in this segment such as urban areas, mining activities and a greater density of main roads.

Pans varying in size from 300 m^2 to 400 000 m^2 occur throughout the study area. The visual character of these pans is defined by their seasonal variations in water level and absolute flatness with no vertical scale whatsoever. The visual character of the study area in terms of the sense of place, landscape character and visual quality is greatly influenced by the presence of these pans. The integrity of these pans is highly sensitive to visual intrusion associated with the introduction of vertical structures.

Mature blue gum and pine trees, typically thirty or more metres in height, that surround farmsteads and line farm lanes in dense

stands, often over 100 m in extent, are a typical feature in the landscape of the study area. Where they occur they are particularly effective in screening and reducing the visual impact of adjacent transmission lines.

9.3.1.2 Construction and Operational Phases

The potential impacts associated with the transmission line relate to its height of up to fifty metres and the metallic, industrial aesthetic that contrasts with the typically flat and agricultural character of the study area (Table 12). The vertical scale of the towers structures render the installation of any mitigation measures to screen them self defeating since the screening would need to be of a similar vertical scale and effectively transfer the visual impact. The specific objectives to be aimed at for each issue discussed below are contained in Appendix C3.

9.3.1.2.1 Transmission line

The potential visual impacts associated with the project components comprising the four proposed corridors identified in section 6 of the VIA. All corridors have the potential to impact negatively on the visual environment. It is not anticipated that any of the project components will have beneficial impacts in terms of the visual environment. The degree of visual impact can be managed through the establishment of a management plan which, if followed, can in order of preference avoid, remove, or minimise potential visual impacts.

9.3.1.2.2 Access roads

The potential visual impacts associated with the construction and maintenance of access roads are related to the need to clear vegetation and carry out minor changes to the topography through excavations and fill. The clearing of vegetation has the greatest potential to produce visual impacts in the Acacia flood plain landscape along the Vet and Vals Rivers. Clearing of vegetation especially in long straight lengths impacts on the sense of place, the visual quality and landscape character, while reducing the landscape's VAC.

9.3.1.2.3 Clearing of servitudes

The potential visual impacts associated with the initial clearing and on going maintenance of servitudes are related to the need to clear

vegetation over a certain height that may pose as a fire risk to the transmission lines. The clearing of vegetation would very likely result in a loss of visual quality and reduced VAC along the servitude. The clearing of vegetation would most likely only be required in the Acacia flood plain landscape along the Vet and Vals Rivers.

9.3.1.2.4 Sub-stations

The extent of disturbance to the visual landscape around the sub-stations is not expected to be great and no or very limited risk of visual impact is anticipated.

9.3.1.2.5 Construction camps and lay down areas

The potential visual impacts associated with the establishment of construction camps and lay down areas relate to the possible clearing of vegetation and the foreign scale and aesthetic of the structures, security and stockpiled materials.

9.3.1.2.6 Construction housing

The potential visual impacts associated with the establishment of construction housing relate to the possible clearing of vegetation, the foreign scale and aesthetic of the accommodation and the increased human activity and associated visual intrusion into a landscape that is typically homogenous and inactive.

Table 12: Visual Impact Table

	Activity	Nature of Impact	Extent of impact	Duration of impact	Intensity of impact	Probability of impact	Significance	
							WOM$^{\Delta}$	WM*
Construction Phases	Construction of transmission line within the Grasslands and Acacia flood plain landscape types.	Negative – impact on the sense of place, visual quality and landscape character	Local	Short-term	High	Highly Probable	High	Medium
	Construction of transmission line within all three landscape types.	Negative – impact resulting from clear contrast in scale.	Regional	Short-term	Low	Definite	Medium	Medium -low
	Construction of the transmission line which is greatly elevated in relation to the topography.	Negative – impact as a result of critical views due to high visibility	Regional	Short-term	Medium	Highly Probable	High	Medium -low
	Clearing of vegetation within the transmission line servitude and access roads.	Negative – impact on sense of place, visual quality, landscape character and scale within Acacia floodplain landscape	Local	Short-term	Medium	Highly Probable	Medium	Low
	Construction of transmission lines close to main roads, tourism nodes and towns.	Negative – visual impact in close proximity to areas with critical views	Regional	Short-term	High	Highly Probable	High	Medium
	Establishment of construction camps and lay down and/or construction housing may require the clearing of relatively large areas of vegetation.	Negative – visual intrusion on the sense of place, visual quality, landscape character and scale within the grasslands and Acacia flood plain landscape types	Site	Short-term	Medium	Probable	Medium	Low-medium
	Establishment of construction camps and lay down and/or construction housing with structures and material stockpiles extending to three metres or more and increased human activity.	Negative – visual intrusion due to high visibility and poor aesthetic quality in locations close to areas with critical views	Site	Short-term	Medium	Probable	Low-medium	Low

	Activity	Nature of Impact	Extent of impact	Duration of impact	Intensity of impact	Probability of impact	Significance	
							WOM$^{\Delta}$	WM*
Operational Phase	Presence of transmission line within the Grasslands and Acacia floodplain landscape types.	Negative – impact on the sense of place, visual quality and landscape character	Regional	Permanent	Medium	Definite	Medium	Medium -low
	Presence of transmission lines that are greatly elevated in relation to the topography.	Negative- impact on critical views due to high visibility	Regional	Permanent	High	Highly Probable	High	Medium high-
	Clearing of vegetation within the transmission line servitude and access roads.	Negative – impact on sense of place, visual quality, landscape character and scale within Acacia floodplain landscape	Local	Permanent	Medium	Highly Probable	Medium	Low
	Presence of transmission lines close to main roads, tourism nodes and towns.	Negative - visual impact in close proximity to areas with critical views	Local	Permanent	High	Highly Probable	High	Medium -high
	Presence of transmission line within 250m of visuals assets	Negative – intrusion of transmission line on sense of place and visual quality, on elevated land forms such as rocky ridges and koppies and on pans that can be considered as visual assess	Regional	Permanent	High	Highly Probable	High	Medium -high

* With Mitigation $^{\Delta}$ Without Mitigation

9.3.2 Mitigation

9.3.2.1 Construction Phase

9.3.2.1.1 Mitigation measures pertaining the construction of the transmission line:

- The corridor should avoid natural features such as elevated ridges and koppies and pans that could be considered as visual

assets and that have the potential to be utilised for passive tourist related activities;

- A minimum buffer of 250 m or 5 times the height of the towers should be allowed between the corridor and any of these natural features;
- A greater distance should be considered around larger and locally unique features;
- Where practical the corridor of the transmission line should run parallel to existing lanes and stands of mature gum and pine trees, which will serve either as a screen or camouflaging backdrop;
- The flagged corridor should be investigated for potential local re-alignment to further reduce visual impacts.

9.3.2.1.2 Mitigation measures pertaining to access roads

- Where new access roads are required in the grasslands landscape they should:
    - Not cross over rises, ridges or areas of steep gradient where excavations or retaining structures would be required,
    - Curve around elevated natural features, mature trees and shrub thickets;
    - Keep to grassland areas and avoid any type of wetland vegetation;
    - Follow the existing grade as closely as possible;
    - Resemble the construction method of surrounding roads preferably modelled on the least disruptive example;
    - Be the absolute minimum width required;
    - Have no or limited cleared verges.

- Where new access roads are required in the cultivated lands:
    - Towers are to be constructed adjacent to existing farm roads;
    - Should it be necessary to align an access road along a significant length of the transmission line that crosses a main road, reduce the sightline to a couple of hundred metres by either curving the road or by aligning it alternatively on either side of the transmission line servitude.
- Where a new access road is required in the Acacia flood plain landscape:
    - The absolute minimum should be constructed, preferably a farm road;
    - The road should be designed for the minimum frequency and lightest traffic essential to inspect the line,
    - Where possible access over the last 100 or 200 m closest to the river and denser vegetation should be on foot,
    - Tracks should be limited to the perimeter of dense vegetation or clear grassland areas,
    - The clearing of trees and shrubs should be avoided and where required should not extend in straight lines for distances of more than 50 m,
    - Tracks should meander around trees and shrub thickets using them to reduce the visible extent of longer tracks,
    - No or very limited verges should be cleared along tracks.

- Where new access roads are required in the vicinity of pans:
    - Roads should run concentrically around pans at a minimum distance of 50 m and preferably not radiate away from pans,
    - They should be sunk slightly into the ground to make them less visible,
    - They should follow “the path of least resistance” around elevated areas and drainage lines,
    - No borrow pits or permanent spoil heaps shall be located within 100 m of the pans and spoil heaps shall not exceed 1 m in height for every 100 m away from the pan,
    - The existing surface profile around the perimeter of a pan shall not be modified, either elevated or cut to accommodate the access road.
- Where access roads are required in the vicinity of elevated landforms such as ridges and koppies:
    - Access roads shall not cross over the crest of these features,
    - Roads shall run parallel to and at a minimum distance of at least the height of the feature from the outline of the foot slopes,
    - Roads should follow “the path of least resistance” around rock outcrops, elevated areas, drainage lines, trees and shrubs.

9.3.2.1.3 Mitigation measures pertaining to clearing of servitudes

- Examine the portion of the flagged corridor that falls within the Acacia flood plain and allow for local realignment to avoid the clearing of mature stands of indigenous trees and thickets of shrubs;

- Where the corridor must pass over dense stands of trees and shrubs or over areas of tall trees, either increase the height of the transmission lines above the safe margin or reduce the extent of flammable material while allowing tall trees and thickets of shrubs of varying heights to remain;

- Do not strip the vegetation all at once, along the boundary line of the servitude, rather remove material from each of the vegetation layers.

9.3.2.2 Mitigation measures pertaining to construction camps and lay downs

- Do not locate camp sites in areas where it would be necessary to remove trees and shrubs or large areas of well established vegetation (especially indigenous vegetation);

- Locate the camp site close to existing stands of exotic trees which can serve as a screen or act as a backdrop;

- If feasible programme and season allowing, set up temporary camp sites behind a buffer of mature maize plantations in a relatively low lying areas away from main roads;

- Where possible make use of sites that have previously been used as material storage sites and that may not have been re-vegetated.

9.3.2.3 Mitigation measures pertaining to construction housing

- Do not locate construction housing in areas where it would be necessary to remove trees and shrubs or large areas of well established vegetation (especially indigenous vegetation);

- Locate them close to existing stands of exotic trees, which can serve as a screen or act as a backdrop;
- Locate construction housing out of sight from critical views sources such as main roads, existing urban and rural settlements and public gathering areas such as schools, sporting facilities, community halls, show grounds, etc.; and
- Where possible make use of sites that have previously been disturbed and that may not have been re-vegetated.

9.4 ECOLOGICAL INVESTIGATION (FLORA AND FAUNA)

Activity:	Clearing of vegetation within the servitude of the transmission line along any one of the four corridors
Impact:	Destruction of vegetation due to clearance of vegetation at construction camps, access roads, etc. Accidental fires could start where construction activities are taking place (grinding of steel, etc.) The close proximity of the planned transmission line to a high density of pans could result in collisions when waterfowls, waders and flamingos migrate from pan to pan.

9.4.1 Assessment of the Ecological Impacts of the Transmission line

9.4.1.1 Status Quo

All the major communities mentioned in section 7.2.1 will be affected by this planned development except for the Kimberley Thorn Bushveld, which would only be significantly affected should Corridor 3 be selected.

Corridor 3 cuts through stands of Camel Thorn (*Acacia erioloba*) (Kimberley Thorn Bushveld). In terms of the Forest Act (Act No. 122 of 1988) the Camel Thorn Tree (*Acacia erioloba*) protected tree. A

permit to cut or remove any Camel Thorns must be obtained before any construction starts.

9.4.1.2 Construction Phases

There is the possibility of sensitive vegetation being indiscriminately destroyed without permission during the clearing of vegetation for the location of construction camps, access roads, etc.

This could have legal implications for Eskom and the Contractor, since in terms of the Forest Act (Act No. 122 of 1988), a permit must be obtained prior to construction.

The potential impacts are applicable to all the above-mentioned major vegetation units (Table 13).

The construction phase is the most destructive part of the planned development. During the construction phase various impacts could cause degradation and destruction of vegetation and animal habitats.

<u>Access roads</u>

The floodplain grassland, *Acacia karroo* shrub and riparian shrub communities are usually situated on soils which erode easily once the vegetation cover has been removed.

The wetland communities are sensitive to disturbance and no access road must be constructed through a wetland.

<u>Contractors' camps</u>

Care must be taken to select the sites outside the tree and shrub communities (*Acacia karroo* shrub and riparian shrub communities). If this is not possible then the damage to the vegetation must be limited to the demarcated area of the camp.

<u>Footprints of the towers</u>

At the footprints of the towers, care must be taken to keep the topsoil separate from the deeper soil. The topsoil must be placed back on top after construction. This layer has a seed bank, which could help the disturbed areas to re-vegetate quicker.

