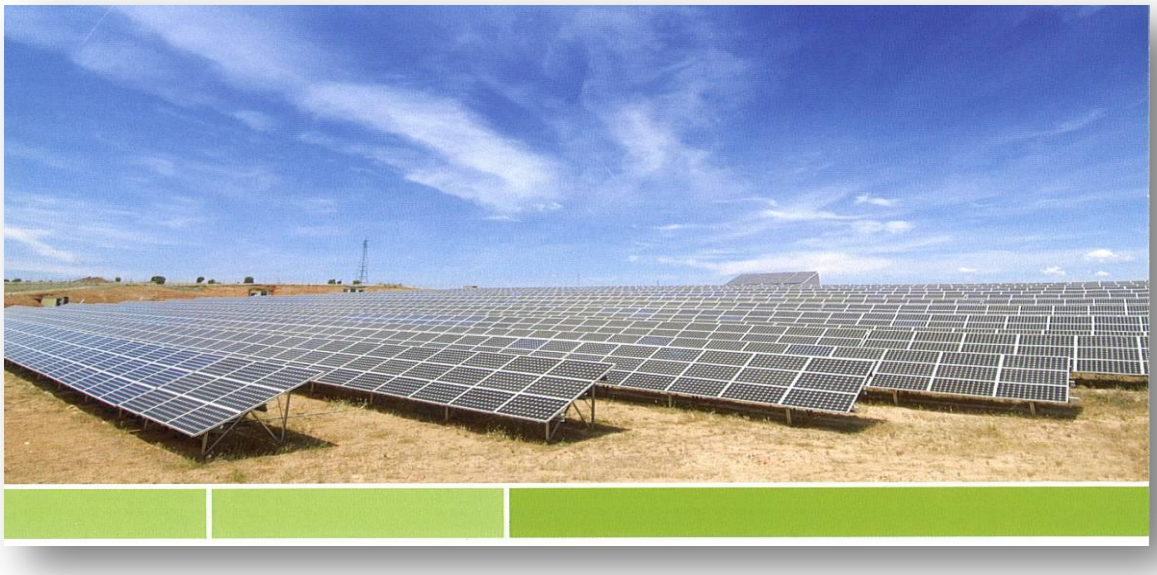

DESKTOP STUDY

in preparation for a full
VISUAL IMPACT ASSESSMENT

ORANIA

Photovoltaic (PV)
Solar Facility Project

PRODUCED FOR:

SolarCapital
RENEWABLE ENERGY

ON BEHALF OF:

eco·compliance
ENVIRONMENTAL COMPLIANCE MANAGERS

COMPILED BY:

ILUNGELO LAMI
CONSULTING PROFESSIONALS

JULY 2018

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INDEPENDENT VIA SPECIALIST

Ilungelolami was tasked by Eco-Compliance to undertake a desktop study in preparation for a full Visual Impact Assessment (VIA) for a 20 MW Photovoltaic (PV) Solar Facility Project. The project site is located on Portion 2 of the farm ROODE PAN 150, approximately 4km south-east of Orania, Northern Cape.

Ilungelolami is a multi-disciplinary consulting company, specializing in consulting services to governmental as well as the private sector. The company is situated in Durban, KwaZulu Natal.

Willem Richter, who is leading the visual assessment, is a GIS consultant registered with PLATO as a GISc Technologist (Reg nr.: G0931), and holds a MSc GISc degree in GIS. The visual assessment team is well-versed with the requirements for a visual impact assessment. The assessment follows the main guidelines as stipulated by the "Guideline for involving visual and aesthetic specialists in EIA processes" (Oberholzer, B. 2005). Guidelines from the Visual Resource Management manual, US Bureau of Land Management, as well as supplementary details from several assessments related to solar energy projects are also incorporated to provide a holistic approach and methodology for such assessments. The complete list of references can be reviewed under Section 11.

DECLARATION OF INDEPENDENCE

I, Wilhelm Richter, ID nr.: 7309015177080, representing Ilungelolami, hereby declares that I am an independent consultant appointed to provide specialist input for a VIA study. I confirm that I have no other interest in the project except for remuneration of the VIA study itself, and neither I nor Ilungelolami will benefit in any other way from the outcomes of this VIA study.

Signed: ..... Date: 18 JULY 2018

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List of Abbreviations

DEA & DP ..... Department of Environmental Affairs & Development Planning
DEM ..... Digital Elevation Model
EIA ..... Environmental Impact Assessment
GIS ..... Geographic Information System
KOP ..... Key Observation Points
NGI ..... National Geo-spatial Information
VIA ..... Visual Impact Assessment
VAC ..... Visual Absorption Capacity
WC ..... Western Cape

List of Definitions

Key issue	An issue raised during the scoping process that has not received an adequate response and which requires further investigation before it can be resolved.
Landscape integrity	The relative intactness of the existing landscape or townscape, whether natural, rural or urban, and with an absence of intrusions or discordant structures.
Receptors	Individuals, groups or communities who are subject to the visual influence of a particular project. Also referred to as viewers, or viewer group.
Sense of place	The unique quality or character of a place, whether natural, rural or urban. Relates to uniqueness, distinctiveness or strong identity. Sometimes referred to as genius loci meaning 'spirit of the place'.
Scenic corridor	A linear geographic area that contains scenic resources, usually, but not necessarily, defined by a route. See also view corridor.
Scenic route	A linear movement route, usually in the form of a scenic drive, but which could also be a railway, hiking trail, horse-riding trail or 4x4 trail.
Stakeholders	A subgroup of the public whose interests may be positively or negatively affected by a proposal or activity and/or who are concerned with a proposal or activity and its consequences. The term includes the proponent, authorities and all interested and affected parties.
View catchment area	A geographic area, usually defined by the topography, within which a particular project or other feature would generally be visible. Sometimes called the visual envelope.
View corridor	A linear geographic area, usually along movement routes, that is visible to users of the route.
Viewpoint	A selected point in the landscape from which views of a particular project or other feature can be obtained.
Viewshed	The outer boundary defining a view catchment area, usually along crests and ridgelines. Similar to a watershed.
View shadow	An area within the view catchment visually obscured from a particular project or feature by the topography, vegetation or buildings.
Visual absorption capacity	The ability of an area to visually absorb development as a result of screening topography, vegetation or structures in the landscape.
Visual exposure	The relative visibility of a project or feature in the landscape. See also zone of visual influence.
Zone of visual influence	An area subject to the direct visual influence of a particular project.

