

Visual Impact Assessment:

Construction of the 2 x 132kV power lines from the existing Lesideng substation with the new Nkwe substation

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EXECUTIVE SUMMARY

The aim of this report is to give a background on the visual impacts associated with the proposed new construction of the 2 x 132kV power lines from the existing Lesideng substation with the new Nkwe substation. The potential impacts are related to the physical presence of the structures and the related impacts to residence, tourists and people passing through the area.

The brief for the project supplied by Enpro Industries was:

Project consists of:

- Construction of two \pm 22 km of 132kV Kingbird power lines from the Lesideng MTS station to the new Nkwe substation.
- An access road to the substation of \pm 720m.
- Construction of the proposed Nkwe 132kV substation 100m x 100m on the farm Maandagshoek 254 KT (area applied for is 200m x 200m to accommodate construction material etc.).
- A 46m communication tower within Nkwe substation.

During the field survey, the possible visual impact from the power lines and substation were investigated. The important aspect used during the study, was to determine areas where the proposed power line will have visual impacts. Each of the problem areas were photographed and will be assessed in the report. The process followed included:

- The site visit aimed to record the receiving environment,
- During the desk top study and site visit the physical characteristics of the project were described,
- General landscape characterisation was recorded and this was done by focussing on the landscape and the nature of the environment,
- The potential views or visual receptors were mapped according to specialist's studies (refer to Social Report) and the I&AP comments on the visual impacts. Concerns were related to the safety when working under the power lines, the impact of the power line on the visual cues from various perspectives and the impact of the power line on livestock.

- From these aspects the significance of the visual impact for each component of the project was determined and then some mitigation and management options are listed.

The primary visual concern of the Nkwe power line project is of the potential impact from a physical presence of the power lines and associated impacts on views to residents, tourists and people passing through the study area. The main aim of the study is to ensure that the visual consequences of the proposed power lines are understood and adequately considered during the environmental planning process.

The construction of the two new 132kV power lines between the new Nkwe substation and the Lesideng substation

One can conclude that the existing visual impacts along the proposed corridors for the new power lines will be varied. The current visual impacts are low to high, with the current infrastructure lowering the visual experience for travellers and local residents. Because of the extensive mining activities, agricultural activities, erosion, power lines, telephone lines, roads and buildings some areas are considered to be of high development and the new power lines will have a low to minimal visual impact (added to existing impacts). Other areas have moderate development and the visual modification due to the power line will be moderate to high.

Conclusions

The primary visual concern of the Nkwe project is the potential impact from a physical presence of the power lines and associated impacts on views to residents and people passing through the study area. The main aim of the study is to ensure that the visual consequences of the proposed power lines are understood and adequately considered during the environmental planning process.

- The route follows a corridor through the landscape with varying activities and associated impacts and visual modifications.
- Alternative 1 can be considered as the preferred option, compared to Alternative 2. Alternative 1 passes further from settlements and will have a lower impact when passing through the settlements, while the second route cut through a number of residential areas with very narrow corridors present.

- A high visual impact for the landowners will be in the area where the corridor passes near the different settlements.

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The Environmental Impact Assessment Regulations (Regulation 17 of Government Notice No R354 of 2010), requires that certain information is included in specialist reports. The terms of reference, purpose of the report, methodologies, assumptions and limitations, impact assessment and mitigation (where relevant to the scope of work) and summaries of consultations (where applicable) are included within the main report. Other relevant information is set out below:

Expertise of author:

- Working in the field of ecology since 1996 and in specific vegetation related assessments since 2000.
- Worked in the field of freshwater ecology and wetlands since 2000.
- Involved with visual assessments since 2009.
- Is registered as a Professional Natural Scientist with the South African Council for Natural Scientific Professions (Reg. No. 400109/95).

Declaration of independence:

BioAssets in an independent consultant and hereby declare that it does not have any financial or other vested interest in the undertaking of the proposed activity, other than remuneration for the work performed in terms of the National Environmental Management Act, 1998 (Act 107 of 1998). In addition, remuneration for services provided by BioAssets is not subjected to or based on approval of the proposed project by the relevant authorities responsible for authorising this proposed project.

Disclosure:

BioAssets undertake to disclose, to the competent authority, any material information that has or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the National Environmental Management Act, 1998 (Act 107 of 1998) and will provide the competent authority with access to all information at its disposal regarding the application, whether such information is favourable to the applicant or not.

Based on information provided to BioAssets by the client, and in addition to information obtained during the course of this study, BioAssets present the results and conclusion within the associated document to the best of the author's professional judgement and in accordance with best practise.



