# APPENDIX F: Landscape and Visual Impact Assessment for the proposed Kipeto Transmission Line Project, Kenya

*Prepared for:*

**Kipeto Energy Limited**

14 Riverside, Riverside Drive, Westlands

P. O. Box 8366 – 00200

Nairobi, Kenya

**August 2013**

**Compiled by:**

**Mr. Henry Holland – LVIA Specialist**

**Approved by:**

**Sanjay Gandhi – NEMA Lead Expert and ESIA Team Leader**

# 1 EXECUTIVE SUMMARY

Henry Holland of Mapthis Trust, was appointed by Kipeto Energy Limited to conduct a visual impact assessment as part of the EIA for the Kipeto-Isinya grid connection transmission line project near Kajiado, Kajiado County, Kenya.

The 220 kV transmission line will connect the Kipeto wind energy facility to the national grid at the Isinya substation near the town of Kajiado. Components of the operational transmission line that will potentially cause visual impact are towers/pylons, cables, access roads and wayleave/right of way zones. The towers are most likely to cause a visual impact due to their height and number.

## 1.1 DESCRIPTION OF RECEIVING ENVIRONMENT

The transmission line will pass through Maasai pastoral land which is mainly used for grazing. Vegetation cover is savannah grassland with scattered trees (of variable canopy density). The topography consists of the western highland above the Rift Valley (further west), and the low, open hills of the Athi-Kapiti plains.

Maasai homesteads are scattered throughout the region towards the western end of the transmission line, while the eastern end is more urbanised and is located between the relatively large towns of Isinya and Kajiado. The transmission line meets up with the 400 kV Mombasa-Nairobi transmission line at the still-to-be-constructed Isinya substation.

The A104 is a major transport route connecting Nairobi with Tanzania. It is also heavily used by tourists visiting the Amboseli game reserve. The proposed transmission line will cross this road between Isinya and Kajiado.

There are no officially recognised protected areas within 10 km of the transmission line route.

## 1.2 ASSESSMENT AND MITIGATION OF IMPACTS

### 1.2.1 Visibility

In terms of viewshed size the potential visibility of the transmission line is high. The viewshed is a theoretical tool and does not take into account the screening effect of vegetation, buildings and atmospheric conditions.

Visual receptors in the Rift Valley are unlikely to have any views of the transmission line.

### 1.2.2 Sensitive Viewers and Viewpoints

Visual receptors that may be affected include:

- Viewers and viewpoints in protected areas;
- Residents of Maasai communal land surrounding the development;
- Residents of surrounding villages/towns, and;
- Motorists (including tourists).

### 1.2.3 Visual Exposure and Intrusion

**Table 1: Table of Visual Impact Criteria**

| Sensitive Viewer | Criteria | Rating | Reasoning |
|---|---|---|---|
| Visual receptors in protected areas | Visual Sensitivity | High to Exceptional | Visual receptors (e.g. viewers and viewpoints) in protected areas are highly sensitive to changes in the landscape since they have an active interest in the surrounding landscape. |
| | Visual Exposure | Low | Recognised conservancies either outside the viewshed (should not have any views of the power line) or are more than 15 km from the proposed corridor. |
| | Visual Intrusion | Low | The Kitangela Game Conservation Area is located among urban and peri-urban structures and at more than 15 km from the development it is unlikely that visitors will notice the power line. |
| | Impact Intensity | Low | Highly sensitive visual receptors will experience low visual exposure to the development due to distance, and are unlikely to notice the power line. |
| Visual receptors on surrounding Maasai communal lands | Visual Sensitivity | High | Residents are normally seen as highly sensitive to developments and changes in their views. |
| | Visual Exposure | High | Visual exposure is high for a small number of residents and viewpoints in close proximity to the power line (< 1 km). |
| | Visual Intrusion | High | Visual receptors in close proximity to the power line (<1 km) will experience a noticeable change in their existing views. |
| | Impact Intensity | High | There are only a few highly sensitive visual receptors in the viewshed that will be highly exposed to the development but it is likely that the development seem incongruent with their existing views. |

| Sensitive Viewer | Criteria | Rating | Reasoning |
|---|---|---|---|
| Motorists | Visual Sensitivity | Low/High | Motorists will spend very little time in the region and they will focus only briefly on features in the landscape, although tourists using the A104 to access Amboseli from Nairobi will have an active interest in the landscape. |
| | Visual Exposure | High | The A104 passes through the proposed power line route. |
| | Visual Intrusion | Low | The section of A104 where motorists will be highly exposed to the power line is between two large towns and a power line will not appear out of place here. Particularly since there are existing 400 kV power line pylons in the same area. |
| | Impact Intensity | Low | The section of road between Kajiado and Isinya is not a tourist attraction and structures associated with urbanisation are common. |
| Residents of surrounding villages/towns | Visual Sensitivity | Low | Existing views of residents of these towns are complex containing highly contrasting elements and patterns. |
| | Visual Exposure | Low | Isinya and Kajiado are more than 5 km from the proposed power line route. |
| | Visual Intrusion | Low | A power line along the proposed route will not appear discordant in existing views of residents. |
| | Impact Intensity | Low | All criteria are rated low for residents of surrounding towns. |

## 1.3 SIGNIFICANCE OF VISUAL IMPACT ON VIEWERS

### 1.3.1 Construction Activity

The significance of the visual impact of construction activity is **medium** due to its large spatial extent (40 km) and high intensity. Mitigation measures, as discussed in the report, are unlikely to lower the significance but will contain the impact intensity.

### 1.3.2 Operational Phase

The significance of visual impact of the transmission line on highly sensitive visual receptors is **high** due to its high intensity (close proximity to receptors) and long duration. If the route can be designed to avoid homesteads within 1 km of the line then the intensity of the visual impact will be moderate to low and the significance of the impact will become medium.

## 1.4 CONCLUSIONS

There are a relatively small number of highly sensitive visual receptors living within 1 km of the proposed transmission line. The existing views of these residents will be highly affected by the tall towers (as a negative visual impact). Even though there are similar structures in the distance (communication towers) the proximity of the transmission line and structures will have a significant impact on their views. It is also unlikely that an alternative route will be found where homesteads within 1 km of the route can be avoided.

# TABLE OF CONTENTS

# INDEX OF TABLES



# INDEX OF FIGURES

List Of Abbreviations

| | |
|---|---|
| **AMSL** | Above mean sea level |
| **DEM** | Digital Elevation Model |
| **DTM** | Digital Terrain Model |
| **EIA** | Environmental Impact Assessment |
| **GIS** | Geographic Information System |
| **GLVIA** | Guideline for Involving Visual and Aesthetic Specialists in EIA Processes (UK, 2002) |
| **IDP** | Integrated Development Plan |
| **IUCN** | International Union for Conservation of Nature |
| **I&APs** | Interested and Affected Parties |
| **ToR** | Terms of Reference |
| **VIA** | Visual Impact Assessment |
| **WPDA** | World Database on Protected Areas |
| **ZTV** | Zone of Theoretical Visibility |
| **ZVI** | Zone of Visual Influence |