1 Introduction

Ilungelolami was tasked by Ecocompliance to undertake a Desktop Study in preparation for a full Visual Impact Assessment (VIA) for a 20 MW Photovoltaic (PV) Solar Facility Project. The project site is located on Portion 2 of the farm ROODE PAN 150, approximately 4km south-east of Orania, Northern Cape.

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The assessment only assessed the anticipated visual impact of the actual solar components. The study excludes ancillary components such as borrow pits, quarries, laydown areas, and physical construction on site.

2 Project Description

The project entails the development of a renewable electricity generation facility utilising a fixed field Photovoltaic (PV) system. This system uses solar panels to convert sunlight into electricity.

The generation capacity of the facility is 75 megawatt.

A typical solar panel farm can be seen in the image below:

Figure 1: Typical solar panel farm

3 Description and Significance of Affected Environment

The facility is to be established on Portion 2 of the farm ROODE PAN 150, approximately 4km south-east of Orania, Northern Cape. The farm falls within the Thembelihle Local Municipality. A locality map of the proposed site can be seen on the proceeding page under Figure 3.

The project area is characterised by the following:

- **Existing Landuse:** Barren land.
- **Groundcover:** Shrubland and low fynbos
- **Cultural or historical value:** None
- **Significance of area:** Rural landscape

Thembalihle Local Municipality falls within some of the highest irradiation incident area in South Africa, and is therefore very suitable for solar renewable energy technologies.

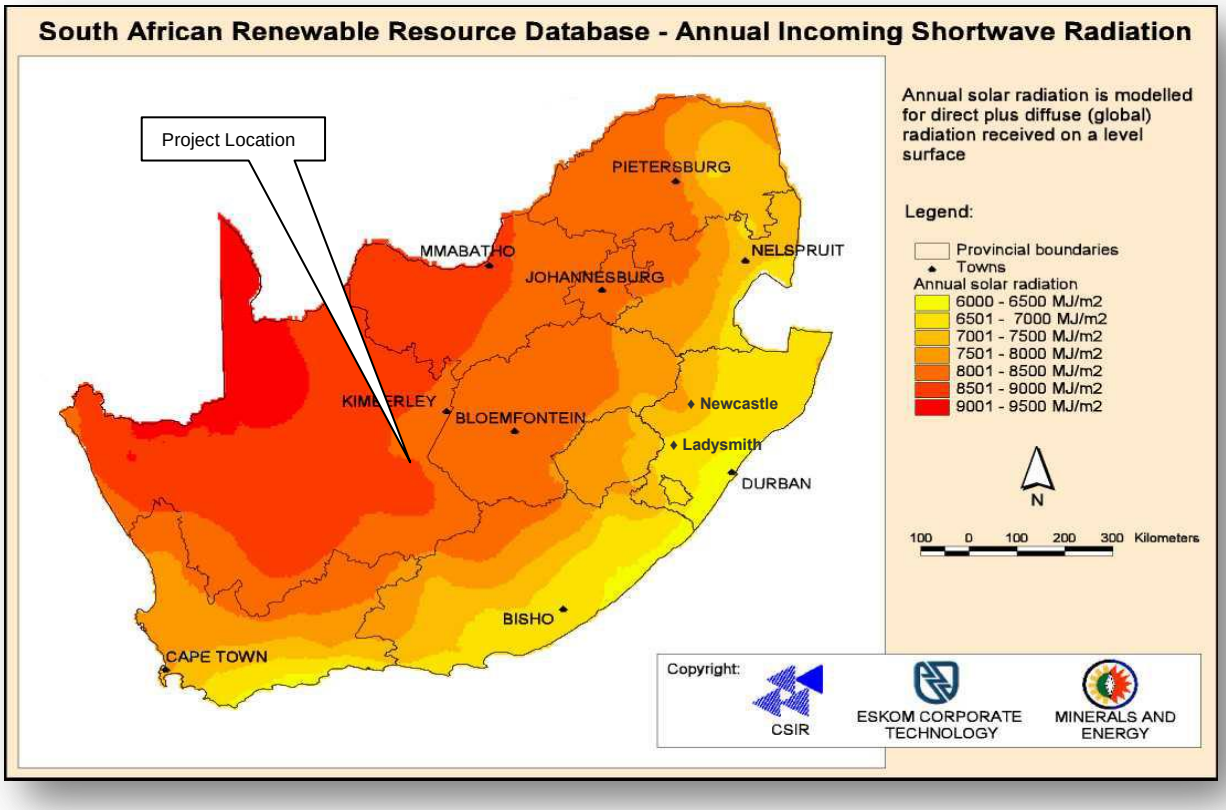

Figure 2: Annual Solar Radiation, RSA (DME, CSIR, Eskom, 2003)