<u>Bush clearing</u>

The area has relatively few shrub communities (only near rivers and on dolerite outcrops). This impact is not of high significance, as succession will restore the plant community over time.

Except for the foundations of the towers the disturbance of vegetation could be of temporary nature, if the construction phase is conducted in a responsible manner. Due to the nature of vegetation to restore itself after disturbance, by means of succession, the degraded areas would be covered after a relatively short period.

9.4.1.3 Operational Phase

The close proximity of the transmission line to a high density of pans and river crossings, or other sensitive habitats could result in collisions when waterfowl, waders and flamingos, which usually migrate from pan to pan. Several sensitive birds are located within the study area, which could be at risk.

Accidental fires could start where maintenance activities are taking place, and this could result in runaway veld fires, leading to loss of important vegetation and faunal habitat.

During this phase the impacts on the vegetation and habitat of the fauna would be relatively low.

Contractors must drive in existing tracks as far as possible to prevent the formation of unnecessary tracks.

<u>Crossing of rivers and other water bodies such as pans</u>

Birds, especially waterfowl and raptors such as the African Fish Eagle migrate up and down the rivers. Collisions with the conductors are a great possibility. Bird flappers must be attached to areas where the transmission line is crossing the Vet and Vals Rivers as well as where it crosses or passes near pans (See the Yellow areas marked on the sensitivity map of Appendix C4).

Table 13: Ecological Impact Table

	Activity	Nature of Impact	Extent of impact	Duration of impact	Intensity of impact	Probability of impact	Significance	
							WOM$^{\Delta}$	WM*
Construction Phases	Vegetation clearing	Negative – destruction of vegetation due to clearing at construction camp sites, access roads etc.	Local	Short-term	Medium	Definite	Medium	Low-medium
	Vegetation clearing	Negative– faunal habitat destruction and loss due to clearing of vegetation at construction camps, access roads etc.	Local	Short-term	Medium	Definite	Low-medium	Low-medium
	Vegetation clearing at construction camps and access roads	Negative - Erosion	Local	Short-term	Medium	Highly Probable	Medium -high	Medium
	Construction activities such as grinding of steel, etc.	Negative – accidental veld fires	Local	Short-term	Medium	Improbable	Medium	Low
Operational Phase	Operation of transmission line close to numerous pans	Negative – bird collisions during migration from pan to pan, resulting in injury and or death of species such as water fowls, waders and flamingos	Local	Permanent	Medium	Highly probable	Medium -high	Low-medium
	Maintenance along the transmission line	Negative – carelessness, indiscriminate disposal of cigarette butts leading to accidental fires	Local	Short-term	Medium	Improbable	Medium	Low

* With Mitigation $^{\Delta}$ Without Mitigation

9.4.2 Mitigation

9.4.2.1 Construction Phase

In order to minimise habitat destruction the following measures have bee proposed in the Ecological Report:

- The Contractor shall provide the Engineer and ECO with a plan detailing the layout of site offices and facilities, such as chemical toilets, areas for stock piling of materials and for storage of hazardous materials.
- The site for the chemical toilets, areas for stock piling of materials and for storage of hazardous materials must be as far away from watercourses as possible.
- No fires may be lit on private property. If fires are lit with the permission of the landowners or in the construction camp, provision must be made so that no accidental fires are started.
- No firewood may be collected in the veld.
- Fire extinguishers must be available on site and in the construction camp.
- Vehicles should be driven at a moderate speed on private roads.
- Camp and offices should be removed and rehabilitated on completion of the contract. The site should be rehabilitated as close as possible to its original condition.
- Chemicals such as oil, fuel, etc must be properly stored. There should be controlled access to the chemicals

With regard to sewage and waste management:

- Adequate chemical toilet facilities are to be provided.
- Use of veld for sanitation or ablution purposes shall not under any circumstances be permitted.
- The Contractor shall be entirely responsible for enforcing the use of toilet facilities and for maintaining such toilets in a clean and sanitary condition, to the satisfaction of the Engineer.
- Toilets shall be positioned within walking distance from wherever employees are employed on the works.

- Waste management and waste minimization must be implemented at the outset of the contract

- No littering by anyone will be permitted. During the construction period the facilities shall be maintained in a neat and tidy condition and the site is to be kept litter free.

The following should be noted in particular, for solid waste removal:

- Solid waste is to be stored in an appointed area for collection and disposal.

- A refuse control system must be established for the collection and removal of refuse to the satisfaction of the ECO. This entails that sufficient waste bins are available on site and in the construction camp. The waste should preferably be dumped at an approved waste disposal site.

Hazardous waste:

- Hazardous waste is to be stored in an appointed area for collection and disposal at a Department of Water Affairs and Forestry (DWAF) licensed landfill site.

Topsoil management:

- In the event of topsoil being stripped it shall be stockpiled on the site for later reuse. (Topsoil is considered to be a minimum of thickness of ± 300mm of the natural soil, including all vegetation and organic matter).

- Weeds appearing on stockpiled topsoil shall be removed by hand before seeding.

- Soil contaminated by hazardous substances shall be disposed of in a Department of Water Affairs and Forestry (DWAF) licensed landfill site.

The following recommendations are made to assist in mitigating the environmental impact of the proposed development.

- Vegetation may not be destroyed unnecessarily; and

- Measures to prevent erosion such as berms, gabions, and mats must also be installed where necessary.

9.4.2.1.1 Post construction and operational phases

- Rehabilitation of damaged areas must be undertaken as specified in the EMP; and
- Measures to prevent erosion such as berms, gabions, and mats must also be installed where necessary.

9.5 IMPACTS ON BIRD-LIFE

Activity:	Constructions activities along any one of the four corridors, involving servitude clearing and construction of access roads and activities of the crew at the construction camps
Impact:	Mortality of birds due to electrocutions, and collisions of sensitive and non-sensitive species with the earth wire of the transmission line, habitat destruction and disturbance.

9.5.1 Assessment of the impacts of the Transmission line on Bird-Life

9.5.1.1 Status Quo

Due to the nature of the proposal and the degree of interaction between the transmission line and birds, the presence of numerous wetland communities and natural habitats suited to birds, the impacts on birds along each alternative corridor was given detailed attention. The total number of bird species recorded for each half-degree square (Harrison *et al.*, 1997) in the study area can be seen in Table 1 of the Bird Impact Assessment study. (Appendix C6).

Although a relatively large number of bird species has been recorded in the study area, most of them have relatively low reporting rates, indicating that they are not common in the area (see Table 2 of the Bird Impact Report). This assertion is supported by the fact that the most sensitive areas identified in terms of sensitivity of the Red Data birds report incidence rates ranging from 0.01 to 0.46. These half-degree squares in order of decreasing sensitivity to Red Data species are 2826A, 2825D, 2726D, 2825B, 2726B, and 2726C.

When interpreting these results, however, it must be borne in mind that the ASAB data was collected during a period of below average rainfall (Harrison *et al*., 1997). This must have had an effect on the reporting rate of important water birds, particularly the two flamingo species, and is most likely the reason for the surprisingly low reporting rates in the pan turf veld. It should therefore be stated here that the squares with the greatest percentage of this veld type are most likely underrated in terms of sensitivity.

9.5.1.2 Construction Phase

Although the most severe impacts are the likelihood of electrocutions, collisions, as well as habitat destruction and disturbance, the particular design of the transmission line also has a bearing on the inherent risks for birds (Table 14). Refer to Appendix E of the Bird Impact Assessment (Appendix C6) for a detailed assessment of the potential impacts on Red Data species in the study area.

9.5.1.3 Operational Phase

The earth wire is the biggest risk, since it is much thinner and could be unseen by a bird in flight. Electrical faults caused by bird excreta being deposited on electricity infrastructure show that birds could also have negative impacts on transmission lines.

Bird-transmission line interactions can either be direct interactions, in which the bird comes into physical contact with the transmission line infrastructure, or indirect interactions, in which the transmission line infrastructure in some way impacts on the bird without coming into direct contact with it. Typically, direct interactions take the form of birds colliding with or being electrocuted on the infrastructure, or using it for nesting, roosting or perching. Indirect interaction is disturbance or habitat destruction as a result of activities relating to the construction or maintenance of the transmission line. Although these activities do not necessarily kill birds, they may impact negatively on birds.

Direct interaction occurs in the form of collision of birds with the earth wire of the proposed line, while indirect interaction takes the form of habitat destruction and disturbance. Eleven bird micro-habitats were identified; the foregoing interactions will be most pronounced in three of the untransformed habitats, namely, the wetlands and ephemeral pans; grasslands and riparian habitats and one transformed habitat namely the Lucerne fields (collisions).

From the Bird-Impact perspective, an analysis of the sensitivity of the four proposed corridors revealed that the least sensitive corridor from a bird impact perspective would be Corridor 4. This means that of the four corridors, Corridor 4 is likely to have the least impact on the Red Data species present, and it is therefore recommended as the proposed servitude (Refer to the Addendum 2 of the Bird Impact Report in Appendix C6).

Table 14: Impacts on Bird-Life

	Activity	Nature of Impact	Extent of impact	Duration of impact	Intensity of impact	Probability of impact	Significance	
							WOM$^{\Delta}$	WM*
Construction Phase	Clearing of servitude, construction of access roads, construction camps etc.	Negative destruction of habitat	Local	Short-term	Medium	Probable	Medium	Low
	Construction activities in the contractor camps	Negative – disturbance of sensitive species by the contraction crew	Local	Short-term	Medium	Probable	Medium	Low
Operational Phase	Operation of the transmission line	Negative – mortality of birds, due to collision with earth wire	Local	Permanent	High	Probable	High	Medium
	Maintenance of the transmission line servitude, access roads	Negative – destruction of habitat by the maintenance crew	Local	Short-term	Low	Probable	Low	Low
	Maintenance of the transmission line servitude, access roads	Negative – disturbance of sensitive species by the maintenance crew	Local	Short-term	Low	Probable	Medium	Low

* With Mitigation $^{\Delta}$ Without Mitigation

9.5.2 Mitigation

9.5.2.1 Construction Phase

9.5.2.1.1 Habitat destruction

Destruction of grassland during construction and operation should be kept to a minimum.

No destruction of Wetlands and Ephemeral pans during

construction and operation should be allowed. In particular no vehicles should be allowed to drive through or across wetlands or pans.

9.5.2.1.2 Disturbance

The activities of the construction and operations staff must be restricted to the servitude and immediate surrounds. Under no circumstances must birds be exposed to more disturbance than is inevitably brought about by construction and operations activities. Potential trapping and hunting of wild birds by construction crews must be strictly forbidden.

9.5.2.2 Operational Phase

9.5.2.2.1 Collisions

On all sections of line passing through Grassland, the earth wire should be fitted with Bird Flappers.

Every effort must be made to avoid Wetlands and Ephemeral pans. If that is not feasible, all sections of line passing through or within 500 m of Wetlands and Ephemeral pans should be fitted with Bird Flappers on the earth wire.

All sections of line crossing rivers and the adjacent Riparian habitat should be fitted with Bird Flappers on the earth wire.

All sections of line passing through or within 500 m of Lucerne fields should be fitted with Bird Flappers on the earth wire.

9.6 CULTURAL AND HERITAGE IMPACTS

Activity:	Constructing the towers of the transmission line at a site having historical and cultural significance, along any one of the four corridors
Impact:	Damage and looting of cultural heritage sites, resulting in loss of heritage.

9.6.1 Assessment of the Impacts on Cultural and Heritage Resources

9.6.1.1 Status Quo

The heritage resources and historical features of the study area have been succinctly described in section 7.4 above. It must be reiterated that as the study area is a predominantly agricultural area, past and present agricultural activities would have an impact on any cultural and historical resources in the area.

9.6.1.2 Construction and Operational Phases

Impact analyses of the cultural resources that could be threatened by the transmission line are based on the present understanding of the construction and operation of a transmission line (Table 15).

Each heritage site is unique and should be treated separately. The significance of a heritage site and its artefacts is determined by its historical, social, aesthetic, technological and scientific value in relation to the uniqueness, condition of preservation and research potential. It must be kept in mind that the various aspects are not mutually exclusive, and that the evaluation of any site is done with reference to any number of these.

Sites regarded as having low significance are viewed as being recorded in full after identification and would require no further mitigation. Impact of the development would therefore be assessed to be low. Sites with a medium to high significance would therefore require mitigation. Mitigation, in most cases the excavation of a site, is in essence destructive and therefore the impact can be viewed as permanent and as such of high significance.