17 June 2015

Dr Wynand Vlok

Date

Pr. Sci. Nat 400109/95

INTRODUCTION

The aim of this report is to give a background on the visual impacts associated with the proposed two new 132kV power lines between the new Nkwe substation and the Lesideng substation. The potential impacts are related to the physical presence of the structures and the related impacts to residence, tourists and people passing through the area.

The brief for the project supplied by Enpro Industries was:

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- The site visit aimed to record the receiving environment,
- During the desk top study and site visit the physical characteristics of the project were described,
- General landscape characterisation was recorded and this was done by focussing on the landscape and the nature of the environment,
- The potential views or visual receptors were mapped according to specialist's studies (refer to Social Report) and the I&AP comments on the visual impacts. Concerns were related to the safety when working under the power lines, the impact of the power line on the visual cues from various perspectives and the impact of the power line on livestock and game.

- From these aspects the significance of the visual impact for each component of the project was determined and then some mitigation and management options are listed.

When one assess the study area, it is clear that various impacts are currently present and it will have an influence on the visual impact assessment. The study area is in some cases highly developed and many activities contribute to have a negative impact on the area. These include farming activities (e.g. cultivation and grazing), a number of existing power lines, small businesses, mining, roads and a large number of residential areas.

For this study it is possible to look at the visual resource associated with the environment and study area and it can be rated as follows:

- High – the majority of the study area is devoid of infrastructure elements
- Moderate – area shows some development, erosion, alterations or degradation
- Low – the area is severely modified or altered, erosion is prevailing and there is little scope for positive enhancement of the area.

One can further rate the impact using the following exposure ratings (Table 1).

Table 1: Visual exposure ratings

	High exposure	Moderate exposure	Low exposure	Insignificant exposure
Surrounding farms	0-1.5km	1.5-3km	3-10km	More than 10km
Tourists	0-1.5km	1.5-3km	3-10km	More than 10km
Motorists	0-1.5km	1.5-3km	3-10km	More than 10km

The following are indicators that could suggest the need for visual input based on the nature of the receiving environment and the nature of the project and includes:

- Areas with protection status, such as national parks or nature reserves;
- Areas with proclaimed heritage sites or scenic routes;
- Areas with intact wilderness qualities, or pristine ecosystems;
- Areas with intact or outstanding rural or townscape qualities;
- Areas with a recognized special character or sense of place;
- Areas lying outside a defined urban edge line;

- Areas with sites of cultural or religious significance;
- Areas of important tourism or recreation value;
- Areas with important vistas or scenic corridors;
- Areas with visually prominent ridgelines or skylines.

Table 2: Categorisation of issues to be addressed by the visual assessment

Type of environment	Type of development - Low to high intensity				
	Category 1 development	Category 2 development	Category 3 development	Category 4 development	Category 5 development
Protected/wild areas of international, national, or regional significance	Moderate visual impact expected	High visual impact expected	High visual impact expected	Very high visual impact expected	Very high visual impact expected
Areas or routes of high scenic, cultural, historical significance	Minimal visual impact expected	Moderate visual impact expected	High visual impact expected	High visual impact expected	Very high visual impact expected
Areas or routes of medium scenic, cultural or historical significance	Little or no visual impact expected	Minimal visual impact expected	Moderate visual impact expected	High visual impact expected	High visual impact expected
Areas or routes of low scenic, cultural, historical significance / disturbed	Little or no visual impact expected. Possible benefits	Little or no visual impact expected	Minimal visual impact expected	Moderate visual impact expected	High visual impact expected
Disturbed or degraded sites / run-down urban areas / wasteland	Little or no visual impact expected. Possible benefits	Little or no visual impact expected. Possible benefits	Little or no visual impact expected	Minimal visual impact expected	Moderate visual impact expected

The key to the categories of development are the following:

- Category 1 development: e.g. nature reserves, nature-related recreation, camping, picnicking, trails and minimal visitor facilities.
- Category 2 development: e.g. low-key recreation, resorts or residential type development, small-scale agriculture or nurseries, narrow roads and small-scale infrastructure.
- Category 3 development: e.g. low density resort and residential type development, golf or polo estates, low to medium-scale infrastructure.
- Category 4 development: e.g. medium density residential development, sports facilities, small-scale commercial facilities and office parks, one-stop petrol stations, light industry, medium-scale infrastructure.
- Category 5 development: e.g. high density township and residential development, retail and office complexes, industrial facilities, refineries, treatment plants, power stations, wind energy farms, power lines, freeways,

toll roads, large-scale infrastructure generally. Large-scale development of agricultural land and commercial tree plantations, quarrying and mining activities with related processing plants.

