VISUAL IMPACT ASSESSMENT FOR THE PROPOSED KHANYAZWE FLEXPOWER PLANT PROJECT, MALELANE, WITHIN THE JURISDICTION OF THE NKOMAZI LOCAL MUNICIPALITY IN THE MPUMALANGA PROVINCE

PREPARED FOR:

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EXECUTIVE SUMMARY

Nsovo Environmental Consulting has been appointed by Khanyazwe Flexpower (Pty) Ltd as the independent environmental consultant to undertake the Environmental Impact Assessment (EIA) process for the proposed development of the Khanyazwe Flexpower Plant and associated infrastructure in Malelane within the jurisdiction of the Nkomazi Local Municipality in the Mpumalanga Province.

Outline Landscape Architects was requested to compile a Visual Impact Assessment (VIA) for the project. This VIA is a specialist study that addresses the visual effects of the proposed development of the energy plant and associated infrastructure.

OVERVIEW OF DEVELOPMENT

Khanyazwe Flexpower (Pty) Ltd (hereafter referred as KFP) is proposing to develop, construct and operate a (maximum) 1000MW natural gas-fired power plant using either gas engines (of Internal Combustion Engines (ICE)) or Combined Cycle Gas Turbines (CCGT)). KFP will source gas from the Republic of Mozambique Pipeline Investments Company (ROMPCO), which has an existing gas pipeline that connects Mozambique's Pande Temane gas fields to Sasol's operations in South Africa, as well as several industrial and retail customers. Alternative sources of gas if gas from the existing Pande Temane fields is not sufficient may include imported LNG projects being developed by Matola, which is able to provide additional gas into the ROMPCO pipeline. KFP is proposing the development of approximately two 500m 275kV and 132kV overhead powerlines from the proposed power plant to the existing Eskom Khanyazwe substation. The power plant will provide a mid-merit power profile to the national grid.

The proposed development will include the construction and assembly of the following associated infrastructures:

- Gas turbines for the generation of electricity through the use of natural gas
- Heat recovery steam generators (HRSG) to capture heat from high-temperature exhaust gases to produce high-temperature and high-pressure dry steam to be utilised in the steam turbines.
- Steam turbines for the generation of additional electricity through the use of dry steam generated by the HRSG.
- Bypass stacks associated with each gas turbine.
- Medium Speed Gas Engines for the generation of electricity through the use of natural gas.
- Waste storage facilities (general and oily water)
- Clustered exhaust stacks for the discharge of combustion gases into the atmosphere.
- Dirty water retention dams and clean water dams.
- Firewater tanks.
- Storm water channels.
- Waste storage facilities (general and hazardous).
- Exhaust stacks for the discharge of combustion gases into the atmosphere.
- A water treatment plant for the treatment of raw water into potable water and the production of demineralised water (for steam generation).

- Water pipelines from the power block to the station's boundary fence and water tanks to transport and store water of both industrial quality and potable quality.
- Dry-cooled system consisting of air-cooled condenser fans situated in fan banks.
- LV and MV switch gear rooms.
- Control room.
- Closed fin-fan coolers to cool lubrication oil for the gas and steam turbines.
- A gas pipeline from the power block to the station's boundary fence and a gas pipeline supply conditioning process facility for the conditioning and measuring of natural gas before being supplied to the gas engines.
- Ancillary infrastructure, including access roads, warehousing, buildings, access control facilities and workshop area, storage facilities, emergency backup generators, firefighting systems, laydown areas, and 275/132kV switchyard.
- A power line to connect the project to the national grid to evacuate the generated electricity.

FINDINGS AND RECOMMENDATIONS

VIEWER SENSITIVITY

Within the receiving environment, specific viewers (visual receptors) experience different views of the visual resource and value it differently. They will be affected because of alterations to their views due to the proposed project. The visual receptors included in this study are:

- Residents
- Tourists
- Motorists

SIGNIFICANCE OF VISUAL IMPACTS

VISUAL IMPACT ON RESIDENTS

The residents of the settlements and farming communities surrounding the power station and overhead lines may experience a moderate degree of visual intrusion. The current presence of large industries in the visual field of the residents will reduce the impact experienced.

The Visual Absorption Capacity (VAC) of the landscape plays a role in the visibility of the proposed power station and associated infrastructure. The landscape is flat and mostly level in the area where the power station is proposed and existing vegetation consists of agricultural crops, so the VAC is low. There is an existing Eskom substation (Khanyazwe) on the proposed site and powerlines cross the landscape. This will reduce the visual impact of the new development because of the association of similar structures in the area.

The region is associated with existing industry which reduces the significance of the overall visual impact and can be regarded as moderately low.

VISUAL IMPACT ON TOURISTS

Tourists travelling to the Kruger National Park and Mozambique will be affected by the visual intrusion when passing through the study area. The areas next to the N4 will be most important.

The industrial and agricultural landscape of that stretch of the N4, with large existing developments, will lessen the visual impact, as the association of the area is industrial in nature.

Views from the southern parts of the Kruger National Park towards the KFP will be intermittent and fleeting as there are large trees and rocky hills that screen the view.

The severity of the visual impact of the power stations and building infrastructure on tourists will be moderate, causing moderate visual impact.

VISUAL IMPACT ON MOTORISTS

The proposed power station and the overhead lines are visible to motorists intermittently along the N4. The undulating landscape can absorb some of the impact at times. The severity and significance of the visual impact on motorists will be moderate.

The region is associated with large-scale existing industry and agricultural areas which reduces the significance of the overall visual impact. The speed at which motorists travel and the association of the regional area with agriculture and industries has a moderating effect on the severity of the visual impact.

RECOMMENDED MITIGATION MEASURES

In most cases, the landscape and visual impacts occurring during the construction phase can be mitigated effectively. Rehabilitation of the disturbed areas may cause a reduction in the negative visual impact of the study area.

Upon closure of the power station, and once rehabilitation has taken place, the visual aesthetics will dramatically improve. Therefore, there is an anticipated *low* significance of visual impact for the proposed development.

CONCLUSION

The proposed Khanyazwe Flexpower Plant in Malelane has been evaluated against internationally accepted criteria to determine the impact they will have on the landscape character and the viewers that have been identified in the study area.

Evaluation of the proposed activities for Khanyazwe Flexpower Plant in Malelane

Evaluation of Proposed Activities							
Activities	**Corrective Measures**	**Impact Rating Criteria**					**Significance**
		Nature	**Extent**	**Duration**	**Magnitude**	**Probability**	
Khanyazwe Flexpower Plant	No	Negative	2 Local	4 Long term	6 Moderate	4 High	48 medium
	Yes	Negative	2 Local	4 Long term	4 Low	3 Medium	30 medium
Above Ground Gas Pipeline	No	Negative	2 Local	4 Long term	4 Low	2 Low	20 low
	Yes	Negative	2 Local	4 Long term	2 Minor	2 Low	16 low
Access Road	No	Negative	2 Local	4 Long term	4 Low	2 Low	20 low
	Yes	Negative	2 Local	4 Long term	2 Minor	2 Low	16 low
Extension of a Busbar at the Eskom Khanyazwe sub-station	No	Negative	2 Local	4 Long term	6 Moderate	3 Medium	36 medium
	Yes	Negative	2 Local	4 Long term	4 Low	3 Medium	30 low-medium
Overhead Powerlines	No	Negative	2 Local	4 Long term	6 Moderate	4 High	44 medium
	Yes	Negative	2 Local	4 Long term	4 Low	3 Medium	30 medium

The following Visual Impact Assessment Criteria (as utilised in table above) applies:

Status of Impact:
The visual impact is assessed as either having a:

- Negative effect (i.e. at a cost to the environment),
- Positive effect (i.e. a benefit to the environment), or
- Neutral effect on the environment.

Extent of the Impact:

(1) Site (site only),
(2) Local (site boundary and immediate surrounds),
(3) Regional,
(4) National, or
(5) International.

Duration of the Impact:
The length that the impact will last for is described as either:

(1) Immediate (<1 year)
(2) Short term (1-5 years),
(3) Medium term (5-15 years),
(4) Long term (ceases after the operational life span of the project),
(5) Permanent.

Magnitude of the Impact:
The intensity or severity of the impacts is indicated as either:

(0) none,
(2) Minor,
(4) Low,

(6) Moderate (environmental functions altered but continue),
(8) High (environmental functions temporarily cease), or
(10) Very high / unsure (environmental functions permanently cease).

Probability of Occurrence:
The likelihood of the impact actually occurring is indicated as either:
(0) None (the impact will not occur),
(1) Improbable (probability very low due to design or experience)
(2) Low probability (unlikely to occur),
(3) Medium probability (distinct probability that the impact will occur),
(4) High probability (most likely to occur), or
(5) Definite.

Significance of the Impact:
Based on the information contained in the points above, the potential impacts are assigned a significance rating (S). This rating is formulated by adding the sum of the numbers assigned to extent (E), duration (D) and magnitude (M) and multiplying this sum by the probability (P) of the impact.
$S= (E+D+M) P$

The significance ratings are given below:

- (<30) low (i.e. where this impact would not have a direct influence on the decision to develop in the area),
- (30-60) medium (i.e. where the impact could influence the decision to develop in the area unless it is effectively mitigated),
- (>60) high (i.e. where the impact must have an influence on the decision process to develop in the area).

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LIST OF ABBREVIATIONS

EIA	Environmental Impact Assessment.
FHWA	Federal Highway Administration of the United States Department of Transportation. The publishers of the guide "*Visual Impact Assessment for High Projects*" 1981.
LCA	Landscape Character Assessment.
LT	Landscape Type
VAC	Visual Absorption Capacity
VIA	Visual Impact Assessment.
ULI	Urban Land Institute
ZVI	Zone of Visual Influence.

1. INTRODUCTION

Nsovo Environmental Consulting has been appointed by Khanyazwe Flexpower (Pty) Ltd as the independent environmental consultant to undertake the Environmental Impact Assessment (EIA) process for the proposed development of the Khanyazwe Flexpower Plant and associated infrastructure in Malelane within the jurisdiction of the Nkomazi Local Municipality in the Mpumalanga Province.

Outline Landscape Architects was requested to compile a Visual Impact Assessment (VIA) for the project. This VIA is a specialist study that addresses the visual effects of the proposed development of the energy plant and associated infrastructure.

Outline Landscape Architects is an independent sub-consultant and neither the author, nor Outline Landscape Architects will benefit from the outcome of the project decision-making.