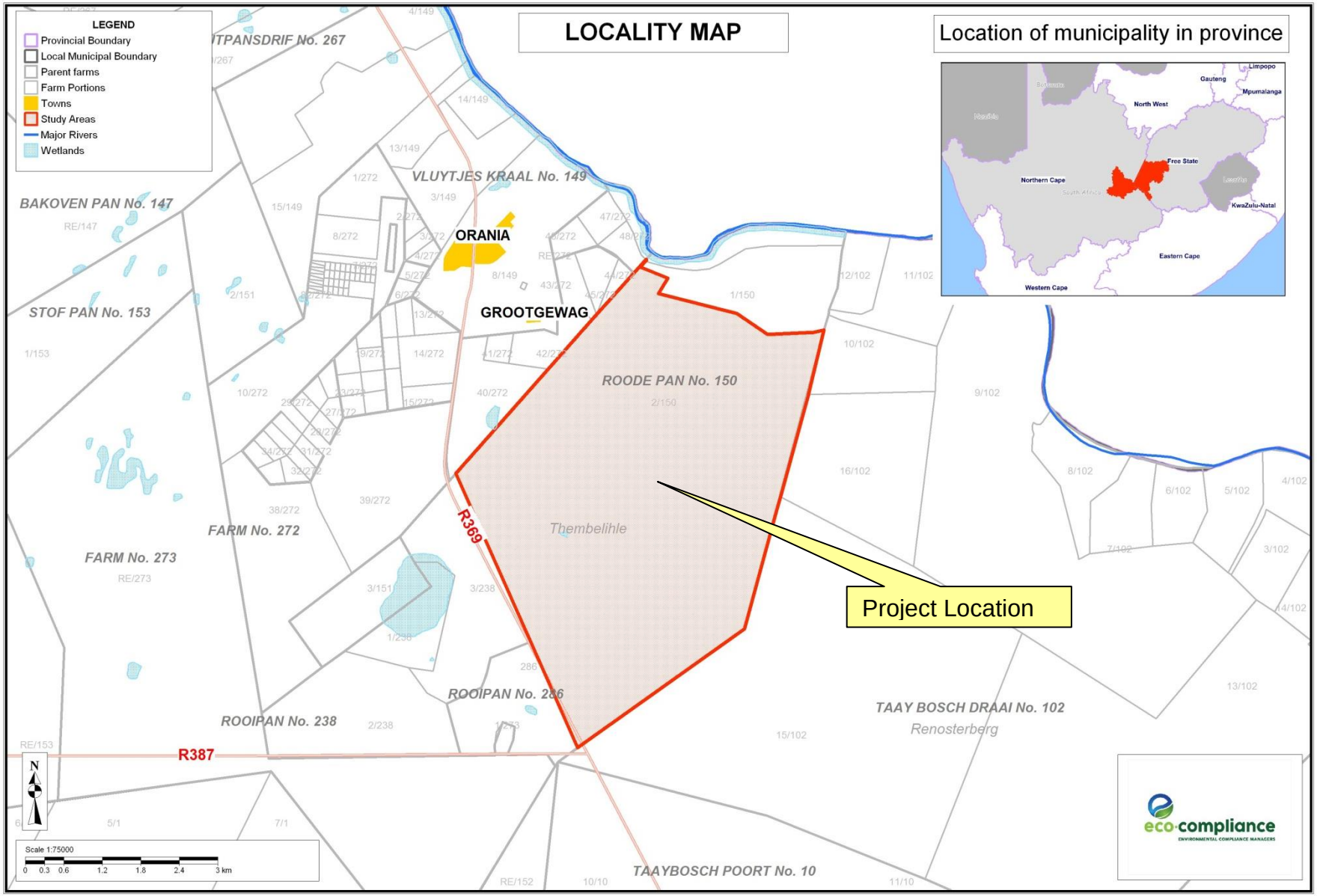

Figure 3: Regional Locality of the Project Area

The solar energy generation facility will be known as the Orania Solar Energy Farm. It will be connected to the existing Eskom national electrical grid through transmission lines erected within a registered servitude to the nearby Orania Eskom Sub-station. Access to the facility shall be gained via an existing access point onto the property from the R369.

4 Objectives and Terms of Reference

Objective of report

The objective of this report is to perform a desktop study in preparation of a full Visual Impact Assessment (VIA). There a number of possible site locations and this desktop study will aim to provide an overview of these site locations, and summarises the anticipated positive and negative aspects of each site location. This report will also determine what level of assessment would be required for a full VIA.

Terms of Reference

The terms of reference for this report is to assess the anticipated visual impacts that the proposed project site locations will have on the surrounding area, as well as provide anticipated positive and negative aspects for each site location. Key issues to be addressed are listed below:

- Mapping of landscape with proposed site location in relation to the surrounding environment
- Digital terrain modeling and viewshed simulations
- Assessments of possible site locations and their anticipated visual impact.
- Provide positive and negative aspects of each possible site location.
- Determine anticipated type and level of VIA required for final VIA assessment
- Conclusion and recommendations.

5 Assumptions and Limitations

All required spatial data sets required for the purpose of this report could be sourced. The latest aerial imagery were obtained from Google Earth and topographic maps from the National Geo-spatial Information (NGI) offices in Cape Town.

3D models of the actual solar farm layout and surrounding fencing are not available for this VIA report and is beyond the scope of this report.

The initial Viewshed map is computer-generated and does not take into account local and visual interruptions such as trees, buildings, vegetation etc., as well as flat topography where visibility is usually much lower than computer-generated viewsheds. The visibility of these maps may be overstated as a result of this. The full assessment of the actual VIA will analyse these factors and provide a more accurate representation of the actual visual impact on-site.

This desktop study assessment only assess the anticipated visual impact of the possible site locations. The study excludes ancillary components such as borrow pits, quarries, laydown areas, and physical construction on site.

6 Approach & Methodology

6.1 Approach

The main approach for this desktop study report follows the guidelines as stipulated by the "Guideline for involving visual and aesthetic specialists in EIA processes" (Oberholzer, B. 2005). Guidelines from the Visual Resource Management manual, US Bureau of Land Management, as well as supplementary details from several assessments related to solar energy projects will also be incorporated to provide a holistic approach for the final assessment.

6.2 Methodology

The methodology for this assessment is based both on qualitative as well as quantitative measurements and aspects of the project characteristics. The following procedures and steps will be followed to obtain relevant details needed for this desktop study:

a) **Phase 1: Desktop Study (to be completed now)**

Determine the anticipated type of visual impact based on:

I. Possible site locations for the solar farm, with their respective positive and negative characteristics.
II. The characteristics of the environment, as well as the scale and type of proposed development.
III. Derive the type of approach and level of assessment required for a full VIA assessment based on the above outcome.

b) **Phase 2: Full Visual Impact Assessment (to be completed after approval of the project)**

I. Review public comments / concerns.
II. Site visit.
III. Post site visit analysis: viewshed analysis, view corridors, KOP's and receptors, photomontage, 3D modeling with and without mitigation.
IV. Potential lighting impact at night.
V. Interpreting assessment criteria, including mitigation measures.

Phase 1 will be discussed in further details in the proceeding section.

7 Assessment Implementation

The following section will provide details of Phase 1.

7.1 DESKTOP STUDY

The following section will detail the possible appropriate areas where the proposed solar farm could be constructed, and assessing the anticipated positive and negative aspects of each site.

7.1.1 Characteristics of surrounding environment

The project area is earmarked by a rural landscape, consisting predominantly of shrubland and low fynbos, with the town of Orania situated 4km north-west of the project area. The project area in relation to the surrounding environment can be reviewed in Figure 4 below.

