VISUAL IMPACT ASSESSMENT REPORT FOR THE PROPOSED TAUNUS – DIEPKLOOF 132kV SERVITUDE, CITY OF JOHANNESBURG METROPOLITAN MUNICIPALITY

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EXECUTIVE SUMMARY

I-scape was appointed by Envirolution Consulting (Pty) Ltd to compile a Visual Impact Assessment (VIA) report for the proposed Taunus - Diepkloof 132kV servitude, located in the City of Johannesburg Metropolitan Municipality. This study is part of an Environmental Impact Assessment (EIA) and will be included in the Environmental Impact Report (EIR). The client, Eskom Holdings Ltd, has proposed the construction of two new substations, the one on the farm Zuurbekom 297IQ and the other near the Randwater Pump station, as well as the erection of a 132kV distribution line between the existing Taunus- and Diepkloof Substations.

The objectives of this VIA will be to:

- Address the concerns that are raised during public participation events which relates to aesthetic or any visual aspects;
- Determine the impact on the observers in the study area due to the change in the visual characteristics of the environment;
- Discuss the preferred substation location and alignment with the least visual impacts; and
- Recommend mitigation measures to alleviate or reduce the anticipated impacts.

STUDY AREA

The study area can shortly be described as the area affected by visual impact. This area is commonly referred to as the Zone of Visual Influence (ZVI) and delineates the extent of the anticipated visual impact. The factors that mostly influence the ZVI are topographic variation and land use/cover which could potentially screen the proposed project from critical viewpoints. These factors also contribute to the prevailing landscape character which establishes the context in which the project is proposed.

The study area along the length of the proposed servitude is characterised by a variety of land uses. The Western Region is located west of Soweto and is typical outskirt developments, characterised by parcels of open grassland and agricultural holdings.

The Central Region of the study area remains on the outskirts of Soweto (north) and Lenasia (south) but is parallel to the Klipriver. The Klipriver is characterised by marshy areas and a string of dams along its length.

The Eastern Region is located in the eastern part of Soweto's urban area. The proposed servitude traverses urban and industrial areas to the existing Diepkloof Substation.

PROJECT DESCRIPTION

The project entails the establishment of a ±40 km, 132kV distribution line and two new substations. The proposed area of the development falls within the boundaries of the City of Johannesburg Metropolitan Municipality, in the Gauteng Province. The project aims to strengthen the network capacity as well as to improve the quality of supply in the southern parts of Soweto.

The distribution line will connect the existing Taunus- and Diepkloof Substations. Currently, a primary alignment has been proposed. Two variations on the primary alignment are also part of

the scope. The type of tower to be used is a steel lattice structure with a maximum height of 31.5 m.

The proposed substations will be located west of Taunus Substation between Section B & C and west of the Randwater Pump Station (Between Section H & J). Two alternative sites have been proposed for the second substation. Site 1, is located between the N12 Highway and the railway line, west of the pump station. Site 2, is located south of the railway line, south of the pump station.

VISUAL RESOURCE ASSESSMENT

The study area, which consists of the landscape and its comprising elements, is considered a visual resource. Similar to other natural resources, a visual resource has a value to a group of people/observers, in this case an aesthetic value. Aesthetic value can be further described as an appreciation of the quality of a visual resource and refers to the sensory experience one has when exposed to the perceivable qualities of a visual resource.

In a developed landscape, these natural features are often removed or greatly modified, sometimes to a point where it is ecologically dysfunctional. The consequence is often that the visual resource looses its original aesthetic appeal.

In general, the study area contains very little natural elements that originally contributed to its pristine character. The grassy plains and the Klip River wetland system in the western and central region of the study area are remnants of the historic natural landscape, but have been severely modified and affected by urban sprawl. The dominant land use is residential and the urban landscape is characterised by one and two storey buildings arranged in the typical broken grid system, provided by the roads infrastructure. The open space corridors through the build-up areas often suffer severe degrees of littering and degradation.

VISUAL IMPACT ASSESSMENT

Within the study area, specific observers experience different views of their environment and therefore value it differently. They will be affected by the proposed project because of alterations to the environment/landscape or specific elements in the landscape which will influence their views.

The significance of this change/impact is a function of:

- The magnitude of the impact;
- The sensitivity of the observer which is impacted on; and
- The exposure of the observer to the impact.

The residents in the study area are classified as visual receptors of **high** sensitivity owing to their sustained visual exposure to the proposed development as well as their attentive interest towards their living environment.

People travelling between their work place and home are considered to be **moderately** sensitive receptors. They have a particular interest in their living environment and are exposed to visual impacts adjacent to the road or near their working environment more frequently than for instance a once-off visitor to the region.

The following areas have been identified as areas of high or medium viewer incidence and are also areas where sensitive viewers are present. These two factors contribute to the potential visual exposure of the project:

- Western extension of Glen Ridge (Section B & C);
- West Rand Garden A.H. (Section D, E, F – G);
- N12 Highway (Section K – M);
- Lenasia (Section H1 – H8); and
- Soweto (Midway between section W and X up to G1).

VISUAL IMPACTS DURING CONSTRUCTION PHASE

Visual impacts will result from the temporary presence of construction camps and material stockyards as well as disturbances and activities within and around the power line servitude and the substation sites.

Throughout the study area observers will experience the visual impact relating to the construction phase in different degrees. The affected observers are mostly residents and people travelling between their work place and home. Typical visual impacts often relate to the unsightly character of such construction sites brought about by the untidy and disorderly placement of ancillary elements and the associated surface disturbances. The impact will cause a negative intrusion on the views of the observers, but is expected to be temporary.

Nature of Impact	Extent of Impact	Duration of Impact	Intensity of Impact	Probability of Impact	Significance of Impact	Level of Confidence
Construction phase – 132kV Power line						
Without mitigation – Construction activities and disturbances will intrude on the views of highly sensitive observers.	Regional	Short term	Medium	Highly probable	Medium	Medium
With mitigation – Duration of impact can be limited through proper planning and effective rehabilitation. Limiting the area of disturbance will reduce the magnitude of impact.	Regional	Short term	Low	Highly probable	Low	High
Construction phase –Substation 1						
Without mitigation – Construction activities and disturbances will intrude on the views of highly sensitive observers. A low viewer incidence is expected.	Local	Short term	Medium	Highly probable	Medium	Medium
With mitigation – With additional screening the magnitude of impact can be reduced, duration of impact can be limited through proper rehabilitation which will reduce the duration of the impact.	Local	Short term	Low	Probable	Low	High
Construction phase –Substation 2 (Alt 1)						
Without mitigation – Construction activities and disturbances will intrude on the views of medium sensitive observers. Medium to low viewer incidence expected.	Local	Short term	Medium	Highly probable	Low	Medium
With mitigation – By retaining the existing screening capacity of the site or through additional screening, the magnitude of impact can be reduced; duration of impact can be limited through proper rehabilitation which will reduce the duration of the impact.	Local	Short term	Low	Highly probable	Low	High
Construction phase –Substation 2 (Alt 2)						
Without mitigation – Construction activities and disturbances will intrude on the views of medium sensitive observers. High viewer incidence expected.	Local	Short term	Medium	Highly probable	Low	Medium
With mitigation – By retaining the existing screening capacity of the site, the magnitude of impact can be reduced.	Local	Short term	Low	Highly probable	Low	High

VISUAL IMPACTS DURING OPERATIONAL PHASE

Visual impact will result from the addition of new elements in the visual environment which alters the existing character of the landscape. The most visible of these elements include the substations and the numerous power line poles which will be spaced along a linear line.

The completed power line will cause a limited visual change to the existing, baseline condition. A single power line with its towers and cables are generally considered a weak visual element in a landscape. Despite its relative size to other elements in the landscape, the towers consist of a slender steel-lattice construction which is almost transparent in nature and therefore considerably reduces its visual dominance.

Generally the Visual Absorption Capacity (VAC) of the study area is considered low. The low-lying topography of the western- and central part of the study area and the predominantly low-growing vegetation provides little, if any visual screening. The eastern part of the study area is topographically more varied and developed which creates more opportunities for screening. This part is considered to have a medium VAC. Despite the low/medium VAC, the character of the landscape is considered fairly robust and will tolerate the proposed power line without significant detriment to its character.

A study done by Hull & Bishop (1988) demonstrates that the impact of a power line on the aesthetic value of a landscape is most significant when the viewing distance is within 500 m from the tower sites. Up to 1 km the impact is still regarded as significant but greatly reduced over the distance. Further than 1 km the change in the aesthetic quality is significantly reduced and are therefore considered minimal or negligible. Based on this information a Zone of Maximum Visual Exposure (ZMVE) is identified.

The viewers inside the Zone of Maximum Visual Exposure (ZMVE) are identified as:

a) Residents along the western perimeter of Glen Ridge (Section B & C);
b) Residents from West Rand Garden A.H. (Section D, E, F – G);
c) Motorists on the N12 Highway (Section K – M);
d) Residents from Lenasia (Section H1 – H8); and
e) Residents and motorists in Soweto (Midway between section W and X up to G1).

a) This residential expansion occurred in recent years and the properties are fairly devoid of vegetation. No screening of the substation and power line will occur and clear views towards the project can be expected. The viewer incidence is expected to be low and the impact will only be experienced by a small group of residents;
b) During the site investigation it was observed that West Rand Garden A.H. consists of large and densely vegetated properties. The vegetation, boundary walls and other building infrastructure provide a degree of visual screening, especially for the residents a block or more away from the proposed servitude. It can be argued that the residents on the western and southern perimeter of the settlement will be most severely impacted due to their close proximity to the corridor. A medium viewer incidence is expected and therefore only a limited number of residents will fall within the ZMVE.
c) Motorists travelling on the local network and specifically the N12 Highway, will have an intermittent visual experience of the power line and will be most aware of its presence when it

crosses the route they travel on. Their visual exposure will be of a very short duration but frequent motorists will be exposed to the impact regularly, thereby increasing the viewer incidence.

d) Lenasia residents will be most severely impacted by deviation/alternative 2. The power line will put the northern part of Lenasia inside the ZMVE. The view over the Klip River wetland system can be described as fairly pleasing, especially during summer. The presence of a power line traversing the wetland will cause a significant visual intrusion. Combined with the high visual exposure the visual impact is expected to be high.
e) This part of the study area is densely populated and an intricate road network exists which leads to the conclusion that a very high viewer incidence can be expected. A great number of residents are within the ZMVE and will be most severely impacted by the presence of the power line. Their views will be intruded on and with the high visual exposure the visual impact is expected to be high.

A mitigating factor, which inherently reduces the magnitude of the impact over most parts of the study area, is the presence of an existing network of power lines. The existing network renders the additional power line as fairly compatible with the region's character, but increases the visual prominence of electrical infrastructure.

Substation 1 will be visible to motorists on the R559, but the duration will be fleeting and the magnitude of the impact low. The greatest impact will be on the new residential extensions of Glen Ridge that are nearing the proposed site. The landscape provides a very low degree of screening and the substation will be fairly visible. Residents from the western part of Glen Ridge will be within the ZMVE and their exposure will be high. The viewer incidence is expected to be relatively low due to the small number of people that will be affected.

Substation 2 has two alternative sites. Both locations will not intrude on the views of highly sensitive observers but will only impact on motorists which have a medium sensitivity. Site 1 will be obscured by a large stand of Eucalyptus trees from the N12 Highway. The site will however be clearly visible from the R558 when crossing the bridge over the railway. The volume of traffic on this section of the road appears to be relatively low and it can be argued that the viewer incidence will be medium to low.

Site 2 will be located closer to the N12 but will be situated in the stand of Eucalyptus trees. The screening capacity of this location is very high and should the vegetation cover be retained, will the substation be out of sight from both transport routes. It is unknown how large the area of clearance will be around the footprint of the substation. The potential is there that the screening capacity may be compromised by clearing and coincidentally open the site up to views from the N12 in particular. If this is the scenario, Site 2 will be exposed to the motorists on the N12 and a high viewer incidence can be expected.

Nature of Impact	Extent of Impact	Duration of Impact	Intensity of Impact	Probability of Impact	Significance of Impact	Level of Confidence
Operational phase – 132kV Power line						
Without mitigation – The new power line will be a weak visual element but its addition will change the baseline conditions of the study area and intrude on certain views.	Regional	Long term	High/Medium	Highly probable	High/Medium	High
With mitigation – Upgrading of an existing power line instead of constructing an additional power line will be the most preferred mitigation measure with the highest affect. Alignment along existing power lines is more accepted than following a new alignment. This will cause the least visual change based on the baseline setting.	Regional	Long term	Medium/Low	Highly probable	Low	High
Operational phase – Substation 1						
Without mitigation – The new substations will intrude on the views of a small number of highly sensitive observers. The landscape provides no screening capacity and exposure is considered high.	Local	Long term	Medium	Highly probable	Medium	High
With mitigation – Relocation of the substation will have the greatest mitigating affect, but additional screen planting can reduce the extent as well as the intensity of the impact	Local	Medium term	Low	Probable	Low	High
Operational phase – Substation 2 (Alt 1)						
Without mitigation – The new substations will only impact on medium sensitive visual receptors but it will change the baseline setting negatively.	Local	Long term	Low	Highly probable	Low	High
With mitigation – By retaining the existing screening capacity of Site 2 the impact can be reduced to almost an insignificant level. Additional screen planting can reduce the extent as well as the intensity of the impact.	Local	Medium term	Low	Highly probable	Low	High
Operational phase – Substation 2 (Alt 2)						
Without mitigation – The new substations will only impact on medium sensitive visual receptors but it will change the baseline setting negatively.	Local	Long term	Low	Highly probable	Low	High
With mitigation – By retaining the existing screening capacity of Site 2 the impact can be reduced to almost an insignificant level.	Local	Medium term	Low	Probable	Low	High

CONCLUSION

The proposed alignment and the two deviations/alternatives are marginally different in their physical alignment and therefore have marginally differences in their individual impacts.

The most preferred alignment is the primary one, referred to as the proposed alignment. The Zone of Maximum Visual Exposure (ZMVE) intersects the least highly sensitive observers and the alignment follows existing power line corridors, mitigating its impact in the process.