Explanation of terms used above is:

- Low-key development – generally small-scale, single-storey domestic structures, usually with more than 75% of the area retained as natural (undisturbed) open space.
- Low density development¹ - generally single or double-storey domestic structures, usually with more than 50% of the area retained as natural (undisturbed) open space.
- Medium density development - generally 1 to 3 storey structures, including cluster development, usually with more than 25% of the area retained as green open space.
- High density development - generally multi-storey structures, or low-rise high density residential development.

The following key to the categories of issues is used:

- Very high visual impact expected:
 - Potentially significant effect on wilderness quality or scenic resources;
 - Fundamental change in the visual character of the area;
 - Establishes a major precedent for development in the area.
- High visual impact expected:
 - Potential intrusion on protected landscapes or scenic resources;
 - Noticeable change in visual character of the area;
 - Establishes a new precedent for development in the area.
- Moderate visual impact expected:
 - Potentially some effect on protected landscapes or scenic resources;
 - Some change in the visual character of the area;
 - Introduces new development or adds to existing development in the area.
- Minimal visual impact expected:
 - Potentially low level of intrusion on landscapes or scenic resources;
 - Limited change in the visual character of the area;

- Low-key development, similar in nature to existing development.
- Little or no visual impact expected:
 - Potentially little influence on scenic resources or visual character of the area;
 - Generally compatible with existing development in the area;
 - Possible scope for enhancement of the area.

In this section the following terms refer as follows:

- Fundamental change – dominates the view frame and experience of the receptor;
- Noticeable change – clearly visible within the view frame and experience of the receptor;
- Some change – recognisable feature within the view frame and experience of the receptor;
- Limited change – not particularly noticeable within the view frame and experience of the receptor;
- Generally compatible – Practically not visible, or blends in with the surroundings.

METHODOLOGY

The route for the power line was assessed and all possible areas of impact were photographed. Current visual impacts and other positive natural features were assessed as part of the survey.

The corridor was mapped and aerial photographs and maps were studied during the desktop assessment to identify landscape features. The inputs from the meetings with stakeholders were used to identify additional areas of concern and the survey was then planned to include all these areas.

When carrying out an assessment of likely effects on a landscape resource and on visual amenity it is important to remember this is a complex issue simply because it is determined through a combination of quantitative and qualitative evaluations. When assessing the visual impact in an area, it is important to take the worst-case scenario into account, as this is how all participants (local inhabitants) experience the possible development. Landscape and visual assessments are separate, although linked, procedures.

The landscape, its analysis and the assessment of impacts on the landscape all contribute to the baseline for visual impact assessment studies. The assessment of the potential impact on the landscape is carried out as an impact on an environmental resource, i.e. the physical landscape. Visual impacts, on the other hand, are assessed as one of the interrelated effects on people (i.e. the viewers and the impact of an introduced object into a particular view or scene).

- The Visual Resource

Landscape character, landscape quality (Warnock and Brown, 1998) and “sense of place” (Lynch, 1992) are used to evaluate the visual resource i.e. the receiving environment. A qualitative evaluation of the landscape is essentially a subjective matter. In this study the aesthetic evaluation of the study area is determined by the professional opinion of the author based on site observations and the results of contemporary research in perceptual psychology.

- Landscape Impact

The landscape impact of a new development is measured as the change to the fabric, character and quality of the landscape caused by the physical presence of the new development. Identifying and describing the nature and intensity of change in the landscape brought about by the proposed new landfill is based on the professional opinion of the author supported by photographic simulations. It is imperative to depict the change to the landscape in as realistic a manner as possible. To do this, photographic panoramas were taken from key viewpoints and altered using computer simulation techniques to illustrate the physical nature of the proposed landfill in its final form within the context of the landscape setting. The resultant change to the landscape can then be observed and an assessment of visual intrusion made.

- Visual Impact

Visual impacts are a subset of landscape impacts. Visual impacts relate to the changes that arise in the composition of available views as a result of changes to the landscape, to people's responses to the changes, and to the overall effect with respect to visual amenity. Visual impact is therefore measured as the change to the existing visual environment (i.e. views) caused by the intervention and the extent to which that change compromises (negative impact) or enhances (positive impact) or maintains the visual quality of the scene as perceived by people visiting, working or living in the area. This approach reflects the layman's concerns, which normally are:

- Will I be able to see the new development?
- What will it look like?
- Will the development affect views in the area and if so how?

Landscape and visual impacts do not necessarily coincide. Landscape impacts can occur in the absence of visual impacts, for instance where a development is wholly screened from available public views, but nonetheless results in a loss of landscape elements and landscape character within a localized area (the site and its immediate surrounds).