Kathrin Hammel, the principal Landscape Architect and Visual Specialist from Outline Landscape Architects undertook this Visual Impact Assessment. She is a registered Professional Landscape Architect at the South African Council of Landscape Architects, SACLAP no. 20162. Kathrin has been involved as a Visual Impact Specialist since 2009

The study will assess the Visual Impact of the activities and associated infrastructure of the Khanyazwe Flexpower Plant.

1.1. BACKGROUND AND BRIEF

This VIA will conform to the requirements of a Level Three assessment which requires the realisation of the following objectives (Adapted from Oberholzer (2005)):

- Determination of the extent of the study area.
- Description of the proposed project and the receiving environment.
- Identification and description of the landscape character of the study area.
- Identification of the elements of particular visual value and -quality that could be affected by the proposed project.
- Identification of landscape- and visual receptors in the study area that will be affected by the proposed project and assess their sensitivity.
- Indication of potential landscape- and visual impacts.
- Assessment of the significance of the landscape- and visual impacts.
- Recommendations of mitigation measures to reduce and/or alleviate the potential adverse landscape- and visual impacts.

1.2. STUDY AREA

The proposed project will be south of an urban area in Malelane town and is within agricultural lands, on Portions 1, 4, and 116 of Farm Malelane 389 FP, situated approximately 3km away from the Kruger National Park and within 2 km of the Malelane Central Business District within the jurisdiction of the Nkomazi Local Municipality in the Mpumalanga Province of South Africa.

Figure 1: Locality Map

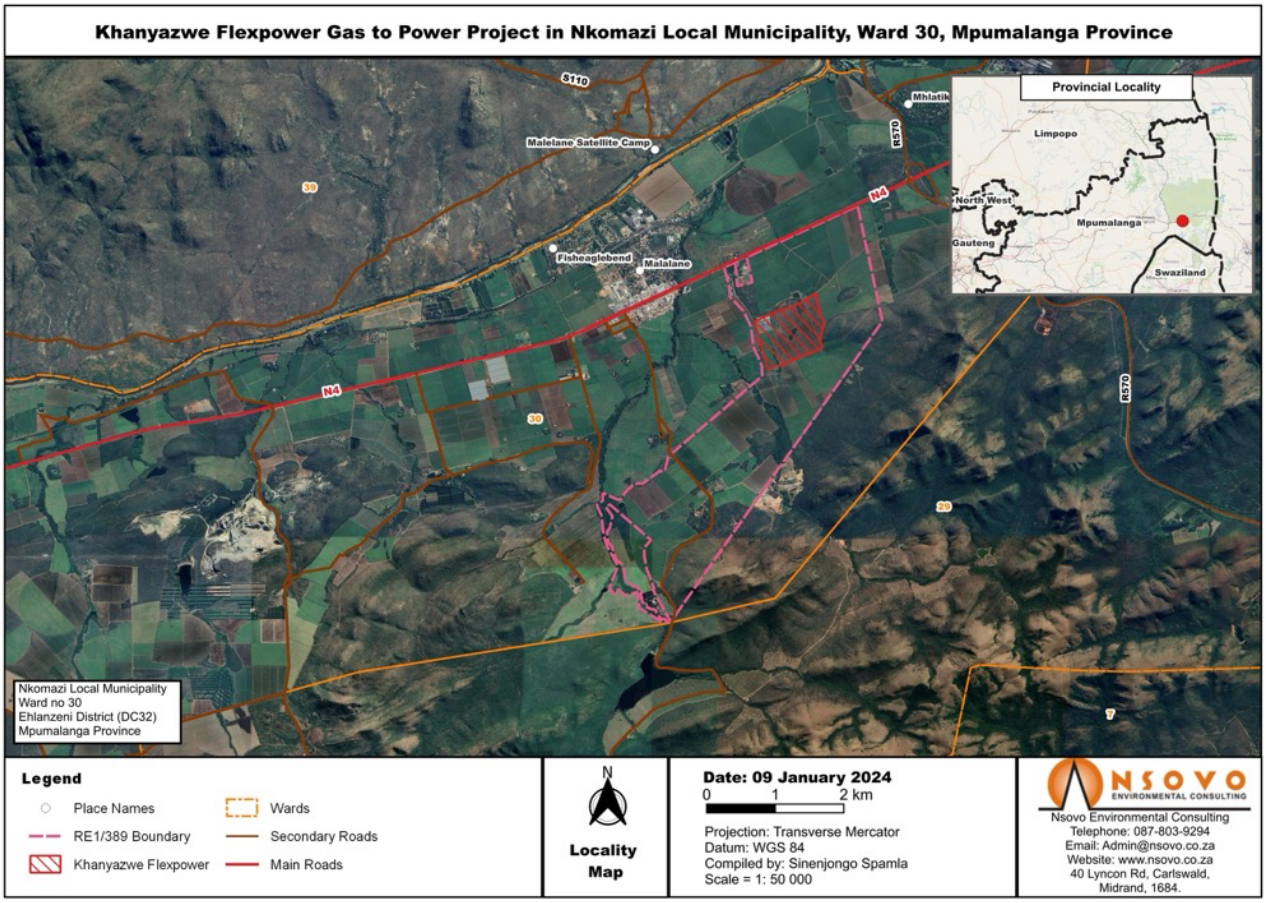

Figure 2: Site Layout

2. STUDY APPROACH

2.1. INFORMATION BASE

This assessment was based on information from the following sources:

- Topographical maps and GIS generated data were sourced from the Surveyor General, and EcoGIS (2024) respectively.
- Observations made and photographs taken during the site visit.
- Professional judgement based on experience gained from similar projects; and
- Literature research on similar projects.

2.2. ASSUMPTIONS AND LIMITATIONS

This assessment was undertaken during the conceptual stage of the project and is based on information available at the time.

- This level of assessment excludes surveys to establish viewer preference and thereby their sensitivity. Viewer sensitivity is determined by means of a commonly used rating system (Table 3).

2.3. LEVEL OF CONFIDENCE

The level of confidence assigned to the findings of this assessment is based on:

- The level of information available and/or understanding of the study area (rated 2); and
- The information available and/or knowledge and experience of the project (rated 3).

This visual impact assessment is rated with a general confidence level of 6. This rating indicates that the author's general confidence in the accuracy of the findings is *high* (Table 12). Where the confidence level of specific findings is not regarded as high, it is noted in the last column of each impact assessment table.

2.4. METHOD

A broad overview of the approach and methodology used in this assessment is provided below:

- The extent of the study area is determined and indicated in Figure 1 and 2.
- The site is visited to establish a photographic record of the site, views and areas of particular visual quality and or -value.
- The project components and activities are described and assessed as potential elements of visual and landscape impacts.
- The receiving environment is described in terms of its prevailing landscape- and visual character.
- Landscape- and visual receptors that may be affected by the proposed project are identified and described.
- Mitigation measures are proposed to reduce adverse impacts.
- The findings of the study are documented in this Visual Impact Assessment.

3. PROJECT DESCRIPTION

3.1. OVERVIEW OF DEVELOPMENT

Khanyazwe Flexpower (Pty) Ltd (hereafter referred as KFP) is proposing to develop, construct and operate a (maximum) 1000MW natural gas-fired power plant using either gas engines (of Internal Combustion Engines (ICE)) or Combined Cycle Gas Turbines (CCGT)). KFP will source gas from the Republic of Mozambique Pipeline Investments Company (ROMPCO), which has an existing gas pipeline that connects Mozambique's Pande Temane gas fields to Sasol's operations in South Africa, as well as several industrial and retail customers. Alternative sources of gas, if gas from the existing Pande Temane fields is not sufficient, may include imported LNG projects being developed by Matola, which is able to provide additional gas into the ROMPCO pipeline. KFP is proposing the development of approximately two 500m 275kV and 132kV overhead powerlines from the proposed power plant to the existing Eskom Khanyazwe substation. The power plant will provide a mid-merit power profile to the national grid.

The proposed development will include the construction and assembly of the following associated infrastructures:

- Gas turbines for the generation of electricity through the use of natural gas
- Heat recovery steam generators (HRSG) to capture heat from high-temperature exhaust gases to produce high-temperature and high-pressure dry steam to be utilised in the steam turbines.
- Steam turbines for the generation of additional electricity through the use of dry steam generated by the HRSG.
- Bypass stacks associated with each gas turbine.
- Medium Speed Gas Engines for the generation of electricity through the use of natural gas.
- Waste storage facilities (general and oily water)
- Clustered exhaust stacks for the discharge of combustion gases into the atmosphere.
- Dirty water retention dams and clean water dams.
- Firewater tanks.
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- Waste storage facilities (general and hazardous).
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- A water treatment plant for the treatment of raw water into potable water and the production of demineralised water (for steam generation).
- Water pipelines from the power block to the station's boundary fence and water tanks to transport and store water of both industrial quality and potable quality.
- Dry-cooled system consisting of air-cooled condenser fans situated in fan banks.
- LV and MV switch gear rooms.

- Control room.
- Closed fin-fan coolers to cool lubrication oil for the gas and steam turbines.
- A gas pipeline from the power block to the station's boundary fence and a gas pipeline supply conditioning process facility for the conditioning and measuring of natural gas before being supplied to the gas turbines.
- Ancillary infrastructure, including access roads, warehousing, buildings, access control facilities and workshop area, storage facilities, emergency backup generators, firefighting systems, laydown areas, and 275/132kV switchyard.
- A power line to connect the project to the national grid to evacuate the generated electricity.

This site is located on portions 389 and 390 of Farm Malelane 389 in close proximity to the Eskom Khanyazwe Substation. The land is currently used for agriculture.

The table below indicates the description of the main proposed activities.

Table 1: Description of Activities

ACTIVITY	DESCRIPTION
Khanyazwe Flexpower Plant	1000MW natural gas-fired power plant using either gas engines (of Internal Combustion Engines (ICE)) or Combined Cycle Gas Turbines (CCGT)) and associated infrastructure structures which will include the gas turbines, steam generators, steam turbines, storage tanks and bulk storage capacity.
Exhaust Stacks	Bypass stacks for each gas turbine and engine, clustered exhaust stacks for the discharge of combustion gases into the atmosphere.
Ancillary Infrastructure	An access road of approximately 8m to the development site will be used as an access road during construction and a service road during the operational phase. Buildings for warehousing, access control facilities, workshop areas, storage facilities, emergency backup generators, firefighting systems, laydown areas and 275/132kV switchyard.
Above Ground Gas Pipeline	Transportation of gas from the ROMPCO gas pipeline to the proposed power plant. A servitude of 36m is required.
Overhead Power Lines	2 x 500m 275 and/or 132kV overhead power lines to connect the proposed power plant to the existing Eskom Khanyazwe sub-station. A servitude of 31m is required.