# GLOSSARY OF TERMS USED IN THE VISUAL ASSESSMENT

| | |
|---|---|
| **Cumulative viewshed** | A viewshed which indicates in some way how much of a development is visible from a particular viewpoint. In a raster based cumulative viewshed each pixel value will indicate how many points within the development area are visible. A power line development could, for example, use pylons as points to generate a cumulative viewshed for the development. Each pixel value in the viewshed will be a count (accumulation) of the number of pylons that will potentially be visible from that pixel. |
| **Digital Elevation Model (DEM)** | A digital or computer representation of the topography of an area. |
| **Landscape baseline** | A description of the existing elements, features, characteristics, character, quality and extent of the landscape (GLVIA, 2002). |
| **Landscape character** | The distinct and recognisable pattern of elements that occurs consistently in a particular type of landscape, and how this is perceived by people. It reflects particular combinations of geology, landform, soils, vegetation, land use and human settlement. It creates the particular sense of place of different areas of the landscape (GLVIA, 2002). |
| **Landscape character sensitivity** | This provides an indication of the ability of a landscape to absorb change from the proposed development without changing character. A pristine landscape prized for its natural beauty, or a landscape of high cultural value will have high sensitivity to changes brought about |

| | |
|---|---|
| | by new developments. |
| **Landscape impacts** | Change in the elements, characteristics, character and qualities of the landscape as the result of development (GLVIA, 2002). These effects can be positive or negative, and result from removal of existing landscape elements, addition of new elements, or the alteration of existing elements. |
| **Memorability** | The quality of being worth remembering; "continuous change results in lack of memorability"; "true memorability of phrase" |
| **Nature-based tourism** | Tourism that involves travelling to relatively undisturbed natural areas with the specific objective of studying, admiring and enjoying the scenery, fauna and flora, either directly or in conjunction with activities such as trekking, canoeing, mountain biking, hunting and fishing (Turpie et al. 2005) |
| **Principal representative viewpoints** | Principal representative viewpoints are identified during the visual baseline desk study and field survey. They should be representative of the visual amenity of the area and include walking public footpaths and visiting areas of open public access. A comprehensive photographic record of these points supports the visual impact assessment (GLVIA, 2002) |
| **Receptor** | An element or assemblage of elements that will be directly or indirectly affected by the proposed development. |
| **Sense of place** | That distinctive quality that makes a particular place memorable to the visitor, which can be interpreted in terms of the visual character of the landscape.<br><br>The unique quality or character of a place, whether natural, rural or urban. Relates to uniqueness, distinctiveness or strong identity (Oberholzer 2005). |
| **Viewer sensitivity** | The assessment of the receptivity of viewer groups to the visible landscape elements and visual character and their perception of visual quality and value. The sensitivity of viewer groups depends on their activity and awareness within the affected landscape, their preferences, preconceptions and their opinions. |
| **Viewshed** | A viewshed is an area of land, water, and other environmental elements that is visible from a fixed vantage point. In digital imaging, a viewshed is a binary raster indicating the visibility of a viewpoint for an area of interest. A pixel with a value of unity indicates that the viewpoint is visible from that pixel, while a value of zero indicates that the viewpoint is not visible from the pixel. |
| **Visibility of Project** | The geographic area from which the project will be visible, or view catchment area. (The actual zone of visual influence of the project may be smaller because of screening by existing trees and buildings). This also relates to the number of receptors affected (Oberholzer 2005) |
| **Visual absorption capacity (VAC)** | Visual Absorption Capacity signifies the ability of the landscape to accept additional human intervention without serious loss of character and visual quality or value. VAC is founded on the characteristics of the physical environment such as vegetative screening, diversity of colours and patterns and topographic |

| | |
|---|---|
| | variability. It also relates to the type of project in terms of its vertical and horizontal scale, colours and patterns. A high VAC rating implies a high ability to absorb visual impacts while a low VAC implies a low ability to absorb or conceal visual impacts. |
| **Visual amenity** | The value of a particular area or view in terms of what is seen. (GLVIA, 2002) |
| **Visual baseline** | A description of the extent and nature of existing views of the site from representative viewpoints, and the nature and characteristics of the visual amenity of the potentially sensitive visual receptors (GLVIA, 2002) |
| **Visual envelope** | The approximate extent within which the development can be seen. The extent is often limited to a distance from the development within which views of the development are expected to be of concern. |
| **Visual exposure** | Visual exposure refers to the relative visibility of a project or feature in the landscape (Oberholzer, 2005). Exposure and visual impact tend to diminish exponentially with distance. |
| **Visual impact** | Changes to the visual character of available views resulting from the development that include: obstruction of existing views; removal of screening elements thereby exposing viewers to unsightly views; the introduction of new elements into the viewshed experienced by visual receptors and intrusion of foreign elements into the viewshed of landscape features thereby detracting from the visual amenity of the area. |
| **Visual impact assessment** | A specialist study to determine the visual effects of a proposed development on the surrounding environment. The primary goal of this specialist study is to identify potential risk sources resulting from the project that may impact on the visual environment of the study area, and to assess their significance. These impacts include landscape impacts and visual impacts. |
| **Visual intrusion** | Visual intrusion indicates the level of compatibility or congruence of the project with the particular qualities of the area – its 'sense of place'. This is related to the idea of context and maintaining the integrity of the landscape (Oberholzer 2005). |
| **Visual quality** | An assessment of the aesthetic excellence of the visual resources of an area. This should not be confused with the value of these resources where an area of low visual quality may still be accorded a high value. Typical indicators used to assess visual quality are vividness, intactness and unity. For more descriptive assessments of visual quality attributes such as variety, coherence, uniqueness, harmony, and pattern can be referred to. |
| **Visual receptors** | Visual receptors include viewer groups such as the local community, residents, workers, the broader public and visitors to the area, as well as public or community areas from which the development is visible. |
| **Visual resource** | Visual resource is an encompassing term relating to the visible landscape and its recognisable elements which, through their coexistence, result in a particular landscape and visual character |
| **Zone of visual** | The extent of the area from which the most elevated structures of the |

| | |
|---|---|
| **influence (ZVI)** | proposed development could be seen and may be considered to be of interest (see visual envelope or viewshed). |
| **Zone of Theoretical Visibility (ZVT)** | The area over which a development can theoretically be seen (also known as a Zone of Visual Influence, visual envelope and viewshed). |

# 2 VISUAL IMPACT ASSESSMENT

## 2.1 INTRODUCTION

This chapter presents the findings of the visual specialist study undertaken by Henry Holland of map(this); as part of the EIA being conducted by Kipeto Energy Limited for the Kipeto-Isinya grid connection transmission line project in the Kajiado County, Kenya.

### 2.1.1 Guiding Concepts for Visual Assessments

This Visual Impact Assessment (VIA) is based on guidelines for visual assessment specialist studies as set out by South Africa's Western Cape Department of Environmental Affairs and Development Planning (DEA&DP) (Oberholzer, 2005) as well as guidelines provided by the Landscape Institute of the UK (GLVIA, 2002). The DEA&DP guideline recommends that a visual impact assessment consider the following specific concepts (from Oberholzer 2005):

- An awareness that 'visual' implies the full range of visual, aesthetic, cultural and spiritual aspects of the environment that contribute to the area's sense of place.
- The considerations of both the natural and cultural landscape, and their interrelatedness.
- The identification of all scenic resources, protected areas and sites of special interest, together with their relative importance in the region.
- An understanding of the landscape processes, including geological, vegetation and settlement patterns, which give the landscape its particular character or scenic attributes.
- The need to include both quantitative criteria, such as 'visibility', and qualitative criteria, such as aesthetic value or sense of place.
- The need to include visual input as an integral part of the project planning and design process, so that the findings and recommended mitigation measures can inform the final design, and hopefully the quality of the project.
- The need to determine the value of visual/aesthetic resources through public involvement.

### 2.1.2 Scope of Study

#### 2.1.2.1 Visual Triggers

Oberholzer (2005) identifies visual triggers which are used to determine the approach and scope of an impact study. The following triggers, related to the receiving environment, are potentially applicable to this project:

- Areas with important vistas or scenic corridors;
- Areas with intact or outstanding rural or townscape qualities;
- Areas with sites of cultural or religious significance;
- Areas of important tourism or recreational value.

Triggers related to the nature of the project:

- A change in land use from the prevailing use;
- A significant change to the fabric and character of the area;
- Possible visual intrusion in the landscape.