- Intensity of Visual Impact

The intensity of visual impact is determined using visual intrusion, visibility and visual exposure criteria (Hull and Bishop, 1988), qualified by the sensitivity of viewers (visual receptors) towards the proposed development. The intensity of visual impact is therefore concerned with:

- The overall impact on the visual amenity, which can range from degradation through to enhancement;
- The direct impacts of the landfill upon views of the landscape through intrusion or obstruction;
- The reactions of viewers who may be affected by the activity.

- Significance of Visual Impact

The significance of impact was determined using a ranking scale, based on terminology from the Department of Environmental Affairs and Tourism's (DEAT, 1998) guideline document on EIA Regulations.

The following criteria are used:

- Occurrence, based on:
 - Probability of occurrence (how likely is it that the impact may occur?)
 - Duration of occurrence (how long may it last).
- Severity, based on:
 - Intensity of impact (will the impact be of High, Moderate or Low intensity?) and
 - Scale/extent of impact (will the impact affect the national, regional or local environment, or only that of the site?)

DISCUSSION

The discussion will focus on the two alternatives for the new proposed power lines from the Nkwe to Lesideng substations.

Existing land use

Land use currently includes the following: mining, settlements, agriculture activities, wood harvesting and other associated infrastructure. The agricultural activities are made up of cultivation and cattle grazing. The residential impacts are associated with the mining activities, agricultural activities, roads, power lines, telephone lines and cell phone towers, wood harvesting, erosion (severe in areas) and dumping of refuse. Mining is the most important activity having a visual impact in the area.

Tourism is not an important activity in the area and travelling to mostly by local residents and visitors to the mines. Some of the roads are tarred, but the majority of roads are not. A number of 400kv and 132kV power lines are present in the area. There are telephone lines present and recently the cell phone communications masts are dotting the landscape.

Landscape character

The landscape at the study site consists of the following components: drainage lines, undulating plains, rocky outcrops, mountains, cultivated lands, mining operations and residential developments.

Construction of the two 132kV Kingbird power lines from the new Nkwe to the Lesideng substation

Alternative 1

The first sector of the power lines from the new Nkwe substation is in an area of severe natural modification with the visual resource in a low state, as it is in a mining complex (Figure 1). The undulating landscape can screen the pylons, but the visual impact will be moderate to high for local residents near the substation. Existing impacts include development (residential, fences and existing power lines), small businesses and agriculture (grazing and cultivation) activities (Category 3 developments). The natural vegetation is in a poor condition.



Figure 1: View of the first part of the power lines – high visual impact to local residents.

Where the corridor swings to the north from the proposed new Nkwe substation to the Lesideng substation the natural landscape is modified and the corridor following the valley floor will mask the pylons. Yet, the settlements are in close proximity of the power line resulting in a moderate to high visual impact (Figure 2 – 5).



Figure 2: View of corridor following existing power line near Nkwe sub – visual impact moderate.

Figure 3: Near the settlements the visual impact will be high.



Figure 4: Some current impacts include severe erosion.



Figure 5: General view of the corridor near the new Nkwe substation.

North of the Nkwe substation sites, the corridor follows the existing power line. It is visible from both sides of the valley, but the undulating landscape and severe erosion gullies will mask the pylons from the settlements (low to moderate visual impact). The visual impact will be moderate to high for residents when tending to the cultivated fields near the corridor (Figure 6 - 9).

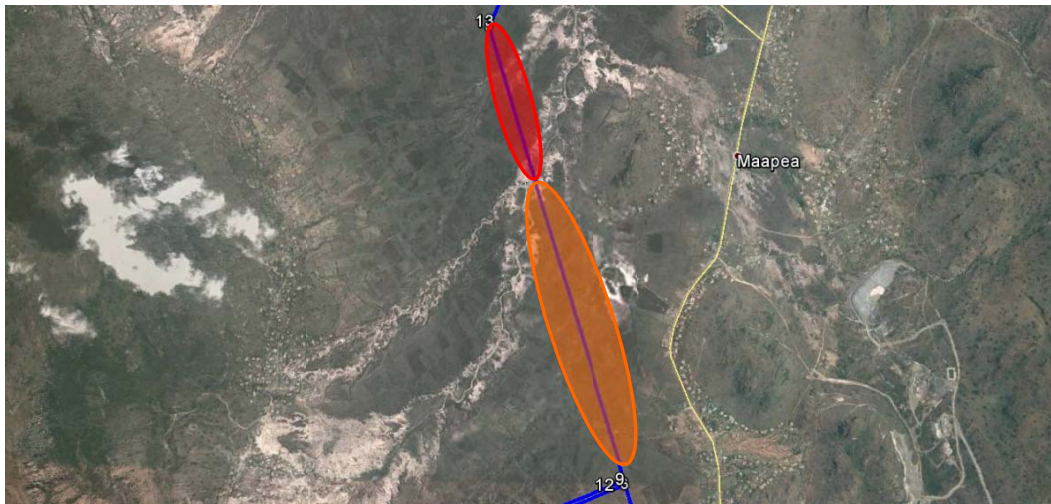


Figure 6: View of the corridor near Nkwe substation (red = high, orange = moderate and yellow = low visual impact).