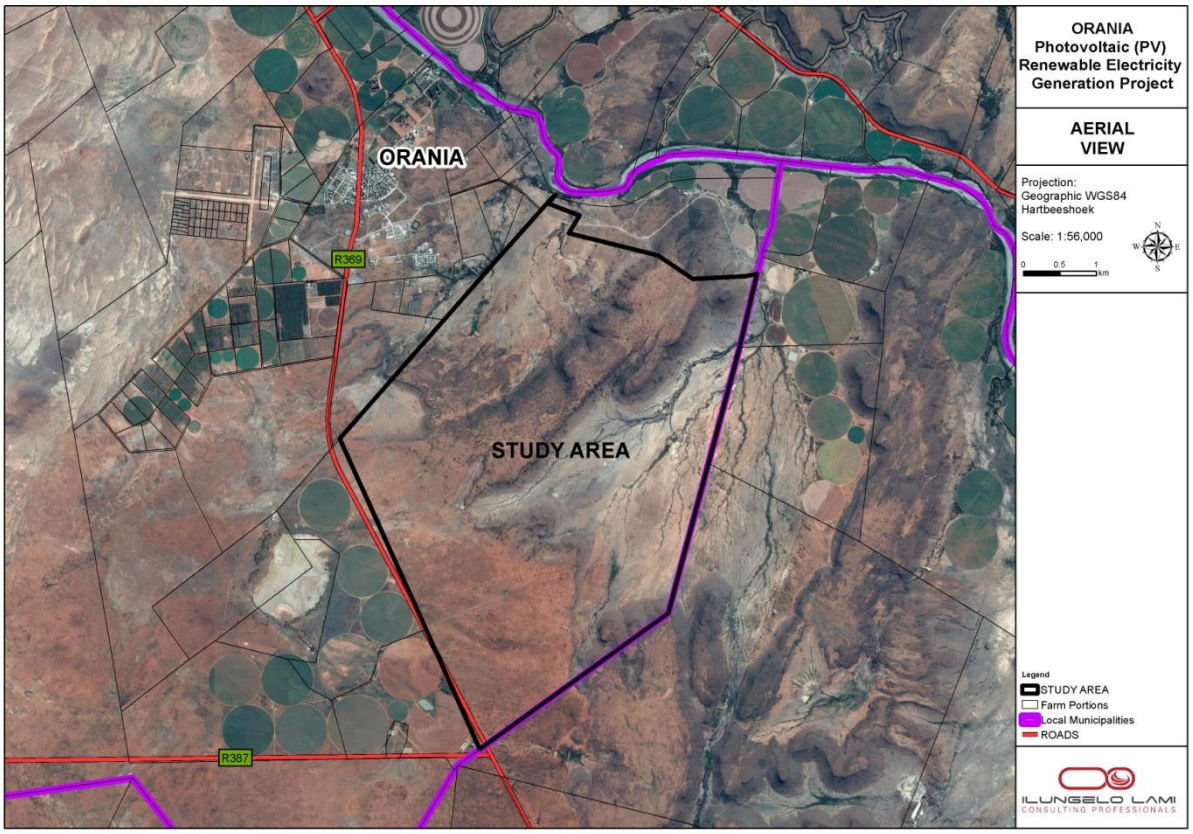

Figure 4: Project area in relation to Surrounding Environment

The R369 will provide access to the site area.

The surrounding area has a relatively flat topography, with an elevated area in the middle of the property. The topography is clearly noticeable in Figure 5. The digital elevation model was created with 5meter contour data sets obtained from NGI.

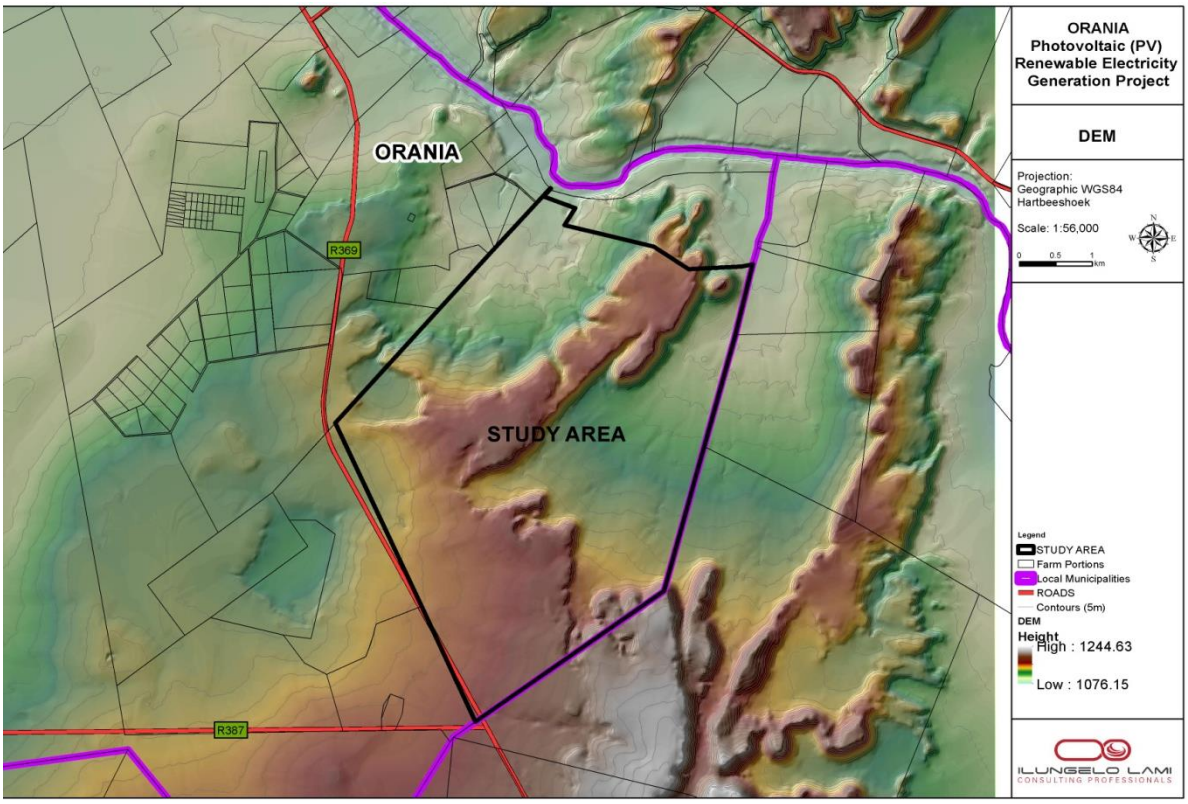

Figure 5: Project Area Topography

Possible site locations were identified based on topography and size appropriate for the proposed solar farm. These locations can be reviewed under Figure 6.