3.2. PROJECT COMPONENTS AND ACTIVITIES

Each project activity will affect the receiving environment differently and is therefore discussed separately. The following project components will occur during the construction and operational phases of the project and are identified as elements that may cause a potential landscape and/or visual impact:

3.2.1. CONSTRUCTION CAMPS AND LAY-DOWN YARDS

Temporary construction camps will be present for the duration of the construction period. The appointed contractor will set up construction camp. The material lay-down yards are expected to be located adjacent to the construction camp and will serve as storage areas for the construction material and equipment.

3.2.2. ACCESS ROADS

Existing access roads to the Khanyazwe Substation can be used. A new access road will be required for a short distance from the substation to the plant. An access road of approximately 8m in width will be made during construction but will remain for the lifetime of the mining activities. Vegetation will be cleared and will change the visual character of the site.

3.2.3. POWER STATION

There is one site proposed for the KFP. The placement and orientation of the power station will be important to minimise the visual impact as far as possible.

3.2.4. OVERHEAD TRANSMISSION LINES

Approximately two 500m 275 and/or 132kV overhead power lines will be constructed from the power station to the existing Eskom Khanyazwe Substation. The structural alternatives i.e., cross-rope suspension type, self-supporting type or guyed V-towers, have not been finalised. The selection of pylons to be used must take the potential visual impact into consideration.

4. DESCRIPTION OF THE AFFECTED ENVIRONMENT

Landscape and visual impacts may result from changes to the landscape. A distinction should be made between impacts on the visual resource (landscape) and on the viewers. The former are impacts on the physical landscape that may result in changes to landscape character while the latter are impacts on the viewers themselves and the views they experience.

4.1. VISUAL RESOURCE

Visual resource is an encompassing term relating to the visible landscape and its recognisable elements, which through their co-existence, result in a particular landscape character.

4.1.1. LANDSCAPE CHARACTER

The proposed facility is within an agricultural area, adjacent to the urban setting of Malelane. It is located on Portions 1, 4, and 116 of Farm Malelane 389 FP. The immediate surroundings of the proposed development site comprise mainly of agricultural lands. The residential communities located adjacent to the proposed development site include informal, semi-suburban (township), and suburban households.

Malelane town is approximately 2km away and is the closest town to the proposed site. The town is characterised by medium income residential households.

Matsulu is a low-medium income residential household located to the west of the proposed site. The town is situated at the Crocodile and Komati Rivers' confluence in the Mpumalanga Province. The town is 4km from the Malelane Gate into the Kruger Park, 48km from the Mozambique border, and 65km from the Eswatini border.

The proposed site is south of the N4 that connects Mbombela with the Mozambique border. A secondary gravel road leads to the site. This section of the N4 is an important route to the Kruger National Park for tourists. There is a small retail development near the proposed site.

The natural landscape is mostly degraded and used for agricultural purposes. The existing Eskom Khanyazwe Substation contributes to the visual degradation of the study area.

The landscape character changes through the study area from savanna landscapes to degraded and agricultural areas. The proposed site for the power station is situated approximately 300m above sea level on flat landscape and are surrounded by higher mountains (Figure 5).

The visual impact of the project will cause changes in the landscape that are noticeable to viewers experiencing the study area, especially from the N4, and from residential areas.

Visual impacts that would potentially result from project activities are likely to be adverse, long-term, and will most likely cause a loss of landscape and visual resources. The visual impact from the Kruger National Park is anticipated to be moderate to low, due to the distance from the site and the topography and bushveld landscape with large trees that will help screen the development.

The proposed site is within the Savanna biome and the Lowveld Bioregion. The main vegetation type that has been identified (Figure 3) for the study area is Granite Lowveld.

The proposed site is approximately 16ha in size. The gas pipeline will require a clearance of vegetation of 36m. The overhead powerlines are approximately 500m long and will require a servitude of 31m.

4.1.2. VISUAL CHARACTER

Visual character is based on human perception and the observer's response to the relationships between and composition of the landscape, the land uses, and identifiable elements in the landscape. The description of the visual character includes an assessment of the scenic attractiveness regarding those landscape attributes that have aesthetic value and contribute significantly to the visual quality of the views, vistas and/or viewpoints of the study area.

The overall landscape varies between flat agricultural fields, natural landscape, which is mostly undulating, to degraded, polluted landscapes around industrial developments and towns. Industrial areas have a negative effect on the visual character of the landscape.

4.1.2.1 Visual Value

Visual value relates to those attributes of the landscape or elements in the landscape to which people attach values that though not visually perceivable, still contribute to the value of the visual resource. These visual values are derived from ecological, historical, social and/or cultural importance and are described in terms of their uniqueness, scarcity, and naturalness and/or conservation status. The importance of the visual value of a landscape or element in the landscape is measured against its value on an international, national and local level.

Only a few parts of the study area have been left undisturbed and there are only small parts of unspoilt pristine landscape remaining. These areas however remain under pressure and are vulnerable due to human settlement expansion and industrial activities.

4.1.2.2 Visual Quality

Visual quality is a qualitative evaluation of the composition of landscape components and their excellence in scenic attractiveness. Many factors contribute to the visual quality of the landscape and are grouped under the following main categories (Table 2) that are internationally accepted indicators of visual quality (FHWA, 1981):

Table 2: Criteria of Visual Quality (FHWA, 1981)

INDICATOR	CRITERIA
Vividness	The memorability of the visual impression received from contrasting landscape elements as they combine to form a striking and distinctive visual pattern.
Intactness	The integrity of visual order in the natural and man-built landscape, and the extent to which the landscape is free from visual encroachment.
Unity	The degree to which the visual resources of the landscape join together to form a coherent, harmonious visual pattern. Unity refers to the compositional harmony of inter-compatibility between landscape elements.

The landscape is allocated a rating from an evaluation scale of 1 to 7 and divided by 3 to get an average. The evaluation scale is as follows: Very Low =1; Low =2; Moderately Low =3; Moderate =4; Moderately High =5; High =6; Very High =7

The regional landscape is assessed against each indicator separately. All three indicators should be *high* to obtain a *high* visual quality. The evaluation is summarised in Table 3.

Table 3: Visual Quality of the regional landscape

VIVIDNESS	INTACTNESS	UNITY	VISUAL QUALITY
3	4	3	Moderate

The visual quality of the landscape is moderate and can be attributed to the agricultural developments and towns and settlements. Visual quality is however improved by the natural attraction of the surrounding mountains.

4.1.2.3 Visual absorption capacity

Visual Absorption Capacity (VAC) 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:

- Degree of visual screening:
  A degree of visual screening is provided by landforms, vegetation cover and/or structures such as buildings. For example, a high degree of visual screening is present in an area that is mountainous and is covered with a forest compared to an undulating and mundane landscape covered in grass.
- Terrain variability:
  Terrain variability reflects the magnitude of topographic elevation and diversity in slope variation. A highly variable terrain will be recognised as one with great elevation differences and a diversity of slope variation creating talus slopes, cliffs and valleys. An undulating landscape with a monotonous and repetitive landform will be an example of a low terrain variability.
- Land cover:
  Land cover refers to the perceivable surface of the landscape and the diversity of patterns, colours and textures that are presented by the particular land cover (i.e. urbanised, cultivated, forested, etc.).

A basic rating system is used to evaluate the three VAC parameters. The values are relative and relate to the type of project that is proposed and how it may be absorbed in the landscape (Table 4).

A three-value range is used; three (3) being the highest potential to absorb an element in the landscape and one (1) being the lowest potential. The values are counted together and categorised in a *high*, *medium* or *low* VAC rating.

Table 4: Regional Visual Absorption Capacity evaluation

ACTIVITY	VISUAL SCREENING	TERRAIN VARIABILITY	LAND COVER	SITE VAC
Khanyazwe Flexpower Plant	1	1	1	Low
Exhaust Stacks	1	2	1	Low
Ancillary Infrastructure	2	2	1	Moderate
Above Ground Gas Pipeline	2	2	1	Moderate
Overhead Power Lines	1	2	1	Low

The VAC of the study area is considered low and provides low overall screening capacity for this project. The low VAC relates to the flat topography and low-growing vegetation. The moderate VAC relates to low structures such as the above ground gas pipeline that can be absorbed by the landscape. Ancillary infrastructure is also expected to be absorbed into the landscape and surrounding infrastructure associated with the substation.

The site has a relatively high VAC regarding views from the Kruger National Park to the site. There are many hills and koppies and large trees providing screening for viewers looking towards the proposed development.