Table 15: Impact on Cultural and Heritage Resources

	Activity	Nature of Impact	Extent of impact	Duration of impact	Intensity of impact	Probability of impact	Significance	
							WOM$^{\Delta}$	WM*
Construction Phase	Construction of transmission line	Negative – damage to heritage sites	Local	Permanent	High	Probable	High	High
	Construction crew working at or near heritage sites	Negative – removal or destruction of artefacts from sites	Local	Permanent	Medium	Probable	High	Low
Operational Phase	Maintenance	Negative – damage to heritage sites	Local	Permanent	Medium	Probable	High	Low
	Unscheduled maintenance work and failure to keep to management plans	Negative – removal or destruction of artefacts from sites	Local	Permanent	Low	Improbable	Low	Low

* With Mitigation $^{\Delta}$ Without Mitigation

9.6.2 Mitigation

9.6.2.1 Construction Phase

The following objectives and design standards, if adhered to, can eliminate, minimise or enhance potential impacts.

- The proponent must ensure that an archaeologist inspects the footprint of each site where a tower is to be erected. If a particular towers impacts on a heritage site but cannot be shifted, mitigation measures, i.e. the controlled excavation of the site prior to development, can be implemented. A qualified archaeologist can only do this after obtaining a valid permit from the Provincial Heritage Resource Agency (PHRA), or SAHRA, if it is a category 1 site.
- The same action holds true for any infrastructure development such as access corridors, construction campsites, borrow pits, etc.

- As stated earlier, people used to settle near water sources. Therefore riverbanks, edges of pans and smaller watercourses should be avoided as far as possible.

- Avoid all bare patches of vegetation unless previously inspected by an archaeologist. These might be old settlement sites.

- Rock outcrops might contain rock shelters, engravings or stone walled settlements, and should therefore be avoided unless previously inspected by an archaeologist.

- Communities living close to the proposed corridor should be consulted as to the existence of sites of cultural significance, e.g. graves, as well as sites that do not show any structures but have sentimental significance, such as battlefields, etc.

- All graves or cemeteries should be avoided, unless when totally impossible. The correct procedure, i.e. notification of intent to relocate them, consultation with descendants and permit application, should then be followed in relocating the graves. If any of the graves are older than 60 years, they can only be exhumed by an archaeologist. Graves of victims of conflict require additional permits from SAHRA before they can be relocated.

- Archaeological material, by its very nature, occurs below ground. The proponent should therefore keep in mind that archaeological sites might be exposed during the construction work. If anything is noticed, work in that area should be stopped and the occurrence should immediately be reported to a museum, preferably one at which an archaeologist is available. The archaeologist should then investigate and evaluate the find.

- Any mitigation measures applied by an archaeologist, in the sense of excavation and documentation, should be published in order to bring this information into the public domain.

9.7 TOURISM IMPACTS

Activity:	Construction of the line on high-potential eco-tourism or conservation land
Impact:	Negative – reduced tourism potential

9.7.1 Assessment of the Impacts on Tourism Potential

9.7.1.1 Status Quo

The tourism resources and features of the study area have been succinctly described in 7.5.2. The centre of tourism in the area is Bothaville, and the focus is on agro-tourism and cultural history.

9.7.1.2 Construction Phases

Analysis of impacts on tourism is outlined in Table 16. The majority of these impacts are indirect (impacts on visual landscape, noise levels and flora and fauna), and are detailed in the relevant specialist reports. Site and timing of construction are crucial factors in minimising negative impacts.

9.7.1.3 Operational Phases

Operation of the transmission line will impact on safety, in terms of the risks associated with operating a high voltage transmission line in areas with bird watching activities. Future plans for hot air ballooning and for fly-over tours will be impacted on by the proposed development.

Table 16: Impact on Tourism

	Activity	Nature of Impact	Extent of impact	Duration of impact	Intensity of impact	Probability of impact	Significance	
							WOM	WM*
Construction and Operational Phases	Construction of the line on high-potential eco-tourism or conservation land	Negative - reduced biodiversity and interference with ecosystem function	Regional	Short-term	Medium	Probable	High	Medium
		Negative – devaluation of land under the line	Regional	Permanent	High	Highly Probable	High	Medium-High
	Construction of the line adjacent to potential or existing eco-tourism sites	Negative - relocation of water points, fences and infrastructure	Local	Permanent	Medium	Probable	Medium	Low
		Negative – diversion of game paths, bird migration routes	Local	Short-term	Medium	Probable	Medium	Low
		Negative - costs of relocation of animals	Local	Short	Medium	Probable	Medium	Low
		Negative - reduced numbers of foreign and local visitors	Regional	Long-term	Medium	Highly Probable	Medium	Medium
	Operation of the 400 kV line	Negative – safety hazards for small aircraft, hot air ballooning tours	Regional	Permanent	Medium	Highly Probable	Medium	Low
		Negative - change in visual character of area	Local	Permanent	High	Highly Probable	High	Medium

* With Mitigation $^{\Delta}$ Without Mitigation

9.7.2 Mitigation

9.7.2.1 Construction Phase and Operation Phase

It is recommended that intersection of the transmission line alignment with protected areas categories 3 and 4 (Nature Reserves and National Parks) be avoided. Categories 1 and 2 (Game Farms and Conservancies) represent locally protected areas that may be intersected by the transmission line, but only in the event that landowners are adequately consulted, and negotiations with Eskom include negotiated costs and responsibilities of relocating animals and infrastructure. It is recommended that construction within the Bothaville area not take place during the NAMPO Festival (18 – 21 May annually). This festival attracts the majority of domestic and foreign tourists, and construction of transmission line would have a significant impact on visitors. During October, Bothaville becomes

the venue for the Witblits Festival, and this should be taken into consideration during construction.

9.8 ENGINEERING AND GEOLOGICAL STUDY

Activity:	Constructing the transmission line in dispersive soils, active clays, collapsible textured soils, or salt pans which will have aggressive surface water
Impact:	Soil erosion, heaving, subsidence, foundation collapse, leading to loss of lives and property, corrosive effects on the founding material of the towers.

9.8.1 Assessment of Impacts of the Transmission line on Soils and Geology

9.8.1.1 Status Quo

The area between Dealesville and Viljoenskroon is generally characterised by flat to gently undulating topography, associated with the widespread distribution of surface soils. Bedrock is therefore largely covered by either transported and/or residual soils. Large dolerite sills generally form topographic rises, characterised by surface dolerite boulders and scattered outcrops.

Soils associated with the sedimentary rocks of the Karoo Supergroup generally comprise fine-grained sandy silt to silty clay. Soils derived from the weathering of mudrocks are characterised by dark coloured, silty clays, which are generally highly plastic and will heave when subjected to soil moisture changes.

The fine-grained soils derived from the Karoo sedimentary rocks are generally dispersive, which may lead to extensive erosion problems and donga formation along moderate slopes. This aspect was not readily observed in the study area due to the predominantly flat-lying nature of the ground, but it may cause unstable soil conditions along sloping ground, particularly where poor ground management occurs, such as over-grazing.

Andesitic lava of the Transvaal Supergroup is characterised by a highly variable weathering profile, but the residual soils derived from the *in situ* weathering of the rock are generally clayey sand to silty clay with a moderate plasticity.

Transported soils have a widespread distribution along the corridors. These are mainly of aeolian origin, but are closely related to the

underlying bedrock. The thickness of these sands is not known, but is believed to be less than 5m. While aeolian redistribution has occurred in the past, these sands owe many of their characteristics to constant turnover of residual soils from beneath by bio-perturbation. They therefore show considerable local variation in composition and engineering properties. The main geo-technical problem associated with these sands is a collapsible fabric associated with an open textured soil, with individual grains being separated by a bridging material.

The southern portion of the corridors (generally south of Wesselsbron) is characterised by the widespread occurrence of pans. Some of these pans cover vast areas and are associated with salt deposits, which have been mined in the past for their sodium content. These pans are generally associated with a semi-arid environment, where they were formed by a combination of mechanical erosion processes caused by animals and wind erosion. The soil profiles of the pans are believed to vary considerably from the adjacent areas in that the soils could be predominantly silty with a high salt content. The high salinity is as a result of cyclic evaporation processes. The thickness of these deposits is not known, but it may be of considerable depths in the more prominent pans, possibly in excess of 10 m. These pans also form localised collection features for sheet wash, which implies that they form vast surface water bodies during the wet season, albeit of very limited depth.

9.8.1.2 Construction and Operational Phases

The potential risk sources related to engineering geology that could affect both the construction and operation phases are limited to the following (see summary in Table 17):

- Subsidence caused by dolomitic ground, which is limited to the far northern portion of the study area, generally to the north of Viljoenskroon.
- Subsidence caused by undermining associated with the gold mining areas.
- Soil erosion caused by dispersive soils in association with disturbances of the vegetation/topsoil cover and poor ground management practices. This risk is limited to moderately sloping ground only.

- Soil heave caused by thick active clay horizons, associated with fluctuated soil moisture, generally seasonally.
- Collapse of soil structure below foundations due to collapsible soils, associated with drastic increase in soil moisture content.
- Seasonally surface water of pans associated with aggressive water (high salt content).

From observations of the proposed corridors, it appears that Corridors 2 and 3 may not be feasible due to the constraint of having to avoid several large salt-pans along a major portion of the corridors, i.e. Dealesville to Wesselsbron.

Salt pans also occur along Corridors 1 and 4, but appear to be limited to the section between Dealesville and Bultfontein and generally of relatively small extent.

Due to the limited presence of the salt-pans along Corridor 4, in comparison to Corridors 1, 2 and 3, Corridor 4 appears to be a feasible corridor. The other geo-technical aspects, such as collapsible grain fabric, active clays and dispersive soils are common to all the corridors and do not play a significant role at this stage with regard to corridor selection.

Table 17: Impacts on Engineering Geology

	Activity	Nature of Impact	Extent of impact	Duration of impact	Intensity of impact	Probability of impact	Significance	
							WOM$^{\Delta}$	WM*
Construction and Operational Phases	Disturbance of dispersive soils along sloping ground during construction	Negative – Soil erosion	Local	Short-term	Medium	Probable	Low	Low
	Disturbance of soils containing active clays during construction	Negative – soil heaving	Local	Short-term	Medium	Highly Probable	Medium	Low
	Construction of towers on dolomitic or undermined areas	Negative – subsidence, which could lead to collapse of the towers and loss of property and lives	Local	Long-term	High	Probable	Medium	Low
	Presence of towers on collapsible soils	Negative – foundation collapse, which could lead to collapse of the towers and loss of property and lives	Local	Long-term	Medium	Probable	Medium	Low
	Presence of towers within salt pans in the event of towers being located in salt pans	Negative – aggressive surface water due to high salt concentration of water could have corrosive effects on the founding materials used for the towers.	Local	Permanent	High	Definite	Medium	Low

* With Mitigation $^{\Delta}$ Without Mitigation

9.8.2 Mitigation

9.8.2.1 Construction and Operational Phases

This engineering geological assessment was based on visual observation of the proposed corridors. A site walkover and a geo-technical investigation should be conducted to properly assess the feasibility of the final corridor for the proposed transmission line. Aerial photograph interpretations should form part of the next investigation phase, from which the various land forms, drainage features and distribution of pans be indicated on a topographical map as part of the preparation of an engineering geological map of the corridor(s).

Possible mitigation measures would be to avoid potential risk sources namely: salt pans, particularly the larger ones, active clays, dolomitic soils and collapsible soils should be avoided as far as possible. Where this is not possible geo-technical advice should be sought on how best to mitigate the risk sources. This is particularly important in determining the exact positions of the towers during the surveying exercise for the transmission line.

9.9 SOILS AND LAND-FORM

Activity:	Constructing the transmission line along any one of the four corridors with high potential arable soils, steep riverbanks valley bottoms and wetlands including pans.
Impact:	Loss of high potential arable land, wind and water erosion, and soil compaction.

9.9.1 Assessment of Impacts of the Transmission line on Soils and Land-form

9.9.1.1 Status Quo

The various soil formation occurring in the study area have been summarily described in section 7.1.2, and details are provided in the soils report in Appendix C5.

The sensitive areas are those where risks with regard to the utilisation of the soil-landform resources are most probable: soils prone to erosion either by wind or water; soils associated with pans, wetlands and valley bottoms; as well as steep river banks.

9.9.1.2 Construction and Operational Phases

<u>Wind erosion</u>

All fine sandy soils with less than 15% clay are prone to wind erosion when they are dry and devoid of vegetative cover during periods of high wind activity. It is therefore probable that this type of erosion will affect a large percentage of the soils during the construction phase, especially where disturbed along roads and in and around construction camps. In general, land types that will be impacted on are Ae38, 40, 46; Ah20; Ai5, 6; Bc24, 25, 28; Bd13, 14, 15, 18; Da1; Db1, 3, 4, 9; and Fc13. Similarly the fine sediments of pan floors may

be subjected to wind erosion and contribute to the dust problem. All in all, the significance of wind erosion is regarded as low to medium without mitigation and low with mitigation (Table 18). For the operation phase no negative impacts are foreseen.

