D5: Visual Impact Assessment

CARPE DIEM NORTH SOLAR PARK

Visual Impact Assessment

January 2025

VISUAL IMPACT ASSESSMENT REPORT

CARPE DIEM NORTH PV SOLAR PARK

GAUTENG

Submitted to:

LEGACY ENVIRONMENTAL MANAGEMENT CONSULTING
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Report Revision No:	*DRAFT ASSESSMENT*
Date Issued:	10 January 2025
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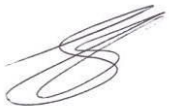

Reference: 097_2023: Carpe Diem PV Solar Park – ASSESSMENT

EXPERTISE OF SPECIALIST

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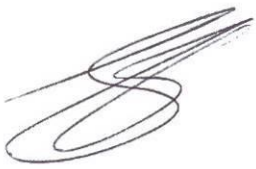
Professional Registration:	South African Council for the Landscape Architectural Profession (SACLAP) Reg. No. 87001 Fellow Institute of Landscape Architects of South Africa (FILASA)
Experience in Years:	45 years
Experience	Graham Young is a registered landscape architect with an interest and experience in landscape architecture, urban design, and environmental planning. He holds a degree in landscape architecture from the Universities of Toronto (BL) and Pretoria (ML). He has conducted visual impact assessments in Canada and Africa, where he has spent most of his working life. He has served as President of the Institute of Landscape Architects of South Africa (ILASA) and vice president of the Board of Control for Landscape Architects. He is a Fellow of the ILASA and a professionally registered landscape architect in South Africa (SACLAP). He is Secretary-General for the International Federation of Landscape Architects, Africa Region (IFLA Africa) and Vice President of IFLA (world). He runs his practice, Graham A Young Landscape Architect (GYLA). A speciality is Visual Impact Assessments, for which he has been cited with an Institute of Landscape Architects of South Africa (ILASA) Merit Award (1999). This work also includes landscape characterisation studies, quarry end-use studies, and computer modelling and visualisation. He has completed over three hundred specialist reports for projects and conducted VIA reviews. He has served as a specialist witness in legal cases involving visual impact issues. Mr Young helped develop the *Guideline for Involving Visual and Aesthetic Specialists in EIA Processes* (Oberholzer 2005) and produced a research document for Eskom, *The Visual Impacts of Power Lines* (2009). In 2011 he produced '*Guidelines for involving visual and aesthetic specialists'* for the Aapravasi Ghat Trust Fund Technical Committee, which manages a World Heritage Site in Mauritius, along with the *Visual Impact Assessment Training Module Guideline Document* for the same client.

DECLARATION OF INDEPENDENCE

I, Graham Young, declare that –

- I am contracted as the Visual Impact Assessment Specialist for the CARPE DIEM NORTH Solar PV Park, Gauteng, South Africa
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant.
- I declare that there are no circumstances that may compromise my objectivity in performing such work.
- I have no, and will not engage in, conflicting interests in the undertaking of the activity.
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing – any decision to be taken concerning the application by the competent authority and – the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority.
- All the particulars furnished by me in this form are true and correct; and



Graham A. Young FILASA PrLArch SACLAP Reg. No. 87001

10 January 2025

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SPECIALIST REPORTING REQUIREMENTS

Specialist Reporting Requirements According to Appendix 6 of the National Environmental Management Act (Act No. 107 of 1998), Environmental Impact Assessment (EIA) Regulation 2014 (as amended on 7 April 2017)	
Requirement	**Relevant section in report**
Details of the specialist who prepared the report	Pg iii and Appendix B
The expertise of that person to compile a specialist report including a curriculum vitae	Pg iii and Appendix B
A declaration that the person is independent in a form as may be specified by the competent authority	Pg iv
An indication of the scope of, and the purpose for which, the report was prepared;	Section 1.3 and 1.4
An indication of the quality and age of base data used for the specialist report;	Section 1.5
A description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 8.4
The duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Section 1.4 and 3.2
A description of the methodology adopted in preparing the report or conducting the specialised process inclusive of equipment and modelling used;	Section 3
Details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure	Section 6
An identification of any areas to be avoided, including buffers	N/A
A map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Figures 5 and 6
A description of any assumptions made and any uncertainties or gaps in knowledge;	Section 1.5
A description of the findings and potential implications of such findings on the impact of the proposed activity or activities;	Section 8
Any mitigation measures for inclusion in the EMPr;	Section 9
Any conditions for inclusion in the environmental authorisation	N/A
Any monitoring requirements for inclusion in the EMPr or environmental authorisation	N/A

A reasoned opinion whether the proposed activity, activities or portions thereof should be authorised regarding the acceptability of the proposed activity or activities; and	N/A
If the opinion is that the proposed activity, or activities or portions thereof should be authorised, any avoidance, management, and mitigation measures that should be included in the EMPr, and where applicable, the closure plan	N/A
A description of any consultation process that was undertaken during the conducting the study	N/A the EAP is conducting this activity
A summary and copies of any comments that were received during any consultation process	N/A
Any other information requested by the competent authority.	N/A

ACRONYMS, ABBREVIATIONS & GLOSSARY

Acronyms & Abbreviations	
BAR	Basic Assessment Report
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme
ESIA	Environmental and Social Impact Assessment
GYLA	Graham Young Landscape Architect
LiLo	Line In Line Out
MW	Megawatt
OPL	Overhead Power Line
PV	Photovoltaic
SACLAP	South African Council for the Landscape Architectural Profession
VAC	Visual Absorption Capacity
VIA	Visual Impact Assessment

Glossary	
Aesthetic Value	Aesthetic value is the emotional response derived from the experience of the environment with its natural and cultural attributes. The response can be either to visual or non-visual elements and can embrace sound, smell and any other factor having a strong impact on human thoughts, feelings, and attitudes (Ramsay, 1993). Thus, aesthetic value encompasses more than the seen view, visual quality, or scenery, and includes atmosphere, landscape character and sense of place (Schapper, 1993).
Aesthetically significant place	A formally designated place visited by recreationists and others for the express purpose of enjoying its beauty. For example, tens of thousands of people visit Table Mountain on an annual basis. They come from around the country and even from around the world. By these measurements, one can make the case that Table Mountain (a designated National Park) is an aesthetic resource of national significance. Similarly, a resource that is visited by large numbers who come from across the region probably has regional significance. A place visited primarily by people whose place of origin is local is generally of local significance. Unvisited places either have

	no significance or are "no trespass" places. (After New York, Department of Environment 2000).
Aesthetic impact	Aesthetic impact occurs when there is a detrimental effect on the perceived beauty of a place or structure. Mere visibility, even startling visibility of a project proposal, should not be a threshold for decision making. Instead, a project, by its visibility, must clearly interfere with or reduce (i.e. visual impact) the public's enjoyment and/or appreciation of the appearance of a valued resource e.g. cooling tower blocks a view from a National Park overlook (after New York, Department of Environment 2000).
Cumulative Effects	The summation of effects that result from changes caused by a development in conjunction with the other past, present, or reasonably foreseeable actions.
Glare	The sensation produced by luminance within the visual field that is sufficiently greater than the luminance to which the eyes are adapted, which causes annoyance, discomfort, or loss in visual performance and visibility. *See* Glint. (USDI 2013:314)
Glint	A momentary flash of light resulting from a spatially localised reflection of sunlight. *See* Glare. (USDI 2013:314)
Landscape Character	The individual elements that make up the landscape, including prominent or eye-catching features such as hills, valleys, woods, trees, water bodies, buildings, and roads. They are generally quantifiable and can be easily described.
Landscape Impact	Landscape effects derive from changes in the physical landscape, which may give rise to changes in its character and how this is experienced (Institute of Environmental Assessment & The Landscape Institute 1996).
Study area	For the purposes of this report this Project the study area refers to the proposed project footprint / project site as well as the 'zone of potential influence' (the area defined as the radius about the centre point of the Project beyond which the visual impact of the most visible features will be insignificant) which is a 5,0km radius surrounding the proposed project footprint / site.
Project Footprint / Site	For the purposes of this report the Project *site* / *footprint* refers to the actual layout of the Project as described.
Sense of Place (genius loci)	Sense of place is the unique value that is allocated to a specific place or area through the cognitive experience of the user or viewer. *A genius locus literally means* 'spirit of the place'.
Sensitive Receptors	Sensitivity of visual receptors (viewers) to a proposed development.
Viewshed analysis	The two-dimensional spatial pattern created by an analysis that defines areas, which contain all possible observation sites from which an object

	would be visible. The basic assumption for preparing a viewshed analysis is that the observer eye height is 1,8m above ground level.
Visibility	The area from which project components would potentially be visible. Visibility depends upon general topography, aspect, tree cover or other visual obstruction, elevation, and distance.
Visual Exposure	Visibility and visual intrusion qualified with a distance rating to indicate the degree of intrusion and visual acuity, which is also influenced by weather and light conditions.
Visual Impact	Visual effects relate to the changes that arise in the composition of available views because of changes to the landscape, to people's responses to the changes, and to the overall effects with respect to visual amenity.
Visual Intrusion	The nature of intrusion of an object on the visual quality of the environment resulting in its compatibility (absorbed into the landscape elements) or discord (contrasts with the landscape elements) with the landscape and surrounding land uses.
Visual absorption capacity	Visual absorption capacity is defined as the landscape's ability to absorb physical changes without transformation in its visual character and quality. The landscape's ability to absorb change ranges from low-capacity areas, in which the location of an activity is likely to cause visual change in the character of the area, to high-capacity areas, in which the visual impact of development will be minimal (Amir & Gidalizon 1990).
Worst-case Scenario	Principle applied where the environmental effects may vary, for example, seasonally to ensure the most severe potential effect is assessed.
Zone of Potential Visual Influence	By determining the zone of potential visual influence, it is possible to identify the extent of potential visibility and views which could be affected by the proposed development. Its maximum extent is the radius around an object beyond which the visual impact of its most visible features will be insignificant primarily due to distance.

EXECUTIVE SUMMARY

INTRODUCTION

LEGACY Environmental Management Consulting commissioned Graham Young Landscape Architect (GYLA) to conduct a visual assessment scoping report for the proposed Carpe Diem Solar Park on Portion 5 of Farm 119 Varkenlaagte and Portion 27 of Farm Doornfontein (the project site). The report focuses on the potential visual impact of the physical aspects of the Project (i.e. form, scale, and bulk) and its potential impact within the local landscape and receptor context. It is part of the Environmental Impact Assessment (EIA) process. The plant is proposed to generate a maximum of up to 240 MW into the Eskom Grid.

PROJECT SITE AND STUDY AREA

The proposed project site is located immediately south of the R501, and new residential areas are being constructed north of the Provincial Road. The site extends south from the R501, with its southernmost boundary immediately north of the Eskom Carmel substation. The site is approximately southwest of residential areas associated with Merafong City (Oberholzer and Carletonville). The northernmost boundary is I,8km southeast of the southernmost sections of Welverdiend.