The second preferred alignment is deviation/alternative 1. The main difference is the deviation between Section F and H. This alternative moves away from existing power line corridors creating a new one not far away. It is considered more preferred to consolidate power lines in one corridor, instead of fragmenting the landscape with numerous power lines, each in its own direction.

The least preferred is deviation/alternative 2. The only reason being its impact on the residents of Lenasia and the high level of intrusion on their views.

The two alternative sites for Substation 2 are also marginally different and on a macro-scale no significant difference can be expected in the impacts. Site 2 is the preferred option but only if the screening capacity of the trees can be retained. This will obscure the substation from most views and lower the impact to almost insignificant. If clearance of the site will result in the substation being exposed, then Site 1 will be more preferred.

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LIST OF ABBREVIATIONS

DEM	Digital Elevation Model
EIA	Environmental Impact Assessment
EIR	Environmental Impact Report
GIS	Geographical Information System
VAC	Visual Absorption Capacity
VIA	Visual Impact Assessment
ZMVE	Zone of Maximum Visual Exposure
ZVI	Zone of Visual Influence

1 INTRODUCTION

I-scape was appointed by Envirolution Consulting (Pty) Ltd to compile a Visual Impact Assessment (VIA) report for the proposed Taunus - Diepkloof 132kV servitude, located in the City of Johannesburg Metropolitan Municipality. This study is part of an Environmental Impact Assessment (EIA) and will be included in the Environmental Impact Report (EIR). The client, Eskom Holdings Ltd, has proposed the construction of two new substations, the one on the farm Zuurbekom 297IQ and the other near the Randwater Pump station, as well as the erection of a 132kV distribution line between the existing Taunus- and Diepkloof Substations (Figure 1).

A VIA is a specialist study which assesses the potential visual changes to an existing baseline setting resulting from the implementation of a proposed project. The associated visual changes could potentially impact on the character and value of the landscape and affect the views and perceptions of observers in the study area. The purpose is to determine the significance of the changes and to recommend mitigation measures where the impacts are considered unacceptably negative.

2 OBJECTIVES AND METHODOLOGY

2.1 VIA OBJECTIVES

The objectives will be to:

- Address the concerns that are raised during public participation events which relates to aesthetic or any visual aspects;
- Determine the impact on the observers in the study area due to the change in the visual characteristics of the environment;
- Discuss the preferred substation location and alignment with the least visual impacts; and
- Recommend mitigation measures to alleviate or reduce the anticipated impacts.

2.2 VIA METHODOLOGY

The above objectives will be met through the implementation of the following methodology:

1) **Delineation of study area:** The determination of the extent of the study area and its comprising features;
2) **Project Description:** A description of the type, scale and extent of the proposed project;
3) **Visual Resource Assessment:** An assessment of the value of the visual resource based on its aesthetical appearance and appreciation;
4) **Visual Impact Assessment:** This section determines the sensitivity of the receptors and assesses the significance of the potential visual impacts;
5) **Comparative Analysis:** Comparing the different alternatives and arriving at a most preferred option; and
6) **Mitigation Measures:** Mitigation measures are proposed to alleviate or completely eliminate the potential impacts that are identified.

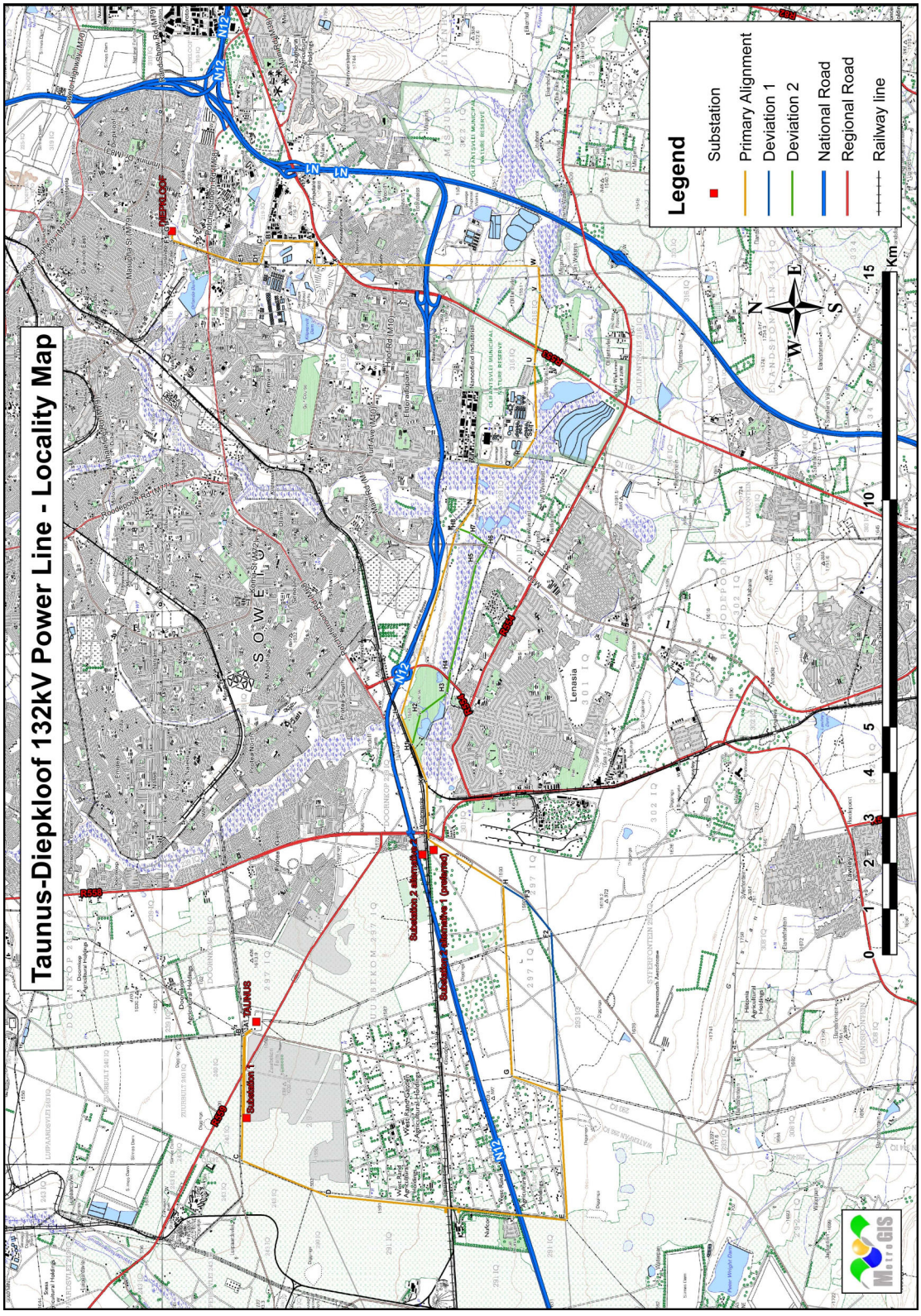


Figure 1: Locality Map

3 LIMITATIONS AND ASSUMPTIONS

This section provides a clear understanding of the limitations and assumptions that negatively affects the accuracy of the assessment and influences the confidence of the visual specialist's professional judgement.

- A Visual Impact Assessment is not a purely objective science and integrates qualitative evaluations, often based on human perceptions. It is the visual specialist's aim to utilise as much quantitative data as possible to substantiate professional judgement and to motivate subjective opinions;
- The field investigation was completed in the month of July and the photographs used in the report portray the character of the study area in the winter. Large parts of the study area were burned down, as is usually the case with grassland vegetation in the winter season. The landscape appeared rather lifeless at the time. In contrast, the summer landscape character is often vibrant. Due to time and budget constraints a follow-up site investigation during the summer season could not be arranged;
- The planning phase of the particular project is not sufficiently advanced and certain construction detail is unknown. No exact location for the construction camps and material stockyards has been determined yet. Certain assumptions were made which are discussed under the relevant section. Due to this uncertainty, a lower level of confidence is assigned to the impact evaluation of the construction phase; and
- The visibility maps in Appendix 1 calculate the screening ability of the landscape based on the natural topography alone. Contour data with a 20 m interval is used to determine the visibility of the linear power line and the substation. The screening affect of trees, structures and man-made landforms is not represented in the maps, but will be addressed under the assessment of the impacts.

4 STUDY AREA

The study area can shortly be described as the area affected by visual impact and usually extends beyond the boundaries of the site. For the purpose of this study, the study area is limited to a radius of 5 km (Refer to Appendix 1). Within the study area there is a Zone of Visual Influence (ZVI) which delineates the areas of visibility as calculated by a visibility analysis.

The factors that mostly influence the ZVI are topographic variation and land use/cover which could potentially screen the proposed project from critical viewpoints. These factors also contribute to the prevailing landscape character which establishes the context in which the project is proposed (Figure 2).

The following topics describe the landscape attributes that influences the ZVI and the landscape character of the study area:

Topography: The study area is located within the catchment of the Klip River system. The Klip River originates in the upper hills of the Witwatersrand Mountain Range near Krugersdorp. From there the floodplain widens resulting in a fairly featureless landscape with no dramatic topographic variation. The floodplain is flanked by two hill ranges which runs in an east-west

alignment. Gatsrant is south of the floodplain and the Witwatersrand Range forms the northern boundary.

The majority of the study area overlaps with the floodplain except for the north-eastern region which moves up into the hilly area of Soweto. The undulating hills are part of the Witwatersrand Range of hills and consist of numerous low koppies and small valleys.

The natural topography has a minimal effect in limiting the ZVI. Due to the undulating and low-lying landscape it is possible to experience open panoramic views of the landscape. The hills near the Diepkloof Substation provide some degree of variance and will influence the ZVI relating to the project. This topic is discussed in more detail in Appendix 1.

Land Use/Cover: The study area comprises a number of land uses. The western region (Section A –J), around Taunus Substation up to the second proposed substation sites, is mainly agricultural, although it seems that only a small area is actively cultivated currently. The remainder of the vacant farmland is an open and fairly mundane landscape. The typical Highveld grassland vegetation is dominant with the exception of sparsely scattered exotic trees on the plains. Low intensity mining activity is visible on the fringes of the study area but is not considered a prominent land use in this region. The West Rand Garden A.H. occupies a relatively large area in the western region of the study area. This is a rather isolated community that consists of relatively large properties. The gardens around the houses are often densely vegetated, thereby obscuring views towards the proposed power line routes.

The central region of the study area (Section J – W) is dominated by the Klip River wetland system. The wetland system occupies a relatively wide floodplain and is mostly vegetated with aquatic vegetation such as rushes and reeds. Small dams are visible along the length of the wetland where the vegetation opens up, but for the most part limited open water is visible.

The Klip River wetland system is flanked by a variety of land uses. In the upper region, between the N12 Highway and the R554, the Lanasia Country Club Golf Course is located. The residential suburb of Lenasia forms a large part of the southern boundary of the Klip River and looks out onto the wetland. This is considered the western perimeter of the urban edge. Further east, west of the R553, the Nancefield Industrial area and a waste water treatment plant occupy a corner of the wetland. The Olifantsvlei Municipal Nature Reserve extends from the Nancefield Industrial area to the east of the N1 Highway. Limited information could be obtained but it is assumed that the Olifantsvlei Municipal Nature Reserve is a conservation area and apparently hosts a great number of bird species.

The northern region of the study area (Section W - G1) is inside the town of Soweto, north of the N12 Highway. The proposed servitude follows existing open space corridors and power line servitudes through the suburbs, until it reaches the Diepkloof Substation. The residential extensions of Devland are characterised by small, single storey units. The open spaces are highly degraded and often littered. From here the servitude crosses the Golden Highway and passes the industrial area of Devland and the waste water treatment plant in Rivasdale. It follows an open space corridor through Power Park suburb, over Bailey Stream where it connects with Diepkloof

Substation. Along the entire servitude route through Soweto, the open space corridors are littered and in a poor aesthetic condition.

Existing Electricity Network: An extensive power line network is already present in most parts of the study area. The network is more intricate near the existing substations due to a convergence of several power lines. The proposed 132kV servitude runs parallel to other existing servitudes for the majority of the way and only on a few occasions, deviate off the existing power line corridors.

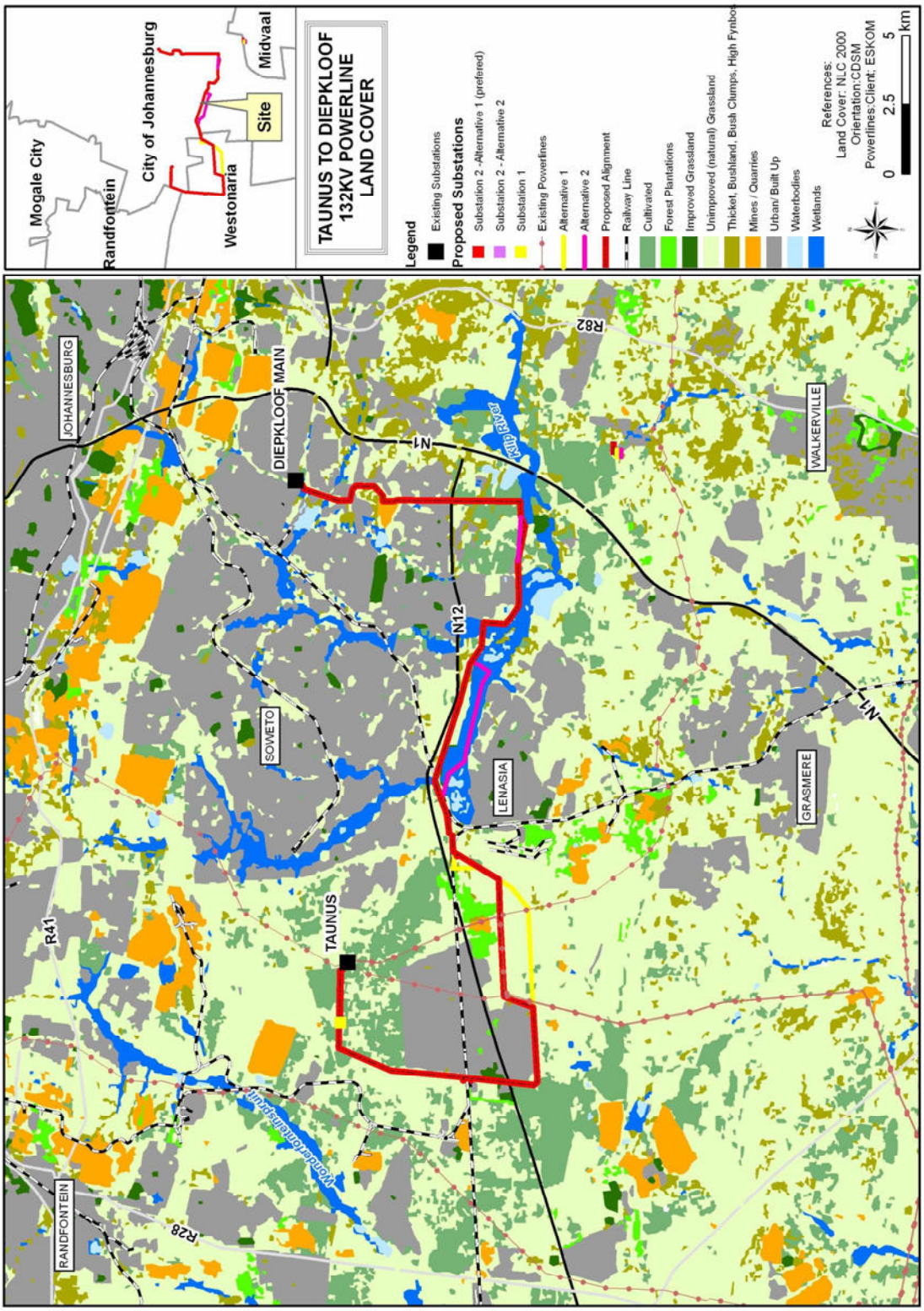


Figure 2: Macro-Scale Land Cover Map

5 PROJECT DESCRIPTION

The project entails the construction of a ±40 km 132kV distribution line and two new substations. The distribution line will be located between the existing Taunus- and Diepkloof Substations. Currently, one alignment has been proposed with two deviations along the route (referred to as "Proposed Alignment" and "Deviation/Alternative 1 and 2" respectively). The type of tower to be used will be a steel lattice structure with a maximum height of 31.5 m (Figure 3)