Figure 3: Vegetation Map

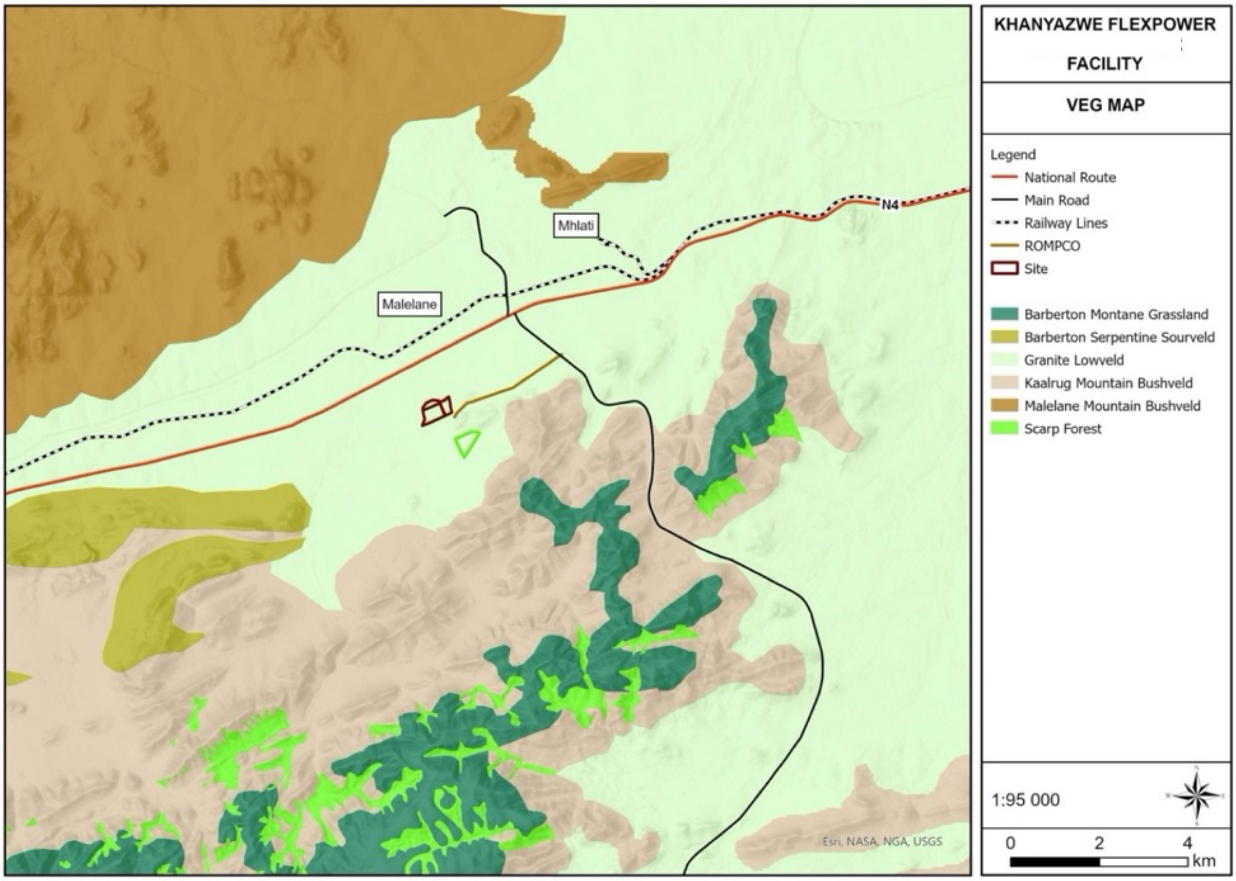


Figure 4: Land Cover Map

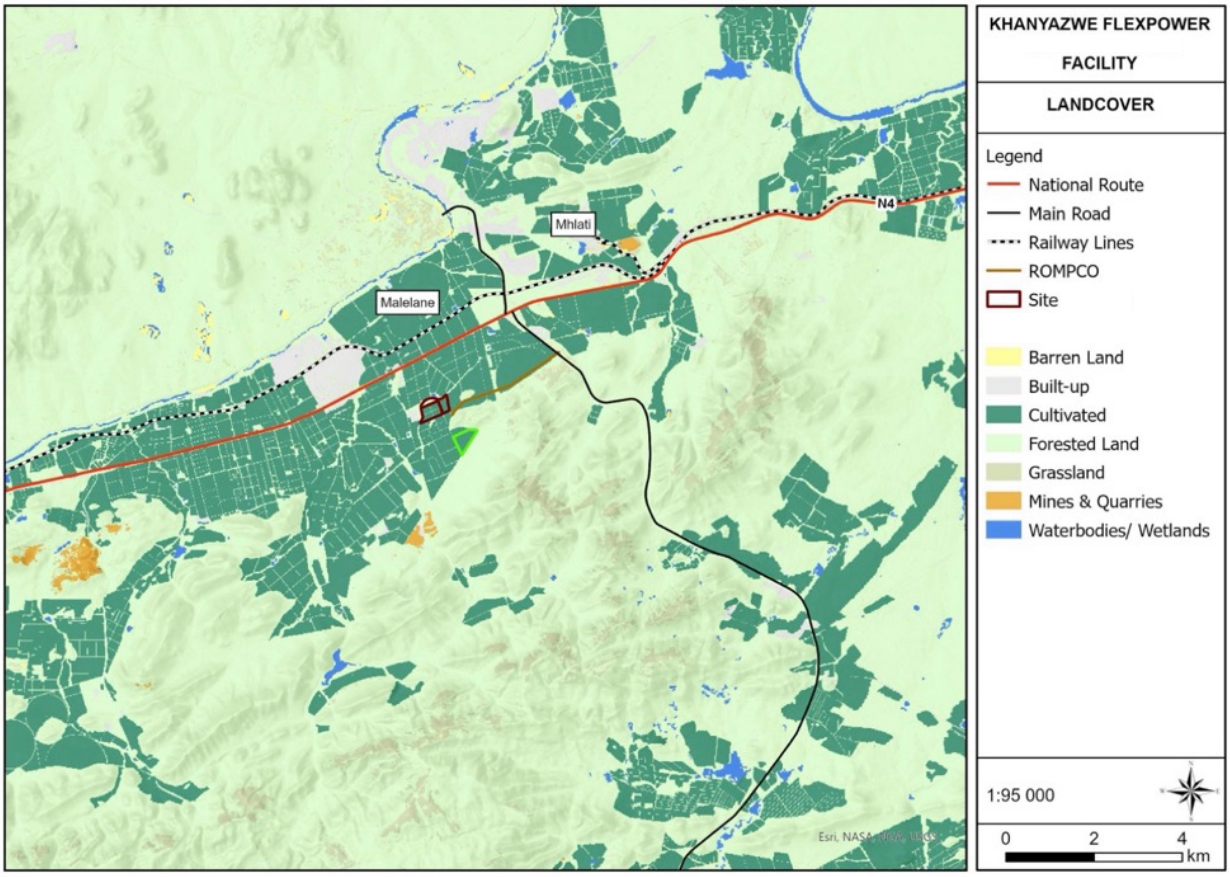


Figure 5: Elevation Map

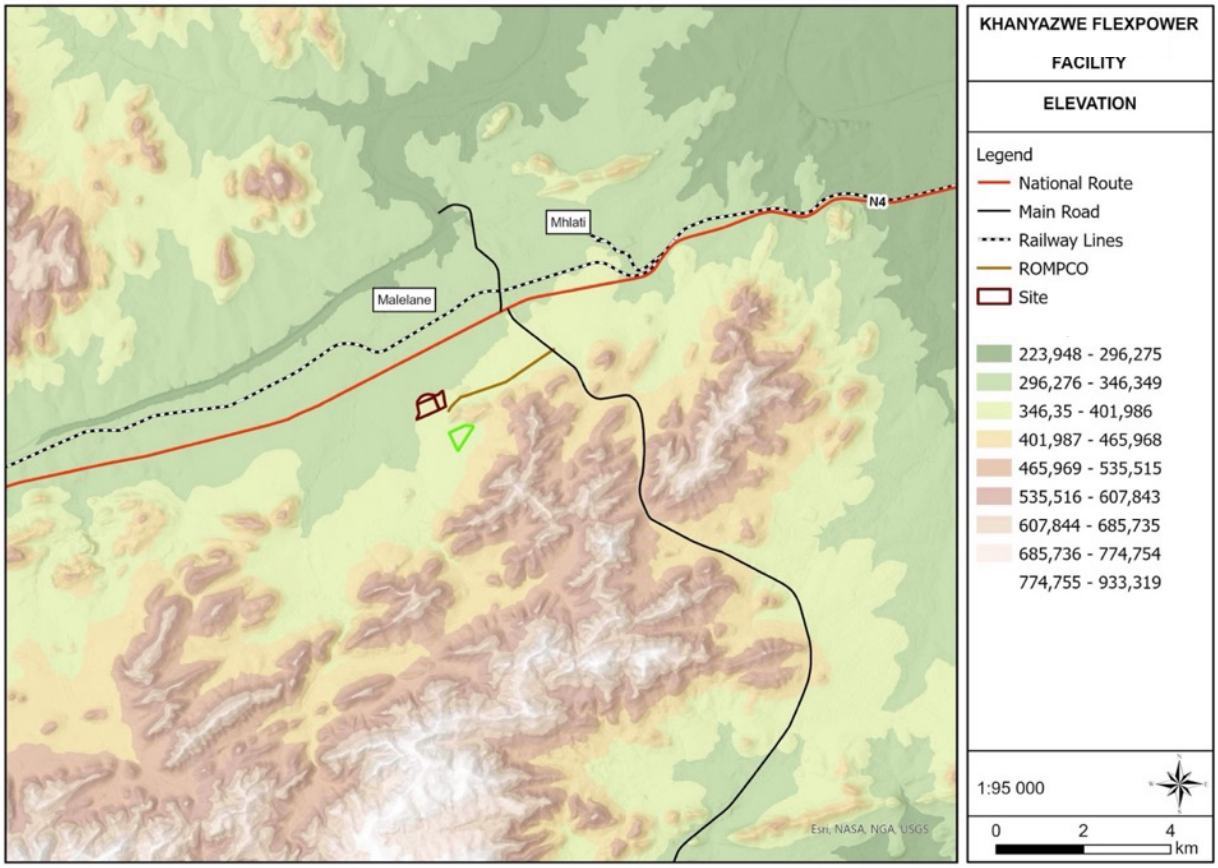


Figure 6: Landscape Character of Study Area

Figure 7: Views towards the site from the Kruger National Park

General landscape character of natural and agricultural area

Figure 8: View towards the site from the N4

Agricultural landscape at the proposed site

Figure 9: Proposed site

Figure 10: View from the gravel road towards the Khanyazwe substation

5. IMPACT ASSESSMENT

The significance of impacts is a comparative function relating to the severity of the identified impacts on the respective receptors. The significance of an impact is considered *high* should a *highly* sensitive receptor be exposed to a *highly* severe impact as indicated on Table below.

Table 5: Significance of impacts

RECEPTOR SENSITIVITY	IMPACT SEVERITY		
	LOW	MEDIUM	HIGH
LOW	No significance	Low	Low
MEDIUM	Low	Medium	Medium
HIGH	Low	Medium	High

5.1. SIGNIFICANCE OF LANDSCAPE IMPACT

5.1.1. LANDSCAPE CHARACTER SENSITIVITY

The sensitivity of the landscape character is an indication of "…the degree to which a particular landscape can accommodate change from a particular development, without detrimental effects on its character" (GLVIA, 2002). A landscape with a *high* sensitivity would be one that is greatly valued for its aesthetic attractiveness and/or have ecological, cultural or social importance through which it contributes to the inherent character of the visual resource.

The majority of the study area is considered to have moderate landscape character sensitivity due to the surrounding natural landscape and high tourism value. The proposed site, is however, environmentally degraded and is mostly used for agriculture. There is also an industrial character, with the Khanyazwe Substation and powerlines crossing the landscape. There are industries associated with agriculture such as sugar mills and processing plants. The relatively flat and level landscape provides minimal visual screening. The vegetation in the surrounding areas is savanna landscape with medium sized trees and grass which is mostly dormant in winter and does not afford much screening. The area directly surrounding the site is agriculture, with sugar cane being the most dominant crop that was noted during the site visit.