AIM OF THE SPECIALIST STUDY

The study's main aim is to document the baseline and ensure that the proposed project's visual/aesthetic consequences are understood.

TERMS OF REFERENCE

A specialist study is required to establish the visual baseline and identify and assess the impact of the Project based on the general requirements for a comprehensive VIA. The following terms of reference were established:

- Data collected during the site visit (conducted on 27 October 2022 and 15 March 2023) and from Google Earth will allow for a description and characterisation of the receiving environment.
- Describe the landscape character and quality and assess the visual resource of the study area.
- Describe the visual characteristics of the components of the Project.
- Qualitatively assess the potential for glint and glare.
- Rate (high-level) the potential impact of the Project. The significance of visual impact will be stated in the subsequent Assessment report.
- Propose mitigation measures to reduce the potential impact of the Project.
- Rate the potential cumulative effect of the Project.

FINDINGS

The existing visual condition of the landscape that may be affected by the proposed Carpe Diem North PV Solar Power Project has been described. The study area's scenic quality has been rated *low* to *high* within the context of the sub-region. Sensitive viewing areas have been identified and mapped, indicating potential sensitivity to the Project, mainly for new residential areas (not yet occupied) to the immediate north of the site and for users of the R501 and local connector road west of the site. Impacts on views are the highest when receptors are sensitive to change in the landscape and the view is focused on and dominated by the change.

The impact on the visual environment during construction is assessed as low intensity over a localised area. It would occur over the short term (less than five years). The significance of the unmitigated impact would be localised but extend beyond the site boundary (to at least 3,0km in some areas) and is predicted to be MODERATE. Implementing mitigation measures would not significantly reduce the anticipated impact, remaining MODERATE.

The impact on the visual environment during the operational phase is assessed to have a moderate intensity and would occur over the long term (anticipated to be thirty years). The unmitigated impact would be localised but extend beyond the site boundary (to at least 3,0km) and is considered MODERATE. The significance of a moderate impact is that it could influence the decision, and the effect will not be avoided unless it is mitigated. With effective mitigation, the impact could be reduced to LOW.

At decommissioning, the impact is expected to be low intensity over a localised area and occur over the short term (less than five years). The significance of the unmitigated impact would be localised but extend beyond the site boundary (to at least 2,0 km in some areas) and is predicted to be LOW. Implementing mitigation measures would not significantly reduce the anticipated impact during this phase and remain LOW.

The degree of confidence in the significance assessment might change if the results of the I&AP process indicate very high sensitivity to the development. The assessment has assumed a moderate receptor sensitivity to the Project.

After decommissioning, the site will be rehabilitated back to its original topography and vegetative cover.

IMPACT OF GLINT AND GLARE

The South African Civil Aviation Authority (SACAA) obstacle notice 3/2020[1] The Additional Requirements for Solar Project Applications state that a Glint and Glare Assessment would not be required if the solar PV facility is not within a 3km radius of the aerodrome (Part 139.01.30 (3)). Therefore, a full Glint and Glare Assessment is not required.

CUMULATIVE EFFECT

The intervisibility and the Project, along with the other solar PV projects proposed in the sub-region, would, over time, result in the nature and character of the study being impacted in a manner beyond the anticipated moderate negative impact of the proposed Project alone. The significance of the cumulative impact of these projects during their operational phases is assessed to be moderate intensity and over the long term, with an unmitigated sub-regional impact extending beyond the sites, which is assessed to be MODERATE.

AUTHOR'S OPINION

GYLA believes that the proposed project's visual impacts are acceptable from a visual perspective, given a predicted moderate negative impact without mitigation and a low negative impact with management measures.

*** GYLA ***

[1] Obstacle Notice 3/2020 (Replacement for 17/11/2017): Additional Requirements for Solar Project Applications:
Kindly note that with immediate effect, A Glint & Glare Assessment will be required as soon as the proposed site is located on the extended runway centreline within the ICAO Annex 14 Approach Surface, Take-Off Climb Surface & Departure Surface, and within 3km radius around an Aerodrome/helistop as pe Part 139.01.30 (3).

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1. INTRODUCTION

1.1 Project Overview and Background

LEGACY Environmental Management Consulting commissioned Graham Young Landscape Architect (GYLA) to conduct a visual assessment scoping report for the proposed Carpe Diem Solar Park on Portion 5 of Farm 119 Varkenlaagte and Portion 27 of Farm Doornfontein (the project site). The report focuses on the potential visual impact of the physical aspects of the Project (i.e. form, scale, and bulk) and its potential impact within the local landscape and receptor context. It is part of the Environmental Impact Assessment (EIA) process. The plant is proposed to generate a maximum of up to 240 MW into the Eskom Grid.

1.2 Project site

The proposed project site is located immediately south of the R501, and new residential areas are being constructed north of the Provincial Road. The site extends south from the R501, with its southernmost boundary immediately north of the Eskom Carmel substation. The site is approximately southwest of residential areas associated with Merafong City (Oberholzer and Carletonville). The northernmost boundary is I,8km southeast of the southernmost sections of Welverdiend. Refer to **Figure 1**.

1.3 Aim of the Specialist Study

The study's main aim is to document the baseline and ensure that the visual/aesthetic consequences of the proposed Project are understood and that a high-level impact of the proposed activities can be predicted.

1.4 Terms and Reference

A specialist study is required to establish the visual baseline and identify and assess the impact of the Project based on the general requirements for a comprehensive VIA. The following terms of reference were established:

- Data collected during the site visit (conducted on 27 October 2022 and 15 March 2023) and from Google Earth will allow for a description and characterisation of the receiving environment.
- Describe the landscape character and quality and assess the visual resource of the study area.
- Describe the visual characteristics of the components of the Project.
- Qualitatively assess the potential for glint and glare.
- Rate (high-level) the potential impact of the Project. The significance of visual impact will be stated in the subsequent Assessment report.
- Propose mitigation measures to reduce the potential impact of the Project.
- Rate the potential cumulative effect of the Project.

1.5 Assumption, Uncertainties and Limitations

The following assumptions limitations have been made in the study:

- The description of project components is limited to what has been supplied to the author prior to the date of completion of this report.
- Site photos taken in early and late summer do not necessarily reflect the complete landscape character of the area as experienced through all seasons. The weather, on both occasions, was

partly cloudy, with slight haze conditions on both site visit occasions.

- At the time of authoring the report, the public participation process had not been completed.

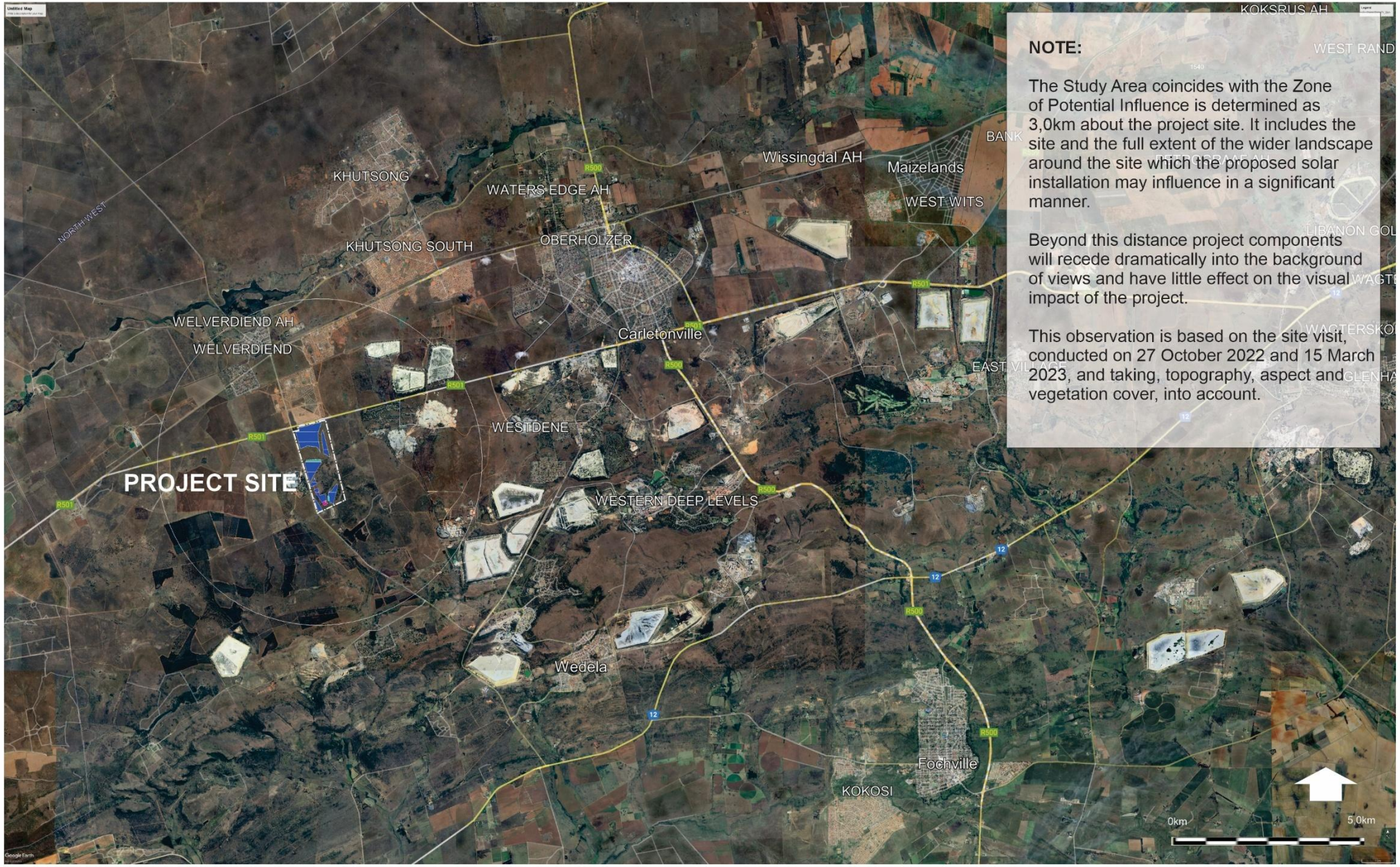


Figure 1: LOCALITY - Carpe Diem North Solar Park

2. NATIONAL ENVIROMENTAL GUIDELINES

National Environmental Management Act (Act 107 of 1998), EIA Regulations

The specialist report is in accordance with the specification on conducting specialist studies as per Government Gazette (GN) R 982 (as amended) of the National Environmental Management Act (NEMA) Act 107 of 1998. The mitigation measures as stipulated in the specialist report can be used as part of the Environmental Management Programme Report (EMPR) and will be in support of the Environmental Impact Assessment (EIA) and Appendix 6 of the EIA Regulations 2014 (as amended).