Water erosion

Except the duplex and clayey soils of land types Da1; Db1, 3; and Dc4, 6, 8, 9 the water erosion hazard of all the other soils is low. Negative impacts in the form of soil erosion are a probability when the duplex and clayey soils are disturbed during the construction phase. The significance of the erosion impact is assumed to be low to medium without mitigation and with mitigation to be low (Table 18). If the steep river banks, valley bottoms (in particular those occurring in the north-eastern portion) and the limited number of wetlands in the same area are to be disturbed during the construction process or for the founding of towers, the environment will be negatively affected. However the probability of occurrence is regarded as improbable. It is important to control soil erosion because of its negative effects on the environment (loss of topsoil, sediments in waterways, reducing the aesthetic quality). Again, no negative impacts are anticipated for the operation phase.

Soil compaction

A very hard, compacted soil will make landscaping and re-vegetation difficult; it could also decrease crop yield potential drastically as well as increase runoff. Due to the fact that the compaction potential of the fine sandy soils (clay content less than 15%) is high, especially when the soils are wet, compaction is a common phenomenon during heavy vehicles passage. It is expected that the following land types will be affected: Ae38, 40, 46; Ah20; Ai5, 6; Bc24, 25, 28; Bd13, 14, 15, 18; Da1; Db1, 3, 4, 9; and Fc13. Despite these negative impacts, the impact is appraised to be medium without and low with mitigation measures (Table 18). During maintenance (operation phase) similar conditions will be encountered with similar negative impacts.

Arable potential

Physical arable potential is represented by the land capability classes based on the soil, landform and climatic factors as shown in Table 4.2 of the Soils and Landform Report (Appendix C5). Of these, class II (land types Bc24, Bc28, Bd13, Bd14, Bd15 and Bd18) as well as class III (land types Ae38, Ae40, Ae46, Ah20, Ai5, Ai6 and Bc25) are suitable for cropping with class II possessing the highest

potential. The construction of a transmission line, across the aforementioned land types will have a permanent (long-term according to Table 18) impact on agricultural production. Notwithstanding the goal of protecting prime agricultural land, only relatively small areas will be utilised during the construction phase and even less for the operation phase, with the result that the significance is regarded as being of low-medium without and low with mitigation (Appendix C5).

Table 18: Impacts on Soils and Land-form

	Activity	Nature of Impact	Extent of impact	Duration of impact	Intensity of impact	Probability of impact	Significance	
							WOM$^{\Delta}$	WM*
Construction Phases	Construction activities such as vegetation clearance, vehicle and movements	Negative – wind erosion of all fine sandy soils and pan floors when dry and devoid of vegetation	Local - regional	Short-term	Low	Probable	Low-medium	Low
		Negative – compaction of all fine sandy soils especially when soils are wet	Local	Short-term	Low	Highly Probable	Medium	Low
	Construction activities around river crossings or river banks, valley bottoms and wetlands	Negative – clayey and duplex soils of land types Db and Dc are susceptible to water erosion when exposed	Regional	Short-term	Low	Probable	Low-Medium	Low
		Negative - disturbance of steep river banks, valley bottoms and wetlands can lead to water erosion	Regional	Short-term	Low	Improbable	Low-medium	Low
	Construction of the line on land types with high arable potential	Negative – permanent loss of land with high arable potential (i.e. all land types with capability classes II and III)	Local-national	Permanent	Medium	Definite	Low-medium	Low
Operational Phase	Maintenance activities during the operation of the line	Negative - compaction (as for the construction phase)	Local	Short-term	Low	Highly probable	Medium	Low

	Activity	Nature of Impact	Extent of impact	Duration of impact	Intensity of impact	Probability of impact	Significance	
							WOM$^{\Delta}$	WM*
	Maintenance activities during the operation of the line	Negative – permanent loss of land with high arable potential (i.e. all land types with capability classes II and III)	Local-national	Long-term	Medium	Definite	Low-medium	Low

* With Mitigation $^{\Delta}$ Without Mitigation

9.9.2 Mitigation

9.9.2.1 Construction and Operational Phases

At this stage the four alternative corridors are proposed (1-4) with three short alternatives (a-c). In order to evaluate the environmental impact of the transmission line certain management objectives need to be expressed as measurable targets. For the soil-landform component of the study, the following objectives can be stated:

- avoid class II and to a lesser degree class III agricultural land.
- prevent negative impacts such as soil erosion (wind and water) as well as soil compaction which normally result in the degradation of the soil resource.

For the various impacts identified, management and mitigation actions will be necessary to minimise degradation of the environment and manage the loss of cultivated land.

<u>Wind erosion</u>

Temporary roads must be sealed (also to improve accessibility) with an environment-friendly sealant; adjoining areas in and around construction camps must be kept moist; and re-vegetated if necessary.

<u>Soil compaction</u>

Compacted areas must be ripped or deep ploughed after construction and maintenance is completed (as a guideline: rip to a depth of 30 cm below compacted layer); compaction should be minimised during both phases by avoiding unnecessary flow of traffic. The construction crew must refrain from movement over soil surface during very wet conditions (as a guideline: stop movement of heavy machinery after 20-25 mm rainfall). Traffic must be limited to

definite road zones.

Water erosion (duplex and clayey soils)

Soil conservation measures must be constructed along roads. For instance, bare, disturbed surfaces must be avoided for long periods; and avoid undue storm-water concentration (e.g. construct runoff measures according to soil conservation principles).

Water erosion (steep river banks, valley bottoms and wetlands)

These areas must not be selected for construction purposes or as locations for towers.

Arable potential

Although it would be a difficult task in the study area, the final corridor should be selected by avoiding, as far as possible, classes II and III land types.

9.10 HYDROLOGY AND SURFACE WATER RESOURCES

Activity:	Constructing the transmission line in sensitive hydrological and surfaces water resources along any one of the four corridors
Impact:	Degradation

9.10.1 Assessment of Hydrology and Surface Water Impacts

9.10.1.1 Status Quo

Based on the classification system of Cowan and Van Riet (1998), the following wetland types are found in the study area and would be exposed to the anticipated impacts:

- Endorheic – permanent and seasonal, brackish, saline or alkaline lakes, flats, pans and marshes
- Riverine – perennial and seasonal rivers;
- Emergent Palustrine – permanent freshwater marshes and swamps;
- Water storage areas – man made dams.

The endorheic pans are predominantly located in the Dealesville, Bultfontein and Wesselsbron areas. The Vet and Vals River are the main riverine wetlands in the study area. Smaller tributaries to these rivers include the Klein Kalkspruit, Barberslaagte, Dermnspruit, Sandspruit, Otterspruit and Olifantsdrift (Figure 2 of Appendix C8). Most of these tributaries are perennial. Emergent palustrine wetlands are associated with these rivers, tributaries, drainage lines and the pans. A limited number of dams are also located along the four alternative corridors.

9.10.1.2 Construction Phases

Erosion of stream banks, floodplains and pans

Access of construction vehicles and construction personnel onto the stream banks, floodplains and pans can result in the onset of erosion. The clearance of vegetation will reduce the capacity of the land surface to retard the flow of surface water, thus decreasing infiltration, and increasing both the quantity and velocity of surface water runoff and erosion. Human activities, which disturb the soil structure, such as the compaction of soil along footpaths and vehicle tracks, and the disturbance of soil structure through movement of soil, can result in increased susceptibility to erosion (Table 19). Roads and pathways created during the construction phase have the potential to become preferred drainage lines, resulting in gully erosion.

Sedimentation of streams and rivers

Clearance of existing vegetation will expose the upper layers of the soil horizon to soil erosion. The transport of eroded soil into the surface water resources, especially the rivers will impact on water quality. The movement of construction vehicles and personnel can also result in the onset of erosion and associated sedimentation of streams and rivers. The stockpiling of excavated earth and construction materials can result in contamination of runoff, through erosion of stockpiles.

Faunal disturbance

During the construction phase, the habitat of the majority of fauna that frequents the construction sites could be damaged or destroyed. Accordingly, these animals can be expected to migrate from the area. As the construction activities will be of relatively short duration and of limited extent, most animals will be able to migrate back. The riparian zone is an important corridor for the movement of wildlife,

and as such the construction activities may temporarily impact on the movement of certain faunal species along the riverine corridor. The construction related activities that will result in a deterioration of the water quality, will ultimately influence aquatic species such as macro-invertebrates, fish, amphibians and birds. This impact would however be limited in terms of duration. The construction activities, if not properly managed, can potentially result in a change in the streambed characteristics through sedimentation, litter and construction rubble, which will ultimately result in the disappearance of certain faunal components like fish and macro-invertebrates that require specific habitat conditions. The presence of the transmission line can impact on the bird life found in and around the pans, especially those that are important feeding habitat for flamingos.

The pans in the western Free State are known for their unique invertebrate composition. Construction activities within the pans or even on the perimeter of pans can expose these unique animals to various impacts, which may jeopardise their chances of survival on a local scale. In addition the confirmed presence of the giant bullfrog (*Pyxicephalis adspersus*) in the pans is an important aspect to be flagged as this species has high conservation value being a red data species.

<u>Floral disturbance (riparian zone, floodplains, pan perimeter)</u>

The clearing of vegetation for construction purposes can have a limited impact due to the small footprint that each of the towers will have. However a small footprint in a sensitive area, for example in a pristine riparian zone can have a major impact on the flora on a local scale. The movement of vehicles through the riparian zone and / or floodplains of rivers and on the perimeter of, or through pans can also result in floral disturbance. Such disturbance can result in the onset of erosion and alien plant invasion.

<u>Surface water pollution</u>

Hydrocarbons-based fuels or lubricants spilled from construction vehicles, construction materials that are not properly stockpiled, and litter deposited by construction workers may be washed into the surface water bodies. Should appropriate toilet facilities not be provided for construction workers at the construction crew camps, the potential exists for surface water resources and surrounds to be contaminated by raw sewerage.

Disturbance of hydrological regime on a micro scale in floodplains, riparian zone and pans

The presence of construction vehicles, personnel and material in floodplains, riparian zones and pans, can result in a local change in flow patterns. This can result in a change in the flow patterns in these areas due to the presence of obstructions (i.e. vehicles, construction material, construction crew camps etc.). Human activities, which disturb the soil structure, such as the compaction of soil along footpaths and vehicle tracks, and the disturbance of soil structure through movement of soil, can also result in a change in the micro scale hydrology.

9.10.1.3 Operational Phase

Erosion of stream banks, floodplains and pans

The presence of the transmission line and associated towers would not result in a substantial increase in erosion during the operational phase. Erosion of stream banks, floodplains and areas around pans, would mainly take place during this phase as a result of the movement of maintenance vehicles and personnel.

Sedimentation of streams and rivers

The presence of the transmission line and associated towers would not result in a substantial increase in sedimentation of surface water resources. The only sedimentation that may take place would be as a result of erosion associated with the maintenance activities.

Faunal disturbance

The major faunal disturbance during the operational phase would be the potential collision and / or electrocution of birds. This would especially be the case where the transmission line is aligned in close proximity to pans. Flamingos would be at risk here, as these birds make substantial use of the larger pans as feeding grounds.

Maintenance activities can result in a short-term disturbance of fauna on a local scale. This would however not be highly significant. Maintenance work that entails the use of paints, solvents and concrete, may result in surface water contamination, which may cause harm or death to aquatic invertebrates, fish and birds.

Floral disturbance (riparian zone, floodplains, pan perimeter)

The presence of the transmission line will result in a disturbance of the flora found in the riparian zone, floodplains and to a lesser extend the pans. Clearing of the servitude to prevent fire hazard, will result in floral disturbance. This will however be limited to the footprint area of the servitude. Access roads to the servitude may also need to pass through wetland areas and / or the riparian zone, which will also result in floral disturbance.

Surface water pollution

Maintenance activities may result in limited surface water pollution. The source of this pollution could be oil and fuel spills from maintenance vehicles, construction material i.e. solvents, paint, concrete etc. In addition activities by the work force (i.e. ablution, washing and littering) in the riparian zone and / or floodplains and pans may also result in increased pollution.

Disturbance of hydrological regime (micro scale) in floodplains, riparian zone, pans.

The presence of the towers in the floodplain, riparian zone and pans, could result in a change in the hydrological regime found within these wetlands. This could result in limited flooding, erosion and changes in the drainage patterns of these wetlands.