Previous human induced activities and interventions have impacted significantly on the original landscape character. In this case, industrial and existing infrastructure, including power lines, roads, and residential developments can be classified as landscape disturbances and elements that cause a reduction in the condition of the affected landscape type and negatively affect the quality of the visual resource.

The assessment of the landscape is substantiated through professional judgement and informed reasoning which is based on the landscape character assessment in Section 4 above. A landscape sensitivity rating was adapted from GOSW (2006) (Table) and applied in the classification of the study area into different sensitivity zones.

Table 6: Landscape character sensitivity rating (Adapted from GOSW, 2006)

	DESCRIPTION
Low sensitivity	These landscapes are likely to: ° Have distinct and well-defined landforms; ° Have a strong sense of enclosure; ° Provide a high degree of screening; ° Have been affected by extensive development or man-made features; ° Have reduced tranquillity; ° Are likely to have little inter-visibility with adjacent landscapes; and ° Exhibit no or a low density of sensitive landscape features that bare visual value.
Moderate sensitivity	These landscapes are likely to: ° Have a moderately elevated topography with reasonably distinct landforms that provides some sense of enclosure; ° Have been affected by several man-made features; ° Have limited inter-visibility with adjacent landscapes; and ° Exhibit a moderate density of sensitive landscape features that bare visual value.
High sensitivity	These landscapes are likely to: ° Consist mainly of undulating plains and poorly defined landforms; ° Be open or exposed with a remote character and an absence of man-made features; ° Are often highly visible from adjacent landscapes; and ° Exhibit a high density of sensitive landscape features that bare visual value.

5.1.2. SEVERITY OF POTENTIAL LANDSCAPE IMPACTS

Landscape impacts are alterations to the fabric, character, visual quality and/or visual value which will either positively or negatively affect the landscape character. During the construction and operational phases, the project components are expected to impact on the landscape character of the landscape types it traverses. The magnitude/severity of this intrusion is measured against the scale of the project, the permanence of the intrusion and the loss in visual quality, -value and/or VAC.

Table 7: Landscape impact – Altering the landscape character.

LANDSCAPE IMPACT								
Activity	**Nature of Impact**	**Extent of Impact**	**Duration of Impact**	**Severity of Impact**	**Probability of Impact**	**Significance without Mitigation**	**Significance with Mitigation**	**Level of Confidence**
Construction phase								
KFP Plant	Negative Impacting on the visual quality of the landscape due to the presence of foreign elements and a loss of vegetation cover	Localised impacts over an extensive area	Permanent if not mitigated	Moderate	Definite	Moderate	Moderate	High
Exhaust Stacks				Moderate	Definite	Moderate	Moderate	High
Ancillary Infrastructure				Moderate	Definite	Moderate	Low	High
Above Ground Gas Pipeline				Low	Improbable	Low	Low	High
Overhead Power Lines				Moderate	Definite	Moderate	Low	High
Operational phase								
KFP Plant	Negative Impacting on the visual quality of the landscape.	Localised impact over an extensive area	Permanent if not mitigated	High	Definite	High	Moderate	High
Exhaust Stacks				High	Definite	High	Moderate	High
Ancillary Infrastructure				High	Definite	High	Moderate	High
Above Ground Gas Pipeline				Low	Probable	Low	Low	High
Overhead Power Lines				High	Definite	High	Moderate	High

Construction phase

The activities that are expected to cause landscape impacts and that are associated with the construction phase, are the establishment of construction camps and the construction of the infrastructure. These activities will create surface disturbances which will result in the removal of vegetation and the exposure of the underlying soil. The exposed soil and change in texture will contrast severely with the intact vegetation around the disturbance footprint.

The construction camps and lay-down yards are anticipated to disturb a much larger area. The size and location of the construction camps will play a major role in the severity of the landscape impact. Accurate technical information is not available for the construction camps but due to the industrial character and ongoing construction of the area, the construction camp may be easily associated with existing activities and therefore mitigates the impact considerably.

Considering the low VAC throughout most of the study area, the developed condition of great parts of the landscape and the relatively high recovery rate of the vegetation, the *severity of the landscape impact* during the construction stage is expected to be *moderate.*

Sensitive placement of the construction camps, limited surface disturbance and prompt rehabilitation can reduce the severity of the impact.

The *severity of the landscape impact* for the development of the infrastructure is expected to be moderate. All surface activities will be visible from a certain distance from the site, however due to the existing industrial developments and Khanyazwe Substation the visual impact is expected to be less significant.

Operational phase

All operational activities will be visible from a certain distance from the development. It may pose a visual impact to residents that look onto the site and road users that regularly use the N4 highway and R570 regional road.

Surface disturbances that occur during construction may remain for an extended period during the operational phase. These are seen as residual effects carried forward from the construction phase and can be completely or substantially mitigated if treated appropriately during the construction phase.

The main impact will be caused as a result of the presence of the completed infrastructure and the buildings. The existing industrial activities and visual association will help to reduce the impact.

Lighting on the power plant at night, will have a high visual impact to viewers within close proximity to the development. The assumption can be made that as the building is visible during the day, the same applies during the night with lighting.

Closure phase

Upon possible closure and end of life of activities, rehabilitation of affected areas will take place and visual aesthetics will be improved. Minimal negative residual impact is expected on visual aspects.

5.2. SIGNIFICANCE OF VISUAL IMPACTS

5.2.1. VIEWER SENSITIVITY

Within the receiving environment, specific viewers (visual receptors) experience different views of the visual resource and value it differently. They will be affected because of alterations to their views due to the proposed project. The visual receptors are grouped according to their similarities. The visual receptors included in this study are:

- Residents
- Motorists
- Tourists

To determine visual receptor sensitivity a commonly used rating system is utilised. This is a generic classification of visual receptors and enables the visual impact specialist to establish a logical and consistent visual receptor sensitivity rating for viewers who are involved in different activities without engaging in extensive public surveys.

5.2.1.1 Residents

Residents of the affected environment are classified as visual receptors of *high* sensitivity owing to their sustained visual exposure to the proposed development as well as their attentive interest towards their living environment.

5.2.1.2 Tourists

These are regarded as visual receptors of exceptional *high* sensitivity. Their attention is focused on the landscape which they essentially utilise for enjoyment purposes and appreciation of the quality of the landscape.

5.2.1.3 Motorists

Motorists are generally classified as visual receptors of *low* sensitivity due to their momentary view and experience of the proposed development. As a motorist's speed increases, the sharpness of lateral vision declines, and the motorist tends to focus on the line of travel (USDOT, 1981). This adds weight to the assumption that under normal conditions, motorists will show *low* levels of sensitivity as their attention is focused on the road and their exposure to roadside objects is brief.

5.2.2. SEVERITY OF POTENTIAL VISUAL IMPACTS

Severity of visual impact refers to the magnitude of change to specific visual receptor's views and/or experience of the landscape. Severity of visual impact is influenced by the following factors:

- The **viewer's exposure** to the project:
  - Distance of observers from the proposed project.
  - The visibility of the proposed project (ZVI).
  - Number of affected viewers.
  - Duration of views to development experienced by affected viewers.
- Degree of **visual intrusion** created by the project.

Empirical research indicates that the visibility of the proposed power station and hence the severity of visual impact, decreases as the distance between the observer and the proposed power station increases. The landscape type can mitigate the severity of visual impact through topographical or vegetative screening. Bishop *et al* (1988) noted that in some cases the power station as an object, may dominate the view for example, silhouetted against the skyline, or in some cases be absorbed in the landscape. A complex landscape setting with a diverse land cover and topographical variation has the ability to decrease the severity of visual impact more than a mundane landscape (Bishop *et al*, 1985).

The Zone of Visual Influence (ZVI) is determined through a Geographical Information System (GIS). The result reflects a shaded pattern which identifies the areas that are expected to experience views of the proposed power station. The ZVI is limited to 5km from the proposed power plant.

A visibility analysis and viewer sensitivity has been completed for the proposed power station and proposed new overhead powerlines (Appendix 1, Figure 11 and 12). According to Bishop *et al* (1988), visual receptors within 1 km from the proposed power plant are most likely to experience the highest degree of visual intrusion, hence contributing to the severity of the visual impact. This is considered as the zone of highest visibility after which the degree of visual intrusion decreases rapidly at distances further away.

In order to assess the extent and degree of visibility in the visual envelope, a Geographical Information System (GIS) was utilized. A visibility analysis was performed which provides the following information on Figure 11 and 12 below:

- The areas within the visual envelope that may experience views of the proposed project; and
- The degree of visibility in terms of the percentage of the proposed project that will be visible from a specific location.

The GIS performs an analysis for an elevated observer points which represents the approximate height of power plant (30m) and overhead transmission lines (40m) in a digital elevation model (DEM). This results in a visibility map with the degree of visibility illustrated by a colour.

The visibility analyses consider worst-case scenarios, using line-of-sight, based on topography alone. The screening capability of vegetation is not captured in the base model of the DEM and is therefore not considered in these results.

5.2.2.1 Potential visual impacts on Residents

Table 8: Potential Visual Impact on Residents

Activities	Corrective Measures	Impact Rating Criteria					Significance S=(E+D+M)P
		Nature	Extent (E)	Duration (D)	Magnitude (M)	Probability (P)	
Khanyazwe Flexpower Plant	No	Negative	2 Local	4 Long term	6 Moderate	4 High	48 medium
	Yes	Negative	2 Local	4 Long term	4 Low	3 Medium	30 medium

The area around the proposed power plant has a low residential population. The area is mostly used for agriculture and industry. The residents of the farmsteads will experience high intrusion on their views due to the presence of the proposed new power plant and overhead lines. They are recognised as the general population of the study area and are identified as affected visual receptors.

The proposed above ground gas pipeline will not affect any residential area and will cross agricultural land. Mitigation measures such as sensitive placement of the pipeline and using vegetation and landforms as screening can be implemented.

It can be concluded that the study area has a moderate to low density of residents that will be affected viewers.

Construction phase

During the construction phase, unsightly views may be created by the presence of the construction camp and the lay-down yards. The duration of the potential visual impact will be temporary which will result in an anticipated *low* significance of visual impact for all the alternatives. The visual exposure to the construction activity will be limited.

The cleared site, construction camp and material lay-down yards will appear unsightly and out of character. Large scale construction machinery will be highly visible and increase awareness of the construction activity over a considerable area. The visual intrusion caused during the construction stage will be moderate but will be temporary in nature.

Operational phase

The residents of the settlements and farming communities surrounding the power plant and overhead lines may experience a moderate to high degree of visual intrusion.