Western Cape Department of Environmental Affairs & Development Planning: Guideline for Involving Visual and Aesthetic Specialists in EIA Processes Edition 1 (CSIR, 2005)

Although the guidelines were specifically compiled for the Province of the Western Cape, they provide guidance that is appropriate for any EIA process. The Guideline document also seeks to clarify instances when a visual specialist should get involved in the EIA process.[2]

[2] The Western Cape Guidelines are the only official guidelines for visual impact assessment reports in South Africa and can be regarded as best practice throughout the country.

3. APPROACH AND METHODOLOGY

3.1 Approach

The assessment of likely effects on a landscape resource and visual amenity is complex since it is determined through quantitative and qualitative evaluations. When assessing visual impact, the worst-case scenario is considered. Landscape and visual assessments are separate, although linked, procedures. The landscape, its analysis, and the assessment of impacts on the landscape all contribute to the visual impact assessment studies baseline. The potential impact on the landscape is assessed as an impact on an environmental resource, i.e. the physical landscape. On the other hand, visual impacts are assessed as one of the interrelated effects on people (i.e. the viewers and the result of an introduced object into a view or scene).

For a detailed description of the methodology to determine the value of a visual resource, refer to **Appendix A**. **Appendices B** and **C** list the criteria for determining the intensity and significance of visual impact. **Image 1** below graphically illustrates the visual impact process used in this Project.

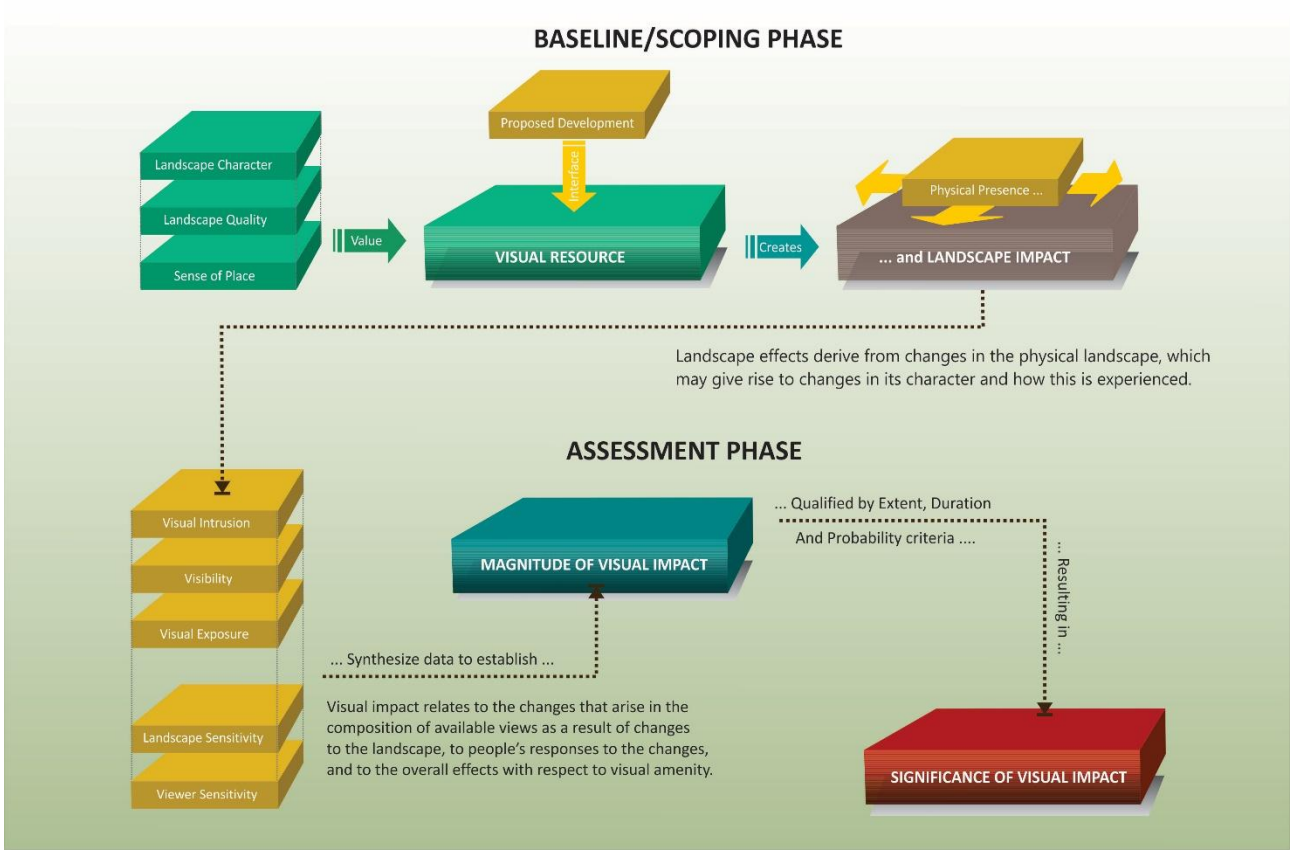


Image 1: Visual Impact Process

3.2 Methodology

The following method was used:

- Site visit: Field surveys were undertaken on 27 October 2022 and 15 March 2023.
- Project components: The physical characteristics of the project components were described and illustrated based on information supplied by the EAP.

- The landscape's character was described and rated in terms of its aesthetic appeal using recognised contemporary research in perceptual psychology as the basis, and its sensitivity as a landscape receptor.
- The sense of place of the study area was described as to its uniqueness and distinctiveness. The primary informant of these qualities was the spatial form and character of the natural landscape together with the cultural transformations associated with the historical/current use of the land.
- The visibility of the proposed Project was determined using on-site observations (viewshed modelling will be done in the Assessment Phase).
- The potential visual impact of the proposed Project was rated based on a professional opinion, the method described above and the risk analysis criteria in Appendix C; and
- Measures to mitigate the negative impacts of the Project were recommended.

4. DESCRIPTION OF THE PROJECT

The selected portions (i.e. that avoid sensitive areas) of the site are suitable for the installation of a photovoltaic (PV) power plant due to its appropriate morphologically and regarding the favourable radiation conditions. The available radiation allows a high rate of electric energy production, as a combination of latitude-longitude and climatic conditions.

The proposed developments (the Photovoltaic (PV) Power Plant and its connection infrastructure) consists of the installation of the following equipment:

- Photovoltaic modules (mono-crystalline, poly-crystalline, mono, or bi-facial modules)
- Mounting systems for the PV arrays (single-axis horizontal trackers or fixed structures) and related foundations
- Internal cabling and string boxes
- Medium voltage stations, hosting DC/AC inverters and LV/MV power transformers
- Medium voltage receiving station(s)
- Workshops & warehouses
- One on-site high-voltage substation with high-voltage power transformers, stepping up voltage, and one high-voltage busbar with metering and protection devices (switching station)
- It is proposed that the solar PV facilities will connect to the Carmel MTS
- Battery Energy Storage System (BESS) will be located next to the onsite substation.
- Electrical system and UPS (Uninterruptible Power Supply) devices
- Lighting system
- Grounding system
- Internal roads
- Fencing of the site and alarm and video-surveillance system
- Water access point, water supply pipelines, water treatment facilities
- Patented Sewage system

Other key features of the project are to ensure an elevated level of reliability, operational and maintenance safety, low water consumption. The expected operational life of a plant is deemed to be approximately 30 years. The construction and the commissioning of a PV plant are expected to last approximately 18 months.

Refer to **Figure 2** for the layout and a typical example of PV arrays on single axis horizontal trackers.

4.1 Alternatives

No alternative sites were considered for the Project. However, a number of restricted areas have been identified during the Opportunities and Constraints review of the site. These areas were avoided when the proposed Project layout was considered. Refer to **Figure 2**.

Three alternatives for the 132kV powerlines connecting the project to the Eskom Carmel substation have been proposed.

- Alternative 1: Line In Line Out (LiLo) that connects to the existing powerline, which in turn connects with the Carmel substation.
- Alternative 2: Underground cabling is routed south from the on-site substation to the north west corner of the Carmel substation.
- Alternative 3: Underground cabling follows the Alternative 2 but then veers east and south around the Carmel substation to connect at its southern end.

Alternative 2 is the preferred visual alternative as its installation would be the least disruptive (of the two underground alternatives) and once installed would not be visible. However, Alternative 1 would be seen within the context of existing and proposed power infrastructure, and therefore be absorbed into the scene, is also acceptable from a visual perspective. It would however contribute to the cumulative effect of power infrastructure in the study area.

Refer to the inlaid image in **Figure 3**, which illustrates the three alternative routes.

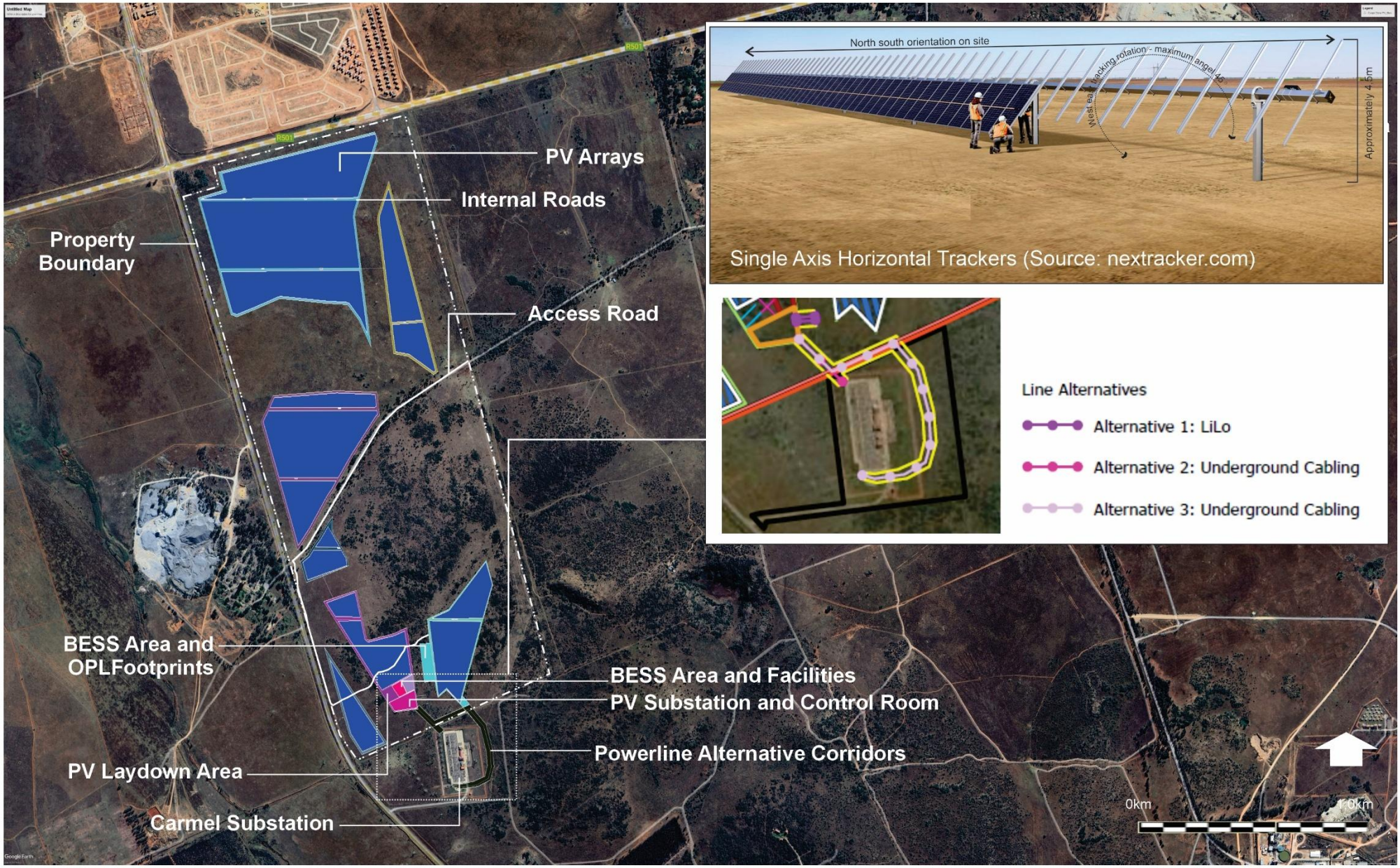


Figure 2: LAYOUT- Carpe Diem North Solar Park

5. POTENTIAL VISUAL ISSUES

PV solar projects typically include medium to large-scale infrastructure that can cause change to the fabric and character of an area and possible visual intrusion in sensitive landscapes due to their physical presence.