#### 2.1.2.2 Information Base

The visual study is based on the following information:

- Documentation supplied by Kipeto Energy Limited (KEL);
- Google Earth software and data;
- Spatial data made available through the Natural Earth project (http://www.naturalearthdata.com/);
- Shuttle Radar Topography Mission (SRTM) elevation data (version 4 - http://srtm.csi.cgiar.org/index.asp);
- ASTER GDEM elevation data (version 2 - http://gdem.ersdac.jspacesystems.or.jp/).

### 2.1.3 Assumptions and Limitations

#### 2.1.3.1 Spatial Data Accuracy

Spatial data used for visibility analysis originate from various sources and scales. Inaccuracy and errors are therefore inevitable. Where relevant these will be highlighted in the report. Every effort was made to minimize their effect.

#### 2.1.3.2 Digital Elevation Model

Viewsheds were calculated using GDEM elevation data derived from ASTER satellite data. The digital elevation model has a resolution of 30 m x 30 m and elevation accuracy of 7 to 14 m (http://www.jspacesystems.or.jp/ersdac/GDEM/E/2.html).

#### 2.1.3.3 Viewshed calculations

Calculation of the viewsheds does not take into account the potential screening effect of vegetation and existing buildings.

#### 2.1.3.4 Study Area

The study area for the landscape description includes the whole area shown on the topographic map) while that of the visual impact assessment is limited to an area surrounding the proposed power line corridor for up to 10 km . The scenic impact of power lines and pylons decreases exponentially with distance from the viewer and will be minimal beyond 5 km (Hull & Bishop 1988).

### 2.1.4 Methodology

The key steps followed in the visual study are presented below.

#### 2.1.4.1 Landscape Description

A desktop study was conducted to establish and describe the landscape character of the receiving environment. A combination of data analysis using a Geographic Information System (GIS) and literature review was used to identify land cover, landforms and land use in order to gain an understanding of the current landscape within which the development will take place (GLVIA, 2002). Landscape features of special interest were identified and mapped, as were landscape elements that may potentially be affected by the development.

#### 2.1.4.2 Visual Impact Assessment

A GIS is used to calculate viewsheds for various components of the proposed development. The viewsheds and information gathered during the field survey are used to define criteria such as visibility, viewer sensitivity, visual exposure and visual intrusion for the proposed development. These criteria are, in turn, used to determine the intensity of potential visual impacts on sensitive viewers. All information and knowledge acquired as part of the assessment process are then used to determine the potential significance of the impacts according to the standardised rating methodology as described in the Terms of Reference.

### 2.1.5 Applicable Policies, Legislation, Standards and Guidelines

There are very few documents that mention visual or landscape specifically with policies mostly related to conservation of biodiversity and socio-cultural aspects of the region.

#### 2.1.5.1 The environmental (impact assessment and audit) regulations, 2003

Visual and landscape issues to be considered in an environmental impact assessment:

"…

- *views opened up or closed;*
- *visual impacts (features, removal of vegetation, etc);*
- *compatibility with surrounding area;*
- *amenity opened up or closed, e.g recreation possibilities.*

*…"*

#### 2.1.5.2 IFC Environmental, Health, and Safety Guidelines for Electric Power Transmission and Distribution

The EHS Guidelines for electric power transmission and distribution document provided by the International Financial Corporation and World Bank (World Bank Group 2007) lists 'visual amenity' as one of the potential industry-specific impacts:

*…may be visually intrusive and undesirable to local residents.*

#### 2.1.5.3 ESIA Guidelines for Transmission Infrastructure for the SAPP Region

Environmental and social impact assessment guidelines for transmission infrastructure provided by the Southern African Power Pool are based on similar guidelines produced by the World Bank and African Development Bank (SAPP ESC 2010). Among other issues to be considered are those which refer to landscape and visual aesthetics:

- *Visual disruption (under social, economic and cultural issues);*
- *Area opened or closed;*
- *Visual impacts;*
- *Blending with surroundings, and;*
- *Recreation facilities.*

### 2.1.6 Statement of Confidence and Independence

Henry Holland has been applying his Geographic Information Systems knowledge and experience to visual impact assessments since 1997, and has conducted a number of assessments for large scale industrial developments such as desalination plants, biomass plants, ore terminals and wind energy facilities. He has extensive practical knowledge in spatial analysis, landscape analysis and environmental modelling, and has been involved in many environmental management projects as GIS coordinator and analyst since 1992.

Henry has undertaken this work for the Kipeto Powerline project as an independent visual specialist, working in accordance with international and national guidelines for visual impact assessments. He has no vested interest in the proposed project.

## 2.2 DESCRIPTION OF PROJECT ASPECTS RELEVANT TO VISUAL IMPACTS

An overall project description is provided in the EIA report. Additional project information relevant to the visual impact assessment is provided below . The table below shows heights for structures that are likely to cause visual impact. The power line is approximately 40 km long and will include suspension towers (32 m high) and tension towers (29 m high) and will feed into the proposed KETRACO's Isinya 220/220kV Switching Station between Isinya and Kajiado.

Access roads and vegetation clearing for wayleave/right of way (ROW) zones can also potentially cause visual impact due to visual contrast with adjacent vegetation and landscape background. Erosion scarring on steep slopes will expose soil and rock which will create high visual contrast which may be visible over long distances. Borrow pits/quarries for construction purposes will potentially cause visual contrast with surrounding landscape and vegetation.

**Table 2: Heights of structures associated with the proposed development**

| Structure | Height |
|---|---|
| Suspension Towers | 32 m |
| Tension Towers | 29 m |

# 2.3 DESCRIPTION OF RECEIVING ENVIRONMENT

## 2.3.1 Landscape Baseline

| | |
|---|---|
| **Landscape baseline** | A description of the existing elements, features, characteristics, character, quality and extent of the landscape (GLVIA, 2002). |

### 2.3.1.1.1 Topography and Drainage

Three distinct physiographic regions can be recognised in the study area. These were formed by processes associated with the development and evolution of the East Africa Rift System. The uplands of the Ol Doinyo Narok plateau represent the uplifted eastern shoulder of the rift and are underlain by igneous rocks associated with the rift-initiating uplift event (Chorowicz 2005). The uplands are bound on the west by an escarp where the land drops down almost 500m to the rift valley floor. The rift valley consists of north-south trending crustal blocks bound by further, smaller scarps (steep fault planes) running more-or-less parallel with the eastern escarp. The valley floor is underlain by rocks of volcanic origin (lava flows), and several dormant or extinct volcanoes are found in the valley (e.g. Olorgesailie) (NEMA 2007). The uplands east of the escarp have been eroded away by large river systems which drain into the Indian Ocean. The Athi-Kapiti plains are formed by the Athi River system and consist of low hills and shallow river valleys. The Kajiado River has formed a similar low relief landscape to the south-east of Ol Doinyo Narok, by eroding the pre-rift highlands of the plateau (Matheson 1966).

Open savannah grassland is the main land cover of the study area. Bush and woodland occur on the steeper slopes along the escarp and in river valleys. Forests are rare and tend to be limited to hill crests (Kurrent Technologies 2011). Vegetation has mostly been transformed by human activities and overgrazing (NEMA 2009). Land use varies in relation to proximity to urban centres such as Kajiado and Nairobi, but most of the study area is still used by semi-nomadic pastoralist Maasai as grazing land for livestock (cattle, goats and sheep). Some horticultural farming (vegetables such as onions, tomatoes and Asian vegetable varieties) occur closer to urban areas, between Isinya and Nairobi.