The Visual Absorption Capacity (VAC) of the landscape plays a role in the visibility of the proposed power station and associated infrastructure. The landscape is flat and mostly level in the area where the power station is proposed. The VAC for the overhead transmission lines to the Khanyazwe Substation is low as the landscape is flat and existing vegetation consists of agricultural crops. There is an existing Eskom substation on the proposed site and powerlines crossing the landscape. This will reduce the visual impact of the new development because of the association of similar structures in the area.

The current presence of large industries and the existing substation in the visual field of the residents is expected to reduce the impact experienced. The region is associated with existing industry which reduces the significance of the overall visual impact and can be regarded as moderately low.

The anticipated visual impact related to lighting will be high for residents in close proximity to the proposed power station. The impact can be lowered to a moderate significance with correct mitigation measures.

5.2.2.2 *Potential visual impacts on tourists*

Table 9: Potential Visual Impact on Tourists

Activities	Corrective Measures	Impact Rating Criteria					Significance S=(E+D+M)P
		Nature	Extent (E)	Duration (D)	Magnitude (M)	Probability (P)	
Khanyazwe Flexpower Plant	No	Negative	2 Local	4 Long term	6 Moderate	4 High	48 medium
	Yes	Negative	2 Local	4 Long term	4 Low	3 Medium	30 medium

The entire regional area is considered to have moderate to high tourism potential and tourists pass through Malelane when entering or exiting the Kruger National Park from the Malelane gate. The N4 highway that passes the proposed area is the main access route to the Mozambique - South Africa border. There are numerous guest houses in Malelane. It is evident from the Visibility Analysis and Viewer Sensitivity (Figure 11 and 12) that the power plant and overhead power lines will be visible from some roads in the southern parts of the Kruger National Park. The digital analysis does not take vegetation into consideration, especially large trees present that do provide screening towards the plant.

The surrounding mountains with natural landscape and agricultural fields has aesthetic value and there are also nature-based economic activities such as eco-tourism establishments in the area. The topographical features must be utilized when selecting the location of the power plant and overhead lines to minimize visual impact and intrusions.

The proposed power plant will not be seen in isolation but within the context of the existing Khanyazwe Substation.

Construction phase

The temporary duration of the construction phase is not expected to cause major visual impacts. The location, number and size of the construction camps and lay-down yards will be crucial in regulating the impact. Detail information is not available, and it is anticipated that the visual impact will occur localised and that a very small number of tourists will be adversely affected by these project components during construction.

The potential visual impact on tourists during the construction phase of the proposed project can be mitigated with relative ease. The greatest factor to consider is the location of the construction camps.

Operational phase

Tourists travelling to the Kruger National Park and Mozambique will be affected by the visual intrusion when passing through the study area. Although it is difficult to pinpoint particular locations in the study area that are of specific value, the areas next to the roads will be most important.

The industrial and agricultural landscape of that stretch of the N4, with large existing developments, will lessen the visual impact, as the association of the area is industrial in nature.

Tourists within the Kruger National Park may have momentary views of the development from the southern roads close to Malelane Gate. But high trees and koppies provide screening and views are expected to be intermittent. Other industrial developments are visible from this area of the Kruger National Park and the sense of wild remoteness is diminished.

The Malelane Satellite Camp is the only overnight camp in the Kruger National Park that may be affected by the view onto the plant and night lighting from the power plant. The camp already experiences visual intrusion as it looks onto Malelane.

The severity of the visual impact of the power plant and building infrastructure on tourists will be moderate, causing moderate visual impact.

5.2.2.3 Potential visual impacts on motorists

Table 10: Potential Visual Impact on Motorists

Activities	Corrective Measures	Impact Rating Criteria					Significance S=(E+D+M)P
		Nature	Extent (E)	Duration (D)	Magnitude (M)	Probability (P)	
Khanyazwe Flexpower Plant	No	Negative	2 Local	4 Long term	4 Low	3 Medium	30 medium
	Yes	Negative	2 Local	4 Long term	2 Minor	2 Low	16 low

The major route within the study area is the N4, connecting the towns, industries and farms. The R570 is the secondary road network in the study area and carries a volume of motorists to the Kruger National Park. Many of the roads are gravel roads which are utilized by the local residents. Their duration of views will be temporary, and it is expected that the visual intrusion that they will experience will be low. There is a gravel road access to the development from the N4.

The power plant and overhead powerlines may be visible within the southern parts of the Kruger National Park. The visibility analysis does not take the high trees into consideration, which do provide screening towards the site.

Construction phase

The potential visual impact that may be experienced by motorists during the construction phase is considered to be minimal. Limited information is available, and the number, location and size of the construction camps and lay-down yards are essential for accurately assessing the visual impact.

The presence of the construction camps and lay-down yards may create unsightly views. Motorists' visual exposure to the impact will be brief and the severity of visual impact will be *low*. The significance of potential visual impact is expected to be *low*.

Operational phase

The proposed power station and the overhead lines are visible to motorists intermittently along the N4. The undulating landscape can absorb some of the impact at times. The severity and significance of the visual impact on motorists will be moderate.

The region is associated with large-scale existing industry and construction sites which reduces the significance of the overall visual impact. The speed at which motorists travel and the association of the regional area with agriculture and industries has a moderating effect on the severity of the visual impact.

At night the lights of the power station may be seen along sections of the N4 where the landscape does not absorb the impact. The visual impact of the lights can be reduced by mitigating the impact.

6. RECOMMENDED MITIGATION MEASURES

The aim of mitigation is to reduce or alleviate the intrusive contrast between the proposed project components and activities, and the receiving landscape to a point where it is acceptable to visual and landscape receptors.

6.1. GENERAL

- All servitude areas that will be disturbed through the destruction of vegetation, for example, the establishment of the construction camp, must be replanted with endemic, indigenous species.
- A hydroseeding application (mix of organic material and endemic veld grass) is recommended to be applied over the disturbed areas as a measure of rehabilitation.

6.2. INFRASTRUCTURE BUILDINGS

- Rehabilitate disturbed areas around buildings as soon as practically possible after construction. This should be done to restrict extended periods of exposed soil.
- Plant fast-growing endemic trees along the building yard and service roads. The trees will with time create a screen and increase the biodiversity of the area.
- It is also recommended that trees be planted in areas where there is a direct view of the power station to reduce the visual impact of viewers.

6.3. ACCESS ROUTES

- Make use of existing access roads where possible.
- Where new access roads are required, the disturbance area should be kept to a minimum. A two-track dirt road will be the most preferred option.

- Locate access routes so as to limit modification to the topography and to avoid the removal of established vegetation.
- Avoid crossing over or through ridges, rivers, pans or any natural features that have visual value. This also includes centres of floral endemism and areas where vegetation is not resilient and takes extended periods to recover.
- Road verges that need to be cleared should be kept to a minimum.
- Access routes should be located on the perimeter of disturbed areas such as cultivated/fallow lands so as not to fragment intact vegetated areas.
- If it is necessary to clear vegetation for a road, avoid doing so in a continuous straight line. Alternatively, curve the road in order to reduce the visible extent of the cleared corridor.

6.4. CLEARED SERVITUDES

- Locate the alignment and the associated cleared servitude so as to avoid the removal of established vegetation.
- Avoid a continuous linear path of cleared vegetation that would strongly contrast with the surrounding landscape character. Feather the edges of the cleared corridor to avoid a clearly defined line through the landscape.

6.5. CONSTRUCTION CAMPS AND LAY DOWN YARDS

- If practically possible, locate construction camps in areas that are already disturbed or where it isn't necessary to remove established vegetation like for example naturally bare areas.
- Utilise existing screening features such as dense vegetation stands or topographical features to place the construction camps and lay-down yards out of the view of sensitive visual receptors.
- Keep the construction sites and camps neat, clean and organised in order to portray a tidy appearance.
- Screen the construction camp and lay-down yards by enclosing the entire area with a dark green or black shade cloth of no less than 2m height.

6.6. LIGHTING

- Shielding the sources of light by physical barriers (walls, vegetation, or the structure itself).
- Directing light sources away from residential units and roads.
- Limiting mounting heights of lighting fixtures.
- Making use of minimum lumen or wattage in fixtures.
- Making use of down-lighters or shielded fixtures.
- Making use of low impact lighting.
- Making use of motion detectors on security lighting. This will allow the site to remain in relative darkness, until lighting is required for security or maintenance purposes.

7. CONCLUSION

The proposed Khanyazwe Flexpower Plant in Malelane has been evaluated against internationally accepted criteria to determine the impact they will have on the landscape character and the viewers that have been identified in the study area.

Table 11: Evaluation of Proposed Activities

Activities	Corrective Measures	Impact Rating Criteria					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Khanyazwe Flexpower Plant	No	Negative	2 Local	4 Long term	6 Moderate	4 High	48 medium
	Yes	Negative	2 Local	4 Long term	4 Low	3 Medium	30 medium
Above Ground Gas Pipeline	No	Negative	2 Local	4 Long term	4 Low	2 Low	20 low
	Yes	Negative	2 Local	4 Long term	2 Minor	2 Low	16 low
Access Road	No	Negative	2 Local	4 Long term	4 Low	2 Low	20 low
	Yes	Negative	2 Local	4 Long term	2 Minor	2 Low	16 low
Extension of a Busbar at the Eskom Khanyazwe sub-station	No	Negative	2 Local	4 Long term	6 Moderate	3 Medium	36 medium
	Yes	Negative	2 Local	4 Long term	4 Low	3 Medium	30 low-medium
Overhead Transmission Lines	No	Negative	2 Local	4 Long term	6 Moderate	4 High	44 medium
	Yes	Negative	2 Local	4 Long term	4 Low	3 Medium	30 medium

The Visual Impact Assessment Criteria for all activities as indicated in Table 11 applies and is rated as per below:

Status of Impact:
The visual impact is assessed as either having a:

- Negative effect (i.e. at a cost to the environment),
- Positive effect (i.e. a benefit to the environment), or
- Neutral effect on the environment.

Extent of the Impact:

(1) Site (site only),
(2) Local (site boundary and immediate surrounds),
(3) Regional,
(4) National, or
(5) International.

Duration of the Impact:
The length that the impact will last for is described as either:

(1) Immediate (<1 year)
(2) Short term (1-5 years),

(3) Medium term (5-15 years),
(4) Long term (ceases after the operational life span of the project),
(5) Permanent.

Magnitude of the Impact:
The intensity or severity of the impacts is indicated as either:
(0) none,
(2) Minor,
(4) Low,
(6) Moderate (environmental functions altered but continue),
(8) High (environmental functions temporarily cease), or
(10) Very high / unsure (environmental functions permanently cease).