Typical issues associated with solar PV projects are:

- Who will be able to see the new development?
- What will it look like, and will it contrast with the receiving environment?
- Will the development affect sensitive views in the area, and if so, how?
- What will be the impact of the development during the day and at night?
- What will the cumulative impact be, if any?

These issues will be considered, and the significance of impact rated. At the time of writing, the public participation process had not been completed. Therefore, it is unknown if the public would raise visual issues and potentially indicate a sensitivity to visual and aesthetic concerns. It is assumed, based on the generic sensitivity criteria listed in **Appendix B** that receptor sensitivity would be moderate to low.

5.1 Glint and Glare

In addition to these common visual and aesthetic issues, the potential of glint and glare can be of concern. PV panel surfaces are designed to absorb the sunlight, therefore substantially reducing the potential for glint and glare. The glass layer covering the PV modules is made of high transmission tempered glass with an anti-reflective (AR) coating. Consequently, the percentage of the reflected light from PV modules can vary from 2% to 30% depending on the angle of incidence (PagerPower 2020:24). However, published guidance shows that the intensity of solar reflections from solar panels are equal to or less than those from water. It also shows that reflections from solar panels are significantly less intense than other reflective surfaces, which are common in an outdoor environment (PagerPower 2020:24). By comparison, a mirror can reflect a percentage of the incident light above 98% (Tata 2015:3).

However, the panels and other components reflect light that may result in glinting (but only at minimal angles), and glare depending on panel orientation, sun angle, viewing angle, viewer distance, and other visibility factors (USDI 2013:77). The images in Figure 2-1 illustrate this effect, where the arrays can vary in colour from black, to blue, to a bright silvery sheen (worst case scenario). The result can also be distributed across a single project site when differing sky conditions exist, as is illustrated in the images of a solar park near Touws Rivier. The southern section of the solar park is in the sun, causing a silver sheen, while the park's northern area, which is in cloud shade, appears dull grey. The effect of glint (a sharp focus of light) is not generally associated with PV arrays; however, glare can occur with certain climatic and orientation conditions, as has been illustrated (USDI 2013:77) in **Figure 2-1**.

Figure 2-2 illustrates a typical installation of PV arrays in the Northern Cape and suggests that glint would not normally occur from low angles. For the most part the arrays would appear as a dark blue line in the landscape as shown in the figure.

The South African Civil Aviation Authority (SACAA) obstacle notice 3/2020[3] Additional Requirements for Solar Project Applications states that a Glint and Glare Assessment would be required if the solar PV facility is within a 3km radius of the aerodrome (Part 139.01.30 (3)[4]. The nearest aerodrome, the Johannesburg Skydiving Club, is over 6kms north east of the Carpe Diem North solar development, i.e., is not within 3km of the aerodrome, a full Glint and Glare Assessment is therefore not required.

In summary, the effect of glint (a sharp focus of light) is not generally associated with PV arrays; however, glare could occur with certain climatic and orientation conditions, for limited periods of the day in the early morning or late afternoon for areas west and east of the Project site. The nature of the visibility of the project and the limited number of people that could be affected, suggests that glint and glare is not a significant issue associated with the Project.

[3] Obstacle Notice 3/2020 (Replacement for 17/11/2017): Additional Requirements for Solar Project Applications
Kindly note that with immediate effect, A Glint & Glare Assessment will be required as soon as the proposed site is located on the extended runway centreline within the ICAO Annex 14 Approach Surface, Take-Off Climb Surface & Departure Surface, and within 3km radius around an Aerodrome/helistop as pe Part 139.01.30 (3).

Apparent colour changes with differing sun angles and viewing geometry at a PV facility. (USDI 2013:78)
Credit: Robert Sullivan, Agganne National Laboratory.

PV panel surfaces are not designed to reflect light and therefore have reduced potential for glint and glare; however, the panels and other components do reflect light that may result in glinting, glare and other visual effects that would vary depending on panel orientation, sun angle, viewing angle, viewer distance, and other visibility factors (USDI 2013:77)

Figure 2-1: POTENTIAL FOR GLINT AND GLARE

Figure 2-2: EFFECT OF DISTANCE ON VISUAL EXPOSURE

Note: Scales of the two options are relative to each other

6. THE ENVIRONMENTAL SETTING

6.1 Landscape Character and Nature of the Study Area

The study area (refer to **Figure 3**) comprises gently undulating land that slopes from the Project site to the west and south to a drainage line west and south of the site. The site slopes from east to west with a fall of approximately 50m to the western parts of the site (**Figure 4-2**). The highest elevations are associated with a local ridgeline that protrudes into the site from the east boundary to the western section of the property, near the Carmel Substation (**Figure 4-4**). The ridge line and the higher portions of the site extend south of the substation and slope south to the drainage line mentioned above. The ridges, north and east of the substation and their adjacent valley, are covered with Gauteng Shale Mountain Bushveld vegetation (**Figure 4-4**). The higher elevations south of the substation are also covered in this vegetation, as well as plantations of Eucalyptus on the lower slopes and adjacent to the local connector road. Further south is the Deelkraal residential area outside the study area. The northernmost sections of the site are dominated by grassland (remnants of Carletonville Dolomite Grassland).

Eskom high voltage powerlines are prevalent throughout the study area and site. Specifically, servitudes aligned along the eastern boundary of the site (Figure 4-1) and meet up with the Carmel substation (**Figure 5**). Servitudes with powerlines from the substation run east and up the slope to the mines east and southeast of the site. Two other powerlines run south from the substation and adjacent to the connector road before crossing over it.

West of the site is open land and a drainage line and its associated wetlands, depicted in **Figures 4-2** and **4-3**. Open grasslands also occur between the site and the Welverdiend residential area (**View 9 Figure 4-3**), although this land appears scheduled for future housing development. Immediately west of the site is an abandoned mine, currently being used as a stone crusher plant. Further west and southwest of the site, on a slightly undulating land area, are plantations of commercial trees (mostly Eucalyptus). The eastern parts of the study area are dominated by mining activities associated with the Blyvoor Gold and Doornfontein mines.

The visual resource value of these landscape types is rated in Table 1 in **Section 7** below.

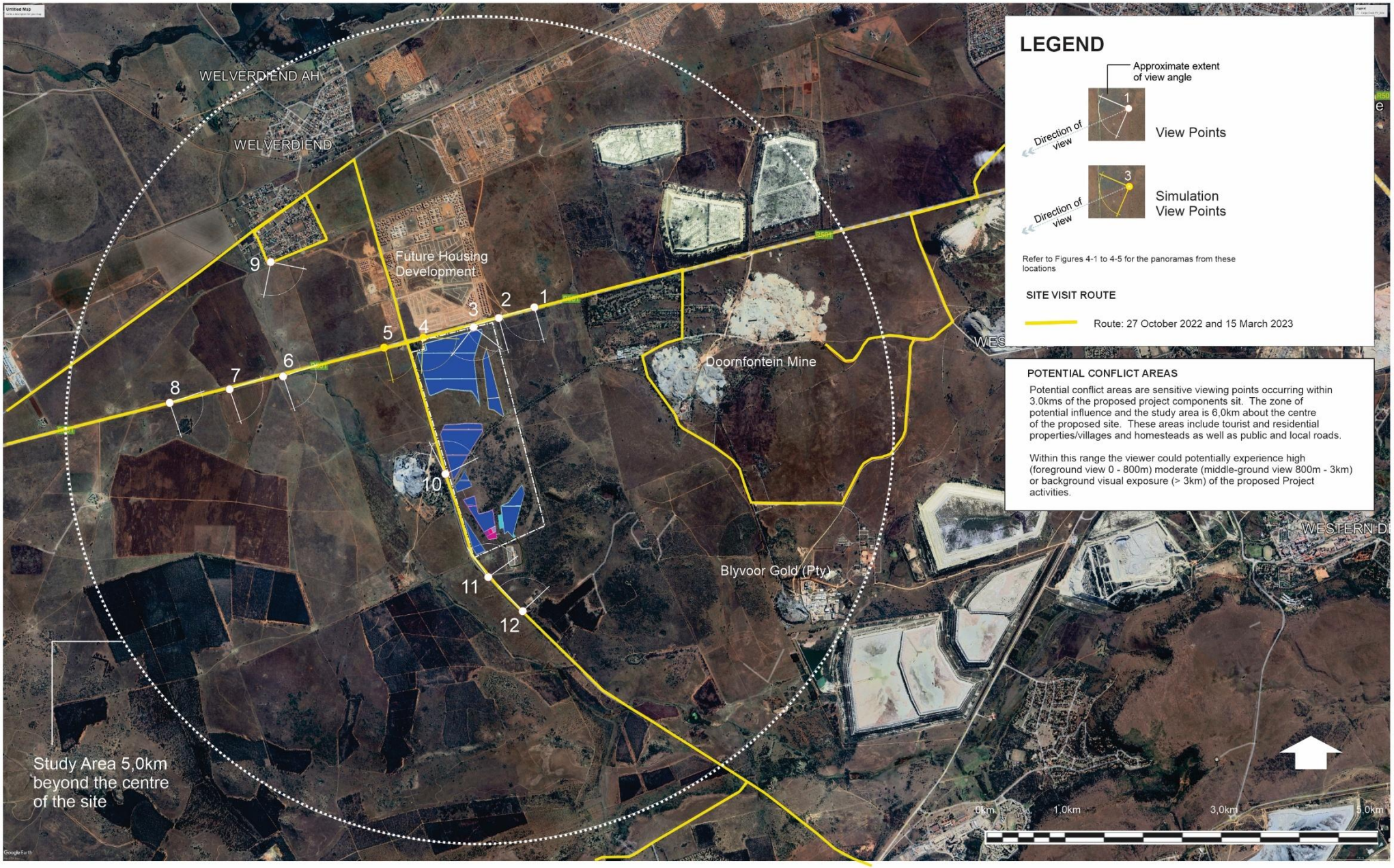


Figure 03: VIEW POINTS - Carpe Diem North Solar Park

View 1: looking west along the R501 towards the north eastern corner of the project site.