### 2.3.1.2 Centres of Population and Houses

Nairobi is a major urban centre in Kenya and although it is more than 25km from the proposed wind farm site, increased signs of human population and urbanisation are apparent towards the north-eastern part of the study area. Nairobi skyscrapers are visible from some locations in the study area. The town of Kajiado, the district headquarters, is located approximately 15km south-east of the proposed wind farm site. The other large settlement in the study area is Isinya which is about 20km east of the proposed site. There are a few other, smaller settlements in the area, but most of these occur north-east of the site towards Nairobi. Elangata Wuas is a small settlement south-west of the site in the rift valley.

Maasai villages and huts are scattered throughout the region and normally consist of a few huts enclosing an area for goats and cattle. Other small crop farms, small-holdings and homesteads are associated with the highlands above the Rift Valley and with proximity to urban centres and major roads.

#### 2.3.1.3 Transport Routes

The A104 is a major, tarred road connecting Nairobi with Kajiado, and which extends to Arusha in Tanzania. Approximately 40km of this road is located within the Study Area. The C58 tar road connects Nairobi with the town of Magadi (and the Magadi soda mine) and is one of the few major roads which provide access to the Rift Valley in the region. The only other tarred road in the Study Area connects the Magadi road (C58) with the A104 (near Isinya). All other roads are untarred and in poor condition (NEMA 2009).

A railway line runs from Magadi town through the southern part of the Study Area connecting Magadi and Kajiado with the Nairobi-Mombasa line further east at Konza.

#### 2.3.1.4 Public Amenities and Facilities

According to the District Environmental Action Plan (NEMA 2009) the major tourist attractions in the Kajiado District are national parks (managed by Kenya Wildlife Services), game reserves (managed by county councils) and wildlife conservancies (privately owned by individuals or communities). There are no national parks or game reserves in the Study Area (IUCN & UNEP 2010). There are a few community based conservancies in the Study Area, namely those belonging to the Olerai community (commonly known as the Kitangela Game Conservation Area, east of the Kiserian-Isinya road) (KWS 2008) and conservancies established by the Elangata Wuas Ecosystem Management Programme (EWCMP) in 1992 for the Elangata Wuas and Kilonito communities (International Development Research Centre (Canada) 1993; Meshack et al. 2007). Eco-tourism is an important aspect of the EWCMP and a couple of eco-tourism camp sites were built in the region of which the Molokua and Kilonito sites are within the Study Area (Safari Seekers 2011).

The Rift Valley Escarpment is a major tourist attraction in Kenya for the scenic views it provides of the Rift Valley. There are a number of resorts and lodges along the top of the escarp in the Study Area and they offer trails into, and scenic views of, the Rift Valley.

## 2.4 PERMIT REQUIREMENTS

There are no permit requirements related to potential visual impact.

## 2.5 ASSESSMENT AND MITIGATION OF IMPACTS

The assessment and mitigation of impacts is conducted in the following steps:

- Identification of visual impact criteria (key theoretical concepts).
- Conducting a visibility analysis.
- Assessment of impacts of the project on the landscape and on receptors (viewers) taking into consideration factors such as sensitive viewers and viewpoints, visual exposure and visual intrusion.

### 2.5.1 Visual Impact Concepts and assessment Criteria

#### 2.5.1.1 Visual assessment criteria used in assessing magnitude and significance

The potential visual impact of the proposed development is assessed using a number of criteria which provide the means to measure the magnitude and determine the significance of the potential impact (Oberholzer, 2005). The **visibility** (Section 2.5.1.2) of the project is an indication of where in the region the development will potentially be visible from. The rating is based on viewshed size only and is an indication of how much of a region will potentially be affected visually by the development. A high visibility rating does not necessarily signify a high visual impact, although it can if the region is densely populated with sensitive visual receptors. **Viewer (or visual receptor) sensitivity** (Section 2.5.1.3) is a measure of how sensitive potential viewers of the development are to changes in their views. Visual receptors are identified by looking at the development viewshed, and include scenic viewpoints, residents, motorists and recreational users of facilities within the viewshed. A large number of highly sensitive visual receptors can be a predictor of a high **intensity/magnitude** visual impact although their distance from the development (measured as **visual exposure** – Section 2.5.1.4) and the current composition of their views (measured as **visual intrusion** – Section 2.5.1.5) will have an influence on the significance of the impact.

The methodology for the impact assessment rating is provided in the main EIA report.

#### 2.5.1.2 Visibility

| | |
|---|---|
| **Visibility of Project** | The geographic area from which the project will be visible, or view catchment area. (The actual zone of visual influence of the project may be smaller because of screening by existing trees and buildings). This also relates to the number of receptors affected (Oberholzer, 2005).<br>• *High visibility* - visible from a large area (e.g. several square kilometres).<br>• *Moderate visibility* – visible from an intermediate area (e.g. several hectares).<br>• *Low visibility* – visible from a small area around the project site. |

In this report there is also another sense in which 'visibility' is used. Cumulative viewsheds indicate not only where a feature is visible from (the meaning of visibility as used in the definition above), but also how much of the feature will be visible from that point or area.

A cumulative viewshed was calculated for power line pylons (towers) which provides an indication of areas within the study area from which the power line will potentially be visible as well as how much of it will potentially be visible. It is clear from the map that potential visibility is high in terms of viewshed size. However, the viewshed does not take into account distance from visual receptor to power line or the screening effect of vegetation and buildings. Vegetation is mostly grassland with varying density of trees, but most buildings are surrounded by trees. The actual viewshed will therefore be significantly smaller than shown on the map.

It is also clear from the viewshed that visual receptors in the Rift Valley are highly unlikely to have any views of the power line.

### 2.5.1.3 Sensitive Viewers and Viewpoints

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

A rating system provided by the Landscape Institute of the United Kingdom was used to determine viewer sensitivity:

| | ***Definition (GLVIA, 2002)*** |
|---|---|
| ***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 may be focussed on the landscape;<br><br>Communities where the development results in changes in the landscape setting or valued views enjoyed by the community;<br><br>Residents with views affected by the development. |
| ***Moderate*** | People engaged in outdoor sport or recreation (other than appreciation of the landscape). |
| ***Low*** | People at their place of work or focussed on other work or activity;<br><br>Views from urbanised areas, commercial buildings or industrial zones;<br><br>People travelling through or passing the affected landscape on transport routes |
| ***Negligible (uncommon)*** | Views from heavily industrialised or blighted areas. |

***Visual Receptors in Protected Areas***

There are no national parks or game reserves (managed by county councils) in the study area. The Kitangela Game Conservation Area is a conservancy located east of the Kiserian-Isinya road owned by the Olerai community. There are also community based conservancies in the Rift Valley west of the proposed power line corridor. Tourists are seen as highly- to exceptionally sensitive visual receptors since they have an active interest in the surrounding landscape.

***Visual receptors on surrounding Maasai communal lands***

Residents are highly sensitive visual receptors since they spend time in the landscape and have an active interest in developments that will potentially affect their surrounding landscape.

***Residents of surrounding villages/towns***

Visual receptors in urban areas are likely to have a low sensitivity to the surrounding landscape since their existing views are complex with highly contrasting elements and patterns.

***Motorists***

Motorists spend a very limited time in a specific landscape and their attention will be focused on the road. They are therefore seen as low sensitivity visual receptors. However, motorists

driving along scenic routes will have a higher sensitivity to aspects of the landscape, particularly if they are tourists.

#### 2.5.1.4 Visual Exposure

| | |
|---|---|
| **Visual exposure** | Visual exposure refers to the relative Visibility of a project or feature in the landscape (Oberholzer, 2005). Exposure and visual impact tend to diminish exponentially with distance. The exposure is classified as follows:<br>• *High exposure* – dominant or clearly noticeable;<br>• *Moderate exposure* – recognisable to the viewer;<br>• *Low exposure* – not particularly noticeable to the viewer |

Visual exposure is calculated using visibility (i.e. how many pylons are visible) and distance from the nearest component of the development for an area within 10 km of development components. Visual exposure beyond 10 km is likely to be very low as structures of the proposed development will make up a small part of views if they are visible at all.