Probability of Occurrence:
The likelihood of the impact actually occurring is indicated as either:
(0) None (the impact will not occur),
(1) Improbable (probability very low due to design or experience)
(2) Low probability (unlikely to occur),
(3) Medium probability (distinct probability that the impact will occur),
(4) High probability (most likely to occur), or
(5) Definite.

Significance of the Impact:
Based on the information contained in the points above, the potential impacts are assigned a significance rating (S). This rating is formulated by adding the sum of the numbers assigned to extent (E), duration (D) and magnitude (M) and multiplying this sum by the probability (P) of the impact.
S= (E+D+M) P

The significance ratings are given below:

- (<30) low (i.e. where this impact would not have a direct influence on the decision to develop in the area),
- (30-60) medium (i.e. where the impact could influence the decision to develop in the area unless it is effectively mitigated),
- (>60) high (i.e. where the impact must have an influence on the decision process to develop in the area).

8. LEGISLATIVE FRAMEWORK

There is little legislation relating directly to visual impact assessments. However, there are guidelines that provide direction for visual assessment as well as a number of laws which aim to protect visual resources and others that apply to specialists in general. The African Development Bank (AfDB) do not provide guidelines for visual impact assessments. The IFC Performance Standard 3: Resource Efficiency and Pollution Prevention provides limited guidance on visual impact assessments but does define pollution to include the creation of potential for visual impacts including light.

Performance Standard	Summary	Applicability
IFC – PS 1	**Assessment and Management of Environmental and Social Risks and Impacts** Assessment and Management of Environmental and Social Risks and Impacts Performance Standard PS 1 applies to all projects that have environmental and social risks and impacts. It underscores the importance of managing environmental and social performance throughout the life of a project establishes the importance of: i. Integrated assessment to identify the environmental and social impacts, risks, and opportunities of projects; ii. Effective community engagement through disclosure of project-related information and consultation with local communities on matters that directly affect them; and iii. The client's management of environmental and social performance throughout the life of the project.	The development and operation of the proposed project presents a risk to both the social and biophysical environments. As a result, undertaking an EIA is critical to complying with this PS
IFC – PS 2 Labour and Working Conditions	Performance Standard PS 2 acknowledges that the pursuit of economic growth through employment creation and income generation should be accompanied by protection of the fundamental rights of workers. The requirements set out in PS 2 have been in part guided by several international conventions and instruments, including those of the International Labour Organization (ILO) and the United Nations (UN). To promote fair treatment, non-discrimination, and equal opportunity of workers. • To establish, maintain and improve the worker-management relationship. • To promote compliance with national employment and labour laws. • To protect workers, including vulnerable categories of workers such as children, migrant workers, workers engaged by third parties, and workers in the client's supply chain. • To promote safe and healthy working conditions, and the health of workers. • To avoid the use of forced labour.	Not assessed in the Visual Impact Assessment.
IFC – PS 3 Resource Efficiency and Pollution Prevention	Performance Standard PS 3 recognizes that increased economic activity and urbanization often generate increased levels of pollution to air, water, and land, and consume finite resources in a manner that may threaten people and the environment at the local, regional, and global levels. There is also a growing global consensus that the current and projected atmospheric concentration of GHG threatens the public health and welfare of current and future generations. PS 3 outlines a project-level approach to resource efficiency and pollution prevention and control in line with internationally disseminated technologies and practices. In addition, it promotes the	This standard has potential relevance to the project scope during the construction and operational phases as the visual impact can be seen as visual pollution in the field of site of the viewer. Night lighting from the Khanyazwe Flexpower Plant

	ability of private sector companies to adopt such technologies and practices as far as their use is feasible in the context of a project that relies on commercially available skills and resources. The objectives of PS 3 are: • To avoid or minimize adverse impacts on human health and the environment by avoiding or minimizing pollution from project activities. • To promote more sustainable use of resources, including energy and water. • To reduce Project-related GHG emissions. This standard has potential relevance to the project scope.	can be deemed as light pollution if mitigation measures are not implemented.
IFC – PS 4 Community Health, Safety, and Security	Performance Standard 4 recognizes that project activities, equipment, and infrastructure can increase community exposure to risks and impacts. While acknowledging the public authorities' role in promoting the health, safety, and security of the public, PS 4 addresses the client's responsibility to avoid or minimize the risks and impacts to community health, safety, and security that may arise from project related activities, with particular attention to vulnerable groups. The objectives of PS 4 are: • To anticipate and avoid adverse impacts on the health and safety of the affected community during the project life from both routine and nonroutine circumstances. • To ensure that the safeguarding of personnel and property is carried out in accordance with relevant human rights principles and in a manner that avoids or minimizes risks to the affected communities.	Not assessed in the Visual Impact Assessment. Community health, safety and security risks are assessed as part of the ESIA. This will remain applicable throughout the project.

IFC – PS 5 Land Acquisition and Involuntary Resettlement	Performance Standard 5 recognizes that project-related land acquisition and restrictions on land use can have adverse impacts on communities and persons that use this land. Involuntary resettlement refers both to physical displacement (relocation or loss of shelter) and to economic displacement (loss of assets or access to assets that leads to loss of income sources or other means of livelihood) because of project-related land acquisition and/ or restrictions on land use. The objectives of PS 5 are: • To avoid, and when avoidance is not possible, minimize displacement by exploring alternative project designs. • To avoid forced eviction. • To anticipate and avoid, or where avoidance is not possible, minimize adverse social and economic impacts from land acquisition or restrictions on land use by: i. providing compensation for loss of assets at replacement cost; and ii. ensuring that resettlement activities are implemented with appropriate disclosure of information, consultation, and the informed participation of those affected. • To improve, or restore, the livelihoods and standards of living of displaced persons • To improve living conditions among physically displaced persons through the provision of adequate housing with security of tenure at resettlement sites.	Not assessed in the Visual Impact Assessment.
IFC – PS 6 Biodiversity Conservation and Sustainable Management of Living Natural Resources	Performance Standard 6 recognizes that protecting and conserving biodiversity, maintaining ecosystem services, and sustainably managing living natural resources are fundamental to sustainable development. The requirements set out in PS 6 have been guided by the Convention on Biological Diversity. The objectives of PS 6 are: • To protect and conserve biodiversity. • To maintain the benefits from ecosystem services. • To promote the sustainable management of living natural resources through the adoption of practices that integrate conservation needs and development priorities.	The site is predominantly agricultural. As a mitigation measure it is recommended to plant trees as screening. A diverse mix of endemic trees is proposed to increase the biodiversity. Despite the site providing limited habitat for terrestrial and aquatic fauna and flora, a biodiversity assessment and separate avifauna assessment have been included as part of the ESIA.

IFC – PS 7 Indigenous Peoples	Performance Standard 7 recognizes that Indigenous Peoples, as social groups with identities that are distinct from mainstream groups in national societies, are often among the most marginalized and vulnerable segments of the population. In many cases, their economic, social, and legal status limits their capacity to defend their rights to, and interests in, lands and natural and cultural resources, and may restrict their ability to participate in and benefit from development. The objectives of PS 7 are: • To ensure that the development process fosters full respect for the human rights, dignity, aspirations, culture, and natural resource-based livelihoods of Indigenous Peoples. • To anticipate and avoid adverse impacts of projects on communities of Indigenous Peoples, or when avoidance is not possible, to minimize and/or compensate for such impacts. • To promote sustainable development benefits and opportunities for Indigenous Peoples in a culturally appropriate manner. • To establish and maintain an ongoing relationship based on Informed Consultation and Participation (ICP) with the Indigenous Peoples affected by a project throughout the project's life cycle. • To ensure the Free, Prior, and Informed Consent (FPIC) of the Affected Communities of Indigenous Peoples when the circumstances described in this Performance Standard are present. • To respect and preserve the culture, knowledge, and practices of Indigenous Peoples.	Not assessed in the Visual Impact Assessment. This PS is not applicable.
IFC – PS 8 Cultural Heritage	Performance Standard 8 recognizes the importance of cultural heritage for current and future generations. Consistent with the Convention Concerning the Protection of the World Cultural and Natural Heritage, PS 8 aims to ensure that clients protect cultural heritage during their project activities. In addition, the requirements of this PS on a project's use of cultural heritage are based in part on standards set by the Convention on Biological Diversity. The objectives of PS 8 are: • To protect cultural heritage from the adverse impacts of project activities and support its preservation. • To promote the equitable sharing of benefits from the use of cultural heritage.	Not assessed in the Visual Impact Assessment.

APPENDIX 1

Figure 11 and 12 reflects the results of a viewer sensitivity visibility assessment, carried out using GIS software. The results provide a clear interpretation of the extent of the visual influence and also provide an indication of the land use that can be expected in the affected areas.