Table 19: Hydrological and Surface Water Impacts

	Activity	Nature of Impact	Extent of impact	Duration of impact	Intensity of impact	Probability of impact	Significance	
							WOM$^{\Delta}$	WM*
Construction and Operational Phases	Movement of vehicles, workforce and construction of towers within sensitive aquatic habitats	Negative – Erosion of stream banks, floodplains and pans	Local	Short-term	Medium	Probable	Medium	Low-Medium
		Negative – Sedimentation of streams and rivers	Regional	Short-term	Medium	Probable`	Low-medium	Low
		Micro-scale changes in hydrological regime during construction.	Local	Medium-term	Medium	Probable	Low	Low
		Negative – Faunal disturbance	Local	Short-term	Medium	Highly Probable	Low-medium	Low-medium
	Uncontrolled activities of the construction crew	Negative - Floral disturbance (riparian zone, floodplains, pan perimeter).	Local	Short-term	Medium	Highly Probable	Low-medium	Low-medium
	Oil and fuel spills from construction vehicles. Accidental deposition of construction material (i.e. concrete, solvents, paints etc.) into sensitive aquatic habitats during construction's activities.	Negative - Surface water pollution	Regional	Short-term	Medium	Probable	Low-medium	Low-medium
	Maintenance of towers within sensitive environments e.g. pan floors and marshes	Negative – Permanent disturbance of hydrological regime (micro scale) in floodplains, riparian zone, and pans.	Local	Permanent	Medium	Probable	Low-medium	Low

* With Mitigation $^{\Delta}$ Without Mitigation

9.10.2 Mitigation

9.10.2.1 Construction Phase

Erosion of stream banks, floodplains and pans

- Appropriate flow diversion and erosion control structures i.e. earth embankments must be put in place where soil may be exposed to high levels of erosion due to steep slopes, soil structure etc.
- Should a freak storm displace the temporary earth embankments or other erosion control structures, a visual inspection of the channel must be made and any damage be recorded. Any damage and loss of soil resulting from a storm is to be remedied immediately. Should the walls collapse due to construction error, the contractor is to fund the remediation process.
- Stormwater at the construction crew camps must be managed so as to reduce the silt loads in the aquatic system. Measures must be implemented to distribute storm water as evenly as possible to avoid point sources of erosion.
- Construction on steep slopes and in soft or erodible material will require erosion control measures and correct grassing methods.
- All construction areas should be suitably top soiled and vegetated as soon as is possible after construction.
- Disturbed surfaces to be rehabilitated must be ripped, and the area must be backfilled with topsoil or overburden.

Sedimentation of streams and rivers

- To prevent erosion of material that is stockpiled for long periods, the material must be retained in a bermed area.
- All topsoil must be removed and stockpiled on the site.
- The temporary storage of topsoil, inert spoil, fill etc. should be above the 20-year flood line or at least 20 m

from the top of the bank of watercourses and pans, whichever is the maximum or as agreed with the environmental control officer (ECO).

- Stockpiles should not be higher than 2m to avoid compaction, and single handling is recommended.

- Dust suppression is necessary for stockpiles older than a month – with either water or a biodegradable chemical binding agent.

Faunal disturbance.

- The Contractor shall ensure that all works are undertaken in a manner, which minimises the impact on the local fauna (including aquatic fauna) and shall apply the following specifications with respect to fauna management and protection:

- Under no circumstances shall any animals (wildlife and domestic animals) be handled, removed, killed or interfered with by the Contractor, his employees, his Sub-Contractors or his Sub-Contractors' employees, with the exception of the following fish species, that may be used as a food source:

    - Carp (*Cyprinus carpio*),

    - Bass (*Micropterus salmoides*),

    - Sharptooth Catfish (*Clarias gariepinus*)

Should any other fish specie be caught, especially yellow fish, these need to be returned to the river with as little damage as possible.

- The Contractor shall ensure that the work site is kept clean and tidy and free from rubbish, which can result in the interference with aquatic animals.

- The Contractor shall advise his workers of the penalties associated with the needless destruction of wildlife, as set out in the Animals Protection Act (Act No. 71 of 1962) sec. 2 (fine R2 000 and/or 12 months imprisonment).

Floral disturbance (riparian zone, floodplains, pan perimeter)

- Construction crew camps should not be located within the riparian zone, floodplains of rivers and streams or / adjacent to pans.
- Any wetland and buffer areas should be rehabilitated after construction has been finalised.
- Clearance of indigenous vegetation in the floodplains, riparian zones, pans and other wetlands, must be kept to a minimum.
- Areas of vegetation that are to be protected must be demarcated and cordoned off during construction, preferably using a temporary fence.
- No indigenous vegetation may be collected, or used for firewood.
- Large trees to be retained or transplanted must be marked and protected against damage by construction activities. Wattle trees and other alien invasive trees should be removed where possible.
- The following provisions shall apply with respect to the protection of areas of indigenous vegetation on or adjacent to the construction sites:
    - No indigenous tree or shrub on or adjacent to the construction site shall be felled, cut or pruned without the prior written approval of the Consulting Engineer or ECO.
    - No indigenous tree or shrub on or adjacent to the site shall be felled or pruned until it has been clearly marked for this purpose by the ECO. The method of marking will be specified by the Consulting Engineer or the ECO, and the Contractor will be informed in writing.

Surface water pollution

- Construction vehicles are to be maintained in good working order, to reduce the probability of leakage of fuels and lubricants.
- A walled concrete platform, dedicated store with adequate flooring or bermed area should be used to accommodate chemicals such as fuel, oil, paint, herbicide and insecticides, as appropriate, in well-ventilated areas.
- Storage of potentially hazardous materials should be above the 100-year flood line, or as agreed with the ECO. These materials include fuel, oil, cement, bitumen etc.
- Sufficient care must be taken when handling these materials to prevent pollution.
- Surface water draining off contaminated areas containing oil and petrol would need to be channelled towards a sump which will separate these chemicals and oils.
- Oil residue shall be treated with oil absorbent such as Drizit or similar and this material removed to an approved waste site.
- Concrete is to be mixed on mixing trays only, not on exposed soil.
- Concrete shall be mixed only in areas, which have been specially demarcated for this purpose.
- All concrete that is spilled outside these areas shall be promptly removed by the Contractor and taken to an approved dumpsite.
- After all the concrete mixing is complete all waste concrete shall be removed from the batching area and disposed of at an approved dumpsite.
- Stormwater shall not be allowed to flow through the batching area. Cement sediment shall be removed

from time to time and disposed of in a manner as instructed by the Consulting Engineer.

- All construction materials liable to spillage are to be stored in appropriate structures with impermeable flooring.
- Portable septic toilets are to be provided and maintained for construction crews. Maintenance must include the removal without sewage spillage.
- Under no circumstances may ablutions occur outside of the provided facilities.
- At all times care should be taken not to contaminate surface water resources.
- No uncontrolled discharges from the construction crew camps to any surface water resources shall be permitted. Any discharge points need to be approved by the relevant authority.
- In the case of pollution of any surface or groundwater, the Regional Representative of the DWAF must be informed immediately.
- Where construction in close proximity to sewer lines is unavoidable then excavations must be done by hand while at all times ensuring that the soil beneath the sewer lines is not destabilised
- Backfill must be compacted to form a stabilised and durable blanket; and the current load above the sewer lines must at no time be exceeded

<u>Disturbance of hydrological regime (micro scale) in floodplains, riparian zone, pans</u>

- Only a single access road should be used to the construction area.
- The movement of construction vehicles at the construction site should be limited to a specific area.
- Access into the riparian zone and floodplains of rivers and pans should be prevented as far as possible. Where access into these areas is required a preferred

corridor should be determined. No deviation from these corridors should be allowed.

- Once the construction of the towers has been completed and the site cleared of building materials and waste, the ECO must inspect the site and give approval that it is ready for rehabilitation.
- Areas to be rehabilitated should be agreed upon by the ECO, contractor and proponent.

9.10.2.2 Operational Phase

Similar measures as proposed for the construction phase are to be enforced.

9.11 HEALTH, SAFETY AND SECURITY

Activity:	Construction activities; establishing the construction campsite for the transmission line along any one of the four corridors.
Impact:	Unhygienic and hazardous working conditions, leading to the spread of diseases and / or injuries with possible loss of lives, separation of male workers from their partners, possibly leading to promiscuity.
Activity	Maintenance operations of Eskom Transmission staff
Impact	Livestock loss due to electrocution, or theft; trespassing; failure to close substation gates and poor maintenance of gates.

9.11.1 Assessment of Health, Safety and Security Hazards of the 400 kV Line

9.11.1.1 Status Quo

Being a predominantly farming community, the overwhelming majority of safety and security risks are associated with farm attacks; farm theft; safety of farm workers, implements or farm animals; and aviation safety. Some of these safety issues such as electrocution are however, associated mainly with Eskom's Distribution Lines rather than transmission lines.

One issue that specifically pertains to transmission lines is Livestock and game loss due to theft or electrocution. According to the local

farmers livestock theft is a problem in the area around Bultfontein district near the proposed Corridor 1. Farmers fear that the problem could escalate during construction of the line. Several landowners are also very weary about having construction camps on their farms.

Another safety concern was that farmers sought clarity regarding whose responsibility it would be to repair damage, if the stay of a tower was damaged during farming activities.

Aircrafts are used for crop spraying in the entire Bothaville district and beyond. Thus, aviation safety was noted as a major concern among the farmers in Bothaville.

9.11.1.2 Construction Phases

The construction phase will be characterised by several activities involving several teams (see section 9.1.1.1.1 on page 106). There will be need for a construction campsite, which could imply that a large number of male workers will be camping in the area, close to one of the numerous farms in the study area. This could be a security threat, even if only a perception (Table 20). The following problems associated with the presence of construction workers could also arise:

- Escalation of livestock theft and damage to farm property;
- Unhygienic living and working conditions with consequent impacts on the spread of diseases. The spread of sexually transmitted diseases could also escalate if male workers are living far away from their partners. Dealesville has been noted as a particularly notorious location for prostitutes in the area;
- Ethnic clashes could arise if workers from neighbouring areas, rife with unemployment, are not employed instead of foreign labour;
- Trespassing into private land, or over-stepping the bounds of the agreed access area could result in negative incidents between construction workers and landowners;
- Any activity that could potentially result in loss of income to farmers could have economic implications for Eskom. For instance, Eskom could be held liable for

the loss of livestock or farm implements either due to theft or damage during construction activities; and

- Eskom must note that the establishment of the construction campsite and the enforcement of safety and security measures during construction will depend very much on the Contractor.

9.11.1.3 Operational Phase

Once erected, the maintenance of the transmission line will require occasional access into private land. Eskom and the Landowners need to establish an agreement that guarantees the safety of maintenance workers. This is important, especially for game farms, where worker could be at risk from wild game.

Furthermore, the potential for maintenance workers to trespass into private land, or over-step the bounds of the agreed access area, could result in negative incidents between maintenance workers and landowners.

The safety of crop spraying could be significantly at risk, if due mitigation measures are not implemented to make the transmission line either more visible or better still far away form areas, with intensive crop spraying.

Table 20: Impacts on Health, Safety and Security

	Activity	Nature of Impact	Extent of Impact	Duration of Impact	Intensity of Impact	Probability of Impact	Significance	
							WOM$^{\Delta}$	WM*
Construction Phases	Various construction activities	Negative – unhygienic and hazardous working conditions, leading to the spread of diseases and / or injuries with possible loss of lives	Local	Short-term	Medium	Probable	Medium	Low
	Establishing the construction campsite for the line	Negative – unhygienic and hazardous working conditions, leading to the spread of diseases and / or injuries with possible loss of lives	Local	Short-term	Medium-high	Probable	Medium -high	Medium -low
		Negative – separation of male workers from their partners, possibly leading to promiscuity and spreading of STDs	Local (Regional if STDs are transmitted)	Short-term	Medium-high	Probable	Medium -high	Medium -low
		Negative loss of livestock due to theft or trespassing; failure to close substation gates	Local	Short-term	Medium	Probable	Medium	Low
Operational Phase	Operations of maintenance crew	Negative loss of livestock due to electrocution, or theft, trespassing; failure to close substation gates and poor maintenance of gates at substation	Local	Long-term	Medium	Probable	Medium	Low

* With Mitigation $^{\Delta}$ Without Mitigation

9.11.2 Mitigation

9.11.2.1 Construction Phase

Aviation safety

The Civil Aviation Authority and the South African Air force have indicated clear aviation safety guidelines, which should be met. The following guidelines should be adhered to if the transmission line occurs near an Aerodrome (the term aerodrome includes air strips, hot air balloons hand glider launching sites and helipads):

- No transmission line must be located closer than 3 000 m from the threshold of a runway in the approach / take-off area of the runway.
- If a transmission line is within 3 000 m from the threshold of a runway within the approach slope area, aviation spheres should be installed up to 10% of the distance from the threshold on either side of the extended centre line of the runaway (e.g. if the transmission line is 2 000 m from the threshold, aviation spheres must be put up to 200 m either on side of the intersection with the extended centreline of the runway); if the transmission line is up to 3 000 m away and below the approach slope (generalised slope shall be taken as 1:50), the threshold and its elevation shall be the point of reference.
- For major airports, lights should be installed on conductors and the towers must be painted.
- According to international standards, aviation spheres need to be between 60 and 130 cm in diameter. A sliding scale is used to determine the distance between spheres. This varies between 30 and 40 m. They should be visible for not less than 1000 mm from the air and not less than 300 m from the ground.
- Aviation spheres must be hung intermittently while and red or orange (orange is often better than red);
- When two transmission lines are close to each other, spheres of one colour should be used per line.