The two proposed substations will be located west of Taunus Substation between Section B & C and west of the Randwater Pump Station (Between Section H & J). Two alternative sites have been proposed for the second substation. Site 1 is located between the N12 Highway and the railway line, west of the pump station. Site 2 is located south of the railway line, south of the pump station (Refer to Figure 1). A description of the visible elements of the substation is provided below.

Construction phase

Limited information is currently available on the construction process of the entire project. The information that is reflected in the following paragraphs is general construction procedures which may change slightly for each project.

The construction of the 132 kV distribution line is expected to continue for approximately 18 - 24 months. It will consist of the following basic phases:

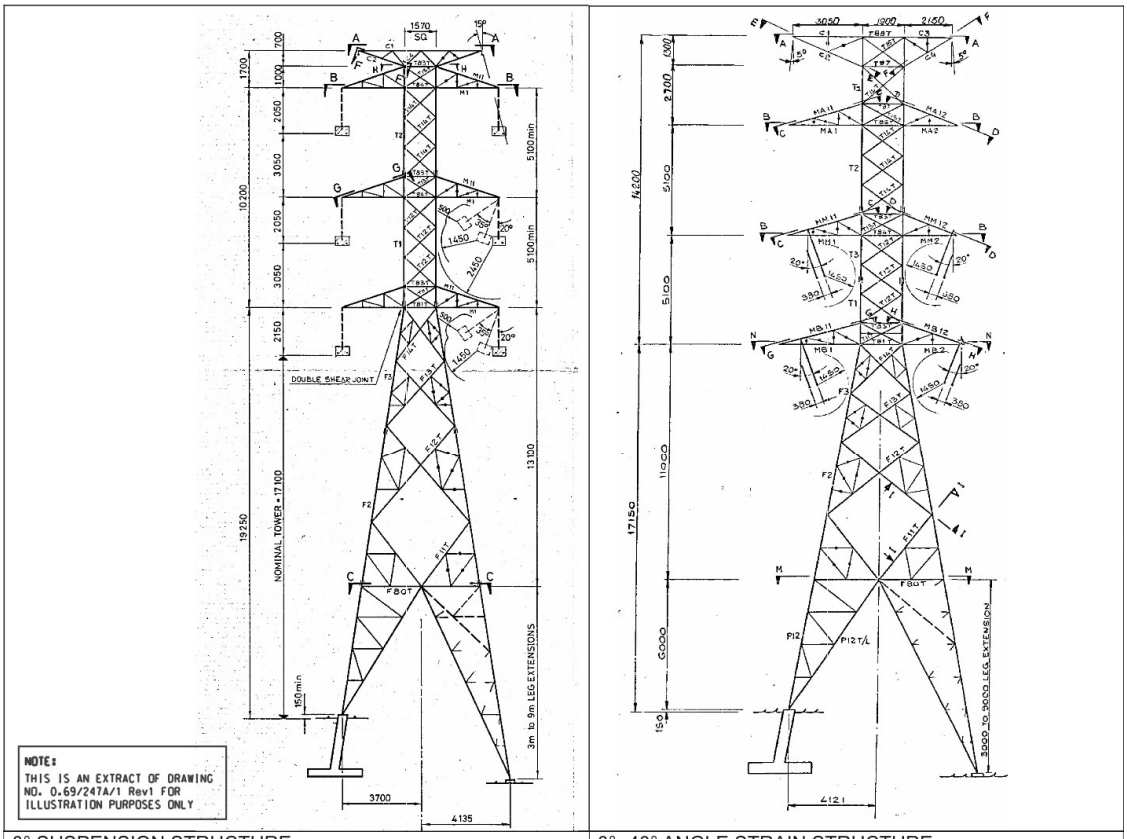
- Establishment of construction camp/s;
- Survey and pegging of tower positions;
- Construction of additional access roads if required;
- Clearing or trimming of vegetation along corridor that may interfere with the line;
- Tower assembly and erection;
- Conductor stringing and tensioning; and
- Servitude rehabilitation.

The construction of the substations is expected to consist of the following sequential phases:

- Establishment of construction camp/s;
- Establishment of an access road if required;
- Clearance and levelling of the 80 m x 80 m footprint;
- Erection of a perimeter fence; and
- Installation of isolators, current transformers, circuit breakers, busbars, voltage transformers, power transformers, lighting posts and floodlighting.

The exact location of the construction camps and material stockyards has not been determined yet. A construction camp is usually a cleared and fenced area where temporary site offices are located and construction materials are stockpiled. Due to its temporary nature and practical function, aesthetic consideration is often less of a concern which could result in an unsightly terrain that may cause a visual impact.

Figure 3: Steel Lattice Towers



0° SUSPENSION STRUCTURE 132kV LATTICE STEEL - GENERAL ARRANGEMENT D-DT 7700 (Code)	0°- 40° ANGLE STRAIN STRUCTURE 132kV LATTICE STEEL - GENERAL ARRANGEMENT D-DT 7701 (Code)

6 VISUAL RESOURCE ASSESSMENT

The study area, which consists of the landscape and its comprising elements, is considered a visual resource. Similar to other natural resources, a visual resource has a value to a group of people/observers, in this case an aesthetic value. An aesthetic value cannot be described in terms of monetary quantities, but it is a qualitative value with an underlying social, cultural and/or ecological connotation. Aesthetic value can be further described as an appreciation of the quality of a visual resource and refers to the sensory experience one has when exposed to the perceivable qualities of a visual resource.

The following question may be asked; “What are the factors that contribute to the value of a particular visual resource and which leads to its appreciation?” The concept of Visual Resource Assessment (VRA) is derived from environmental management practices. It can be argued that the approach to assessing the value of a visual resource is rather bio-centric, implying that the aesthetic quality of a landscape is often “measured” in terms of its ecological and biological excellence. It has however been proved through empirical research that a relation does exist between a landscape’s aesthetic value and/or appreciation and the intactness of its natural features (i.e. trees, water bodies, mountains, etc.).

In a developed landscape, these natural features are often removed or greatly modified, sometimes to a point where it is ecologically dysfunctional. The consequence is often that the visual resource looses its original aesthetic appeal. It can be argued that the need to preserve the aesthetic quality of a landscape was less of a concern when the basic needs for livelihood were paramount. The need for food and shelter transformed the study area significantly. In the modern era, basic needs also include transportation and the supply of energy. These aspects played a fundamental role in the manufacturing of a "new" landscape character.

In general, the study area contains very little natural elements that originally contributed to its pristine character. The grassy plains and the Klip River wetland system in the western and central region of the study area are remnants of the historic natural landscape, but have been severely modified and affected by urban sprawl. The dominant land use is residential and the urban landscape is characterised by one and two storey buildings arranged in a typical broken grid system, divided by the roads infrastructure. The open space corridors through the build-up areas often suffer severe degrees of littering and degradation.

The vacant grassland areas, west of Taunus Substation and West Rand Garden A.H., already accommodate numerous power line corridors and are further fragmented by railways and roads. The Klip River wetland system dominates the central region of the study area but significant encroachment has occurred on both sides of the system. This is considered the only unique natural feature in the study area that has a relatively high ecological significance and contributes to the aesthetic appeal of the central study area (Refer to Appendix 2, V07). Its positive visual appeal are only affective on its local environment.

7 VISUAL IMPACT ASSESSMENT

Within the study area, specific observers experience different views of their environment and therefore value it differently. They will be affected by the proposed project because of alterations to the environment/landscape or specific elements in the landscape which will influence their views.

The significance of this change/impact is a function of:

- The magnitude of the impact;
- The sensitivity of the observer which is impacted on; and
- The exposure of the observer to the impact.

Magnitude of impact

The magnitude of an impact can be described according to the scale, extent and intensity of the impact. The magnitude is often mitigated by the inherent capacity of the landscape to absorb changes. The capacity of a landscape refers to the robustness of its character and its resulting ability to tolerate changes from a particular intervention without detrimental effects to its original qualities and/or values.

A landscape with a high capacity is one that:

- Has a high Visual Absorption Capacity (VAC) and consequently screens views from sensitive vantage points;
- Is often intensely developed or transformed by exploitive human activities and therefore has a low value and scenic quality as a baseline condition to start with;

- Has characteristic land uses that are compatible with the proposed project; and/or
- Has a low concentration of valued attributes or its attributes are of a low value.

On the other end of the scale, a landscape with a low capacity is one that:

- Has a low VAC and are often an exposed landscape with few topographic or surface features that creates visual screens from sensitive vantage points;
- Comprises of land uses that are incompatible with the proposed project; and/or
- Has a very high concentration of valued attributes or its attributes are of a high value.

Sensitivity of observers

The observers in the study area can be separated in two general categories namely residents and commuters. The categorisation implies that the observers in that particular category will experience and appreciate the visual resource in a fairly similar fashion and will therefore have a similar sensitivity.

The sensitivity of an observer is related to the value an observer has for the particular visual resource being impacted on. To determine viewer sensitivity a commonly used rating system is utilised. This is a generic classification of observers and enables the visual impact specialist to establish a logical and consistent viewer sensitivity rating for viewers who are involved in different activities without engaging in extensive public surveys.

Table 1: Viewer Sensitivity

VIEWER SENSITIVITY	DEFINITION (BASED ON THE LANDSCAPE INSTITUTE, 2002 ED PP90-91)
Exceptional	Views from major tourist or recreational attractions or viewpoints promoted for or related to appreciation of the landscape, or from important landscape features.
High	Users of all outdoor recreational facilities including public and local roads or tourist routes whose attention or interest may be focussed on the landscape; Communities where the development results in changes in the landscape setting or valued views enjoyed by the community; Residents with views affected by the development; People generating an income from the visual resource or pristine quality of the environment.
Moderate	People engaged in outdoor sport or recreation (other than appreciation of the landscape); People commuting between work place and home or other destinations.
Low	People at their place of work or focussed on other work or activity; Views from urbanised areas, commercial buildings or industrial zones. Views from heavily industrialised or blighted areas

The residents in the study area are classified as visual receptors of **high** sensitivity owing to their sustained visual exposure to the proposed development as well as their attentive interest towards their living environment.

People travelling between their work place and home are considered to be **moderately** sensitive receptors. They have a particular interest in their living environment and are exposed to visual

impacts adjacent to the road or near their working environment more frequently than for instance a once-off visitor to the region.

Exposure to impact

An observer's exposure to an impact is influenced by a combination of the following aspects:

- Distance from the source of impact;
- True visibility of the project keeping in mind visual contrast and the decrease in visibility over distance (Refer to Appendix 1);
- Duration, i.e. sustained, temporary, intermittent exposure, etc; and
- Viewer incidence is a measure of determining the frequency and number of viewers viewing the proposed project. Due to a lack of quantitative data the rating is based on an arbitrary scale from high to low specifically designed for this project:
    - For a high viewer incidence to occur the servitude should be located within 0.5 km from a densely populated residential area, cross or run in parallel to a major transport route and/or pass through a recognised public area such as a park;
    - A medium viewer incidence occurs if the servitude is between 0.5 - 1 km from a densely populated area or major transport route, or cross through or nearby a sparsely populated area such as a farming community or agricultural holdings; and
    - A low viewer incidence occurs if the servitude pass through vacant land with no populated areas within 1 km and only a tertiary road network is present.

The following areas have been identified as areas of high or medium viewer incidence and are also areas where sensitive viewers are present. These two factors contribute to the potential visual exposure of the project:

- Western extension of Glen Ridge (Section B & C);
- West Rand Garden A.H. (Section D, E, F – G);
- N12 Highway (Section K – M);
- Lenasia (Section H1 – H8); and
- Soweto (Midway between section W and X up to G1).

7.1 VISUAL IMPACTS DURING CONSTRUCTION PHASE

Visual impacts will result from the temporary presence of construction camps and material stockyards as well as activities and disturbances within the power line servitude and substation site. As mentioned previously, the location and size of the construction camps and material stockyards have not been determined, which impedes the accurate assessment of the visual impacts associated with the construction phase. It is therefore assumed that the construction camp and material stockyard will be located adjacent to each other on a site that is fairly central and accessible, but it is not possible to attribute the visual impact to a specific location.