View 2: looking west from the R501 near the north eastern corner of the project site which occurs on a low ridge line and the site is not visible

View 3: looking directly south across the Project site from the R501 near the entrance to the new housing development

Figure 04-1: LANDSCAPE CHARACTER - Views 1, 2 and 3

Refer to Figure 2 for location of viewing points

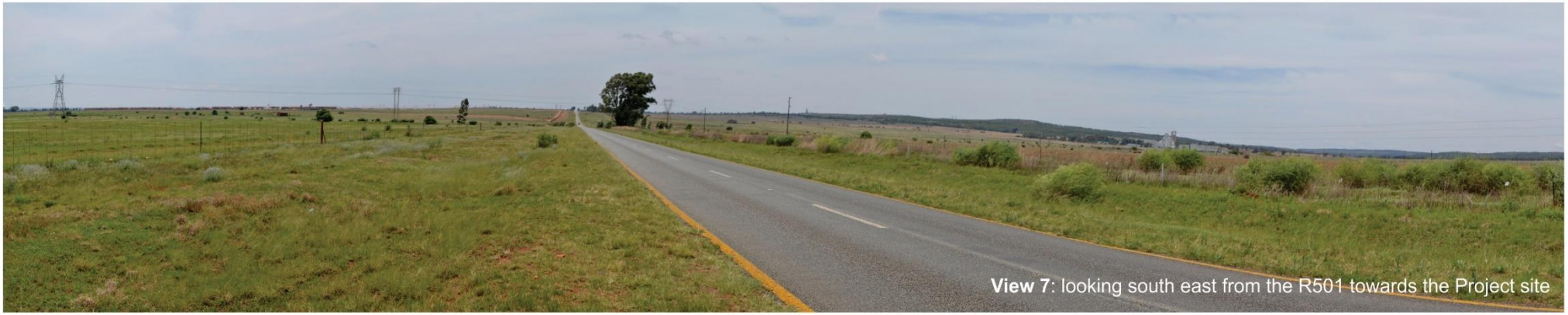
View 4: looking south east from the R501 across the project site from near its north western corner

View 5: looking south east from the R501 towards the Project site

View 6: looking south east to the Project site from the R501

Figure 4-2: LANDSCAPE CHARACTER - Views 4, 5 and 6

Refer to Figure 2 for location of viewing points



View 7: looking south east from the R501 towards the Project site

View 8: looking south east from the R501 towards the Project site

View 9: looking south east to the Project site from 1st Avenue, Welverdiend

Figure 4-3: LANDSCAPE CHARACTER - Views 7, 8 and 9

Refer to Figure 2 for location of viewing points

View 10: looking east to the Project site from the local connector road

View 11: looking north to the Project side from the local connector road and immediately adjacent to the Eskom Carmel sub-station

View 12: looking north towards the Project site from the local connector road which passes the site along its western boundary

Figure 4-4: LANDSCAPE CHARACTER - Views 10, 11 and 12

Refer to Figure 2 for location of viewing points

7. VISUAL RESOURCE

7.1 Visual Resource Value, Scenic Quality and Landscape Sensitivity

The value of the visual resource and its associated scenic quality are derived from the landscape characteristics described above. As a scenic resource, the study area's landscape can be defined as moderate to low (as indicated in Table 1 below) within the context of the sub-region. These ratings are dependent on the landscape's character:

- Does it contribute to the area's sense of place and distinctiveness?
- Quality? – in what condition is the existing landscape?
- Value – is the landscape valued by people, local community, and visitors, and is the landscape recognised locally, regionally, or nationally? and
- Capacity – what scope is there for positive change in the landscape character?

When the criteria listed in **Appendix A** are considered and understood within the context of the sub-region, a visual resource value is low (power, mining infrastructure and exotic plantations) and moderate for the rolling grasslands and moderate to high for the bush-covered ridgelines. The proposed Project site occurs across all these landscape types, with power infrastructure servitudes passing adjacent to and within the site, as indicated in **Figure 5**.

The study area exhibits a mixed landscape character, which is expected within the sub-region, with some positive characteristics. Still, there is significant evidence of alteration and degradation of these features, resulting in negative areas primarily associated with the power and mining infrastructure. A summary of these values is provided in **Table 1** below, which categorises the various local landscape character types and sensitivities within the context of the sub-region.

Table 1: Value of the Visual Resource
(After: LIEMA 2013)

Moderate to High Bush covered low ridge lines	**Moderate** Rolling grasslands with some natural bush	**Low** Power and Mine infrastructure
This landscape type is considered to have a *high* value because it is a: A distinct landscape that exhibits a positive character with valued features that combine to give the experience of unity, richness, and harmony. It is a landscape that may be important to conserve and has an intense sense of place.	This landscape type is considered to have a *moderate* value because it is a: A common landscape that exhibits some positive character, but which has evidence of alteration/degradation/ erosion of features resulting in areas of more mixed character.	This landscape type is considered to have a *low* value because it is a: A minimal landscape is generally negative in character with few valued features.

Sensitivity: It is sensitive to change in general and will be detrimentally affected if the change is inappropriately managed.	Sensitivity: It is potentially sensitive to change in general, and change may be detrimental if it is inappropriately managed.	Sensitivity: It is not sensitive to change in general and change.

7.2 Sense of Place

According to Lynch (1992), a sense of place is the extent to which a person can recognise or recall a place as distinct from other places - as having a vivid, unique, or at least particular, character of its own. The sense of place for the study area derives from the local landscape types described above and their impact on the senses. The natural landscape character types in the study area are common within the sub-region but have been impacted by mining, power infrastructure and exotic plantations.

The site and study area are visually characterised by open grassland west, northeast, and east of the site, mining further to the east and southeast and the residential regions (existing and in the process of being constructed) north of the R501 and southwest of the site. These characteristics give the area general mixed characteristics within a relatively open landscape and sense of place. Mining dominates to the east of the site, and rural farmland/plantations to the west, with residential north and south of the site. The site is at the interface of these visually distinct areas.

8. LANDSCAPE IMPACT

Landscape impacts derive from changes in the physical landscape, which may give rise to changes in its character and affect its scenic values. This may, in turn, affect the perceived value ascribed to the landscape. The proposed Project site occurs in a low to moderately high-rated landscape character, as discussed above.

During the construction phase, a number of activities, as described in **Section 4**, will result in clearing the vegetation to establish the development areas for the PV modules, cable trenches, inverter stations, etc. Gravel will be laid between the rows of arrays, and construction activities for the PV arrays and support infrastructure will begin. These activities will significantly impact the landscape, resulting in a high-intensity landscape impact as they would contrast noticeably with the baseline vegetation, visible from surrounding areas.

9. VISUAL IMPACT

Visual impacts relate to the changes in the composition of available views due to changes in the landscape (as described in Section 8), people's responses to the changes, and the overall effects concerning visual amenities. Visual impact is therefore measured as the change to the existing visual environment (caused by the physical presence of a new development) and the extent to which that change compromises (negative impact), enhances (positive impact), or maintains the visual quality of the area.

Four main factors are considered to assess the potential *intensity* of the Project's visual impact.

Visual Intrusion:	The nature of intrusion or contrast (physical characteristics) of a Project component on the visual quality of the surrounding environment and its compatibility/discord with the landscape and surrounding land use.
Visibility:	The area/points from which Project components will be visible.
Visual exposure:	Visibility and visual intrusion qualified with a distance rating to indicate the degree of intrusion.
Sensitivity:	Sensitivity of visual receptors to the proposed development

A numerical or weighting system is avoided when synthesising the criteria. Attempting to attach a precise numerical value to qualitative resources is rarely successful and should not be used as a substitute for reasoned professional judgment (LI-IEMA 2013). According to the results tabulated below in **Table 3**, the *intensity* of visual impact will be *moderate* (during the construction and operational phases without mitigation) for foreground views for users of the R501, the local connector road west of the site, and future residents living immediately north of the proposed power plant. Intensity is low to negligible for the remainder of the study area. At decommissioning, when all infrastructure is dismantled and removed and the site rehabilitated, the intensity of visual impact is insignificant.

9.1 Visual Receptors

Visual receptors include people living in, visiting, travelling through, or adjacent to the study area on the R501 and the connector road immediately west of the site.

9.2 Sensitive Viewers and Locations

Potentially sensitive viewing areas are predominantly from the R501 (**Figures 4-1** to **4-3**) and the future residential areas immediately north of the R501 (View 1 **Figure 4-1**) and farmland west of the site **(Figures 4-2** and **4-3**). Also, the site being topographically oriented to the west, exposes views from the west and immediate north. Views from the east along the R501 are mostly blocked due to topographic relief (View 1 **Figure 4-1**). Views from the south are partially screened by topography and existing exotic and natural trees (View 12 **Figure 4-4**). Views east of the site are blocked by a low natural ridgeline immediately east of the site.

The receptors and viewing areas identified in **Table 2** below and illustrated in **Figure 5** are potentially sensitive to the proposed solar PV development.

Table 2: Sensitivity and Location of Visual Receptors

High	**Moderate**	**Low**
Receptors at residential units across the study area. Primarily north and south of the site.	Locals travelling along the R501 and on the local connector roads west of the site.	People working or travelling to work in the study area and related to the power infrastructure.
Typical receptors -Visitors of tourist attractions and travelling along local routes, whose intention or interest may be focused on the landscape. -Communities where the development results in changes in the landscape setting or valued views enjoyed by the community. -Occupiers of residential properties with views affected by the development.	**Typical receptors** -People travelling through or past the affected landscape in cars or other transport routes.	**Typical receptors** - Visitors and people working within the study area and travelling along local roads whose attention may be focused on their work or activity and who, therefore, may be less susceptible to changes in the view.

9.3 Visibility and Visual Exposure

Activities associated with the Project will be visible to varying degrees and distances from sensitive viewing areas north, south, and west of the site, as indicated in the viewshed in Figure 6. During the construction phase, the Project's visibility will be influenced by preparatory activities, primarily earthworks and building works. During the operational phase, the established solar PV arrays and associated infrastructure will determine the project's visibility.