- They should be visible for not less than 1000 mm from the air and not less than 300 m from the ground.

Selection of the construction campsite

- The location of the construction camps must be done with the assistance and approval of the landowner or Town Council. Input from the Free State Health Department should be obtained.

- No campsites should ideally be located close to townships in urban centres, with high unemployment rather than near farmsteads.

- All campsites must be fenced along the entire perimeter of the camp. Not only will this define the limits of the campsite accommodation and service area, it will also help to prevent livestock from entering the campsite.

- On completion of the use of the campsite, all structures and equipment must be removed from the site. Also, pit latrines must be backfilled and compacted. Thereafter, all remaining materials (including fencing and concrete foundations) must be removed.

Hygiene, safety and security at campsite

- Arrangements must be made with the landowner or the local authority for a suitable source of potable water for use at the campsite. Payment for water must be agreed to with the supplier. Abstraction of water from streams or a borehole on the site without prior approval and arrangement with the landowner is not permitted.

- Where a camp site has been established, suitable refuse containers must be provided for the temporary storage of all domestic refuse prior to their removal to a registered land-fill site in the area.

- Burning of waste such as packaging materials, paper and plastic is strictly prohibited due to the high risk of uncontrolled veld fires.

- Mobile toilets and other hygiene facilities must be provided at the campsite. All toilets are to be cleaned

and disinfected regularly. The disposal of waste should occur at a registered waste disposal site.

- Only gas, paraffin or petrol stoves are to be used for cooking and water heating purposes. Open fires, fires in perforated metal barrels, and wood and coal fired stoves are prohibited due to the high risk of uncontrolled fires. By inference, the collection of firewood on site is prohibited.

Security of access and control during construction

- Where the access road passes through farms, all existing farm gates must be closed and locked immediately after use or in accordance with the specific conditions laid down by the landowner and agreed to by all parties. The movements of Eskom Transmission's teams must be known to the landowner. In particular, movement of vehicles during the hours of darkness is strictly limited to emergencies only. At all times, vehicles are to travel with caution due to the risk of collision with cattle and game.

Fire Arms

- No unauthorised firearms are allowed on site. The landowner must be notified of all personnel carrying firearms. The discharge of any firearms on the site must be reported to the South African Police Service.

Poaching

- Hunting, poaching or collection, removal or disturbance of vegetation, artefacts, rocks or the like is strictly prohibited. At all times, the teams must maintain minimal disturbance whilst undertaking the work required.

Vehicle access from campsite to construction site

- A route to the construction area from the camp site must be identified with the assistance and approval of the landowner.

Auditing of the environmental management stipulations

- These measures should be included in the final EMP submitted to the contractor. The EMP is to be monitored by Eskom Transmission's Negotiator, an independent environmental consultant and the landowner to ensure compliance.

9.11.2.2 Operational Phase

Formal notice of any maintenance work should be given in advance to the landowner and approval requested for access to the farmland, if it is necessary to gain access to the servitude. Otherwise access to the line must be via the approved access roads and corridors (agreed with the landowner). The request must give details of the purpose of the access, the contact person and number of people to be involved, time frames and machinery that will be used.

9.12 ELECTROMAGNETIC FIELDS (EMF)

Activity:	Operation of the transmission line along on farmland where Precision Agriculture is employed, i.e. GPS technologies etc.
Impact:	Radio Interference with signals used in precision implements, Audible Noise and possible loss of income if wrong signals are sent to implements.

9.12.1 Assessment of Electromagnetic impacts of the Transmission line

9.12.1.1 Status Quo

The characteristics of electromagnetic fields associated with high voltage transmission lines have been discussed in Appendix B4, which details the predicted values for Audible Noise, Radio Interference, as well as Electric and Magnetic Fields for the Mercury-Perseus 400 kV transmission line.

Although the structure used for the analysis was the Cross-Rope Suspension tower, whatever the tower used for the line the final choice will still be subject to the same stringent environmental conditions as used for the EMF predictions. The values predicted for the prospective line have been compared with the values observed by Eskom and those recommended by international organizations (IRPA, NIRPA) for the design of High and Extra High Voltage

transmission lines. These values for points of interest (edge of servitude) will be well below those observed by Eskom.

A significant section of the farming community makes use of Precision Agriculture, that utilises devices like GPS which could be affected by EMF of a transmission line. A brief discussion of the perceptible effects of electromagnetic lines is provided below.

9.12.1.1.1 Corona, surface discharge and sparking

Intense electric fields may occur at the surface of conductors and other “live “elements of transmission lines. In some circumstances this could lead to electrical breakdown of the air in the close proximity of the conductor (ionisation). This effect is known as corona discharge or simply as “corona”. The presence of small protrusions on the surface of the conductor (dirt, rain drops, detached strands etc.) may considerably enhance the corona activity by augmenting the electric field at the conductor irregularities. Beside, the “dazzling” visual effect, in certain circumstances the ionising discharge will give rise to radio and television interference.

9.12.1.1.2 Sparking

Poor contact between components at high voltage can lead to sparking across the gaps, especially in dry weather. Dampness tends to short-circuit the small gaps. Adjusting or replacing the defective component always eliminates such disturbances.

9.12.1.1.3 Radio Interference (RI)

Radio interference is any effect in the reception of a desired radio signal due to disturbance within the radio-frequency spectrum. Radio interference is first of concern for weak amplitude modulated signals (AM), while other forms of broadcasting (frequency modulation or FM) are least affected. However, the weaker the reception of broadcasted radio signals along the transmission line corridor, the more annoying the Radio Interference will be and the measure of the offensive effect is quantified by a signal-to-noise ratio.

When establishing limits for the emission of RI from transmission lines, the minimum reception signal strength has to be determined. This is subject to the broadcasting authorities with the international standards giving guidance only on how to establish limits.

9.12.1.1.4 Audible Noise (AN)

The audible noise from corona consists of both broad-band spectrum ("crackling") and of discrete tones ("humming"). The broadband component is the dominant noise and is responsible for uniqueness of corona noise compared with other noise in the environment. The particularity of the corona noise is based on its energy that is concentrated in the medium and high frequency audible band while the background noise has dominant components in the low frequency band. In general the corona generated audible noise is a major design consideration for overhead lines operating at voltages of 300 kV and above. For these lines the fittings are so selected that only corona on conductors can be a source of audible noise. The sensitivity of the human ear to noise is dependent of the magnitude of the sound pressure as well as on its frequency. The variation of sound pressure from different sources is immense and for this reason sound pressure is measured in a logarithmic scale in "audible" decibels (dBA). As the audible noise created by corona is more perceptive in wet weather - when rain droplets collect on the underside of the conductor - the AN measure is completed by a time dimension called L50 or L5. L50 is the value exceeded for 50% of the time and L5 is exceeded 5% of the time. The peculiar units of measure for sound pressure can be made demonstrative by comparing them with other environment noise and its measure.

9.12.1.2 Construction and Operational Phases

The predominant concern among farmers is that EMF generated by the transmission line could interfere with the implements used for large-scale precision agriculture (Table 21).

Precision Agriculture: is used in large farming implements to cultivate large tracts of land. Farmers are concerned that there will be interference with the precision devices used on these implements (harvesters, planters and tractors). The potential exists for such interference to occur since Eskom intends to allow farming practices to continue within the servitude, so long as no permanent structures are erected. If faulty signals are relayed to these implements it could lead to their malfunctioning. Were such a problem to arise it could require the use of more fertiliser to remedy the situation, with huge financial loses.

Radio-signal Interference: The main cause for concern appears to be the potential interference with the radio signals used in Precision Agriculture. Precision implements are capable of computing the

precise amounts of fertiliser required, as they are linked to computers, with soil nutrient data. Others are linked via satellite to a database. However, it is not the satellite connection per se that is affected, but the radio signal that connects to the CPU of the computer.

GPS Technology: According to one landowner the implements that use GPS technologies are at risk. The main problem, being that the GPS does not function properly if it is directly under the line.

For all these reasons it is important to ensure that the design of the transmission line, does not generate EMF that could interfere with large-scale precision agriculture. The consequences of not being able to use this technological advance could be disastrous for the important agricultural sector in the Free State.

Table 21: Impacts of Electromagnetic Fields

	Activity	Nature of Impact	Extent of impact	Duration of impact	Intensity of impact	Probability of impact	Significance	
							WOM$^{\Delta}$	WM*
Operational Phase	Operation of the transmission line with the generation of EMF on agricultural land where Precision Implements are utilised	Negative – Radio Interference with signals of Precision Implements, leading to dysfunction and economic losses	Local	Short-term	Medium	Improbable	Medium	Low
		Negative – malfunctioning of GPS when under the line, leading to economic losses	Local	Short-term	Low	Improbable	Medium	Low

* With Mitigation $^{\Delta}$ Without Mitigation

9.12.2 Mitigation

9.12.2.1 Construction Phase

The design of the transmission line must be in line with standards observed by International bodies (IRPA and NIRPA), as well as Eskom.

If these standards are duly met, then for the following reasons EMF should not interfere with precision agriculture:

i) The dual frequency GPS technology communicates with satellites in the L-band (1,5GHz) whereas any interference likely to be

generated by transmission lines are well below 1GHz - thus out of band.

ii) These technologies typically adjust for multipathing and the physical structure is not like to affect communication.

iii) The satellites will span the sky plus the onboard GPS will move about in the field - the transmission line will not necessarily always be between the satellite and the GPS.

9.12.2.2 Operational Phase

The maintenance crew must inquire about any unwanted disturbances specifically due to EMF and ensure that measure are taken to rectify any faulty components of the line. They must be sensitive to complaints voiced by the landowners regarding this issue.

9.13 CUMULATIVE IMPACTS

Cumulative impacts result from actions, which may not be significant on their own, but which are significant when added to the impact of other similar actions. Cumulative impacts relating to the construction of this transmission line include:

- The contribution of vegetation clearing, earthworks, alteration of drainage lines, to soil erosion and contamination of the surface water resources in the study area;
- The contribution of the sterilisation of parcels of high potential arable land (varying in size from small to large) to the overall decrease in agricultural production in the affected area;
- The contribution of potential devaluation of land that could otherwise be used in various agro-tourism ventures in future; and
- The contribution of varying small-scale impacts of a socio-economic nature on the lives and means of livelihood of the communities in the study area.

Various mitigation measures address these cumulative impacts that have been suggested in the previous sections of the report (Section 9.1 – 9.11).

9.14 RESIDUAL IMPACTS

Residual impacts are those that are likely to remain notwithstanding the implementation of mitigation measures. Potential residual impacts are those

associated with the following:

- The loss of land types with high arable potential, leading to a decrease in agricultural production, with impacts on the productivity of the study area; and
- The implications of having the transmission line on cultivated land, pertaining particularly to access for maintenance purposes.

The EMP is drafted in such a manner as to set out the Best Management Practices for the construction and operation of the transmission line.

SECTION 10: CONCLUSIONS AND RECOMMENDATIONS

The purpose of this report is to provide the relevant authority with sufficient information to make an informed decision regarding the potential impacts of the development. Potential impacts were identified in consultation with I&APs, as well as through the technical expertise and experience of the investigation team. The significant impacts identified in this EIR are summarised such that if effectively mitigated, they will not result in any significant negative impacts. The most important of these impacts are summarised in order of importance below.

10.1 POTENTIAL IMPACTS OF THE MERCURY – PERSEUS TRANSMISSION LINE

The probable significant impacts that warrant mitigation measures and management during the construction of the transmission line are as follows:

- *Loss of high potential arable land*: economic losses due to crop damage / poor yield or due to electromagnetic interference with precision farming implements. This impact is considered to be of concern to the landowners and other stakeholders. The prudent approach would be to limit the loss of high potential arable land, thereby reducing the significance of the impact.

- *Decrease in future agro-tourism potential of land* within the servitude: Although related to the loss of high potential arable land, this impact focuses more on the future possibilities that land within the servitude could have. A specific recommendation is to, where possible, avoid key tourism areas and valuable agro-tourism land, such that this impact becomes of medium to low significance.

- *The most significant faunal impact of the transmission line will be on bird-life:* mitigation measures as proposed by the Avi-faunal specialist reduce these impacts to acceptable levels.

- *Pans, wetlands and rivers are the naturally preferred habitats for numerous bird species*: hence, any corridor impacting on these environments could be considered as undesirable. The most effective mitigation is proactively and consciously adhering to the mitigation measures stated by the various specialists regarding this impact.