Figure 7: Example of undulating terrain on the valley floor – screening of pylons lower visual impact.

Figure 8: Severe erosion a problem in the area.



Figure 9: General view of the corridor north of Nkwe substation.

Near Mokoropo and Galane the corridor crosses some streams and rivers in a severely modified state due to erosion (Figure 10). The visual impact from the settlements vary from moderate to high due to the current impacts (erosion and power line) and screening effect from small trees and the undulating nature of the landscape. Activities in this sector of the corridor include cultivation, grazing, wood harvesting and the infrastructure related to the settlements (Figure 11 – 15).

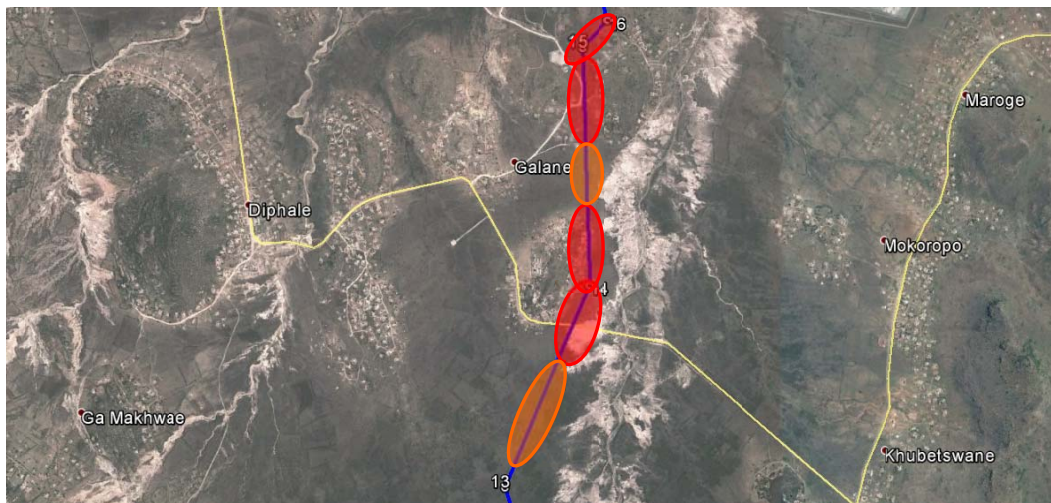


Figure 10: Corridor passes to the north of Klipfontein – high visual impact (red = high, orange = moderate and yellow = low visual impact).



Figure 11: View of the corridor following the existing power line.

Figure 12: Some of the current impacts along the sector – erosion and the power line.





Figure 13: Example of modified vegetation – low screening resulting in moderate to high visual impact from the settlements.

Figure 14: View of the corridor in grazing and cultivated area of the corridor.

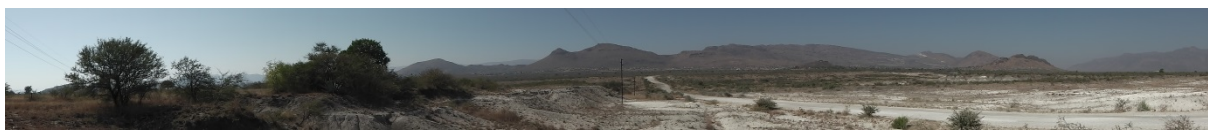


Figure 15: General view of the corridor.

North of Galane the corridor enters the mining complex at Bothashoek (Figure 16) and here the current impacts are high. Apart from the mining infrastructure and mine dump having a negative impact on the visual character, the modified vegetation contributes to the high visual impact rating.

In addition, the local communities in the settlements surrounding the mining complex graze cattle and gather wood for building material, cooking and heating and this all contribute to the high erosion impacts in the area (Figure 17 – 21).