Project components are planned within a landscape with a relatively low visual absorption capacity (VAC) as illustrated in Figure 6. However, due to the nature of the land (topography and scattered vegetation) immediately adjacent and in the general vicinity of the site, the landscape, although reasonably exposed, provides a moderate visual absorption capacity (VAC) despite the apparent visibility. This is due to the low height of the PV arrays (maximum 4m when angled to the west or east), the nature of the vegetation cover, and the viewers' relatively low perspective. Therefore, the landscape can ‘absorb’ some visual change, primarily in the southern parts of the study area.

However, the solar PVs would displace extensive vegetation areas, reducing the landscape's absorption capacity near the site. Therefore, it is imperative that only the proposed footprint of the solar arrays, the associated infrastructure, and any remaining sensitive vegetation, both internally and peripheral to the site boundaries/servitude, be retained.

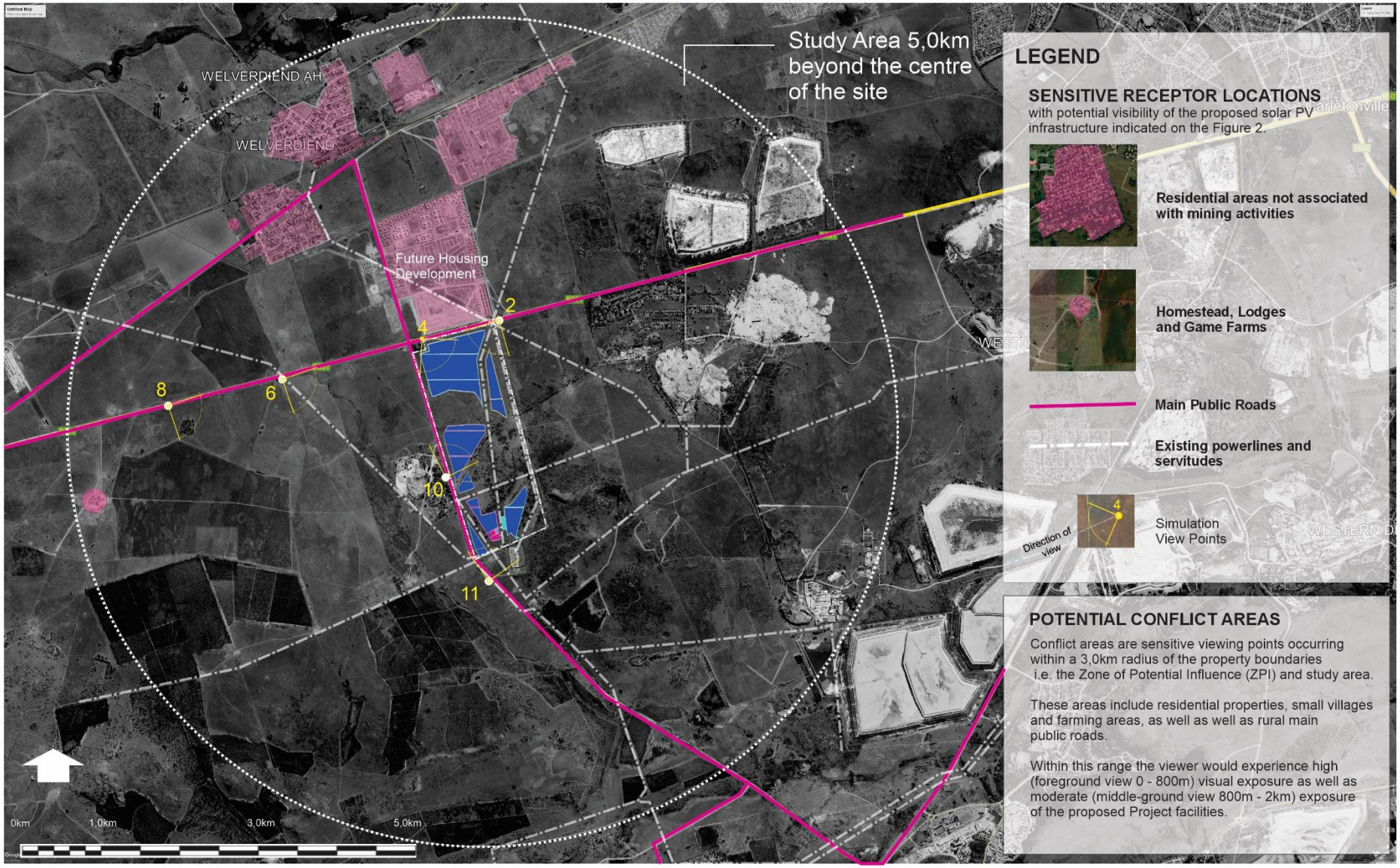


Figure 5: RECEPTOR SENSTIVITIES - Carpe Diem North Solar PV Facility

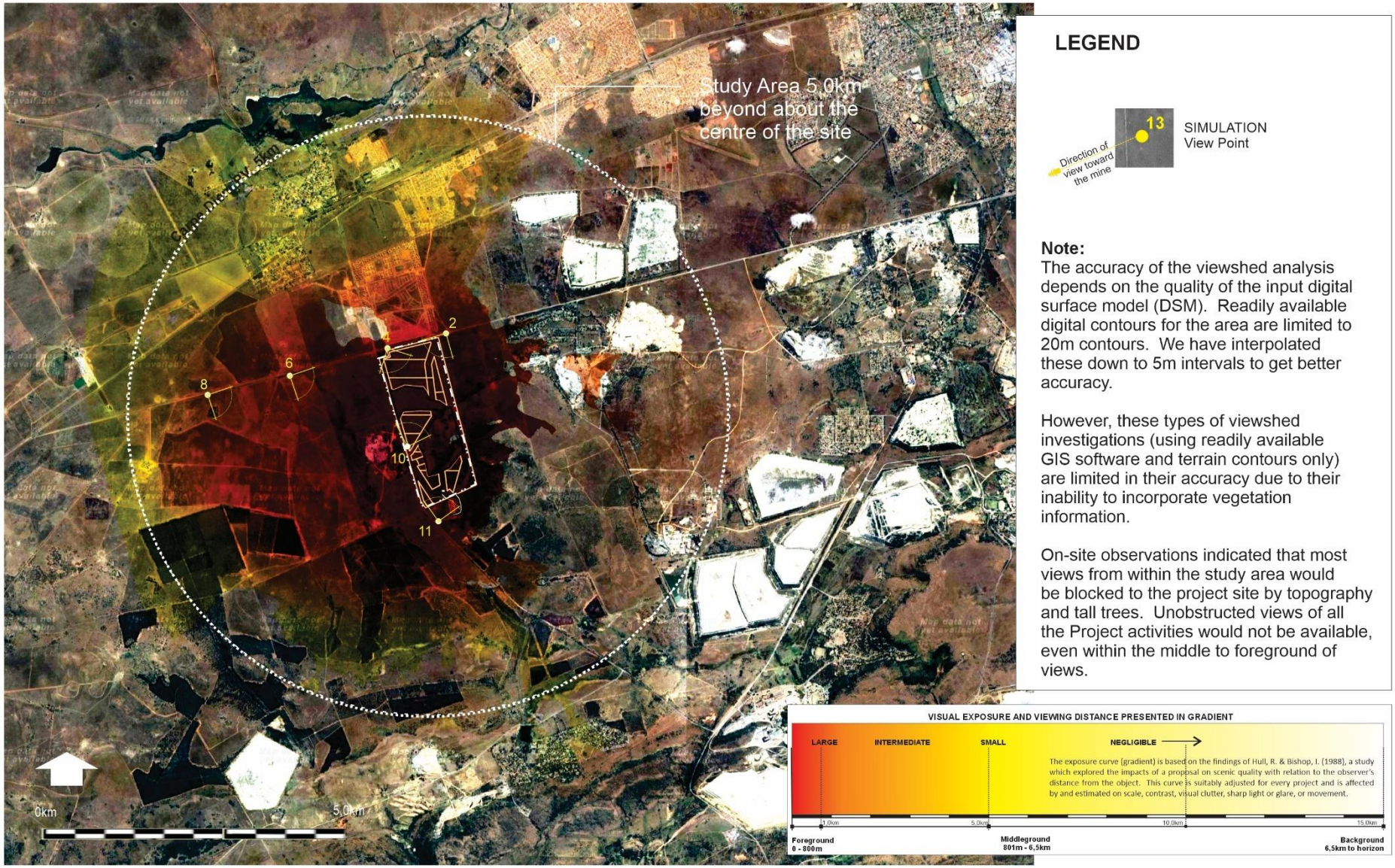


Figure 06: VIEWSHED ANALYSIS - Carpe Diem North Solar PV

9.4 Effects of Night Lighting

I&APs consistently raise the impact of night lighting, specifically when they can be seen from tourist or residential sites and when the effect would continue for the Project's life. The negative effect of night lighting caused by the Project would be seen against a relatively dark rural sky. However, the contrast would be reduced due to the urban and mining activities east of the site. Night lights could be a nuisance to people living west and north of the Project site. As proposed in Section 10, management measures should be implemented to limit light spillage beyond the Project's site boundaries.

9.5 The *Intensity* of Visual Impact

The potential impact ratings are based on the worst-case scenario and when the impacts of all aspects of the Project are taken together. It is anticipated that visual impacts could result from the activities and infrastructure in all the project phases, i.e., construction, operation, and closure.

Table 3: *Intensity* of visual impact without mitigation during the Construction and Operational Phases of the Solar PV Park

High None	**Moderate** Users of the R501, the local connector road west of the site and future residents of the residential areas north of the power plant	**Low** Residents of residential areas in the far north of the study area	**Negligible to None** The remainder of the study area
Significant loss of or alteration to the baseline's key elements/features/characteristics near the site. i.e., a pre-development landscape or view and/or the introduction of elements considered uncharacteristic when set within the attributes of the receiving landscape. Result: A *high* scenic quality impact would result.	Partial loss of or alteration to the baseline's key elements/features/characteristics. i.e., a pre-development landscape or view and/or the introduction of elements that may be prominent but not necessarily be substantially problematic when set within the attributes of the receiving landscape. Result: A *moderate* scenic quality impact would result in an intense but localised area.	Minor loss of or alteration to the baseline's key elements/features/characteristics. i.e., a pre-development landscape or view and/or introduction of elements that may not be problematic when set within the attributes of the receiving landscape. Result: A *low* scenic quality impact would result.	Very minor or no loss or alteration to the baseline's key elements/features/characteristics. i.e., a pre-development landscape or view and/or the introduction of elements that are not problematic with the surrounding landscape—approximating the 'no change' situation. Result: *Negligible* to *no* scenic quality impacts would result.