- *Due to the nature of overhead transmission lines visual intrusion, constitutes a significant impact.* The impacts will be most severe if the line is located in areas with critical views or in areas with visual assets such as koppies. Also, the Visual Impact Assessment clearly indicates the need to avoid any areas with critical views or visual assets, e.g. areas with tourism potential. Visual intrusion as a result of the building

and operation of the transmission line could be reduced if these and other mitigation measures are implemented.

- *The potential impacts of electromagnetic are a remote possibility* and therefore of low importance. The risk of interference of EMF generated by the line with onboard communication devices in precision implements (e.g. combined harvesters) does not seem likely due to the following reasons: the dual frequency GPS technology communicates with satellites in the L-band (1,5GHz) whereas any interference likely to be generated by transmission lines is well below 1GHz – and thus out of frequency.

- *Contamination of surface water* as a result of siltation caused by the construction activities. Mitigation measures could successfully reduce the occurrence of increased erosion by construction activities, in turn reducing the significance of the impact, namely siltation of surface water bodies.

- *Increased erosion and surface water runoff* due to vegetation clearing for the construction transmission line. Mitigation measures reduce the significance of this impact.

- *Destruction of vegetation zones and habitats:* with due precautions, as stated in the mitigation measures proposed by the specialists, the impacts can be kept at low to medium levels of significance.

- *Faunal destruction and displacement:* with due precautions, as stated in the mitigation measures proposed by the specialists, the impacts can be kept at low levels of significance.

- *Social impacts on the lives and means of livelihood of several communities such as* farm owners, farm workers and other people with agriculturally oriented occupations. These impacts can be minimised by ensuring that the conditions stipulated, particularly for construction camps, in the EMP are adhered to.

10.2 EVALUATION OF ALTERNATIVES

During the scoping exercise preliminary specialist studies were conducted to identify potential impacts and key issues. These issues were investigated in greater detail, with due focus on the most significant issues such as the loss of high potential arable land, impacts on bird-life and visual intrusion. A holistic approach based on the principles of IEM were used to integrate and weigh the likely impacts of the erection of the transmission line along four alternative corridors. This was undertaken by mapping all the infrastructure and possible impact points along the proposed

corridors (such as pans, vegetation types, tourism locations, game farms etc.). Through continual interaction with the specialists and I&APs, the best alternative was identified.

For the EIA phase, the most sensitive (deciding) issues were studied for each corridor and an integration workshop (attended by most specialists) was held to determine the preferred corridor. Through this process, and with the input of all the specialists, **Corridor 4** emerged as the most preferred corridor for the Mercury – Perseus transmission line for the following reasons:

- Corridor 4 optimises the opportunity of following existing infrastructures such as roads, railways and existing servitudes.
- Corridors 2 and 3 may be problematic due to the presence of large salt pans from Dealesville to Wesselsbron. The salt pans occurring along Corridor 1 are scattered along the corridor between Dealesville and Bultfontein. Corridor 4 is the best solution in avoiding pans where possible, and the least number of pans are affected.
- From the geo-technical assessment, Corridor 4 appears to be the most feasible corridor, as it has fewer pans than Corridors 1, 2 and 3. Other geo-technical aspect, such as collapsible grain fabric, active clays and dispersive soils are common to all the corridors and as such does not play a significant role in corridor selection.
- The soil specialist submitted that from a physical agricultural potential perspective all proposed corridors would have impacts with similar degree and extent. No obvious choice is evident.
- Corridor 4 has the lowest impact on arable land with a high potential in comparison the other three alternatives
- Corridor 4 traverses a minimal amount of the Kimberley Thorn Bushveld, which is a relatively sensitive vegetation type (White-backed Vultures use Camel Thorns to breed) in comparison to Corridor 3; and
- Bird impacts will be least along this corridor.

10.3 ISSUES AND CONCERNS RAISED BY I&APS

The issues register summarises all the comments, questions and suggestions that were raised during the public participation process. The comments, questions and suggestions have been answered, and where possible referenced to various reports (refer to Annexure A, Appendix A5).

An attempt has been made to address and accommodate the concerns of the I&APs, expressed in the petitions (Refer to Annexure A, Appendix A11), regarding the choice of the preferred corridor for the transmission line.

Given the nature of the project an extensive public participation process was undertaken. The I&APs contacted in the Scoping and EIA phase have been mapped (refer to Annexure A, Appendices A6 & A7). It is evident that the majority of the landowners that could potentially be affected have been contacted in one way or another.

10.4 MITIGATION AND ENHANCEMENT

Mitigation measures detailed in this EIR must be implemented in a project specific Environmental Management Plan (EMP). I&APs in the study area suggested a number of these measures. The purpose of the EMP is to ensure that the negative impacts of the project (especially on a local scale) are minimised.

10.5 CONCLUSION

The construction of a 400 kV transmission line is a major development project that could have negative impacts on the biophysical and social environments. However, if duly mitigated and planned the project will enhance the economic potential of the benefiting region, while impacting minimally on the affected environment.

All the significant impacts flagged by the scoping exercise have been thoroughly investigated during the EIA phase. None of these impacts are impossible to mitigate and manage with a detailed EMP in place.

DEAT is to approve a corridor, wherein the actual servitude of 55 m will be registered. This is to ensure that the final alignment for the transmission line servitude can be adjusted to accommodate any local–scale issues or concerns identified during the negotiation process.

In summary, the order of preference for the alternative corridors should be:

1. **Proposed Corridor 4 (although it is slightly longer than Corridor 1 passing east of Hoopstad)**
2. Proposed Corridor 1 (shortest corridor passing west of Bultfontein across farmland and away from roads);
3. Proposed Corridor 2 (corridor passing east of Bultfontein and alongside the R719); and
4. Proposed Corridor 3 (the longest corridor extending some distance to the west of Bultfontein).

Accordingly, the least preferred corridor is Corridor 3. Refer to Table 6 and 7 in Section 6 for the detailed comparative assessment of the four alignments.

Parts of Corridor 4 are currently being used as cultivated farmlands, grazing land, and a variety of other surrounding land-uses. The faunal and floral impacts of the transmission line along this corridor can be mitigated to an acceptable level. The 'loss' of high potential arable land is unavoidable, since any corridor chosen in an attempt to connect the Mercury and Perseus substations is bound to encounter high potential arable land. This loss is minimised along Corridor 4.

It is thus recommended that the proposed development be permitted to proceed, since the detailed impact assessment indicates that its attendant impacts can be effectively mitigated. The final decision needs to balance socio-economic imperatives at the national level with local issues such as agricultural production in the Free State.

SECTION 11: GLOSSARY OF TECHNICAL TERMS

Alien species: A plant or animal species introduced from elsewhere: neither endemic nor indigenous.

Alternative Corridor: Refers to a specific Corridor (1 – 3) with one of the variations (a-b).

Apedal soil: General term to denote soils with massive or weakly structured materials.

Arable potential: Land with soil, slope and climate components where the production of cultivated crops is economical and practical.

Base status: A qualitative expression of base saturation.

Compensation: A sum of money paid by Eskom to a landowner as agreed in a document specifying that he or she grants rights in favour of Eskom's servitude.

Conductor: A component of a transmission line, which reduces energy losses. "Multiple" or "bundled" conductors for each phase are used in EHV transmission lines to reduce the corona-related effects (such as audible noise).

Corridor: Refers to a specific corridor as numbered on the study area map (1 – 3)

Duplex soil: A soil with a relatively permeable topsoil clearly to abruptly overlying a very slow permeable subsoil.

Earthwire: The section of the transmission line that carries alternative current (electricity). This is the most dangerous section that could electrocute an organism if, it came in contact with the transmission line.

Ecology: The study of the interrelationships between organisms and their environments.

Electromagnetic Fields: Fields are defined as physical entities that can take different values at different points in space. When electric currents flow through a transmission line's phase conductors a Magnetic Field is created. Since this field is caused by an electric current and is magnetic in nature, it known as an electromagnetic field. Electromagnetic fields produced by transmission lines decay rapidly in magnitude with distance from the source.

Environment: all physical, chemical and biological factors and conditions that influence an object.

Environmental Impact Assessment: assessment of the effects of a development on the environment.

Environmental Management Plan: A working document on environmental and socio-economic mitigation measures, that must be implemented by several responsible parties during all the phases of the proposed 400 kV Mercury-Perseus transmission line.

Half degree square: A grid cell of 30'x30' (approximately 2 500 km²)

Hillslope units: The subdivision of the land (terrain) surface into crest, scarp, midslope, footslope and valley bottom, each with its own morphological properties.

Historical Period: A period in time dating back to the arrival of the white settlers - c. AD 1840 - in this part of the country.

Interference: interference is any effect in the reception of a wanted communication signal due to an unwanted disturbance within the communication frequency spectrum.

Ionising radiation: Intense electric fields may occur at the surface of conductors and other "live "elements of the transmission lines. In some circumstances this can lead to electrical breakdown of the air in the close proximity of the conductor (ionisation).

Iron Age: Period covering the last 1800 years, when new people brought a new way of life to southern Africa. They established settled villages, cultivated domestic crops such as sorghum, millet and beans, and they herded cattle as well as sheep and goats. These people, according to archaeological evidence, spoke early variations of the Bantu Language. Because they produced their own iron tools, archaeologists call this the Iron Age. Early Iron Age: AD 200 - AD 1000; Late Iron Age: AD 1000 - AD 1830.

Kilo-Volt: A kilo volt is a measure of how much electrical current can be carried by a transmission line.

Land evaluation: The process of assessment of land performance when used for specified purposes, involving the interpretation of landscape data.

Land type: It denotes an area that can be shown at 1:250 000 scale and that displays a marked degree of uniformity with respect to terrain form, soil pattern and climate.

Local relief: The difference between the highest and lowest points in a landscape. For this study, it is based on 1:50 000 scale.

Megawatt: A million units of a Watt; a watt is defined as the unit of power that gives rise to the production of energy at the rate of one joule per second. The amount of electrical power supplied by Eskom's supply nodes is measured in Megawatts.

Non-ionising radiation: The only interaction of power frequency electric and magnetic fields with people is the induction of currents. Strong electric fields may also cause perceptible effects such as hair vibration and small shocks when touching metallic objects. International bodies like the World Health Organisation (WHO) have stated that up to an induced current of 10 mA/m^2 only minor biological effects have been detected. Also, naturally occurring current densities within the body caused by the nervous system activity are of a similar value.

Phase: Typical transmission lines consist of three phases. Each phase is sequentially separated from the others by 120 “electrical degrees”, which is of importance in reducing the magnitude of the electric and magnetic fields in steady-state operation of the line.

Plinthic catena: A sequence of soils from the higher to the lower lying sites in the landscape which owe their different characteristics to variation in topography and drainage, e.g. from well-drained Hutton soils through moderately well-drained Avalon soils to somewhat poorly drained Longlands soils.

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

Servitude: Eskom transmission selects the corridor for a transmission line to achieve the most suitable balance between environmental, technical and financial constraints. For reasons of safety, operation and maintenance, Eskom Transmission requires servitudes under transmission lines. Servitudes, for new lines, need to be secured prior to construction. Once the preferred corridor for the new line is identified, landowners are contacted by Eskom to discuss servitude rights.

Soil compaction: Soil becoming dense by blows, vehicle passage or other type of loading. Wet soils compact easier than moist or dry soils.

Stone Age: The first and longest part of human history is the Stone Age, which began with the appearance of early humans between 3-2 million years ago. Stone Age people were hunters, gatherers and scavengers who did not live in permanently settled communities. Their stone tools preserve well and are found in most places in South Africa and elsewhere. Early Stone Age:2 000 000 - 150 000 Before Present; Late Stone Age: 30 000 - until c. AD 200; Middle Stone Age: 150 000 - 30 000 BP.

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

Substation: A distribution point within the local and national network from which electrical current is rerouted along different transmission lines as well as distributed to local and municipal networks.

Succession: The natural restoration process of vegetation after disturbance.

Towers: Several types of structures that are used to support transmission lines.

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

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ANNEXURE A – PUBLIC PARTICIPATION

Appendix A1 TEXT OF NEWSPAPER ADVERTISEMENTS

ENVIRONMENTAL IMPACT ASSESSMENT (EIA) PROCESS: 400kV transmission line (transmission) between the Perseus substation near Dealesville and the Mercury substation near Vierfontein

Notice is given in terms of Regulation 4(6), Government Notice R. 1183 under Section 26 of the Environment Conservation Act (Act No. 73 of 1989) that Eskom proposes to construct and operate a 400kV transmission transmission line between the existing Perseus substation (north-west of Dealesville) and Mercury (north of Vierfontein) substation covering a length of approximately 300 - 350 km.

This transmission line is important in an effort to provide the necessary electricity to power the Coega initiative near Port Elizabeth.

In order to ensure that you are identified as an Interested or Affected Party (I&AP), please submit your name, contact details and the reason for your interest to the firm below, on or before **FRIDAY 25 APRIL 2003**.