Throughout the study area, observers will experience the visual impact relating to the construction phase in different degrees. The affected observers are mostly residents and people travelling between their work place and home (See previous section). Residents are considered as highly sensitive receptors as they will experience a sustained exposure to the impact for an extended period of time. Motorists that live and work in the area will be exposed to the impact intermittently or for short periods at a time, over the duration of the construction phase. They are regarded as moderately sensitive receptors.

Typical visual impacts often relate to the unsightly character of such construction sites brought about by the untidy and disorderly placement of ancillary elements and the associated surface disturbances. The impact will cause a negative intrusion on the views of the observers, but is expected to be temporary.

Power line construction:
The construction of the power lines will cause surface disturbances along the servitude during this period. Construction vehicles will travel up and down the corridor as foundations are prepared for the towers. Vegetation around the tower base will be trampled and tall trees and shrubs will be trimmed or removed in the servitude. This will cause physical damage to the existing vegetation cover. This will be a temporary impact that will eventually return to the baseline condition, or at least similar to the baseline condition.

The magnitude of the visual impact will be medium along the length of the servitude. No major surface disturbances are expected, except for the foundation preparation of the four legs for the towers. This form of surface disturbance will extend over the entire length of the servitude, at each tower location, therefore at intervals of a few 100 m over the 40 km servitude span. The visual intrusion that will be created by the construction activity, will have the greatest negative impact in the areas of high visual exposure and the location of sensitive visual receptors. The proximity of the construction activity and the relatively high viewer incidence contribute to the visual intrusion of the construction phase, but this is inherently mitigated by the temporary nature and the medium magnitude of the impact.

Substation construction:
The footprint of the substations will be 80 m x 80 m. Typically the construction of a substation will include clearing and grading of the site after which construction will follow.

Substation 1 will be located in a vacant parcel of land between the R559 and the R93. Major expansion of Glen Ridge has occurred towards the west in recent years, bringing residential development closer to the proposed site. The western perimeter of the residential extension is approximately 700m from the site, placing it in a location where it is potentially highly visible. Motorists travelling on the R559, will have a fleeting view of the construction site. The construction activity is expected to intrude on the views of residents in the western extremities of Glen Ridge development. A relatively small number of residents will be impacted but their exposure is considered high due to their close proximity.

Both the alternative locations of Substation 2 are outside the areas of high visual exposure but a high viewer incidence is expected due to the proximity to major transport routes (N12 & R558). Motorists are considered medium sensitive viewers due to their brief exposure to the impact. Site 1 will be located in an open field, south of the railway line. Views from the N12 will be obscured by a large stand of Eucalyptus trees. The site will however be clearly visible from the R558 when crossing the bridge over the railway. The volume of traffic on this section of the road appears to be relatively low and it can be argued that the viewer incidence will be medium to low.

Site 2 will be located closer to the N12 but will be situated in the stand of Eucalyptus trees. The screening capacity of this location is very high and should the vegetation cover be retained, will the substation be out of sight from both transport routes. It is unknown how large the area of clearance will be around the footprint of the substation. The potential is there that the screening capacity of the site may be compromised through clearing and coincidentally open the site up for views from the N12 in particular. If this is the scenario, Site 2 will be exposed to the motorists on the N12 and a high viewer incidence can be expected. The magnitude of the impact will however be medium and limited to a relatively small area.

Table 2: Visual Impact during Construction Phase

Nature of Impact	Extent of Impact	Duration of Impact	Intensity of Impact	Probability of Impact	Significance of Impact	Level of Confidence
Construction phase – 132kV Power line						
Without mitigation – Construction activities and disturbances will intrude on the views of highly sensitive observers.	Regional	Short term	Medium	Highly probable	Medium	Medium
With mitigation – Duration of impact can be limited through proper planning and effective rehabilitation. Limiting the area of disturbance will reduce the magnitude of impact.	Regional	Short term	Low	Highly probable	Low	High
Construction phase –Substation 1						
Without mitigation – Construction activities and disturbances will intrude on the views of highly sensitive observers. A low viewer incidence is expected.	Local	Short term	Medium	Highly probable	Medium	Medium
With mitigation – With additional screening the magnitude of impact can be reduced, duration of impact can be limited through proper rehabilitation which will reduce the duration of the impact.	Local	Short term	Low	Probable	Low	High
Construction phase –Substation 2 (Alt 1)						
Without mitigation – Construction activities and disturbances will intrude on the views of medium sensitive observers. Medium to low viewer incidence expected.	Local	Short term	Medium	Highly probable	Low	Medium
With mitigation – By retaining the existing screening capacity of the site or through additional screening, the magnitude of impact can be reduced; duration of impact can be limited through proper rehabilitation which will reduce the duration of the impact.	Local	Short term	Low	Highly probable	Low	High
Construction phase –Substation 2 (Alt 2)						
Without mitigation – Construction activities and disturbances will intrude on the views of medium sensitive observers. High viewer incidence expected.	Local	Short term	Medium	Highly probable	Low	Medium
With mitigation – By retaining the existing screening capacity of the site, the magnitude of impact can be reduced.	Local	Short term	Low	Highly probable	Low	High

7.2 VISUAL IMPACTS DURING OPERATIONAL PHASE

Visual impact will result from the addition of new elements in the visual environment which alters the existing character of the landscape and could potentially intrude on the views of observers. The most prominent project elements are the substations and the numerous power line towers which will be spaced rhythmically inside the proposed servitude.

Power line operation:
The completed power line will cause a limited visual change to the existing, baseline condition. A single power line with its towers and conductors are generally considered a weak visual element. Despite its relative size to other elements in the landscape, the towers consist of a slender steel-lattice construction which is permeable and therefore minimises its visual dominance.

Generally the Visual Absorption Capacity (VAC) of the study area is considered low. The low-lying topography of the western- and central part of the study area and the predominantly low-growing vegetation provides little, if any visual screening. The eastern part of the study area is topographically more varied and developed, which creates more opportunities for screening. This part is considered to have a medium VAC. Despite the low/medium VAC, the character of the landscape is considered fairly robust and will tolerate the proposed power line without significant detriment to its character.

A study done by Hull & Bishop (1988) demonstrates that the impact of a power line on the aesthetic value of a landscape is most significant when the viewing distance is within 500 m from the tower sites. Up to 1 km the impact is still regarded as significant but greatly reduced over the distance. Further than 1 km the change in the aesthetic quality is significantly reduced and are therefore considered minimal or negligible. Based on this information a Zone of Maximum Visual Exposure (ZMVE) is identified (Appendix 1).

The viewers inside the Zone of Maximum Visual Exposure (ZMVE) are identified as:
a) Residents along the western perimeter of Glen Ridge (Section B & C);
b) Residents from West Rand Garden A.H. (Section D, E, F – G);
c) Motorists on the N12 Highway (Section K – M);
d) Residents from Lenasia (Section H1 – H8); and
e) Residents and motorists in Soweto (Midway between section W and X up to G1).

a) This residential expansion occurred in recent years and the properties are fairly devoid of vegetation. No screening of the substation and power line will occur and clear views towards the project can be expected. The viewer incidence is expected to be low and the impact will only be experienced by a small group of residents;
b) During the site investigation it was observed that West Rand Garden A.H. consists of large and densely vegetated properties. The vegetation, boundary walls and other building infrastructure provide a degree of visual screening, especially for the residents a block or more away from the proposed servitude. It can be argued that the residents on the western and southern perimeter of the settlement will be most severely impacted due to their close proximity to the corridor. A medium viewer incidence is expected and therefore only a limited number of residents will fall within the ZMVE.

c) Motorists travelling on the local network and specifically the N12 Highway, will have an intermittent visual experience of the power line and will be most aware of its presence when it crosses the route they travel on. Their visual exposure will be of a very short duration but frequent motorists will be exposed to the impact regularly, thereby increasing the viewer incidence.
d) Lenasia residents will be most severely impacted by deviation/alternative 2. The power line will put the northern part of Lenasia inside the ZMVE. The view over the Klip River wetland system can be described as fairly pleasing, especially during summer. The presence of a power line traversing the wetland will cause a significant visual intrusion. Combined with the high visual exposure the visual impact is expected to be high.
e) This part of the study area is densely populated and an intricate road network exists which leads to the conclusion that a very high viewer incidence can be expected. A great number of residents are within the ZMVE and will be most severely impacted by the presence of the power line. Their views will be intruded on and with the high visual exposure the visual impact is expected to be high.

A mitigating factor, which inherently reduces the magnitude of the impact over most parts of the study area, is the presence of an existing network of power lines. The existing network renders the additional power line as fairly compatible with the region's character, but increases the visual prominence of electrical infrastructure.

Substation operation:
Substation 1 will be visible to motorists on the R559, but the duration will be fleeting and the magnitude of the impact low. The greatest impact will be on the new residential extensions of Glen Ridge that are nearing the proposed site. The landscape provides a very low degree of screening and the substation will be fairly visible. Residents from the western part of Glen Ridge will be within the ZMVE and their exposure will be high. The viewer incidence is expected to be relatively low due to the small number of people that will be affected.

Substation 2 has two alternative sites. Both locations will not intrude on the views of highly sensitive observers but will only impact on motorists which have a medium sensitivity. Site 1 will be obscured by a large stand of Eucalyptus trees from the N12 Highway. The site will however be clearly visible from the R558 when crossing the bridge over the railway. The volume of traffic on this section of the road appears to be relatively low and it can be argued that the viewer incidence will be medium to low.

Site 2 will be located closer to the N12 but will be situated in the stand of Eucalyptus trees. The screening capacity of this location is very high and should the vegetation cover be retained, will the substation be out of sight from both transport routes. It is unknown how large the area of clearance will be around the footprint of the substation. The potential is there that the screening capacity may be compromised by clearing and coincidentally open the site up to views from the N12 in particular. If this is the scenario, Site 2 will be exposed to the motorists on the N12 and a high viewer incidence can be expected.

Table 3: Visual Impacts during Operation Phase

Nature of Impact	Extent of Impact	Duration of Impact	Intensity of Impact	Probability of Impact	Significance of Impact	Level of Confidence
Operational phase – 132kV Power line						
Without mitigation – The new power line will be a weak visual element but its addition will change the baseline conditions of the study area and intrude on certain views.	Regional	Long term	High/Medium	Highly probable	High/Medium	High
With mitigation – Upgrading of an existing power line instead of constructing an additional power line will be the most preferred mitigation measure with the highest affect. Alignment along existing power lines is more accepted than following a new alignment. This will cause the least visual change based on the baseline setting.	Regional	Long term	Medium/Low	Highly probable	Low	High
Operational phase – Substation 1						
Without mitigation – The new substations will intrude on the views of a small number of highly sensitive observers. The landscape provides no screening capacity and exposure is considered high.	Local	Long term	Medium	Highly probable	Medium	High
With mitigation – Relocation of the substation will have the greatest mitigating affect, but additional screen planting can reduce the extent as well as the intensity of the impact	Local	Medium term	Low	Probable	Low	High
Operational phase – Substation 2 (Alt 1)						
Without mitigation – The new substations will only impact on medium sensitive visual receptors but it will change the baseline setting negatively.	Local	Long term	Low	Highly probable	Low	High
With mitigation – By retaining the existing screening capacity of Site 2 the impact can be reduced to almost an insignificant level. Additional screen planting can reduce the extent as well as the intensity of the impact.	Local	Medium term	Low	Highly probable	Low	High
Operational phase – Substation 2 (Alt 2)						
Without mitigation – The new substations will only impact on medium sensitive visual receptors but it will change the baseline setting negatively.	Local	Long term	Low	Highly probable	Low	High
With mitigation – By retaining the existing screening capacity of Site 2 the impact can be reduced to almost an insignificant level.	Local	Medium term	Low	Probable	Low	High

8 MITIGATION

The aim of mitigation is to reduce or alleviate the anticipated impacts that are a consequence of the proposed project's components and activities.

Mitigation measures are provided for three phases of the project namely, the design, construction and operational phases. "Mitigation is a design skill that should start at the very inception of a project with the analysis of environmental opportunities and constraints." (Institute of Environmental Assessment and Landscape Institute, 1995) This approach generates preventative measures that will influence design decisions instead of relying on cosmetic landscape remediation of a completed project.

8.1 DESIGN PHASE

The single most important mitigation measure that should be addressed in the design phase is the suitable location of the proposed power line and substations. A thorough assessment of alternative locations for the proposed project can yield the greatest results in limiting visual impact. The following mitigatory considerations can assist in locating the project components:

- The human eye tends to follow dominant lines in a scene and is stimulated to explore their origin and termination. This is the study of visual force where an observer follows certain lines or edges in a scene in a particular direction. Usually the eye will move up in valleys and down ridges of a mountainous scene. These are the obvious locations where power lines and substations should be prohibited in order to maintain visual coherence of the horizon line;
- Each study area has a natural screening capacity, either through topographical variation or vegetative screening, or a combination of both. The study area provides the opportunity to locate certain sections of the power line and the new substation in/through exotic woodlands which will in effect completely or partially conceal the power line from outside vantage points. This type of planning must go hand in hand with on-site confirmation in order to establish the best location that will require the least clearing of trees and so retain the sites natural screening capacity;
- Instead of constructing a new substation at Site 1, consider the option of upgrading or expanding the existing Taunus Substation which is only 2 km away from the proposed site. In doing this, visual elements associated with the power grid is consolidated together and not scattered across the landscape and visually "polluting" it with fragmented power infrastructure. Alternatively, locate the site further west in order to place the substation out of the 1 km ZMVI; and
- It is highly recommended that the existing power line network be upgraded instead of the addition of more power lines. Where an existing power line can be dismantled and substituted by a single larger capacity power line, the option must be considered as this will have the least visual change. This will also prevent several power lines running in parallel in a corridor and increasing the cumulative visual impact to unacceptable levels.