Figure 11: Visibility Analysis of Proposed Khanyazwe Flexpower Power Station

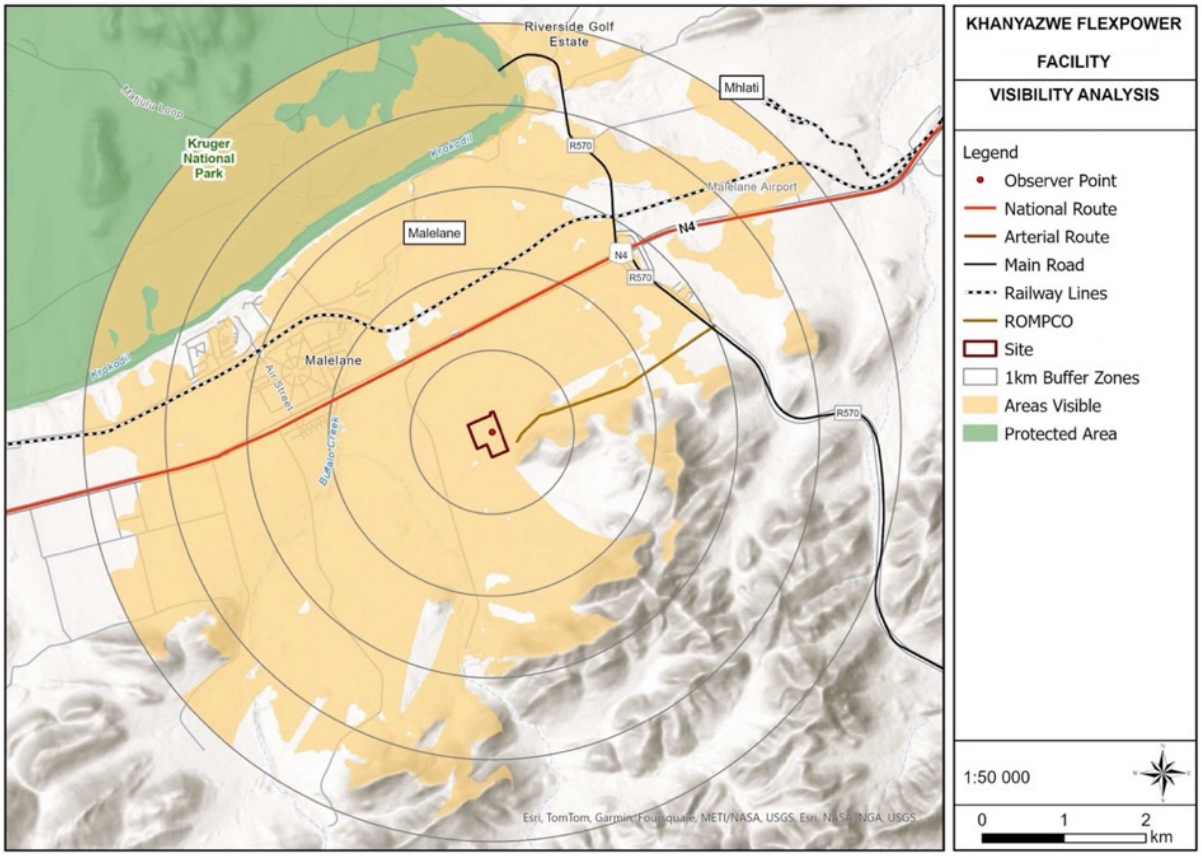
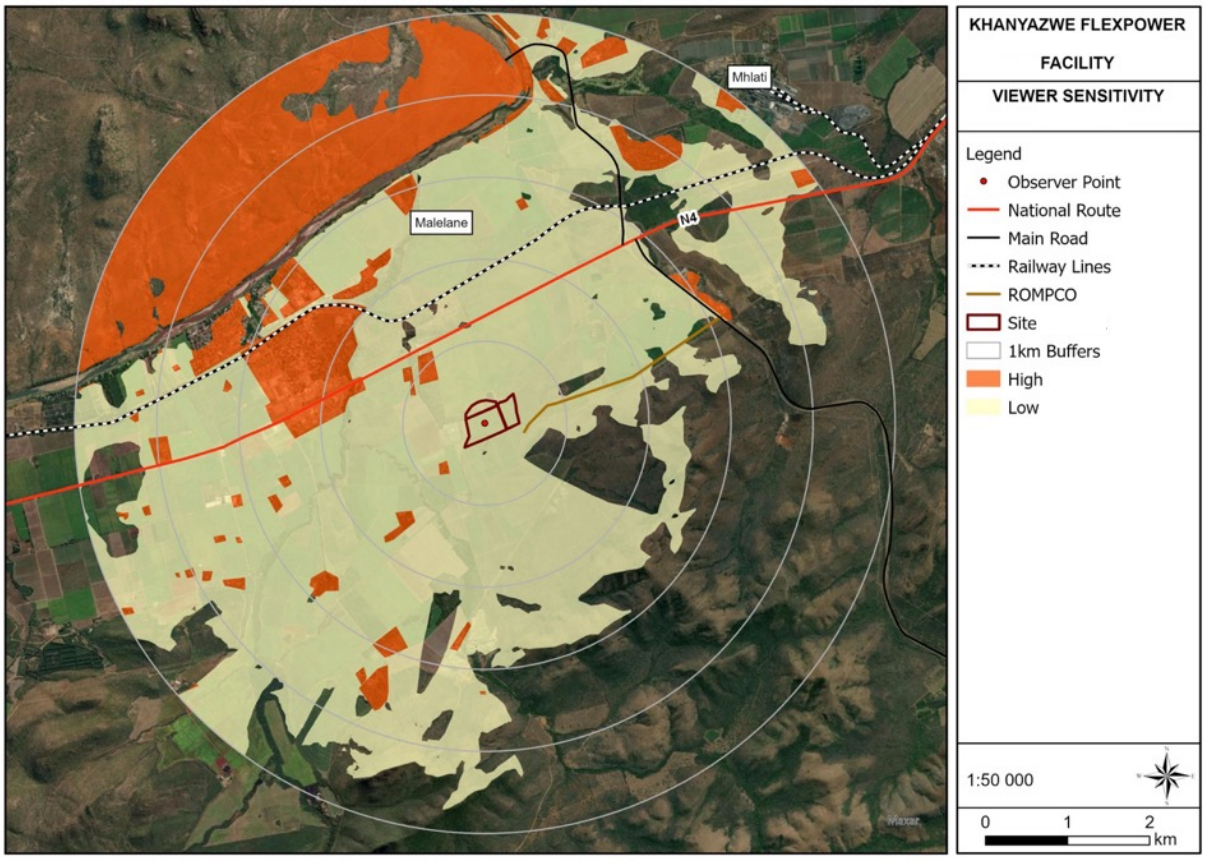


Figure 12: Viewer Sensitivity of Proposed Khanyazwe Flexpower Power Station



GLOSSARY OF TERMS

Aesthetics	The science or philosophy concerned with the quality of sensory experience. (ULI, 1980)
Horizon contour	A line that encircles a development site and that follows ridgelines where the sky forms the backdrop and no landform is visible as a background. This is essentially the skyline that when followed through the full 360-degree arc as viewed from a representative point on the site defines the visual envelope of the development. This defines the boundary outside which the development would not be visible.
Landscape characterisation/ character	This covers the gathering of information during the desktop study and field survey work relating to the existing elements, features, and extent of the landscape (character). It includes the analysis and evaluation of the above and the supporting illustration and documentary evidence.
Landscape condition	Refers to the state of the landscape of the area making up the site and that of the study area in general. Factors affecting the condition of the landscape can include the level maintenance and management of individual landscape elements such as buildings, woodlands etc and the degree of disturbance of landscape elements by non-characteristics elements such as invasive tree species in grassland or car wrecks in a field.
Landscape impact	Changes to the physical landscape resulting from the development that include the removal of existing landscape elements and features, the addition of new elements associated with the development and altering of existing landscape elements or features in such a way as to have a detrimental effect on the value of the landscape.
Landscape unit	A landscape unit can be interpreted as an "outdoor room" which are enclosed by clearly defined landforms or vegetation. Views within a landscape unit are contained and face inward.
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. A more emotive sense of place is that of local identity and attachment for a place "*which begins as undifferentiated space* [and] *becomes place as we get to know it better and endow it with value*" (Tuan 1977)[1].
Viewer exposure	The extent to which viewers are exposed to views of the landscape in which the proposed development will be located. Viewer exposure considers the visibility of the site, the viewing conditions, the viewing distance, the number of viewers affected the activity of the viewers (tourists or workers) and the duration of the views.
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.
Visual absorption capacity (VAC)	The inherent ability of a landscape to accept change or modification to the landscape character and/or visual character without diminishment of the visual quality or value, or the loss of visual amenity. 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.

[1] Cited in Climate Change and Our 'Sense of Place', http://www.ucsusa.org/greatlakes/glimpactplace.html

Visual amenity	The notable features such as hills or mountains or distinctive vegetation cover such as forests and fields of colour that can be identified in the landscape and described. Also included are recognised views and viewpoints, vistas, areas of scenic beauty and areas that are protected in part for their visual value.
Visual character	This addresses the viewer response to the landscape elements and the relationship between these elements that can be interpreted in terms of aesthetic characteristics such as pattern, scale, diversity, continuity and dominance.
Visual contour	The outer perimeter of the visual envelope determined from the site of the development. The two-dimensional representation on plan of the horizon contour.
Visual contrast	The degree to which the physical characteristics of the proposed development differ from that of the landscape elements and the visual character. The characteristics affected typically include: • Volumetric aspects such as size, form, outline and perceived density; • Characteristics associated with balance and proportion such scale, diversity, dominance, continuity; • Surface characteristics such as colour, texture, reflectivity; and • Luminescence or lighting.
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 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 view shed experienced by visual receptors and intrusion of foreign elements into the view shed 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 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	Includes 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. The existing visual amenity enjoyed by the viewers can be considered a visual receptor such that changes to the visual amenity would affect the viewers.
Zone of visual influence	The extent of the area from which the most elevated structures of the proposed development could be seen and may be considered to be of interest (see visual envelope).

LEVEL OF CONFIDENCE

Table 12: Confidence level chart and description

CONFIDENCE LEVEL CHART				
	Information, knowledge and experience of the **project**			
Information, and knowledge of the **study area**		3b	2b	1b
	3a	9	6	3
	2a	6	4	2
	1a	3	2	1

3a – A *high* level of information is available of the **study area** in the form of recent aerial photographs, GIS data, documented background information and a thorough knowledge base could be established during site visits, surveys etc. The study area was readily accessible.

2a – A *moderate* level of information is available of the **study area** in the form of aerial photographs GIS data and documented background information and a moderate knowledge base could be established during site visits, surveys etc. Accessibility to the study area was acceptable for the level of assessment.

1a – *Limited* information is available of the **study area** and a poor knowledge base could be established during site visits and/or surveys, or no site visit and/or surveys were carried out.

3b – A *high* level of information and knowledge is available of the **project** in the form of up-to-date and detailed engineering/architectural drawings, site layout plans etc. and the visual impact assessor is well experienced in this type of project and level of assessment.

2b – A *moderate* level of information and knowledge is available of the **project** in the form of conceptual engineering/architectural drawings, site layout plans etc. and/or the visual impact assessor is moderately experienced in this type of project and level of assessment.

1b – *Limited* information and knowledge is available of the **project** in the form of conceptual engineering/architectural drawings, site layout plans etc. and/or the visual impact assessor has a low experience level in this type of project and level of assessment. (Adapted from Oberholzer. B, 2005)

VISUAL RECEPTOR SENSITIVITY

Table 13: Visual receptor sensitivity

VISUAL RECEPTOR SENSITIVITY	DEFINITION (BASED ON THE GLVIA 2ND ED PP90-91)
Exceptional	Views from major tourist or recreational attractions or viewpoints promoted for or related to appreciation of the landscape, or from important landscape features.
High	Users of all outdoor recreational facilities including public and local roads or tourist routes whose attention or interest may be focussed on the landscape; Communities where the development results in changes in the landscape setting or valued views enjoyed by the community; Residents with views affected by the development.
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; Views from urbanised areas, commercial buildings or industrial zones; People travelling through or passing the affected landscape on transport routes.
Negligible (Uncommon)	Views from heavily industrialised or blighted areas

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