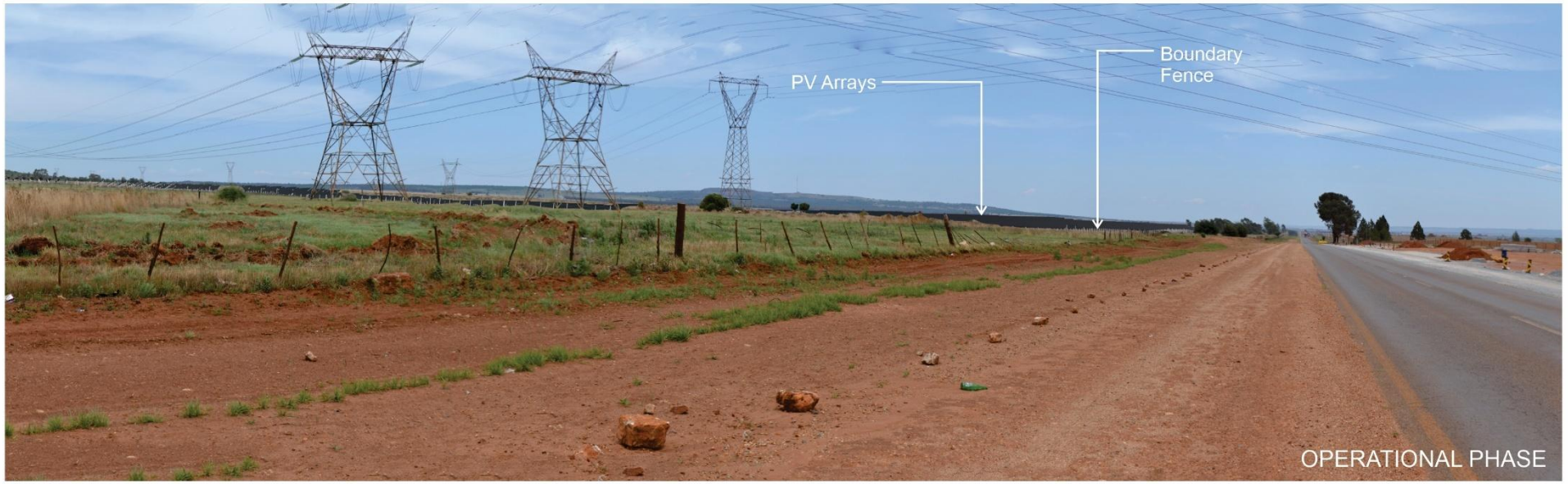
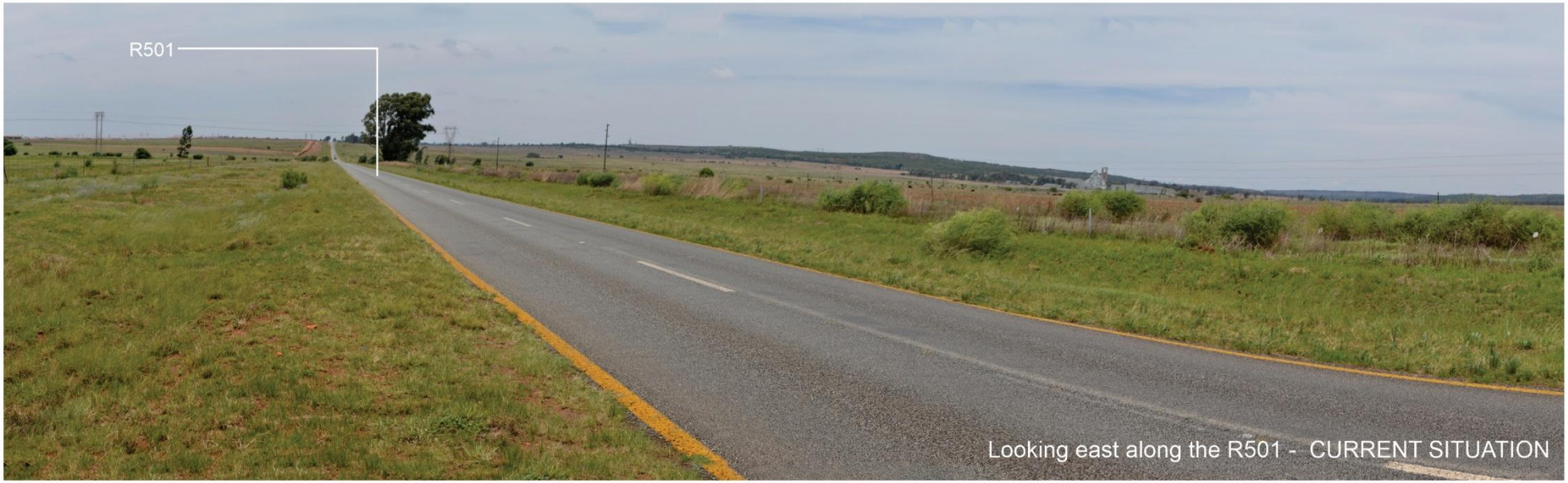


Figure 7-1: SIMULATION VIEW 2 - Carpe Diem North Solar PV Project

Refer to Figure 3 for the location of the view points

Figure 7-2: SIMULATION VIEW 4 - Carpe Diem North Solar PV Project

Refer to Figure 3 for the location of the view points



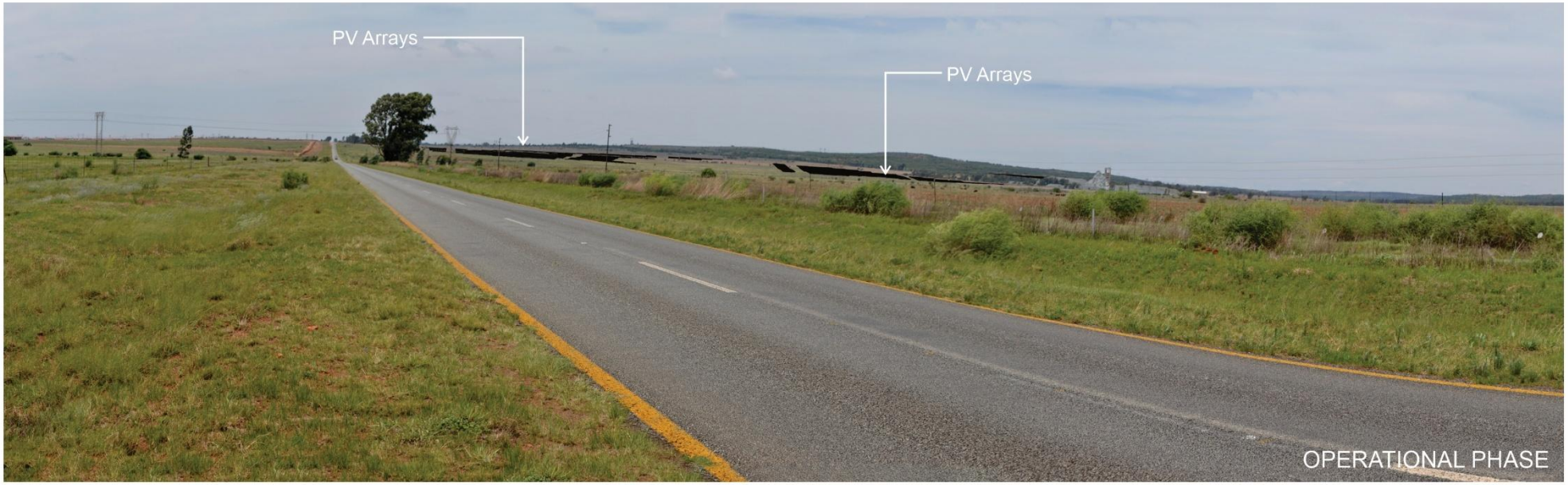


Figure 7-3: SIMULATION VIEW 6 - Carpe Diem North Solar PV Project

Refer to Figure 3 for the location of the view points

Figure 7-4: SIMULATION VIEW 8 - Carpe Diem North Solar PV Project

Refer to Figure 3 for the location of the view points

Figure 7-5: SIMULATION VIEW 10 - Carpe Diem North Solar PV Project

Refer to Figure 3 for the location of the view points

Figure 7-5: SIMULATION VIEW 11 - Carpe Diem North Solar PV Project

Refer to Figure 3 for the location of the view points

10. MANAGEMENT MEASURES

Three rules are considered when considering mitigating measures: the measures should be feasible (economically), effective (how long will it take to implement and what provision is made for management/maintenance), and acceptable (within the framework of the existing landscape and land use policies for the area).

The following generic mitigation measures are suggested for the Project. The following general actions are recommended:

10.1 Planning and Site Development

- With the preparation of the land within the full extent of the Project site onto which activities will take place, the minimum amount of existing vegetation and topsoil should be removed.
- The EMPr should include specifications regarding the placement of construction camps (if required) and a site plan for the construction camp, indicating waste areas, storage areas, and ablution facilities. These areas should be screened or positioned so they would be less visible from the public road north of the Project site.
- Construction activities should be limited to between 08:00 and 17:00 or with the ECO.
- Adopt responsible construction practices that strictly contain construction/establishment activities in demarcated areas.
- Disposing of building or waste material should be undertaken at an authorised location, which should not be within sensitive areas.

10.2 Earthworks and Vegetation

- Earthworks should be executed to expose only the footprint and a small 'construction buffer zone' around the proposed activities. Naturally occurring vegetation should be retained in all other areas, especially along the site's periphery (s).
- All cut and fill slopes (if any) and areas affected by construction work should be progressively topsoiled and re-vegetated as soon as possible.
- Disturbed soil must be exposed for the minimum time possible once vegetation is cleared to avoid prolonged exposure to wind and water erosion and to minimise dust generation.

10.3 Structures and associated infrastructure

- Paint all structures (structural support for the arrays) with colours that reflect and complement the colours of the surrounding landscape.

10.4 Good housekeeping

- "Housekeeping" procedures should be developed for the Project to ensure that the project site and lands adjacent to it are kept clean of debris, garbage, graffiti, fugitive trash, or waste generated on-site; procedures should extend to control of "track out" of dirt on vehicles leaving the active construction site and controlling sediment in stormwater runoff.
- During construction, temporary fences surrounding the material storage yards and laydown areas should be covered with 'shack' cloth (khaki coloured) or shade cloth.
- Operating facilities should be actively maintained during operation.

10.5 Lighting

Light pollution is primarily the result of bad lighting design, which allows artificial light to shine outward and upward into the sky, where it is not wanted, instead of focusing the light downward, where it is needed. Ill-designed lighting washes out the darkness of the night sky and radically alters the light levels in rural areas, where light sources shine as 'beacons' against the dark sky and are generally not wanted.

Of all the pollution faced, light pollution is the most easily remedied. Simple changes in lighting design and installation yield immediate changes in the amount of light spilt into the atmosphere. The following are measures that must be considered in the lighting design of the Project, particularly at the management and service platforms:

- Install light fixtures that provide precisely directed illumination to reduce light "spillage" beyond the immediate surrounds of the site. Specifically, lights are to be aimed away from adjacent farmstead areas, specifically west and north of the Project site.
- Minimize the number of light fixtures to the bare minimum, including security lighting.
- Avoid high pole-top security lighting along the periphery of the site and use only lights activated upon illegal entry.