8.2 CONSTRUCTION PHASE

As a general rule of thumb, one can significantly reduce the extent and magnitude of visual impact by limiting the area of surface disturbance during construction. Exposed soil or damaged

vegetation is expected to cause visual intrusion and impact on the scenic quality of the environment. The following techniques can be implemented to reduce surface disturbances:

- Locate construction camps and stock yards in the least visible areas. Make use of the natural screening capacity of the site by placing these facilities in the lower lying areas of the study area or adjacent a dense vegetation patch with sufficient height to conceal these project components. Alternatively, the screening capacity of the site can be temporarily enhanced through the erection of a 2 m high shade cloth fence around the construction camp and substation site during construction. The colour of the shade cloth should be similar to that of the adjacent vegetation, i.e. a light brown or green;
- Keep the construction camp neat and tidy at all times. Remove any waste products from the site or contain it in an enclosed area out of the sight from viewers;
- Establish limits of disturbances during construction through the demarcating of the construction areas;
- Keep to existing road infrastructure as far as possible to minimise the physical damage to vegetation in the power line servitude;
- Retain as much of the existing vegetation as possible, specifically existing mature trees that contributes to the natural screening capacity of the study area; and
- Implement rehabilitation of disturbed areas as soon as possible to limit the duration of exposed surfaces.

Additional mitigation measures can be implemented to specifically reduce the visual impact during construction of the substations:

- Minimise unsightly cut- and fill areas by stepping the substation building platform and thereby lowering the structure by as much as possible;
- Shape the cut and fill embankments by rounding the edges and giving it a more natural appearance if space permits. Alternatively, embankments must be stabilised preferably through planting (unlikely to be an option inside the substation boundary fence due to safety consideration) to cover up any exposed soil and to restrict erosion;
- Establish screening planting along the perimeter of the substation;
- Signage should be simple and unobtrusive and not protrude above the skyline when viewed from any direction; and
- A definite effort should be made to reduce the height and scale of the structures, if at all possible.

8.3 OPERATIONAL PHASE

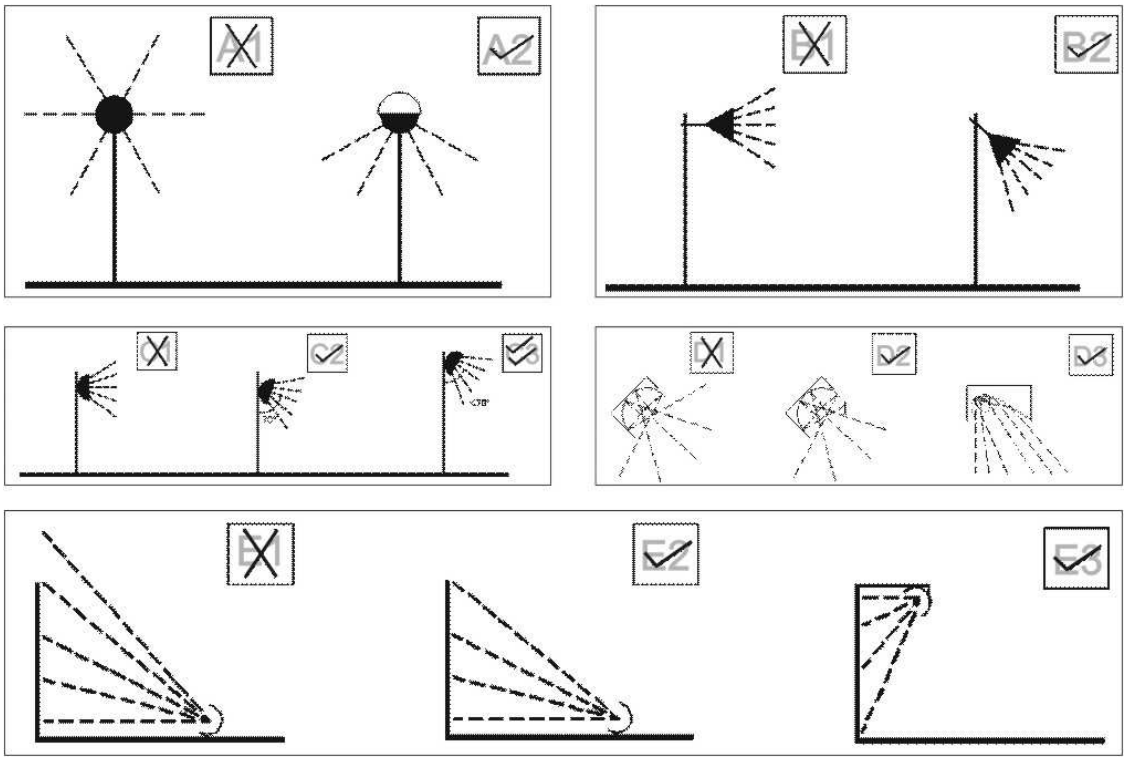
- Maintenance of the servitude in terms of clearing up littering and dumped refuse is highly recommended. This must be done on a routine basis in order to keep the servitude neat and maintain a visually unobtrusive condition;
- All lighting, especially perimeter security lighting at the substations must be shielded to minimise light spillage and pollution. No direct light sources must be seen from outside the site;
- Previously rehabilitated areas must be monitored to prevent the infestation of weeds that may become an unsightly feature; and
- Screen planting that was specifically established to minimise the intrusiveness of the power line or substation must be maintained and dead or sick plants replaced for a determinate period after construction.

Obtrusive lighting is not identified as a visual impact, and is very difficult to predict and requires the service of a lighting engineer in order to quantify potential obtrusive lighting impacts. The mitigation proposed here is preventative measures that should form part of the design phase of the development.

- Confine light output within property boundaries through using specifically designed luminaires such as full cut-off luminaires to minimise upward spread of light near to and above the horizontal (Figure 4 – A);
- Tilt spotlight luminaires to direct the light to the intended spot, instead of allowing it to light areas outside its purpose (Figure 4 – B);
- Mount outdoor spot lights on the appropriate pole height. Higher mounting heights allow lower main beam angles which can reduce glare (Figure 4 – C).
- Utilise control systems to reduce light levels during inactive periods or at predetermined times while maintaining sufficient lighting for safety and security (NEMA , 2000).
- Where vertical surfaces are illuminated, such as advertising signs or buildings façades, it is recommended that luminaires should light downwards. If up-lighting is the only alternative, the use of shields, baffles or louvers should be installed to reduce light spillage over or under the structure (Figure 4 – E).
- Do not over illuminate areas. Use the correct illuminance intensity for the purpose intended.

Figure 4: Guidelines for the Reduction of Obtrusive Lighting

(Source: ILE, 2005)



9 COMPARATIVE ANALYSIS AND CONCLUSION

The proposed alignment and the two deviations/alternatives are marginally different in their physical alignment and therefore have marginally differences in their individual impacts.

The most preferred alignment is the primary one, referred to as the proposed alignment. The Zone of Maximum Visual Exposure (ZMVE) intersects the least highly sensitive observers and the alignment follows existing power line corridors, mitigating its impact in the process.

The second preferred alignment is deviation/alternative 1. The main difference is the deviation between Section F and H. This alternative moves away from existing power line corridors creating a new one not far away. It is considered more preferred to consolidate power lines in one corridor, instead of fragmenting the landscape with numerous power lines, each in its own direction.

The least preferred is deviation/alternative 2. The only reason being its impact on the residents of Lenasia and the high level of intrusion on their views.

The two alternative sites for Substation 2 are also marginally different and on a macro-scale no significant difference can be expected in the impacts. Site 2 is the preferred option but only if the screening capacity of the trees can be retained. This will obscure the substation from most views and lower the impact to almost insignificant. If clearance of the site will result in the substation being exposed, then Site 1 will be more preferred.

9.1 NO-GO OPTION

As part of the EIA requirements, it is necessary to discuss the no-go option. The no-go option is defined as the option where the project will not be implemented. In terms of the visual impact, this option will not cause any changes to the baseline condition and therefore no visual change will occur. The visual impact will therefore be neutral as no observers will be affected and no changes to the visual environment will occur. The no-go option is the most preferred option above all the alternatives that have been proposed based on the fact that no negative visual impacts will occur.

10 REFERENCES

As a matter of best practice, this assessment is based on internationally accepted guidelines and standards with regards to VIA. The following sources are frequently referred to:

- Barnard, D, Friend, F, Barnard, C and Visser, H. 2006. *Road Map to Environmental Legislation: Edition 3.* Impact Books CC, Pretoria.
- Hull, R.B. and I.D. Bishop. 1988. *Scenic Impacts of Electricity Transmission Towers: The influence of Landscape Type and Observer Distance.* Journal of Environmental Management. 1988. Vol. 27: pp. 99-108.
- Landscape Institute. 2002. *Guidelines for Landscape and Visual Impact Assessment*. The Landscape Institute with the Institute of Environmental Management and Assessment. Spon Press, London, United Kingdom.
- The Countryside Agency and Scottish Natural Heritage (2002). *Landscape Character Assessment – Topic paper 6.*
- The Institution of Lighting Engineering (ILE) (2005). *Guidance Notes for the Reduction of Obtrusive Lighting.* (http://www.ile.org.uk/documents/RLP%202005.pdf). Accessed February 2006.
- U.S. Department of the Interior, Bureau of Land Management - Visual Resource Management. Web Site (www.blm.gov/VRM/index.html). Accessed April 2005.
- U.S.D.O.T., Federal Highway Administration, Office of Environmental Policy. (1981). *Visual Impact Assessment for Highway Projects*. U. S. Department of Transportation Washington D. C.

APPENDIX 1

VISIBILITY ANALYSIS FOR ALTERNATIVE ALIGNMENTS AND SITE SELECTIONS

The Zone of Visual Influence (ZVI) can be determined through a method called visibility/viewshed mapping. This is utilised to establish a first order impression of a project's extent of visibility. Visibility/viewshed analysis assists the Visual Specialist in identifying sensitive observers that may be affected by a proposed project. It is a GIS procedure which incorporates topographical features and the screening it provides from a particular point in the landscape. The study area is limited to a distance of 5 km beyond which the sources of visual impact is considered negligible and thus omissible

The visibility of an object in the landscape is influenced by a combination of factors. Apart from physical objects that occur in the line of sight between the observer and an object, empirical research indicates that the visibility of an object also decreases as the distance between the observer and the object increases. The ability to perceive detail is dependent on several aspects of which distance from an object and contrast between the object and its surroundings, is considered most influential[1].

Hull & Bishop's (1988) research concluded that the maximum visual impact occurs within a radius of 1 km from the power line pole/tower. Beyond this distance the impact decreases considerably up to a point where it is virtually insignificant and where the distance factor plays a considerable role in reducing visibility. The visibility maps indicate 1 km buffer zones of which the impact in the first kilometre is referred to as the Zone of Maximum Visual Exposure (ZMVE).

CONCLUSION

The visibility analyses show that the (ZMVE) overlaps populated areas and major transport routes which can be classified as sensitive viewpoints. Sensitive viewpoints are areas where a high viewer incidence is present, i.e. areas with a high concentration of viewers such as settlements and high traffic volume routes. Such sensitive viewpoints have been identified as:

- Western extension of Glen Ridge (Section B & C);
- West Rand Garden A.H. (Section D, E, F – G);
- N12 Highway (Section K – M);
- Lenasia (Section H1 – H8); and
- Soweto (Midway between section W and X up to G1).

[1] To explain this concept the following example can be used: A black object displayed against a white background from a particular distance will be much more visible than a red object displayed against a maroon background at the same distance. This is because the contrast in colour between a black object and white background is greater and therefore easily distinguished. The same principle applies for texture and form.