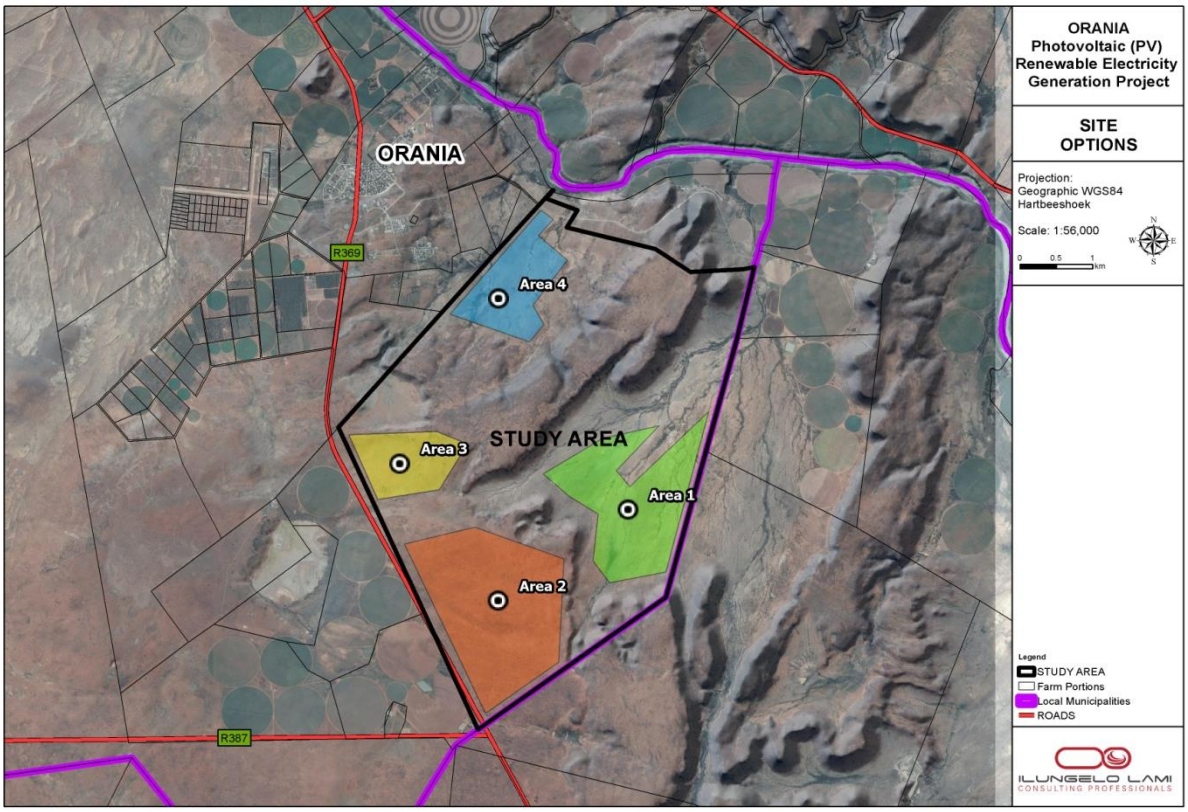

Figure 6: Possible Site Locations

7.1.2 Spatial Analysis on Possible Site Locations

A viewshed analysis was done for each possible site location to determine the visual impact aspect of each area. The site extent is not implying the actual perimeter of the final project extent, and is merely an indication of possible areas which could be used for the actual solar farm extent.

Due to the flat topography of the surrounding areas, as well as the relatively low height of the proposed infrastructure to be erected, it is anticipated that the proposed project infrastructure will not have a high visual impact beyond a distance of 3km. A 3km buffer boundary was therefore created to delineate the anticipated visual impact from each site location.

Each possible site location will be briefly discussed below.

AREA 1

Area 1 is situated on the eastern side of the property. It is situated within a lower-lying area characterised by a gradual slope towards the north-eastern boundary. It is mostly secluded from public observation points such as nearby roads and farm houses, and will have no visual impact on the town of Orania.

The ground surface is mostly eroded with little vegetation, which will have a cost implication for constructing proper drainage and stormwater infrastructure.

It is far from existing access points for gaining access to the site, and is situated far away from the existing ESKOM substation. This would make Area 1 the most expensive option in terms of accessibility and connectivity to the substation.