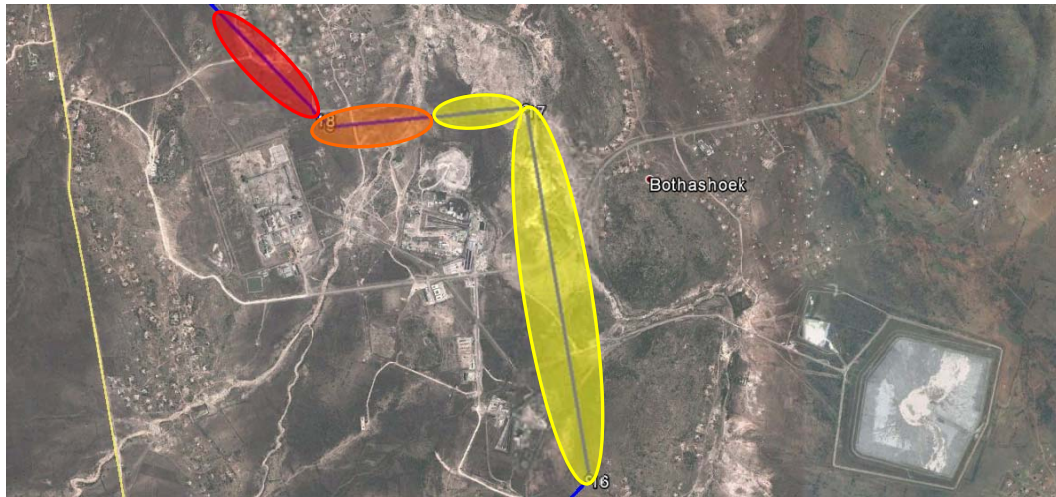


Figure 16: Corridor north of Galane near the mining complex.



Figure 17: General view of the corridor near Galane.



Figure 18: Corridor near the mining complex following the existing power line.

Figure 19: View of the mining area near Bothashoek.





Figure 20: Some of the current impacts in the sector.



Figure 21: General view of the corridor near the mining area.

As the corridor continues north, it passes the T-off with the proposed corridor for Alternative 2 (separate discussion in this report) to Melao (Figure 22). The impacts currently include the infrastructure development (settlements and roads), grazing, cultivation and wood harvesting (Figure 23 - 26). Apart from the modification of the natural vegetation, erosion is a serious consequence of the activities. The visual impact will vary between moderate (further from settlements) to high (near the residential areas).

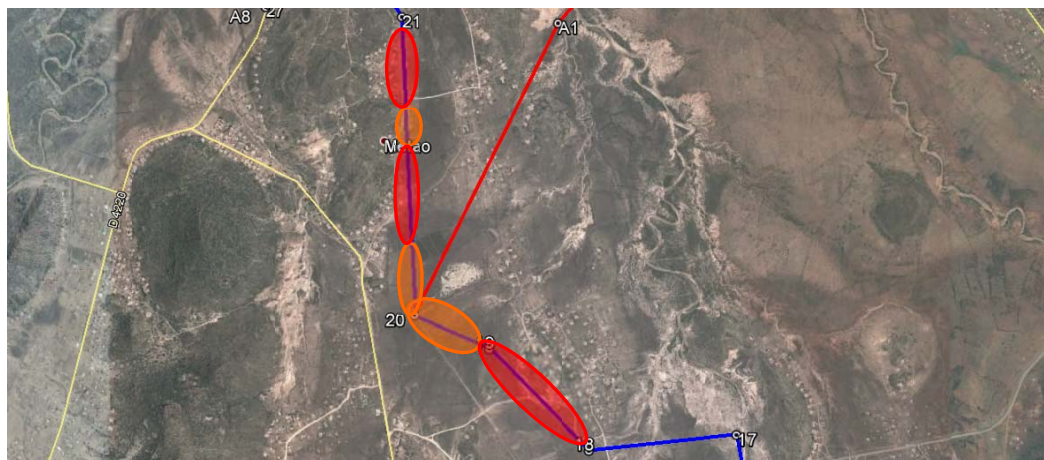


Figure 22: Some screening of the structures will be done by the trees, undulating landscape and distance from the settlements (red = high, orange = moderate and yellow = low visual impact).



Figure 23: Some of the areas near the corridor – visual impact will be high for the local community.

Figure 24: Impacts near villages high due to poor land use practices.



Figure 25: Impacts result in severe erosion to the landscape.



Figure 26: General view of corridor near mountain ridge.

As the corridor swings west towards the Lesideng substation, it crosses the low mountain area (Figure 27). Here the visual impact will be high due to the fact that the natural vegetation in the area is in fair condition and the pylons will further be visible against the horizon. As it passes through the village, it will have a high visual impact to the local inhabitants (Figure 28 – 31).