***Visual receptors in protected areas***

The Olerai community conservancy (Kitangela Game Conservation Area) is more than 15 km from the proposed power line corridor and visual receptors in this area will experience low visual exposure to the development. Conservancies in the Rift Valley will not be exposed to the power line.

***Visual receptors on surrounding Maasai communal lands***

There are a number of houses/buildings within 1 km of the proposed power line (Google Earth satellite images). Residents of these will be highly exposed to the power line and pylons.

***Residents of surrounding villages/towns***

The two main villages that may be affected by the development are Kajiado and Isinya. However, they are more than 5 km from the proposed route and residents will experience low visual exposure to the power line.

***Motorists***

An approximately 10 km section of the A104 between Isinya and Kajiado will potentially be moderate to highly exposed to the power line (approximately 8 minutes at 80 km/h).

#### 2.5.1.5 Visual Intrusion

| | |
|---|---|
| **Visual intrusion** | Visual intrusion indicates the level of compatibility or congruence of the project with the particular qualities of the area – its *sense of place*. This is related to the idea of |

| | |
|---|---|
| | context and maintaining the integrity of the landscape (Oberholzer, 2005). It can be ranked as follows:<br>High – results in a noticeable change or is discordant with the surroundings;<br>Moderate – partially fits into the surroundings, but is clearly noticeable;<br>Low – minimal change or blends in well with the surroundings. |

*Sense of place* is defined by (Oberholzer, 2005) as: '*The unique quality or character of a place...[It] relates to uniqueness, distinctiveness or strong identity.*' It describes the distinct quality of an area that makes it memorable to the observer.

Localities (photo sites) from which photographs were taken are as follows

***Visual receptors in protected areas***

The conservancies mentioned in section 2.5.1.3 are either not in the viewshed (Rift Valley) or are more than 15 km from the proposed power line (Kitangela Game Conservation Area). The Kitangela conservancy is located among urban and peri-urban structures and a power line viewed from such a distance is unlikely to be noticed. These visual receptors will therefore experience **low** intrusion on their existing views.

***Visual receptors on surrounding Maasai communal lands***

Residents live in houses that are scattered throughout the landscape. There are very few views that do not contain a building or two since the topography is that of low, rolling hills and vegetation cover is mostly open grassland with varying tree density. Communication towers are also visible on the hills above the Rift Valley to the west. Views are therefore not pristine and man-made structures are relatively common. However, power lines are particularly disruptive elements in landscapes and it is likely that the power line will be **highly** intrusive on views of residents living within 1 km of it. For these visual receptors the power line will result in a noticeable change in their visual surroundings. It is not clear from the Google Earth satellite images of the area exactly how many residences there are within 1 km of the power line route.

*Figure 1: Farmstead/residence in Maasai communal lands near the proposed power line corridor (viewpoint KVP003).*

*Figure 2: Farmsteads/residences in the Maasai communal lands on the highlands above the Rift Valley (viewpoint KVP003)*

*Figure 3: Communication towers on the hills above the Rift Valley (viewpoint KVP003)*

*Figure 4: 400 kV power line pylons (approximately 40 m high) near the site for the Isinya substation. These are between 4 and 6 m higher than those proposed for this project, but the photograph provides an idea of the visual intrusion of pylons on views of this*

### *Residents of surrounding villages/towns*

The proposed power line will cause minimal change to residents' existing views since those views are already complex containing highly contrasting elements and patterns. Towns tend to have one or more high communication towers and power lines. It is unlikely that the proposed power line will be noticed by residents of these villages (due to distance and complexity of existing views).

*Figure 5: View towards the town of Kajiado from viewpoint KVP021. Power lines and towers are common elements of existing views in towns.*

### *Motorists*

The section of road that will be highly exposed to the proposed power line is between the towns Isinya and Kajiado. It is clear when driving this section that one is in close proximity to urban areas since there are very few views that do not include man-made structures (not including the road itself) and buildings. There are also signs of the townships expanding as construction sites are common. The 400 kV power line from Mombasa to Nairobi is currently under construction and only the pylons have been built. This power line will cross the road very close to the 220 kV power line proposed for this project and both will meet at the Isinya substation (not yet constructed). Another power line in this section of road will therefore not seem out of character and visual intrusion will be **low** for motorists.

*Figure 6: View from A104 road between Isinya and Kajiado (viewpoint KVP002). The 400 kV power line pylons are approximately 1 km away*

*Figure 7:Large building under construction along A104 near the proposed power line corridor (viewpoint KVP002).*

Table 3: Visual impact assessment criteria

| Sensitive Viewer | Criteria | Rating | Reasoning |
|---|---|---|---|
| Visual receptors in protected areas | Visual Sensitivity | High to Exceptional | Visual receptors (e.g. viewers and viewpoints) in protected areas are highly sensitive to changes in the landscape since they have an active interest in the surrounding landscape. |
| | Visual Exposure | Low | Recognised conservancies either outside the viewshed (should not have any views of the power line) or are more than 15 km from the proposed corridor. |
| | Visual Intrusion | Low | The Kitangela Game Conservation Area is located among urban and peri-urban structures and at more than 15 km from the development it is unlikely that visitors will notice the power line. |
| | Impact Intensity | Low | Highly sensitive visual receptors will experience low visual exposure to the development due to distance, and are unlikely to notice the power line. |
| Visual receptors on surrounding Maasai communal lands | Visual Sensitivity | High | Residents are normally seen as highly sensitive to developments and changes in their views. |
| | Visual Exposure | High | Visual exposure is high for a small number of residents and viewpoints in close proximity to the power line (< 1 km). |
| | Visual Intrusion | High | Visual receptors in close proximity to the power line (<1 km) will experience a noticeable change in their existing views. |

| Sensitive Viewer | Criteria | Rating | Reasoning |
|---|---|---|---|
| | Impact Intensity | High | There are only a few highly sensitive visual receptors in the viewshed that will be highly exposed to the development but it is likely that the development seem incongruent with their existing views. |
| Motorists | Visual Sensitivity | Low/High | Motorists will spend very little time in the region and they will focus only briefly on features in the landscape, although tourists using the A104 to access Amboseli from Nairobi will have an active interest in the landscape. |
| | Visual Exposure | High | The A104 passes through the proposed power line route. |
| | Visual Intrusion | Low | The section of A104 where motorists will be highly exposed to the power line is between two large towns and a power line will not appear out of place here. Particularly since there are existing 400 kV power line pylons in the same area. |
| | Impact Intensity | Low | The section of road between Kajiado and Isinya is not a tourist attraction and structures associated with urbanisation are common. |
| Residents of surrounding villages/towns | Visual Sensitivity | Low | Existing views of residents of these towns are complex containing highly contrasting elements and patterns. |
| | Visual Exposure | Low | Isinya and Kajiado are more than 5 km from the proposed power line route. |

| Sensitive Viewer | Criteria | Rating | Reasoning |
|---|---|---|---|
| | Visual Intrusion | Low | A power line along the proposed route will not appear discordant in existing views of residents. |
| | Impact Intensity | Low | All criteria are rated low for residents of surrounding towns. |

### 2.5.2 Significance of visual impact on viewers

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

#### 2.5.2.1 Intrusion of activity associated with construction of a power line on existing views of sensitive visual receptors

***Cause and Comment***

There are various aspects of the construction phase of the power line that will potentially affect sensitive visual receptors. Among potential visual disturbances are the following:

- Increase in traffic, both small vehicles for workers and large construction-related vehicles such as excavators and cranes.
- Clearance of vegetation for the right of way (ROW) and pylons.
- Soil stockpiles and heaps of cleared vegetation.
- Soil scars and exposed slope faces on steep slopes.
- Worker presence and activity (there should only be one construction camp since the line is less than 100 km).
- Dust emissions from construction activity.
- Construction work against the skyline.