Figure 5: Visibility Analysis – Proposed Alignment

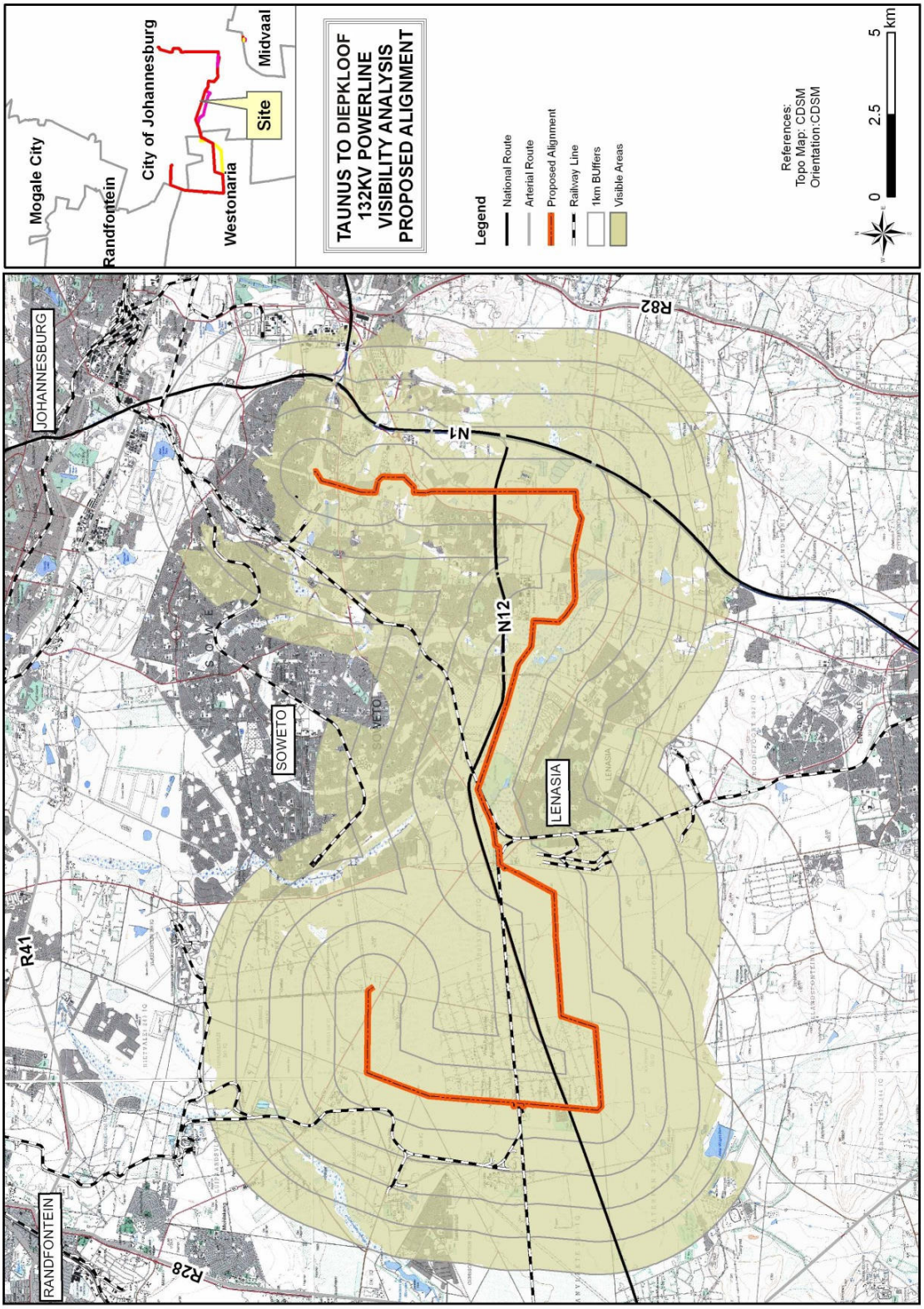


Figure 6: Visibility Analysis – Alternative 1

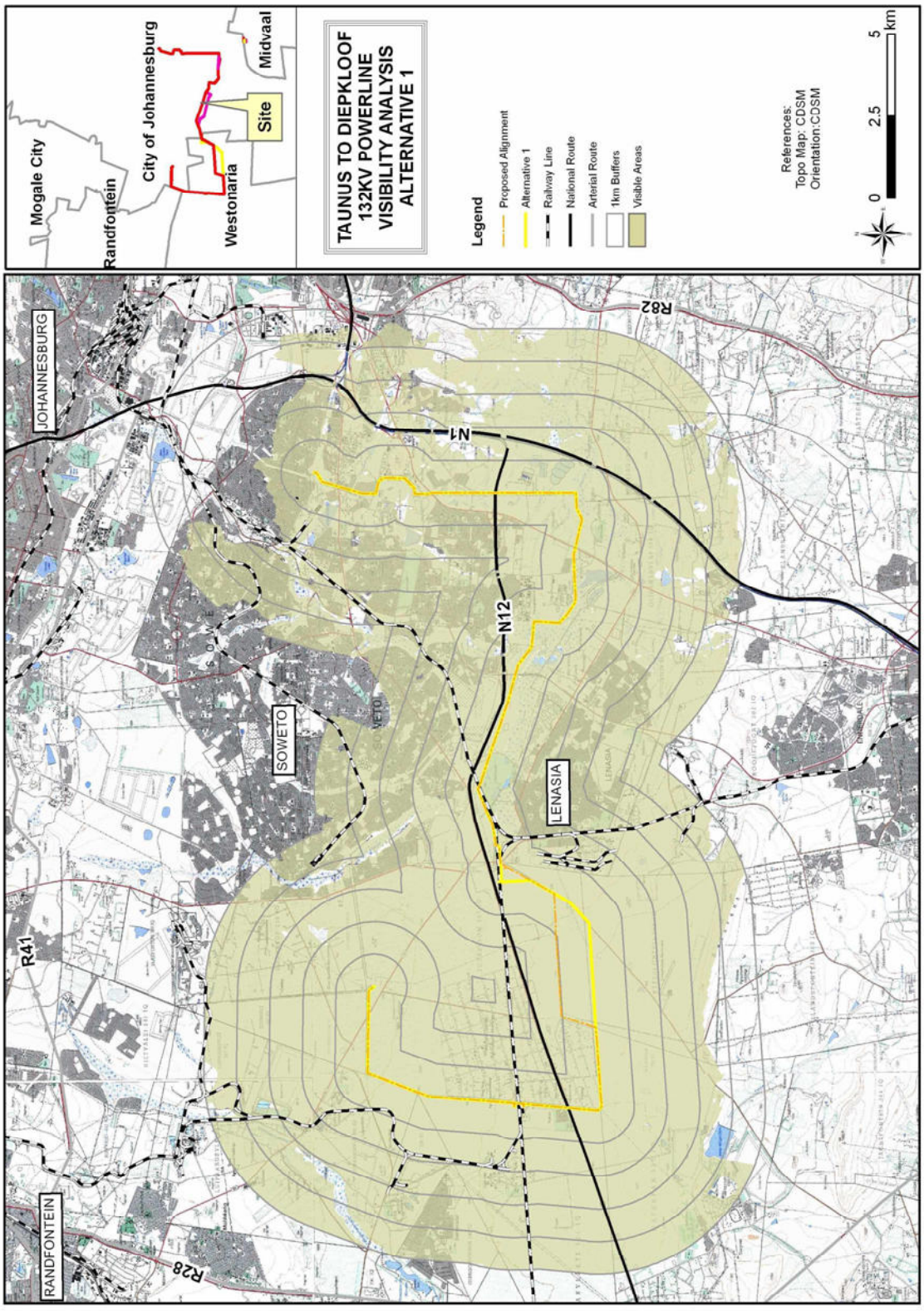


Figure 7: Visibility Analysis – Alternative 2

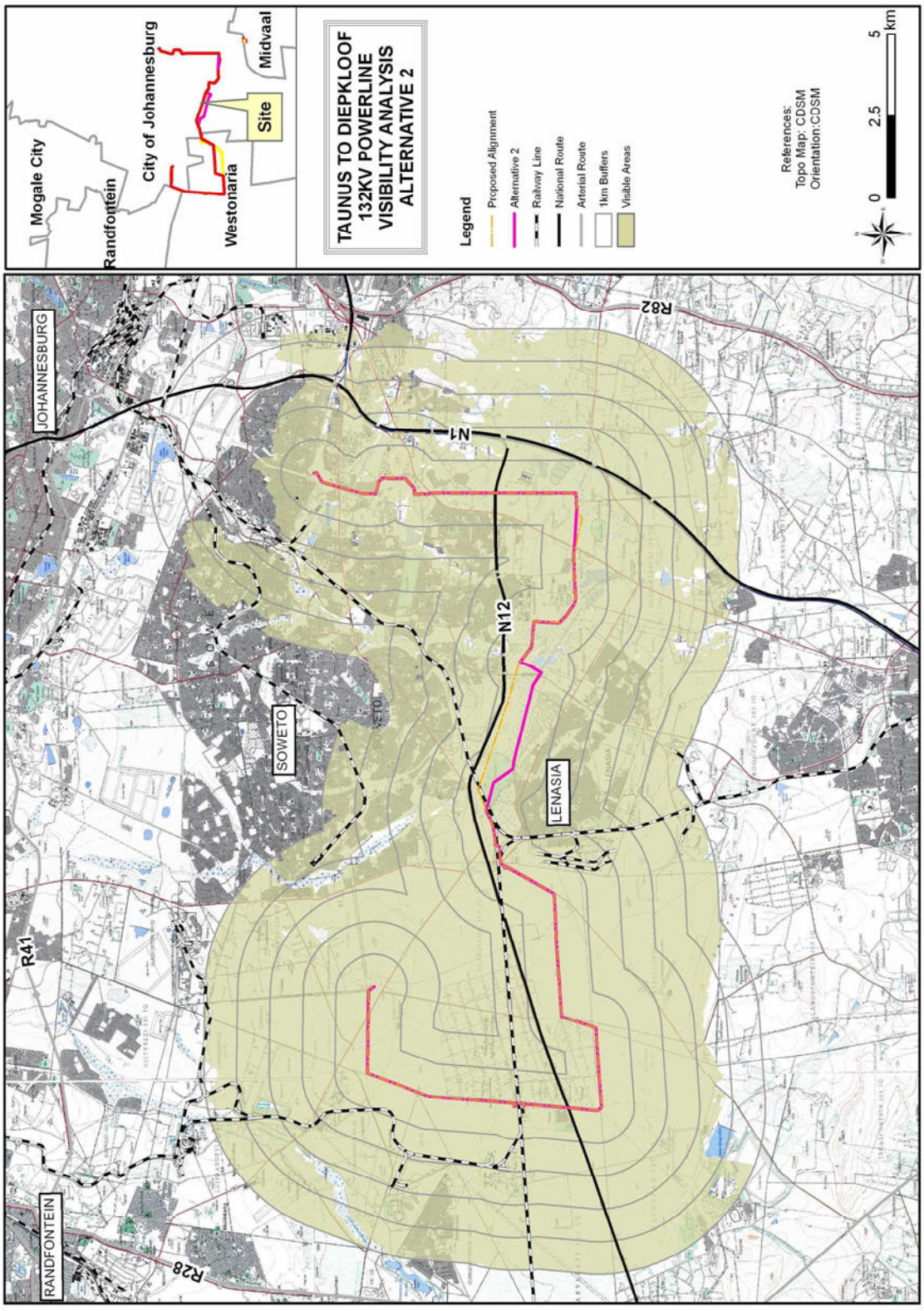


Figure 8: Visibility Analysis – Substation 1

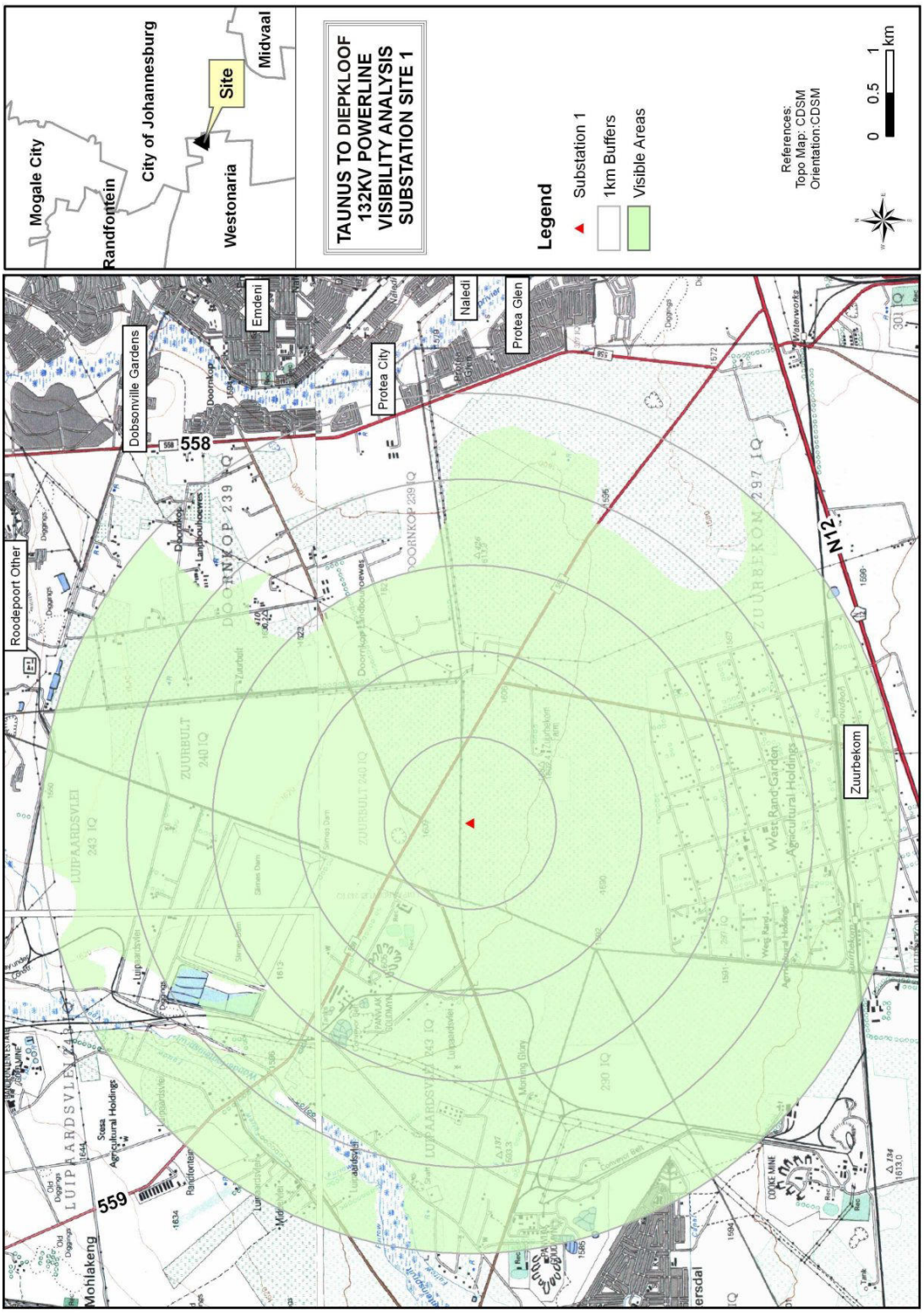


Figure 9: Visibility Analysis – Substation 2 Site 1

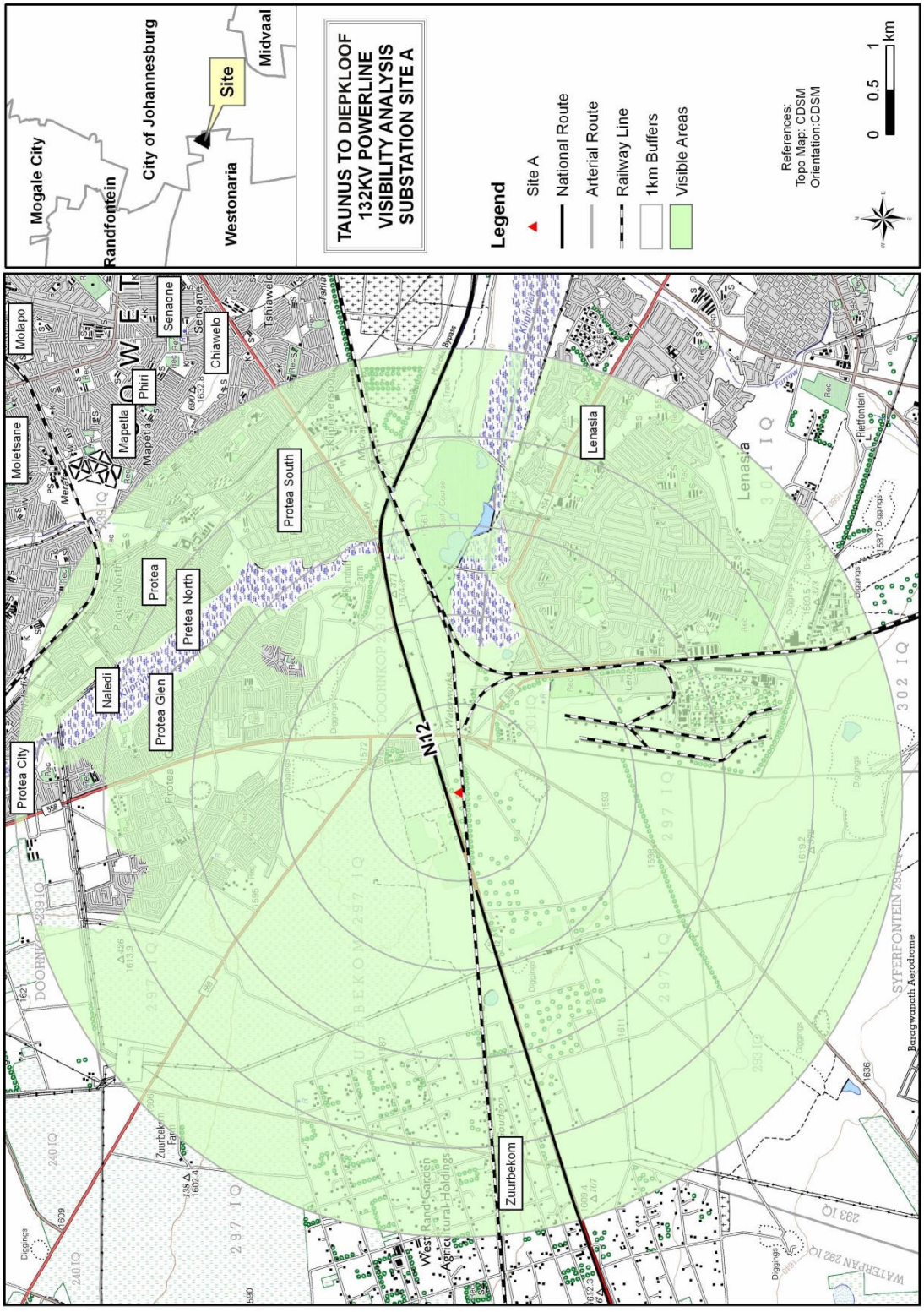
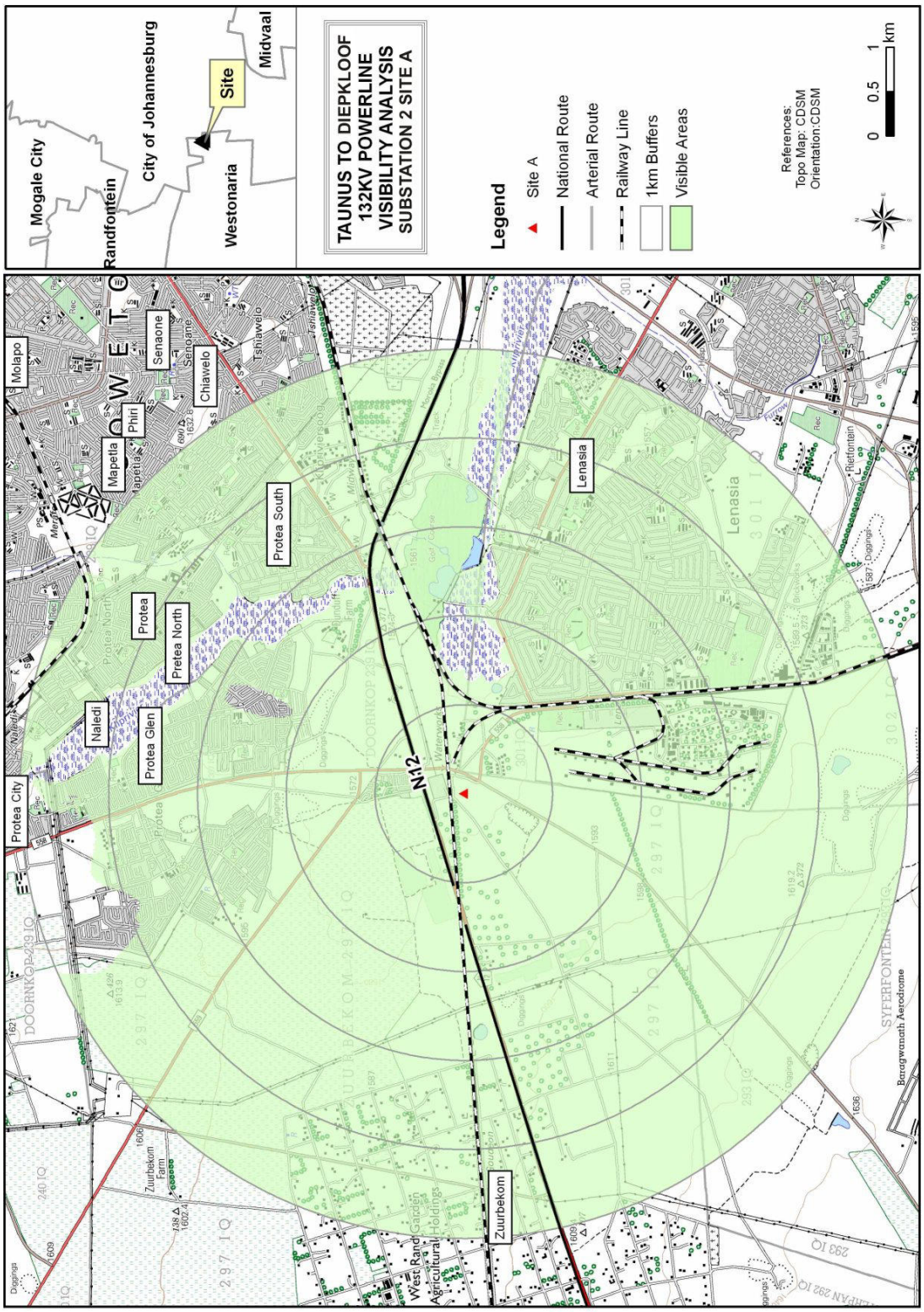


Figure 10: Visibility Analysis – Substation 2 Site 2



APPENDIX 2

Ten locations have been selected as sensitive viewpoints in the study area. Although these are not the only sensitive viewpoints they are considered to represent the study area and the views that can be experienced in the study area. On each panoramic photograph certain dominant landscape features are indicated to provide the reader with some reference points.

V01: Viewpoint 1 is taken from the Taunus Substation in a westerly direction. The exiting power line in view is parallel to the proposed servitude. The location of the proposed substation 1 is approximately halfway between point B and C and is just out of sight on this photograph. It is behind the line of trees that are visible on the opposite side of the R559.
V02: Viewpoint 2 is taken on the bend at point C. The proposed servitude deviates from the direction of the existing power line in a southern direction towards West Rand Garden A.H. Note the typical Highveld landscape character over the plain towards Gatsrant.
V03: Viewpoint 3 is taken along the servitude at Section D – E. Nufcor is on the left behind the lane of trees and West Rand Garden A.H. is on the right.
V04: Viewpoint 4 is taken on the eastern edge of West Rand Garden A.H. and portrays the character of the landscape adjacent the urban edge.
V05 & V06: Viewpoint 5 & 6 are representative of the two alternative sites for Substation 2.
V07: Viewpoint 7 is taken from the Nancefield Sewage Disposal Works across the Klip River wetland system.
V08: Viewpoint 8 shows the topographical variation that is present in the eastern part of the study area and is also representative of the type of development in this region.
V09: Viewpoint 9 is taken from the Diepkloof Substation in the direction of the incoming power line.
V10: Viewpoint 10 is indicative of the typical unauthorised dumping that takes place in open space corridors in Soweto.