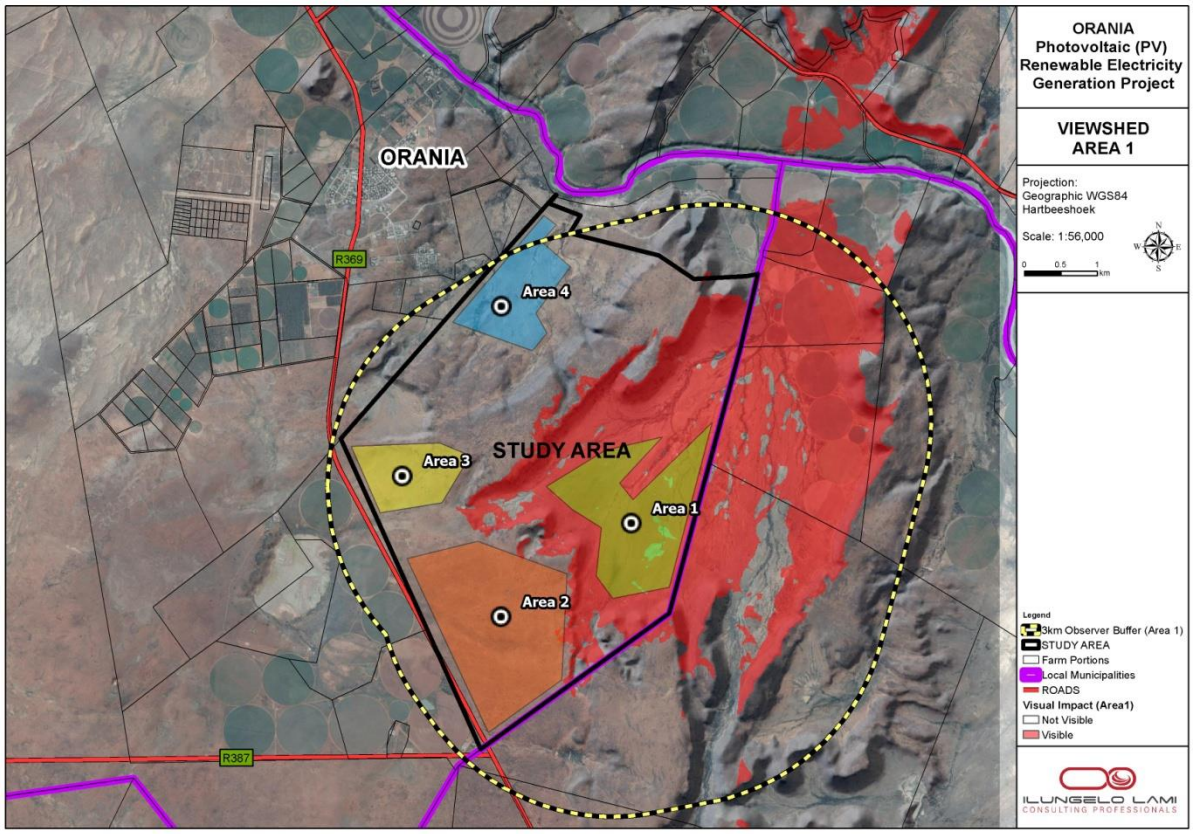

Figure 7: Proposed Project Area 1

AREA 2

Area 2 is situated on the southern side of the property. It is adjacent to the R369, which will have a high visual impact for motorists travelling on the road. With proper mitigation this could however be reduced to an acceptable visual impact. The proposed site extent should not have any visual impact on the town of Orania.

The site has a flat topography with very little vegetation, making it ideal for the proposed project. The suitability of Area 2 for agricultural use as an expansion of the area across the road is to be confirmed during the full VIA assessment.

Access to the site would not be a issue, and connectivity to the existing ESKOM substation would be less expensive than Area 1.

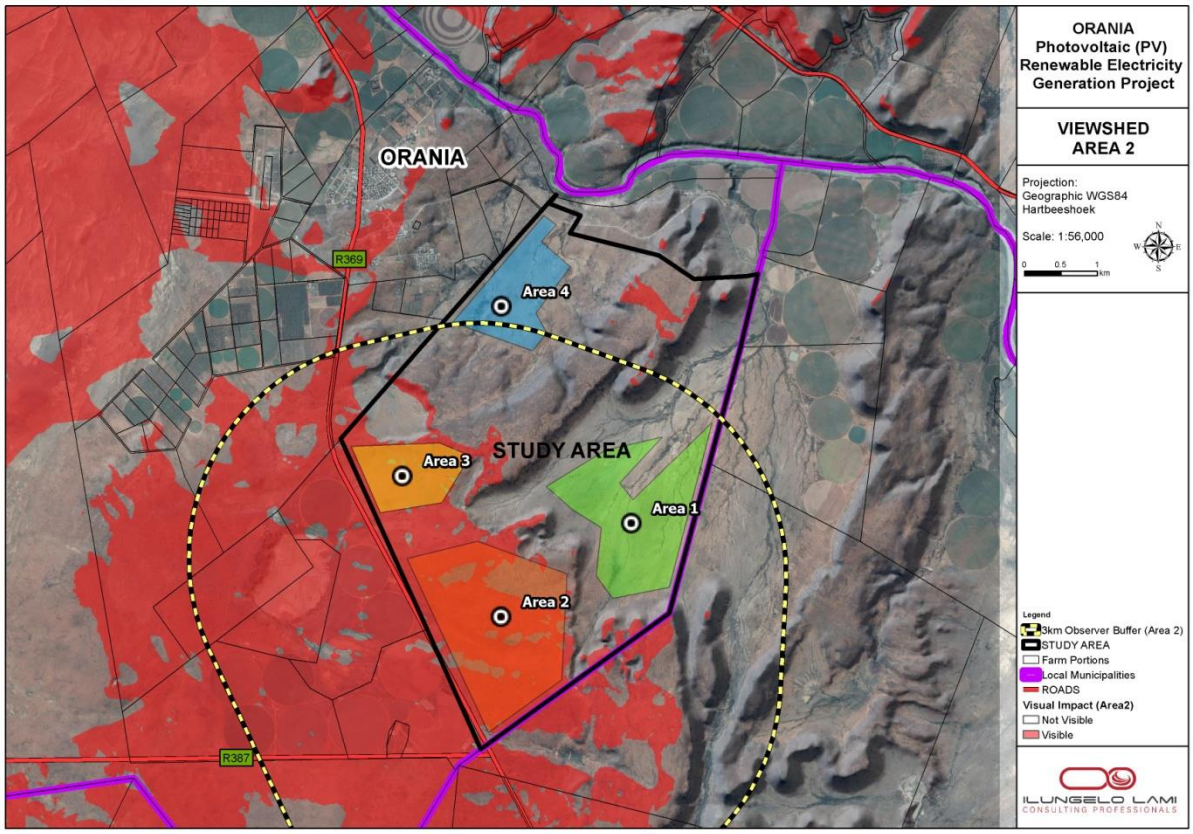

Figure 8: Proposed Project Area 2

AREA 3

Area 3 is situated on the western side of the property. It is adjacent to the R369, which will have a high visual impact for motorists travelling on the road. With proper mitigation this could however be reduced to an acceptable visual impact. The proposed site extent should not have any visual impact on the town of Orania.

The site has a flat topography with very little vegetation, making it ideal for the proposed project. The probability of the site area to be used for agricultural purposes seems low, but will have to be confirmed during the full VIA assessment.

Access to the site would not be a issue, and connectivity to the existing ESKOM substation would be less expensive than Area 1 and 2.