***Mitigation Measures***

- Strict dust management procedures should be employed as dust emissions increases the visibility of construction activity.
- Clearance of indigenous vegetation should be minimised and rehabilitation of temporarily cleared areas should start as soon as possible.
- Maintenance of construction site – good housekeeping on site to avoid litter and minimise waste.
- Project developers should demarcate construction boundaries and minimise areas of surface disturbance.

- Night lighting of construction sites/camps should be minimised within requirements of safety and efficiency.
- Where possible locate laydown areas and construction camps in areas that are already disturbed or cleared of vegetation. Alternatively use the topography of the region to locate camps and laydown areas in low visibility areas.
- Locate quarries/borrow pits in low visibility areas.
- Existing tracks/roads should be used for access where possible.
- New access roads should be two-track roads similar to the existing roads in the surrounding region.

***Significance Statement***

The duration of the impact is *short term* (while construction lasts – <12 months). The spatial extent of the impact will be limited to within 1 km of the corridor but over a distance of 40 km. The intensity of the visual impact will be *high* due to the low number of visual receptors that will be affected. The impact *will probably* occur (likelihood) since there are a small number of sensitive visual receptors in the viewshed. The significance of the impact is **medium** due to its large spatial extent and high intensity. Mitigation measures are unlikely to lower the significance of impact but will contain the intensity thereof. Reversibility of the impact is *high* since structures can be removed completely and areas cleared for construction will be rehabilitated. Irreplaceability of the visual resource is *low* since construction activity is temporary.

#### 2.5.2.2 Visual intrusion of a 220 kV power line on existing views of sensitive visual receptors

***Cause and Comment***

Transmission lines and associated structures are normally experienced as impacting negatively on the aesthetics of a landscape. They often introduce an industrial aspect to otherwise rural landscapes. They are large structures (due to their length) and often highly visible (due to the height of pylons) and can therefore potentially affect many visual receptors. The topography of the region is such that some pylons will be exposed against the skyline where hills and ridges are traversed, but this is unavoidable and alternative routes will face similar issues.

***Mitigation Measures***

- Rehabilitate temporary areas cleared during construction.
- Locate towers in such a way as to maximize the screening effect of existing topography – avoid where possible locations where towers will be exposed against the skyline.
- Lattice towers/pylons (such as those used for the 400 kV Mombasa-Nairobi line that is being constructed) are preferred to solid towers since they create lower visual contrast with natural landscape features and since there are already similar structures in the landscape.
- Towers and structures should have a non-reflective finish.
- Minimise the use of strain towers (used where the power line changes direction of more than 3°) since the denser lattice pattern is more intrusive on views than the normal suspension towers.

- Leave the project area in a condition that protects soil and surface materials, both on and off site, against erosion and instability.

***Significance Statement***

The duration of the impact is *long term* (it will last as long as the development lifetime). The spatial extent will be *local* since high visual exposure will be limited to within 1 km from the site (Hull & Bishop 1988). The intensity of the visual impact will be *high* since a number of highly sensitive visual receptors may potentially be affected. The probability of the impact occurring is *highly probable* since the visual receptors are highly sensitive. The significance of the impact is **high** since it is of long to permanent duration and its intensity is high. Mitigation measures will keep the impact intensity to a minimum but are unlikely to lower it. Reversibility is *high* since the structures (pylons and cables) can be completely removed from views. Irreplaceability of the visual resource is *low* since there are similar existing views outside the viewshed within the same landscape unit (north and south of the proposed route on the highlands above the Rift Valley).

| Construction Phase | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Direct Impacts** | | | | | | | | | | |
| **Impact Description** | **Mitigation** | **Spatial Extent** | **Intensity** | **Duration** | **Reversibility** | **Irreplaceability** | **Probability** | **Significance & Status** | | **Confidence** |
| | | | | | | | | **Without Mitigation** | **With Mitigation** | |
| 220 kV Transmission Line | | | | | | | | | | |
| Intrusion of activity associated with construction of a power line on sensitive visual receptors | • Demarcate construction boundaries and minimise areas of surface disturbance.<br>• Night lighting of construction sites should be minimised within requirements of safety and efficiency.<br>• Good housekeeping on site to avoid litter and minimise waste.<br>• Where possible locate laydown areas and construction camps in areas that are already disturbed or cleared of vegetation.<br>• Existing tracks/roads should be used for access where possible. | Local | High | Short Term | High | Low | Probable | Medium Negative | Medium Negative | High |

| Operational Phase | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Direct Impacts | | | | | | | | | | |
| **Impact Description** | **Mitigation** | **Spatial Extent** | **Intensity** | **Duration** | **Reversibility** | **Irreplaceability** | **Probability** | **Significance & Status** | | **Confidence** |
| | | | | | | | | **Without Mitigation** | **With Mitigation** | |
| Visual intrusion of a 220 kV power line on existing views of sensitive visual receptors | • Rehabilitate temporary areas cleared during construction.<br>• Locate towers in such a way as to maximize the screening effect of existing topography – avoid where possible locations where towers will be exposed against the skyline.<br>• Lattice towers/pylons (such as those used for the 400 kV Mombasa-Nairobi line that is being constructed) are preferred to solid towers since they create lower visual contrast with natural landscape features and since there are already similar structures in the landscape.<br>• Towers and structures should have a non-reflective finish.<br>• Minimise the use of strain towers (used where the power line changes direction of more than 3°) since the denser lattice pattern is more intrusive on views than the normal suspension towers.<br>• Leave the project area in a condition that protects soil and surface materials, both on and off site, against erosion and instability. | Local | High | Long Term | High | Low | Probable | High Negative | High Negative | High |

#### 2.5.2.3 Cumulative Impact

The power line will connect a wind energy facility with the Kenya national grid at the Isinya Substation. As such the cumulative visual impact of the wind energy facility and the power line should be considered. In the regional context the visual impact of the wind turbines is likely to overshadow that of other structures associated with the facility. They will be visible over much greater distances than power lines and pylons.

Other existing structures such as the highly visible communication towers visible on the hills on the edge of the Rift Valley have already introduced structures visually similar to power line pylons into the viewshed and the existing landscape is not that of a pristine wilderness area with a sense of remoteness.

The cumulative visual impact of a power line in this region is therefore expected to be **low**.

## 2.6 CONCLUSIONS AND RECOMMENDATIONS

The power line will pass through a landscape of low, open hills covered in grassland and thorn trees. There are no officially recognised protected areas that will be affected with most of the land used by Maasai for grazing for their cattle. There are two large villages in the viewshed, Kajiado and Isinya, but both are more than 5 km from the proposed route and residents are unlikely to notice the power line. Tourists using the A104 to travel from Nairobi to Amboseli will not be highly affected by the power line since it crosses the road where existing views already contain similar structures and signs of urbanisation are common.

There are, however, a number of highly sensitive visual receptors in close proximity to the power line and the power line will intrude considerably on their existing views. These visual receptors are mostly residents with houses within 1 km of the route. Mitigation measures are unlikely to reduce the visual impact of the power lines on these visual receptors.

Alternative routes are likely to encounter similar situations since houses are spread out throughout the region. The ideal route in terms of visual impact will maintain a 1 km exclusion zone around residential buildings (farmsteads, dwelling or huts).

# 3 REFERENCES

Chorowicz, J., 2005. The East African rift system. *Journal of African Earth Sciences*, 43(1-3), pp.379–410.

GLVIA, 2002. *Guidelines for Landscape and Visual Impact Assessment* 2nd ed., United Kingdom: Spon Press.