PUBLIC EVENTS

In an effort to provide ample opportunity for members of the public to provide input into the EIA, the Draft Scoping Report will be available for perusal and comment later in the process (please contact Afrosearch to obtain a list of all the venues where copies will be available or to request a CD-Rom containing the Draft Scoping Report). A copy of the Background Information Document as well as an electronic registration form will also be available on the Eskom website: www.eskom.co.za/eia. Comment on the report should be directed to Afrosearch.

Two Open Days will be held to inform the public of the development. Formal Public Meetings form part of the Open Days. The purpose of the public meetings are to present the project and identify environmental issues and concerns that will be addressed by the environmental consultants in their report to the National Department of Environmental Affairs and Tourism. These concerns will be taken into account by the authorities in their decision making process. The details of these meetings are as follows:

BULTFONTEIN	**BOTHAVILLE**
DATE: 23 April 2003	DATE: 24 April 2003
TIME: Open Day: 09:00 – 14:00	TIME: Open Day 09:00 – 14:00
TIME: Public Meeting: 14:00-16:00	TIME: Public Meeting: 14:00-16:00
VENUE: Town Hall (3 Bosman Street)	VENUE: Commando Hall (Next to Shell)

To register as an I&AP or to obtain any further information, please contact the Public Participation Consultant. Our details are as follows:

Afrosearch (Pty) Ltd.
Contact person: Marita Oosthuizen
P. O. Box 13540
HATFIELD
0028
Telephone: (012) 362-2908
Facsimile: (012) 362-2463
E-mail: marita@afrosearch.co.za

FIGURE 1A: TEXT USED IN NEWSPAPER ADVERTISEMENTS, THE RADIO, IN FLYERS AND IN COMMUNICATION WITH PRE-IDENTIFIED I&APs

OMGEWINGSBESTEKBEPALINGSPROSES (OIS): 400kV transmissie kraglyn tussen Eskom se Perseus substasie naby Dealesville en die Perseus substasie naby Vierfontein

Ingevolge Regulasie 4(6) van Goewermentskennisgewing No. R 1183 onder Artikel 26 van die Wet op Omgewingsbewaring (Wet No. 73 van 1989), word hiermee kennis gegee dat Eskom beoog om 'n nuwe 400kV transmissie kraglyn te bou en bedryf. Die voorstel is dat hierdie kraglyn gebou sal word tussen Eskom se bestaande Perseus substasie (noord-wes van Dealesville) en die bestaande Mercury substasie noord van Vierfontein. Die lengte van hierdie kraglyn sal ongeveer 300 – 350km wees.

Hierdie kraglyn is vir Eskom belangrik omdat dit sal help om elektrisiteit aan die Coega-inisiatief te verskaf.

Om te verseker dat u as 'n geïnteresseerde of geaffekteerde party geïdentifiseer word, voorsien asseblief die onderstaande firma van u naam, kontakinligting en die rede vir u belangstelling voor of op **VRYDAG 25 APRIL 2003**.

OPENBARE GELEENTHEDE

Ten einde aan lede van die publiek genoegsame geleentheid te bied om insette te lewer, sal die Voorlopige Bestekopnameverslag vir besigtiging en kommentaar beskikbaar gestel word (kontak asseblief vir Afrosearch vir 'n lys van die plekke waar die verskag beskikbaar gestel sal word, of indien u graag 'n kopie van die verslag op CD-Rom wil bekom). Voorts sal 'n kopie van die agtergrondinligtingsdokument sowel as 'n elektroniese registrasievorm beskikbaar wees op Eskom se webwerf: www.eskom.co.za/eia. Alle kommentaar moet ook aan Afrosearch gerig word.

Twee Openbare Vergaderings gekombineer met 'n Opedag sal ook gehou word om die projek aan die gemeenskap bekend te stel en om inligting, vrae en kwessies van die publiek af te versamel. Hierdie inligting word dan deur die Omgewingskonsultant in sy verslag verwerk om deur die Departement van Omgewingsake en Toerisme in ag geneem te word, tydens hul besluitnemingsproses. Die besonderhede vir hierdie geleenthede is as volg:

BULTFONTEIN	**BOTHAVILLE**
DATUM: 23 April 2003	DATUM: 24 April 2003
TYD: Opedag: 09:00 – 14:00	TYD: Opedag 09:00 – 14:00
TYD: Openbare vergadering: 14:00-16:00	TYD: Openbare vergadering14:00-16:00
PLEK: Stadsaal (Bosmanstraat 3)	PLEK:Kommandosaal (Langs Shell)

Om te registreer as 'n geïnteresseerde en geaffekteerde party of om verdere inligting te bekom, kontak asseblief die Openbare Deelname Konsultant (Afrosearch). Ons kontakbesonderhede is as volg:

Afrosearch (Edms) Bpk.
Kontakpersoon: Marita Oosthuizen
Telefoon: (012) 362-2908
Faksimilee: (012) 362-2463
Posbus 13540
HATFIELD
0028
E-pos: marita@afrosearch.co.za

FIGURE 1B: TEXT USED IN NEWSPAPER ADVERTISEMENTS, THE RADIO, IN FLYERS AND IN COMMUNICATION WITH PRE-IDENTIFIED I&APs

ENVIRONMENTAL IMPACT ASSESSMENT (EIA) PROCESS: 400kV transmission line (transmission) between the Perseus substation near Dealesville and the Mercury substation near Vierfontein

This reminder is published in terms of Regulation 4(6), Government Notice R. 1183 under Section 26 of the Environment Conservation Act (Act No. 73 of 1989). Eskom proposes to construct and operate a 400kV transmission transmission line between the existing Perseus substation (north-west of Dealesville) and the existing Mercury substation (north of Vierfontein) covering a length of approximately 300 - 350 km. Currently, this study is in the Environmental Impact Assessment (EIA) phase.

This transmission line is important to increase capacity required on the Cape .

PUBLIC PARTICIPATION

If you have not already registered as an Interested or Affected Party (I&AP), please submit your name, contact details and the reason for your interest to the company below, on or before **TUESDAY 09 SEPTEMBER 2003**.

As advertised in April 2003, please note that two Public Meetings will be held in September 2003 to present the findings of the studies as well as to identify further environmental issues and concerns that should be taken into consideration by the National Department of Environmental Affairs and Tourism during their decision-making process. The details of these meetings are as follows:

BULTFONTEIN	**BOTHAVILLE**
DATE: 10 September 2003	DATE: 11 September 2003
TIME: Public Meeting: 14:00-16:00	TIME: Public Meeting: 14:00-16:00
VENUE: Town Hall (3 Bosman Street)	VENUE: Commando Hall (Next to Shell)

In an effort to provide ample opportunity for members of the public to provide input into the EIA, the Draft EIA Report will be available for perusal and comment. (Please contact Afrosearch – contact details provided below – to obtain a list of all the venues where copies will be available or to request a CD-Rom containing the Draft EIA Report. Comment on the report should also be directed at Afrosearch).

In order to register as an I&AP or to obtain any further information, please contact the Public Participation Consultant. Our details are as follows:

Afrosearch (Pty) Ltd.
Contact person: Marita Oosthuizen
P. O. Box 13540
HATFIELD
0028
Telephone: (012) 362-2908
Facsimile: (012) 362-2463
E-mail: marita@afrosearch.co.za

FIGURE 2A: TEXT USED IN NEWSPAPER ADVERTISEMENTS AND IN COMMUNICATION WITH REGISTERED I&APs

OMGEWINGSBESTEKBEPALINGSPROSES (OIS): 400kV transmissie kraglyn tussen Eskom se Perseus substasie naby Dealesville en die Perseus substasie naby Vierfontein

Ingevolge Regulasie 4(6) van Goewermentskennisgewing No. R 1183 onder Artikel 26 van die Wet op Omgewingsbewaring (Wet No. 73 van 1898), word u daaraan herinner dat Eskom beoog om 'n nuwe 400kV transmissie kraglyn te bou en bedryf. Die voorstel is dat hierdie kraglyn gebou sal word tussen Eskom se bestaande Perseus substasie (noord-wes van Dealesville) en die bestaande Mercury substasie noord van Vierfontein. Die lengte van hierdie kraglyn sal ongeveer 300 – 350km wees. Tans is hierdie studie in die Omgewingsimpakstudie (OIS) fase.

Hierdie kraglyn is belangrik om kapasiteit te bou in die Kaap korridor.

OPENBARE DEELNAME

Indien u nie reeds as 'n geïnteresseerde of geaffekteerde party geïdentifiseer word, voorsien asseblief die onderstaande firma van u naam, kontakinligting en die rede vir u belangstelling voor of op **DINSDAG 09 SEPTEMBER 2003**.

Soos in April 2003 geadverteer, word u egter herinner aan die twee Openbare Vergaderings wat in September 2003 gehou sal word om terugvoer aangaande die bevindinge aan die gemeenskap te gee en om verdere vrae en kwessies van die publiek af te versamel sodat dit deur die Departement van Omgewingsake en Toerisme in ag geneem kan word tydens hul besluitnemingsproses. Die besonderhede vir hierdie geleenthede is as volg:

BULTFONTEIN	**BOTHAVILLE**
DATUM: 10 September 2003	DATUM: 11 September 2003
TYD: Vergadering: 14:00-16:00	TYD: Vergadering: 14:00-16:00
PLEK: Stadsaal (Bosmanstraat 3)	PLEK:Kommandosaal (Langs Shell)

Ten einde aan lede van die publiek genoegsame geleentheid te bied om insette te lewer, sal die Voorlopige OIS-verslag vir besigtiging en kommentaar beskikbaar gestel word. (Kontak asseblief vir Afrosearch – kontakinligting hieronder – ten einde 'n lys van die plekke waar die voorlopige verslag beskikbaar sal wees, te kry of 'n CD-Rom met die verslag op te bestel. Kommentaar moet ook aan Afrosearch gerig word.)

Om te registreer as 'n geïnteresseerde en geaffekteerde party of om verdere inligting te bekom, kontak asseblief die Openbare Deelname Konsultant (Afrosearch). Ons kontakbesonderhede is as volg:

Afrosearch (Edms) Bpk.
Kontakpersoon: Marita Oosthuizen
Telefoon: (012) 362-2908
Faksimilee: (012) 362-2463
Posbus 13540
HATFIELD
0028
E-pos: marita@afrosearch.co.za

FIGURE 2B: TEXT USED IN NEWSPAPER ADVERTISEMENTS AND IN COMMUNICATION WITH REGISTERED I&APs

Appendix A2 TEXT OF SITE NOTICE AND FLYERS

Appendix A3 BACKGROUND INFORMATION DOCUMENT

Appendix A4 LIST OF REGISTERED I&APS

Appendix A5 ISSUES REGISTER

Appendix A6 MAP OF I&APS CONTACTED DURING THE SCOPING PHASE

Appendix A7 MAP OF I&APS CONTACTED DURING THE EIA PHASE

Appendix A8 MINUTES OF PUBLIC MEETINGS

Appendix A9 MINUTES OF FOCUS GROUP MEETINGS

Appendix A10 CORRESPONDENCE

Appendix A11 PETITION

Appendix A12 MOBILE DISPLAYS

Appendix A13 PRESENTATIONS

ANNEXURE B – TECHNICAL INFORMATION

Appendix B1 MAP OF STUDY AREA

Appendix B2 MAP OF PROPOSED CORRIDOR

Appendix B3 TECHNICAL SPECIFICATIONS OF THE 400 KV TRANSMISSION LINE

Drawing 1: Cross rope suspension type

Drawing 2: Compact cross rope type

Drawing 3: Guyed suspension type

Drawing 4: Self-supporting type

Drawing 5: Self-supporting strain tower type

Drawing 6: Comparison drawing and servitude of two 400 kV Transmission Lines (Strain tower type).

Drawing 7: Comparison drawing and servitude of two 400 kV Transmission Lines (Guyed suspension type).

Appendix B4 ELECTROMAGNETIC FIELDS REPORT

Appendix B5 THE NEED FOR THE MERCURY – PERSEUS 400 KV TRANSMISSION LINE

Appendix B6 GENERIC ENVIRONMENTAL MANAGEMENT PLAN

ANNEXURE C – SPECIALIST REPORTS

Appendix C1 AGRICULTURAL ECONOMIC IMPACT

Appendix C2 SOCIO-ECONOMIC IMPACT ASSESSMENT

Appendix C3 VISUAL IMPACT ASSESSMENT

Appendix C4 ECOLOGICAL ASSESSMENT

Appendix C5 IMPACTS ON SOILS AND LANDFORM

Appendix C6 IMPACTS ON BIRD-LIFE

Appendix C7 ENGINEERING GEOLOGICAL STUDY

Appendix C8 IMPACTS ON HYDROLOGY AND SURFACE WATER RESOURCES

Appendix C9 IMPACT ON TOURISM

Appendix C10 IMPACT ON CULTURAL AND HERITAGE RESOURCES