Figure 11: Location of Viewpoints

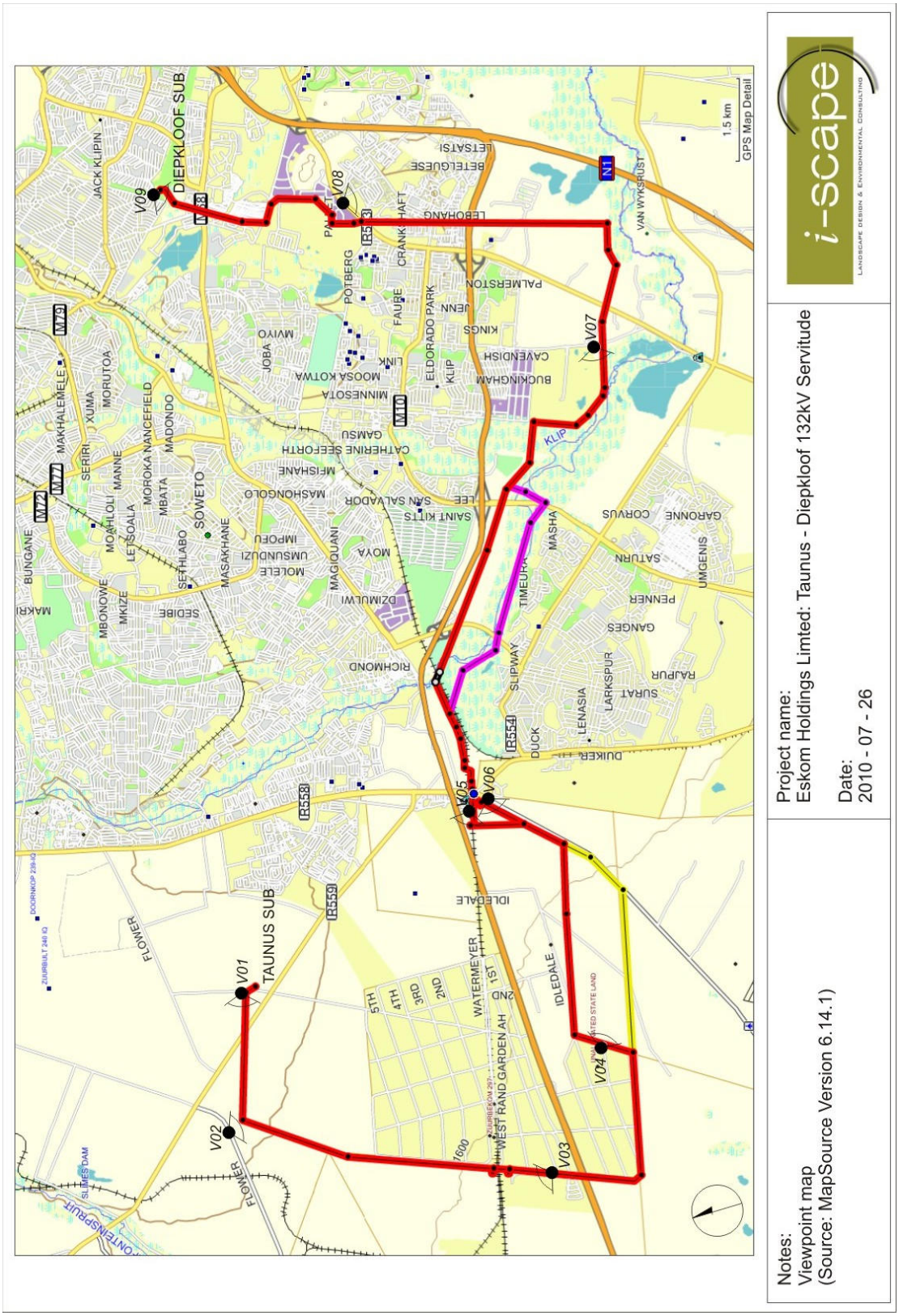


Figure 12: Viewpoints 1&2

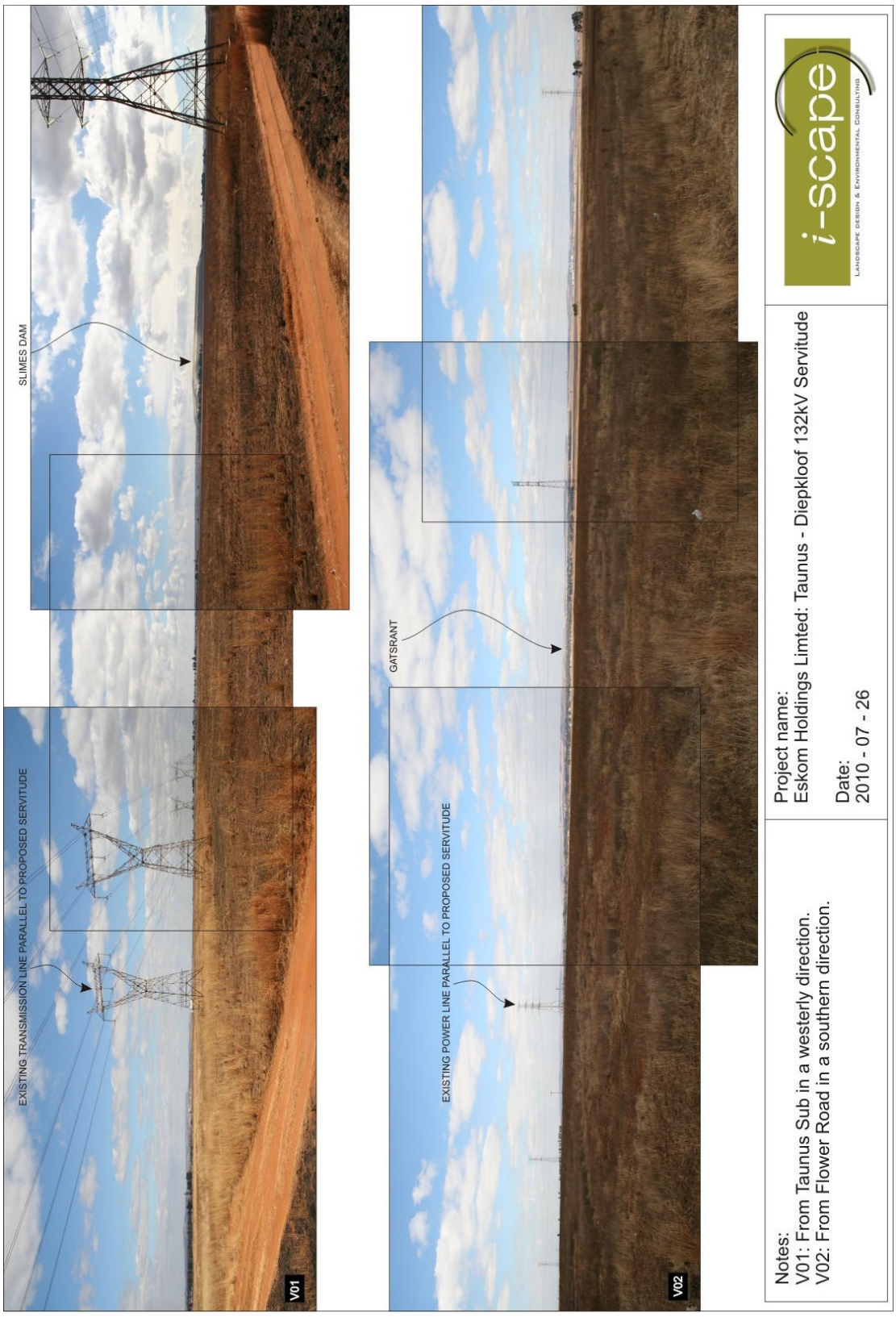


Figure 13: Viewpoints 3&4

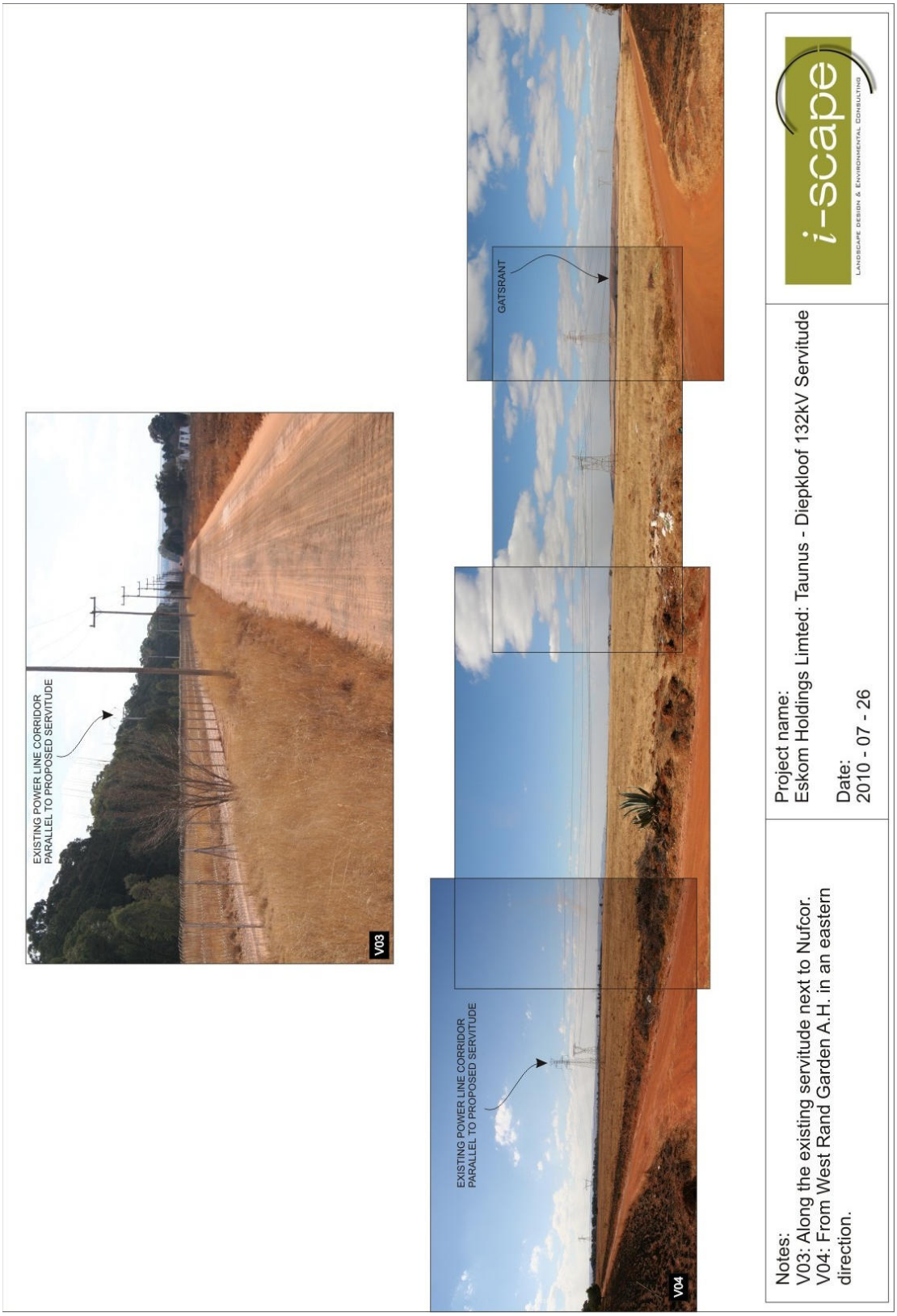


Figure 14: Viewpoints 5&6

Figure 15: Viewpoint 7&8

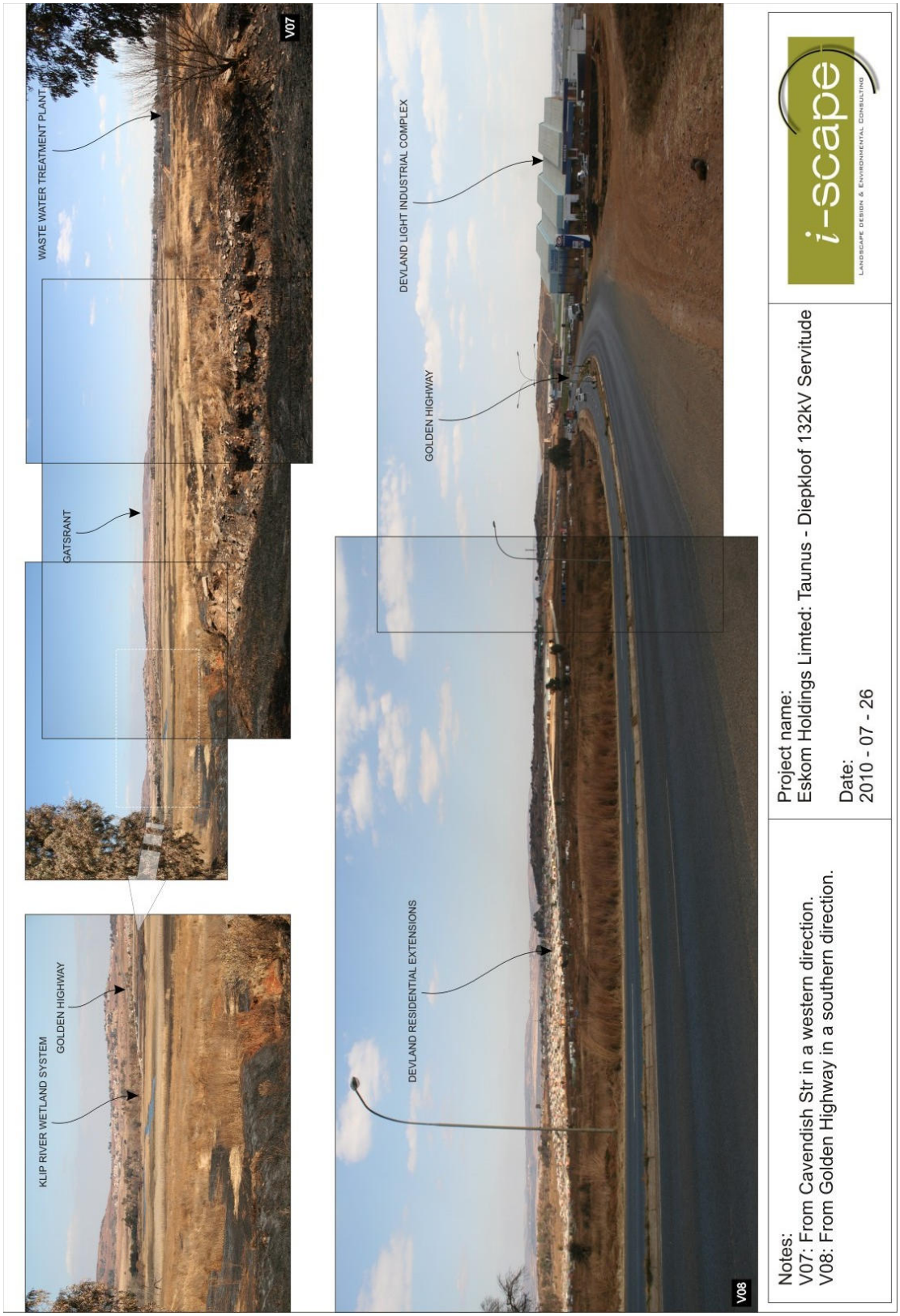
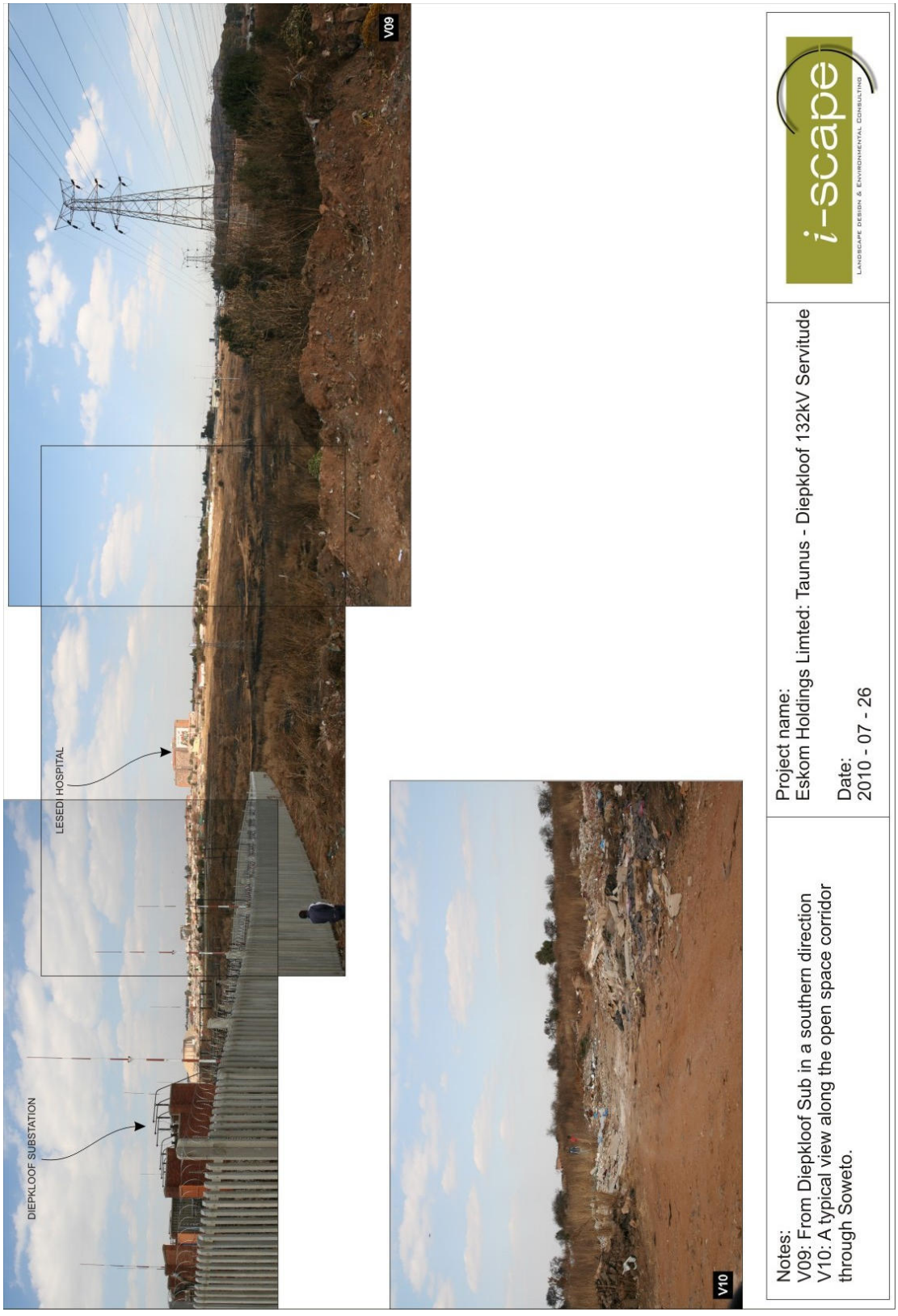


Figure 16: Viewpoint 9&10



APPENDIX 3

IMPACT ASSESSMENT CRITERIA

Various criteria are defined in the Environmental Impact Assessment Regulations (DEAT, 1998) which are adopted for the assessment of the visual impacts on the observers in the study area. The interpretation of these criteria is described as follows:

- **Nature of impacts:** An appraisal of the visual effect the activity would have on the receiving environment. This description should include the sensitivity of the receptors that are affected, and the manner in which they are affected, (both positive and negative effects).
- **Extent of impacts:** The spatial or geographic area of influence of the visual impact, i.e:
  - Site-related: extending only as far as the activity;
  - Local: limited to the immediate surroundings;
  - Regional: affecting a larger metropolitan or regional area;
  - National: affecting large parts of the country;
  - International: affecting areas across international boundaries.
- **Duration of impacts:** The predicted life-span of the visual impact:
  - Short term, (e.g. duration of the construction phase);
  - Medium term, (e.g. duration for screening vegetation to mature);
  - Long term, (e.g. lifespan of the project);
  - Permanent, where time will not mitigate the visual impact.
- **Intensity of impacts:** The magnitude of the impact on views, and character of the visual resources.
  - Low, where the character of visual resources or views of the visual resource are not affected;
  - Medium, where the character of visual resources or views of the visual resource are affected to a limited extent;
  - High, where the character of visual resources or views of the visual resource are significantly affected.
- **Probability of impacts:** The degree of likelihood of the visual impact occurring:
  - Improbable, where the possibility of the impact occurring is very low;
  - Probable, where there is a distinct possibility that the impact will occur;
  - Highly probable, where it is most likely that the impact will occur; or
  - Definite, where the impact will occur regardless of any prevention measures.
- **Determination of significance of impacts:** The significance of impacts can be determined through a synthesis of the aspects produced in terms of their nature, duration, intensity, extent and probability, and are described as:
  - Low, where it will not have an influence on the decision;
  - Medium, where it should have an influence on the decision unless it is mitigated; or
  - High, where it would influence the decision regardless of any possible mitigation. (Oberholzer, 2005)