Hull, R.B. & Bishop, I.D., 1988. Scenic impacts of electricity transmission towers: The influence of landscape type and observer distance. *Journal of Environmental Management*, 27(1), pp.99–108.

International Development Research Centre (Canada), 1993. *Annual report - International Development Research Centre*, International Development Research Centre.

IUCN & UNEP, 2010. The World Database on Protected Areas (WDPA). Available at: http://protectedplanet.net/ [Accessed January 4, 2011].

Kurrent Technologies, 2011. *Environment Project Report Study for a Proposed 100MW Wind Energy Project, Kajiado District, Kenya*, Kajiado District, Kenya: Kipeto Energy Ltd.

KWS, 2008. OLERAI COMMUNITY CONSERVANCY. *Kenya Wildlife Service*. Available at: http://www.kws.org/parks/community_wildlife_program/Conservancies/olerai.html [Accessed January 4, 2012].

Matheson, F.J., 1966. *Geology of the Kajiado Area*, Kenya: Ministry of Natural Resources and Wildlife, Geological Survey of Kenya.

Meshack, M., Odera, J. & Ochuodho, T., 2007. Challenges and opportunities in community based dryland natural resources management. In *Challenges and opportunities in community based dryland natural resources management*. African Economic Conference 2007: Opportunities and Challenges of Development for Africa in the Global Arena. Adis Ababa, Ethiopia: UN. ECA, p. 11. Available at: http://www.uneca.org/aec/documents/Meshack%20Malo_Jeff%20Odera%20_Thomas%20Ochuodho.pdf [Accessed January 5, 2012].

NEMA, 2009. *Kajiado District Environment Action Plan 2009-2013*, Nairobi, Kenya: National Environment Management Authority, Ministry of Environment and Mineral Resources.

NEMA, 2007. *Provincial Environment Action Plan, Rift Valley Province, 2007-201*, Rift Valley Province, Kenya: National Environment Management Authority, Kenya.

Oberholzer, B., 2005. *Guideline for involving visual & aesthetic specialists in EIA processes*, Cape Town: CSIR, Provincial Government of the Western Cape, Department of Environmental Affairs & Development. Available at: http://www.capegateway.gov.za/Text/2005/10/5_deadp_visual_guideline_june05.pdf.

Safari Seekers, 2011. Ecotourism - The Elangata Wuas ecosystem Management Programme. *Safari Seekers*. Available at: http://www.safari-seekerskenya.com/ecotourism.htm [Accessed January 4, 2012].

SAPP ESC, 2010. *Environmental and Social Impact Assessment Guidelines for Transmission Infrastructure for the SAPP Region.*, Zimbabwe: Southern African Power Pool. Available at: http://www.sapp.co.zw/docs/ENVIRONMENTAL%20%20AND%20SOCIAL%20IMPACT%20ASSESSMENT%20GUIDELINES%20FOR%20TRANSMISSION%20INFRASTRUCTUREINFRUSTRACTURE2%20_Final_%20-Sept%202010%20_2_.pdf [Accessed July 27, 2013].

World Bank Group, 2007. *Environmental, Health, and Safety Guidelines for Electric Power Transmission and Distribution*, International Finance Corporation (IFC). Available at: http://www.ifc.org/ifcext/enviro.nsf/AttachmentsByTitle/gui_EHSGuidelines2007_ElectricTransmission/$FILE/Final+-+Electric+Transmission+and+Distribution.pdf [Accessed January 25, 2012].

## 3.1 MAPS

**Figure 8: Topography and major rivers of the region surrounding the proposed power line corridor. A topographic profile of the corridor is also included as an inset on the map**