Figure 27: Corridor sector crossing the low mountain to the Lesideng substation.



Figure 28: View of settlement on the D4220, west of the low ridge.



Figure 29: View of the corridor crossing the D4220 – high visual impact.



Figure 30: Corridor following the existing power line west towards the Lesideng substation.



Figure 31: General view of the corridor west of the D4220.

The last sector of the corridor for Alternative 1 continues north to the Lesideng substation and the landscape is modified. The impacts include cultivation, grazing, wood harvesting and some infrastructure development (houses and minor roads) (Figure 32).

The visual impact from the roads and settlements will be low to moderate due to the distance (1 – 2km) from the power line. The impact will be high for local when they tend to the cultivated fields near the corridor (Figure 33 – 36).

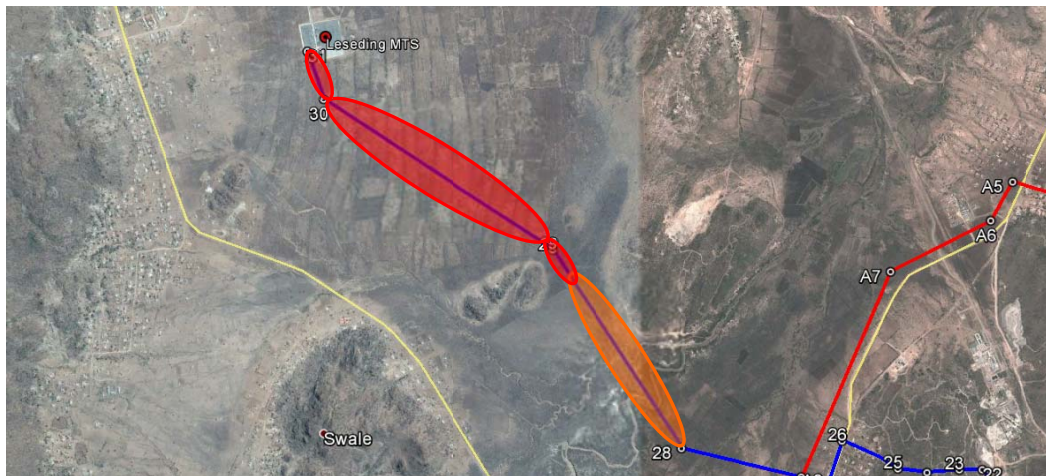


Figure 32: View of the final sector of the power line from Nkwe substation to the Lesideng substation (Alternative 1) (red = high, orange = moderate and yellow = low visual impact).



Figure 33: Higher visual impact near inhabited areas along the last sector.



Figure 34: Some erosion present due to poor land use practices – lower the visual aesthetics in the area.

Figure 35: Land clearing for new developments – low visual rating in the area due to severe changes to the landscape.



Figure 36: General view along the corridor near the Lesideng substation.

Alternative 2

The route for Alternative 2 is a short deviation to the east from Alternative 1. The corridor passes through a settlement (high visual impact) and then crosses the open areas east of the village (Figure 37). Here the visual impact will vary between moderate to high, depending on the distance from the settlements. In addition, the low trees and undulating landscape will further screen the pylons (Figure 38 – 41).

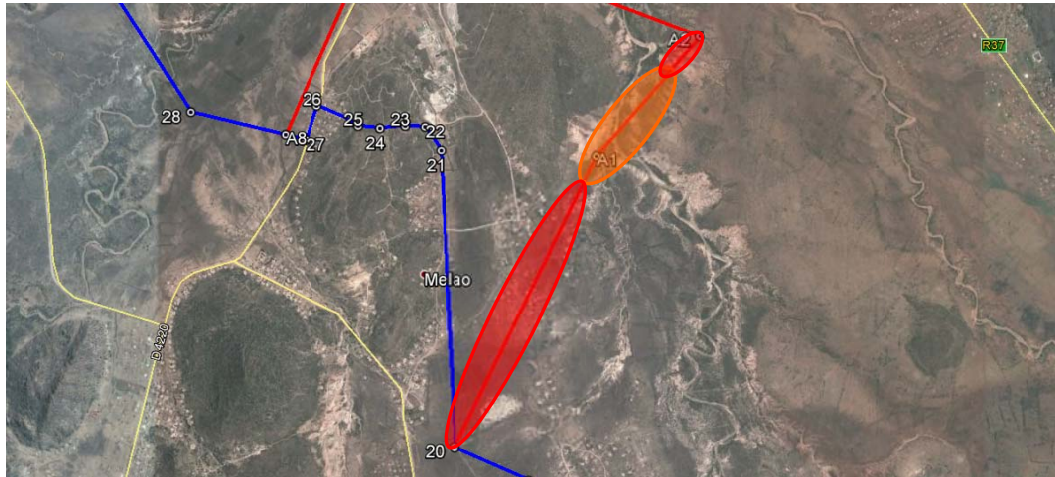


Figure 37: The first sector (Alternative 2) following a short deviation to the east of Alternative 1 (red = high, orange = moderate and yellow = low visual impact).