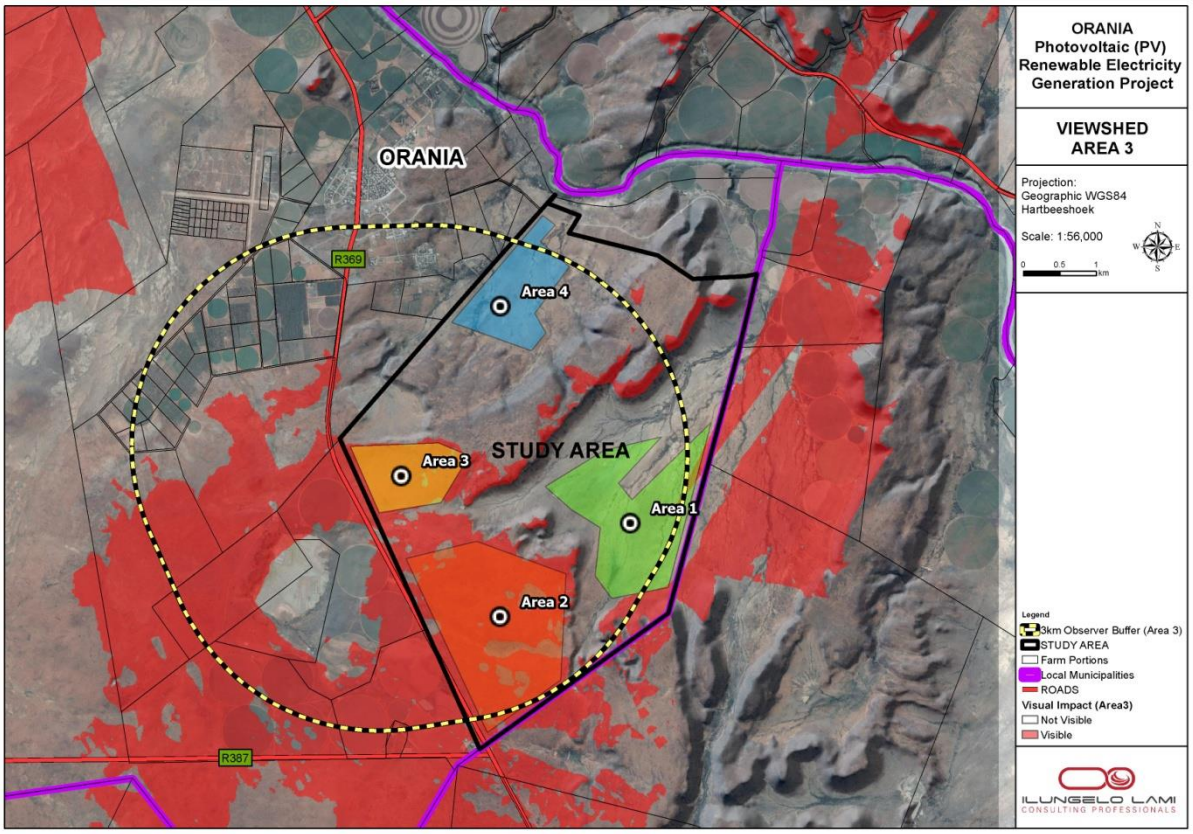

Figure 9: Proposed Project Area 3

AREA 4

Area 4 is situated on the north-western side of the property, adjacent to the town of Orania. This will make Area 4 highly visible to the eastern side of the town of Orania, and could restrict further expansion of the town should development planning be ideal for that particular area.

The site is close to the existing ESKOM substation with a fairly flat topography. Access to the site should not be an issue. These factors makes Area 4 the most cost-effective option of the 4 sites.

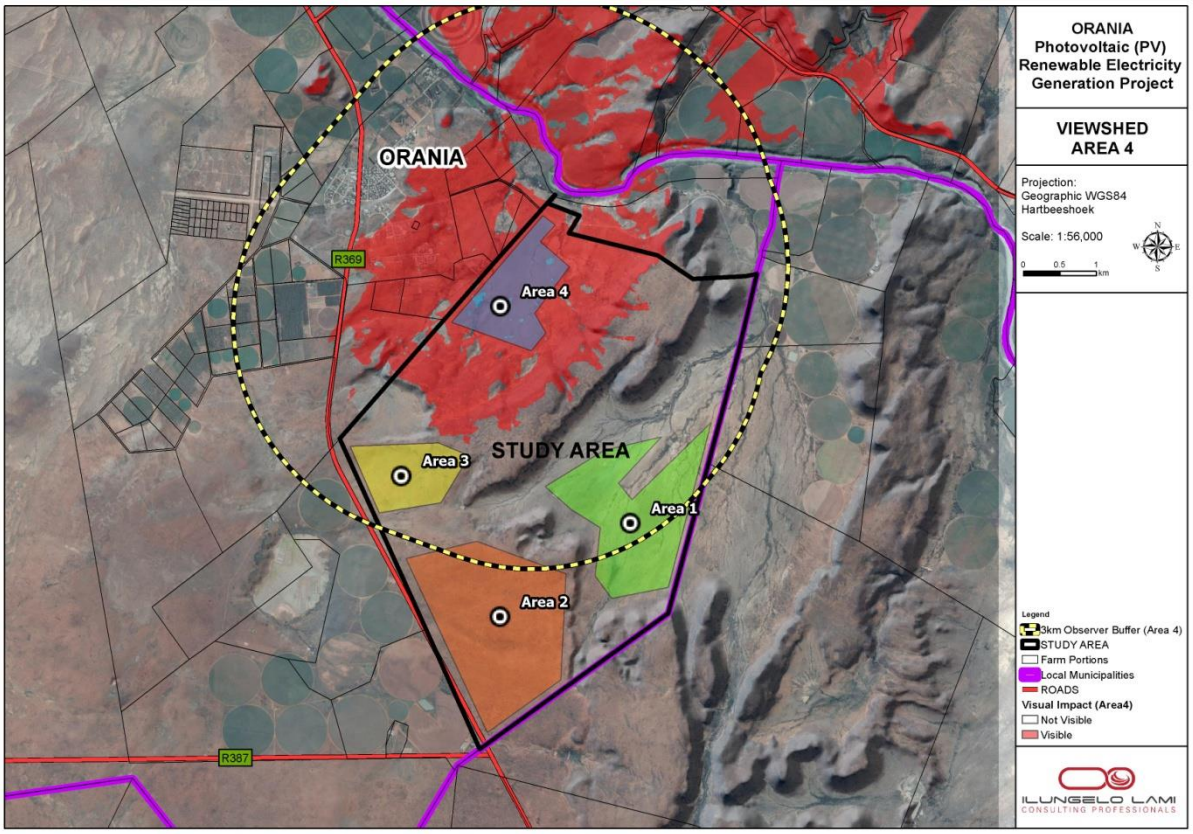

Figure 10: Proposed Project Area 4

7.1.3 Evaluation on Possible Site Locations

The following table provides a summarised evaluation of the positive and negative aspects of each proposed site location. Some assumptions have been made based on spatial analysis alone, and should be verified with stakeholders.