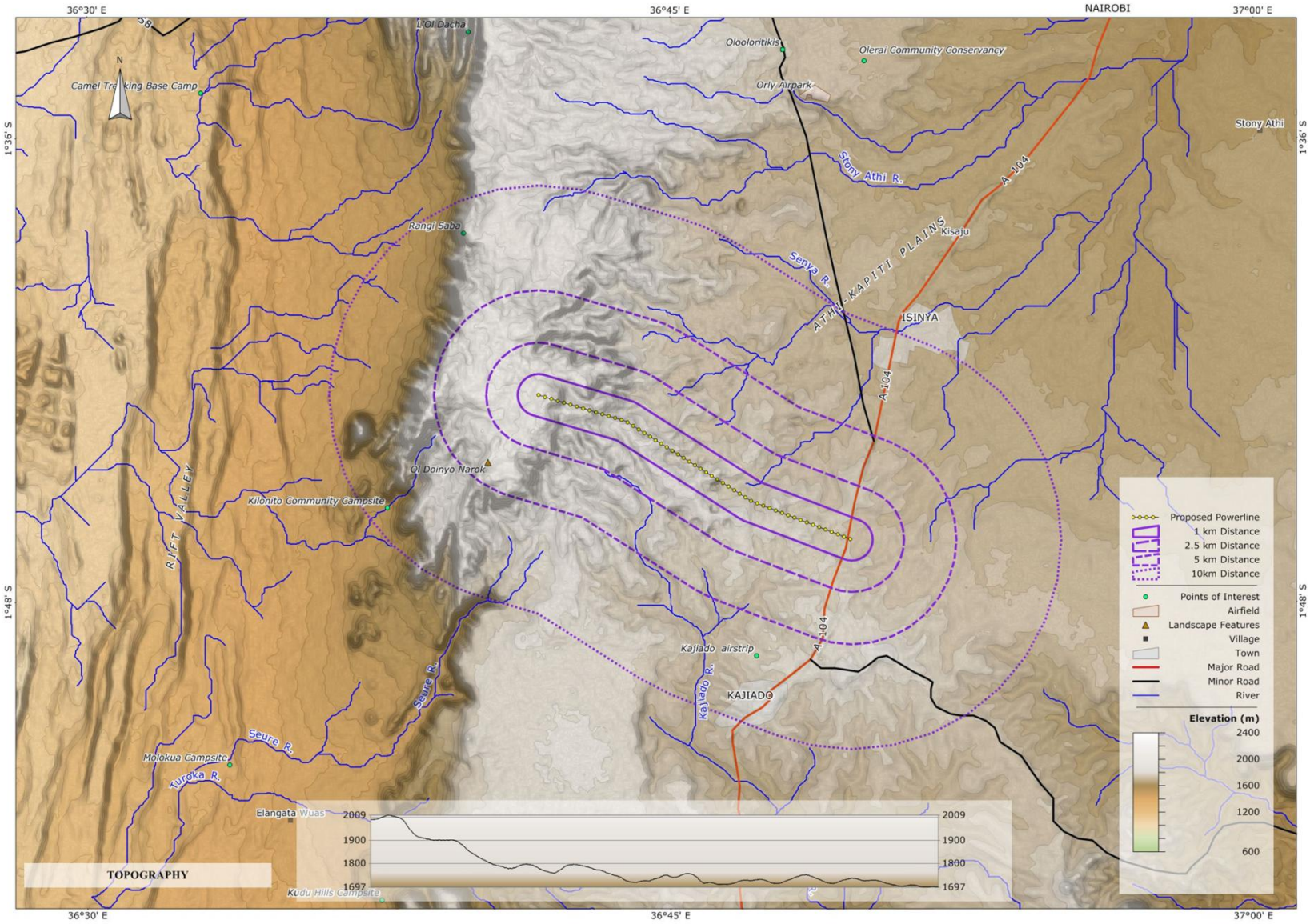

**Figure 9: Map of the land cover of the region surrounding the proposed power line corridor**

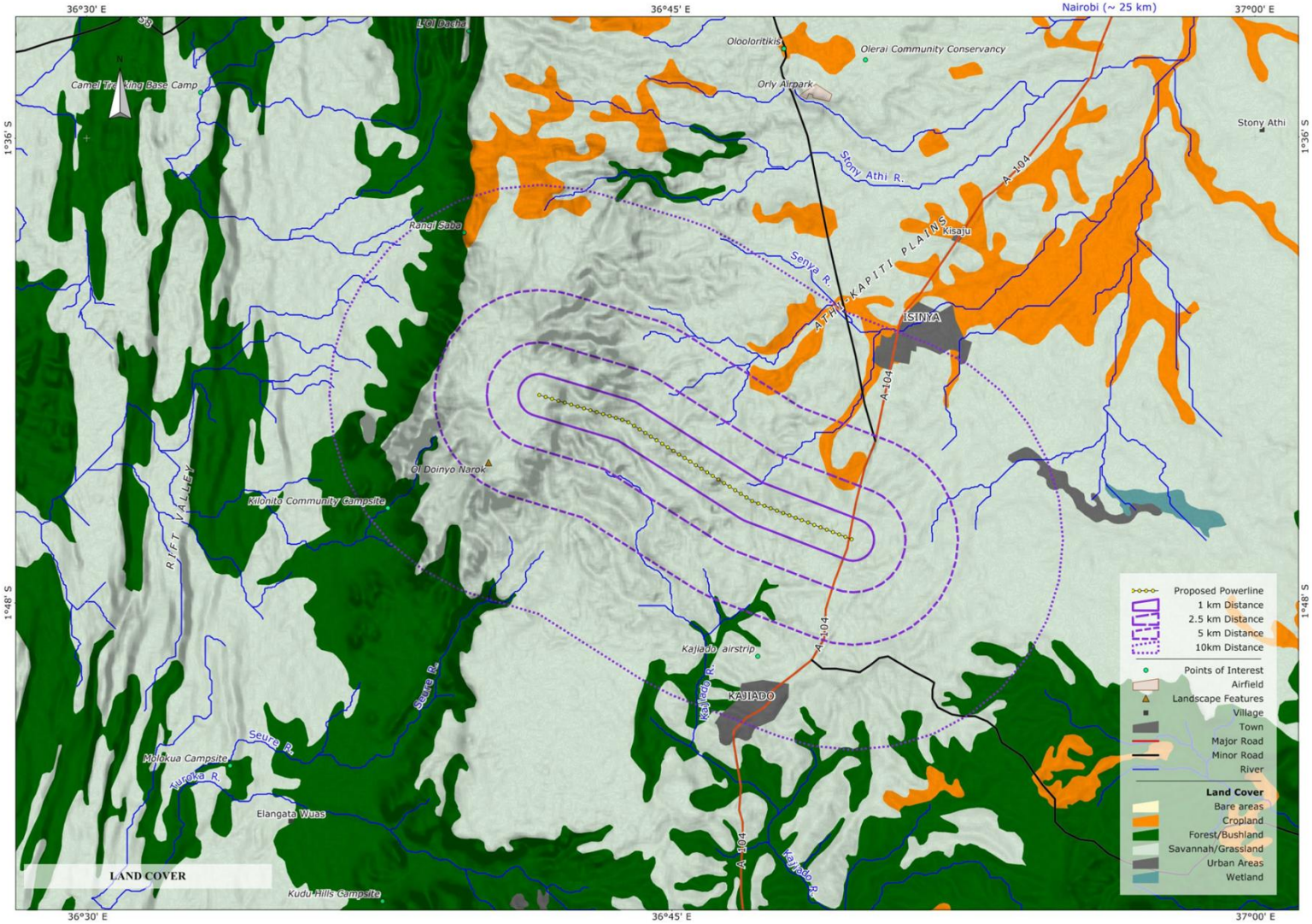

**Figure 10: Cumulative viewshed of the proposed power line development. Sites from which photographs were taken during the site visit are also indicated**

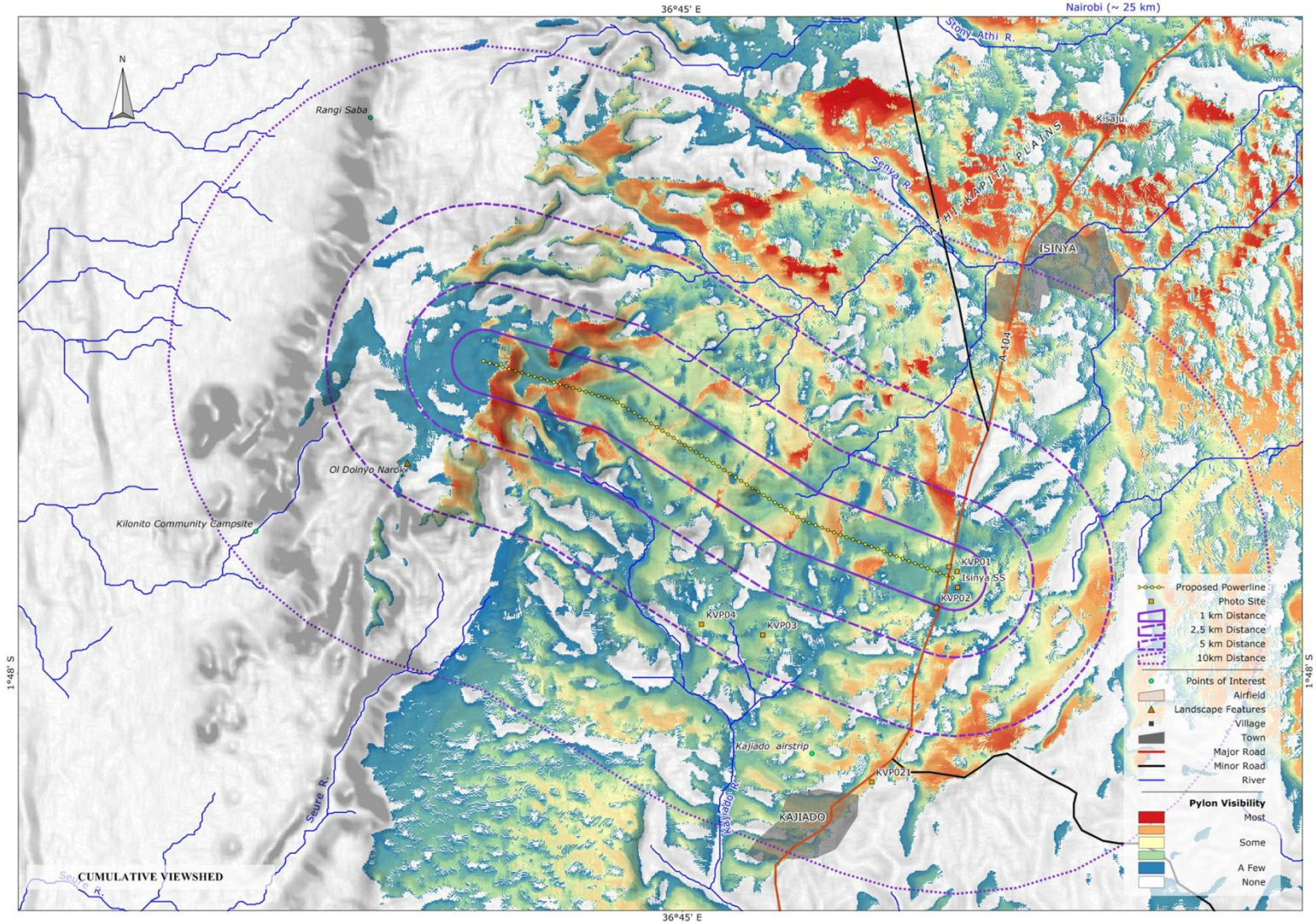

**Figure 11: Map indicating the levels of visual exposure that visual receptors within 10 km of the proposed power line will potentially experience**