Figure 38: View of corridor near settlement.



Figure 39: General view of the corridor near the village.



Figure 40: View of some low trees that can screen the pylons – lower the visual impact.



Figure 41: In some areas, the distance from settlements will lower the visual risk to inhabitants.

The last sector for Alternative 2 will have a mixed visual impact, but it will be mostly high due to the exposed nature of the landscape with only limited trees and vegetation to screen the pylons (Figure 42). The current impacts along the corridor include mining, settlements, grazing and wood harvesting. Serious erosion gullies are present (Figure 43 – 46).

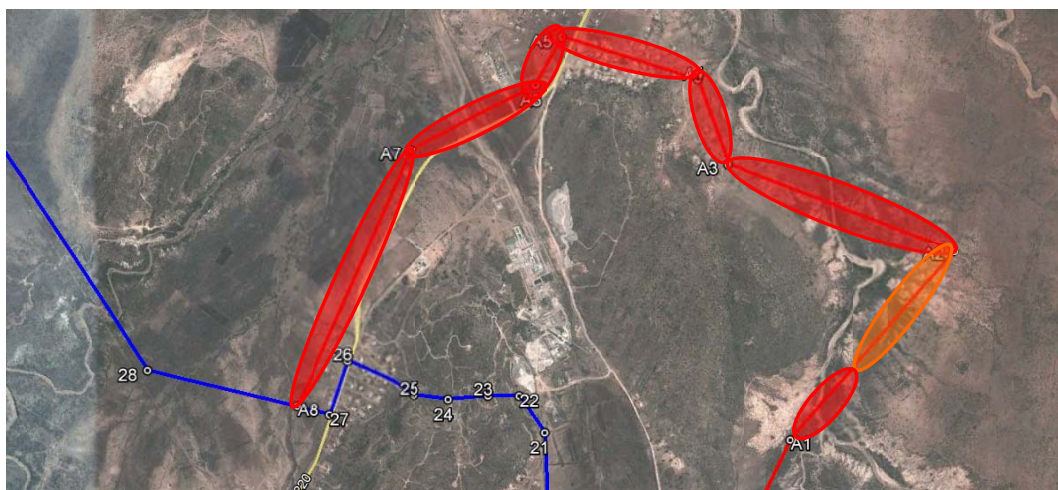


Figure 42: The last sector of Alternative 2 of the power line between the Nkwe and Lesideng substation.



Figure 43: Some poor land use practices lower the visual characteristics of the area.

Figure 44: Portions of the route is far from settlements and will have a moderate to low visual impact for the residents.



Figure 45: Near villages a higher visual impact will be incurred, but current impacts lower the visual attractions in the area.



Figure 46: General view along the last sector of the corridor.

CONCLUSIONS

The primary visual concern of the Nkwe project is the potential impact from a physical presence of the power line and associated impacts on views to residents and people passing through the study area. The main aim of the study is to ensure that the visual consequences of the proposed power lines are understood and adequately considered during the environmental planning process.

Construction of the 2 x 132kV Kingbird power lines from the new Nkwe substation to the Lesideng substation

Alternative 1

- The route follows a corridor through the landscape with varying activities and associated impacts and visual modifications.
- Alternative 1 is a possible option due to its proximity to the existing power line corridor and current visual impacts along the route.
- A high visual impact for the landowners will be in the area where the corridor passes near the different settlements and to areas of cultivation.

Alternative 2

- The route follows a corridor through the landscape with varying activities and associated impacts and visual modifications.
- Alternative 2 is a possible option, but its route through some settlements can be a problem.
- A high visual impact for the landowners will be in the area where the corridor passes near the different settlements.

From the study, it is clear that there are a variety of impacts and effects that contribute to the visual landscape. Because of the extensive mining activities, agricultural activities, erosion, power lines, telephone lines, roads and buildings some areas are considered to be of high development and the new power line will have a low to minimal visual impact (added to existing impacts). Other areas have moderate development and the visual modification due to the power line will be moderate to high. Alternative 1 can be considered as the preferred option, compared to Alternative 2. Alternative 1 passes further from settlements and will have a lower

impact when passing through the settlements, while the second route cut through a number of residential areas with very narrow corridors present.

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