	AREA 1	AREA 2	AREA 3	AREA 4
Access to site	**Difficult**	Easy	Easy	Easy
Distance to substation	**Far**	**Far**	Medium	Close
Stormwater and drainage problems	**High**	Low	Low	Medium
Cost relating to site access, drainage and substation connectivity	**High**	Moderate	Moderate	Low
Topography	**Difficult**	Good	Good	Fair
Visual impact to Orania	N/A	N/A	N/A	**High**
Visual impact to general public	Low	**High, but acceptable with proper mitigation.**	**High, but acceptable with proper mitigation.**	**High**
Negative impact on possible future development planning	Low	Possible	Low	**Potentially High**

Before the full VIA assessment is initiated, stakeholders need to agree on the most appropriate site location, taking the above factors and characteristics of each site into consideration.

7.2 ANTICIPATED VIA ASSESSMENT CRITERIA

The following section will detail the screening process required to determine the type and According to the DEA & DP Guidelines of the Western Cape (Oberholzer, B. 2005), varying levels of expected visual impact can be derived from the correlation between environmental types and development types. This ranges on a scale from no visual impact to very high expected visual impact. In Table 1 below, the correlation can be reviewed between the environmental and development types:

Table 1: Visual impact screening

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

The development categories are explained below:

Category 1 development:
e.g. nature reserves, nature-related recreation, camping, picnicking, trails and minimal visitor facilities.

Category 2 development:
e.g. low-key recreation / resort / residential type development, small-scale agriculture / nurseries, narrow roads and small-scale infrastructure.

Category 3 development:
e.g. low density resort / residential type development, golf or polo estates, low to medium-scale infrastructure.

Category 4 development:
e.g. medium density residential development, sports facilities, small-scale commercial facilities / office parks, one-stop petrol stations, light industry, medium-scale infrastructure.

Category 5 development:
e.g. high density township / residential development, retail and office complexes, industrial facilities, refineries, treatment plants, power stations, wind energy farms, power lines, freeways, toll roads, large-scale infrastructure generally. Large-scale development of agricultural land and commercial tree plantations. Quarrying and mining activities with related processing plants.

Figure 11: Development categories

The explanations of the above terms used can be reviewed next:

- **Low-key development**
  Generally small-scale, single-storey domestic structures, usually with more than 75% of the area retained as natural (undisturbed) open space. Low density development1 - generally single or double-storey domestic structures, usually with more than 50% of the area retained as natural (undisturbed) open space.

- **Medium density development**
  Generally 1 to 3-storey structures, including cluster development, usually with more than 25% of the area retained as green open space.

- **High density development**
  Generally multi-storey structures, or low-rise high density residential development.

The expected visual impact ratings from low to high are defined below:

Very high visual impact expected:
Potentially significant effect on wilderness quality or scenic resources;
Fundamental change in the visual character of the area;
Establishes a major precedent for development in the area.

High visual impact expected:
Potential intrusion on protected landscapes or scenic resources;
Noticeable change in visual character of the area;
Establishes a new precedent for development in the area.

Moderate visual impact expected:
Potentially some affect on protected landscapes or scenic resources;
Some change in the visual character of the area;
Introduces new development or adds to existing development in the area.

Minimal visual impact expected:
Potentially low level of intrusion on landscapes or scenic resources;
Limited change in the visual character of the area;
Low-key development, similar in nature to existing development.

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

Figure 12: Expected visual impact ratings

The above screening process should however not be regarded as a comprehensive list of criteria, and should therefore not replace the need for a comprehensive, systematic scoping process to identify the range of issues arising from a particular development.

The above process has been used to screen the level of anticipated visual impact on the proposed project, and the outcome can be reviewed below:

- **Type of environment**: Areas or routes of low scenic, cultural, historical significance
- **Type of development**: Category 5 (large-scale development, eg. energy farm)

Anticipated Visual Impact: **High Visual Impact**

7.1.3 Assessment level

From the above screening process outcome, the type of visual impact assessment approach needs to be determined. The type of assessment levels can be reviewed below (Adapted from Oberholzer, B. 2005):

Table 2: Assessment levels

Anticipated level of visual impact	Little or no visual impact expected	Minimal visual impact expected	Moderate visual impact expected	High visual impact expected	**Very high visual impact expected**
Level of visual input recommended	**Level 1** visual input	**Level 2** visual input	**Level 3** visual input	**Level 4** visual input	**Level 5** visual input

The associated scope of works for each of the above levels should include the following aspects (Oberholzer, B. 2005):

Level 1 input:
Identification of issues, and site visit;
Brief comment on visual influence of the project and an indication of the expected impacts / benefits.

Level 2 input:
Identification of issues raised in scoping phase, and site visit;
Description of the receiving environment and the proposed project;
Establishment of view catchment area and receptors;
Brief indication of potential visual impacts, and possible mitigation measures.

Level 3 assessment:
Identification of issues raised in scoping phase, and site visit;
Description of the receiving environment and the proposed project;
Establishment of view catchment area, view corridors, viewpoints and receptors;
Indication of potential visual impacts using established criteria;
Inclusion of potential lighting impacts at night;
Description of alternatives, mitigation measures and monitoring programmes.
Review by independent, experienced visual specialist (if required).

Level 4 assessment:
As per Level 3 assessment, plus complete 3D modeling and simulations, with and without mitigation.
Review by independent, experienced visual specialist (if required).

Figure 13: Scope of works for visual impact levels

A **LEVEL 4** assessment is concluded based on the above scoring methodology.

9 Conclusion & Recommendation

This desktop study was compiled in preparation for a full VIA assessment. Four possible site locations have been identified on the proposed property where the project is to be implemented.

Various positive and negative aspects and characteristics of the 4 sites makes it essential for relevant stakeholders to come to an agreement on the most appropriate site for implementation before a full VIA can be done.

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