11. SIGNIFICANCE OF VISUAL IMPACT

The significance of the visual impact is based on the worst-case scenario for the Project and its associated infrastructure and the OPL and when the impacts of all aspects of the Project are taken together. The sensitive receptors and areas of concern are (refer to **Figure 5**):

- Users of the R501 arterial road
- The local connector road west of the site
- Future residential areas north of the site and the farmstead west of the site.

Visual impacts are anticipated from the activities and infrastructure in all project phases: construction, operation, and closure. **Appendix C** sets out the method for assessing potential impacts. This methodology enables the assessment of the environmental effects, including cumulative impacts.

SP (significance points) = (intensity + duration + spatial extent + irreplaceable + reversibility) x probability.

Potential visual impacts are predicted based on the discussions in previous sections. The estimated time for the construction phase is eighteen months, and the operational phase is approximately thirty years. The construction and decommissioning phases are estimated to be eighteen months.

Should the proposed mitigation options listed in Section 10 be rigorously applied and managed throughout the project's life, the significance of potential impacts could be reduced to some degree during the operational phase.

11.1 Visual Impact of the Solar PV Park

Tables 4, **5** and **6** summarise the potential visual impact for all project phases.

11.1.1 Construction Phase

Construction activities include the removal of vegetation, earthworks required to create building terraces for internal substations, the preparation of internal roads and excavations for the array structures foundations, and the erection of the PV arrays and associated infrastructure. Construction activities would negatively affect the landscape's visual quality and sense of place relative to its baseline. They would contrast with the patterns that define the structure of the landscape.

The impact on the visual environment during the construction phase is assessed to have a potential moderate intensity over a localised area (but extend beyond the site boundary to at least 2,0 km). It would occur over the short term (less than six years). There is a low potential for losing irreplaceable resources, and the impact is reversible after decommissioning. The impact would probably occur, resulting in MODERATE significance of impact.

Implementing mitigation measures would not significantly reduce the anticipated impact, remaining MODERATE.

Table 4: SIGNIFICANCE of Visual Impact - CONSTRUCTION PHASE

Issue: Change to the landscape characteristics and key views during the construction phase		
Criteria	Without Mitigation	With Mitigation
Intensity	Moderate (6)	Moderate (6)
Duration	Long Term (4)	Long Term (4)
Spatial Extent	Local (2)	Local (2)
Irreplaceable	Low (2)	Low (2)
Reversibility	Reversible (1)	Reversible (1)
Probability	Definite (5)	Definite (5)
SIGNIFICANCE	MODERATE (75)	MODERATE (75)
The degree to which impact can be reversed	The effect can be reversed after project cessation or decommissioning	
The degree to which impact may cause irreplaceable loss of resources	Low potential for loss of irreplaceable resources.	

11.1.2 Operational Phase

Operational activities include the regular cleaning of the PV modules, vegetation management under and around the PV modules, and maintenance of all other infrastructural components. Security lighting and other lighting associated with the movement of security vehicles at night also contribute to the visual impact. These activities and the physical presence of the Project components day and night constitute the visual impact.

The impact on the visual environment during the operational phase is assessed to have a potential moderate intensity over a localised area (but extend beyond the site boundary to at least 2,0 km). It would occur over the long term (approximately 30 years). There is a low potential for losing irreplaceable resources, and the impact is reversible after decommissioning. The impact would probably occur, resulting in MODERATE significance of impact.

Implementing mitigation measures would reduce the impact. However, it would remain MODERATE.

Table 5: SIGNIFICANCE of Visual Impact - OPERATIONAL PHASE

Issue: Change to the landscape characteristics and key views during the operational phase		
Criteria	Without Mitigation	With Mitigation
Intensity	Moderate (6)	Low (4)
Duration	Long Term (4)	Medium Term (3)
Spatial Extent	Local (2)	Local (2)
Irreplaceable	Low (2)	Low (2)
Reversibility	Reversible (1)	Reversible (1)
Probability	Highly probable (4)	Medium (3)
SIGNIFICANCE	MODERATE (60)	LOW (36)
The degree to which impact can be reversed	The effect can be reversed after project cessation or decommissioning	
The degree to which impact may cause irreplaceable loss of resources	Low potential for loss of irreplaceable resources.	

11.1.3 Decommissioning Phase

Decommissioning and closure activities include dismantling and removing infrastructure and restoring the site to its current, primarily natural state.

The impact on the visual environment during the decommissioning phase is assessed as low intensity over a localised area. It would occur over the short term (less than five years). The probability of the unmitigated impact is low, resulting in a predicted significance of LOW. Implementing mitigation measures is feasible. However, the anticipated impact would remain LOW.

Table 6: SIGNIFICANCE of Visual Impact - DECOMMISSIONING PHASE

Issue: Change to the landscape characteristics and key views during the decommissioning phase		
Criteria	Without Mitigation	With Mitigation
Intensity	Low (4)	Low (4)
Duration	Short Term (2)	Short Term (2)
Spatial Extent	Local (2)	Local (2)
Irreplaceable	Low (2)	Low (2)
Reversibility	Reversible (1)	Reversible (1)
Probability	Probable (2)	Probable (2)
SIGNIFICANCE	LOW (22)	LOW (22)
The degree to which impact can be reversed	The effect can be reversed after project cessation or decommissioning	
The degree to which impact may cause irreplaceable loss of resources	Low potential for loss of irreplaceable resources.	

11.2 Visual Impact – OPL Alternatives 1, 2, and 3

The visual impact during the construction phase is caused by the activities associated with erecting the tower structures or excavations for the underground cabling. The estimated time for this phase is eighteen months. The physical presence of the towers and powerlines (Alternative 1 - LiLo) would cause a minor visual impact during the operational phase; however, the proposed OPL would mostly be absorbed into the existing scene and not stand out as a lingering visual impact. Activities associated with Alternatives 2 and 3 would not be visible after the construction phase. The operational phase is approximately thirty years (same as the PV Solar Project), and the decommissioning phase is also estimated to be eighteen months.

11.2.1 Construction Phase

The impact of the three alternatives during construction is assessed as very low intensity in a localised area. It would occur over the short term (less than five years). The probability of the unmitigated impact is medium, resulting in a predicted LOW significance of the effects. Implementing mitigation measures would not reduce the anticipated impact.

Table 7: SIGNIFICANCE of Visual Impact OPL all Alternatives - CONSTRUCTION PHASE

Issue: Change to the landscape characteristics and key views during the construction phase		
Criteria	Without Mitigation	With Mitigation
Intensity	Very Low (2)	Very Low (2)
Duration	Short Term (2)	Short Term (2)
Spatial Extent	Local (2)	Local (2)
Irreplaceable	Low (2)	Low (2)
Reversibility	Reversible (1)	Reversible (1)
Probability	Highly probable (4)	Highly probable (4)
SIGNIFICANCE	LOW (36)	LOW (36)
The degree to which impact can be reversed	The effect can be reversed after project cessation or decommissioning	
The degree to which impact may cause irreplaceable loss of resources	Low potential for loss of irreplaceable resources.	

11.2.2 Operational Phase

The worst-case impact (i.e. for Alternative 1) during the operational phase is assessed as low intensity. It would occur over the long term (anticipated to be thirty years). The probability of the unmitigated impact is medium, resulting in an impact of LOW significance. There is a low potential for losing irreplaceable resources, and the impact is reversible after decommissioning. The effect of mitigation would not reduce the predicted impact.

Table 8: SIGNIFICANCE of Visual Impact OPL all Alternatives - OPERATIONAL PHASE

Issue: Change to the landscape characteristics and key views during the operational phase		
Criteria	Without Mitigation	With Mitigation
Intensity	Low (3)	Low (3)
Duration	Long term (4)	Long term (4)
Spatial Extent	Local (2)	Local (2)
Irreplaceable	Low (2)	Low (2)
Reversibility	Reversible (1)	Reversible (1)
Probability	Probable (2)	Probable (2)
SIGNIFICANCE	LOW (24)	LOW (24)
The degree to which impact can be reversed	The effect can be reversed after project cessation or decommissioning	
The degree to which impact may cause irreplaceable loss of resources	Low potential for loss of irreplaceable resources.	

11.2.3 Decommissioning Phase

The impact on the visual environment during the decommissioning phase is assessed as very low intensity in a localised area. It would occur over the short term (less than five years). The probability of the unmitigated impact is medium, resulting in a predicted LOW significance of the effect. Implementing mitigation measures would not reduce the anticipated impact.

Table 9: SIGNIFICANCE of Visual Impact OPL all Alternatives - DECOMMISSIONING PHASE

Issue: Change to the landscape characteristics and key views during the decommissioning phase		
Criteria	Without Mitigation	With Mitigation
Intensity	Very Low (2)	Very Low (2)
Duration	Short Term (2)	Short Term (2)
Spatial Extent	Local (2)	Local (2)
Irreplaceable	Low (2)	Low (2)
Reversibility	Reversible (1)	Reversible (1)
Probability	Medium (3)	Medium (3)
SIGNIFICANCE	LOW (27)	LOW (27)
The degree to which impact can be reversed	The effect can be reversed after project cessation or decommissioning	
The degree to which impact may cause irreplaceable loss of resources	Low potential for loss of irreplaceable resources.	

12. CUMULATIVE EFFECT

Cumulative landscape and visual effects (impacts) result from additional changes to the landscape or visual amenity caused by the proposed development in conjunction with other developments (associated with or separate from it) or actions that occurred in the past, present, or are likely to happen soon. They may also affect how the landscape is experienced, and cumulative effects may be positive or negative. They may form part of the mitigation measures, comprising a range of benefits.

Cumulative effects can also arise from the intervisibility of a range of developments and the combined effects of individual components of the proposed development (all five phases of the project) occurring in different locations or over some time. The separate effects of such individual developments may not be significant, but they may adversely impact visual receptors within their combined visual envelopes. Intervisibility depends upon general topography, aspect, vegetative cover or other visual obstruction, elevation, and distance, as this affects visual acuity, which is also influenced by weather and light conditions (LI-IEMA (2013)).

10.1 The cumulative effect of the Project

The cumulative impact of the Project is potentially MODERATE when other solar PV projects in the vicinity of the Project site (within a radius of 10km from the Carpe Diem North site) are considered along with proposed new powerlines. **Figure 8** indicates solar projects in the general area of the proposed project. The intervisibility and the Project, along with these solar PV projects, would, over time, result in the nature and character of the sub-region being impacted like the anticipated moderate cumulative negative impact of the proposed Project alone. The combined effect of these developments would cause a change in the nature, sense of study and character of the sub-region's landscape's baseline. However, the projects would never be viewed in the same visual scene.

The significance of the cumulative impact of these projects during their operational phase is assessed to have a moderate intensity and, over the long term, an unmitigated sub-regional impact of MODERATE. I.e., it could influence the decision not to proceed with the projects or require modification(s) of the various projects' design/locations (where relevant).

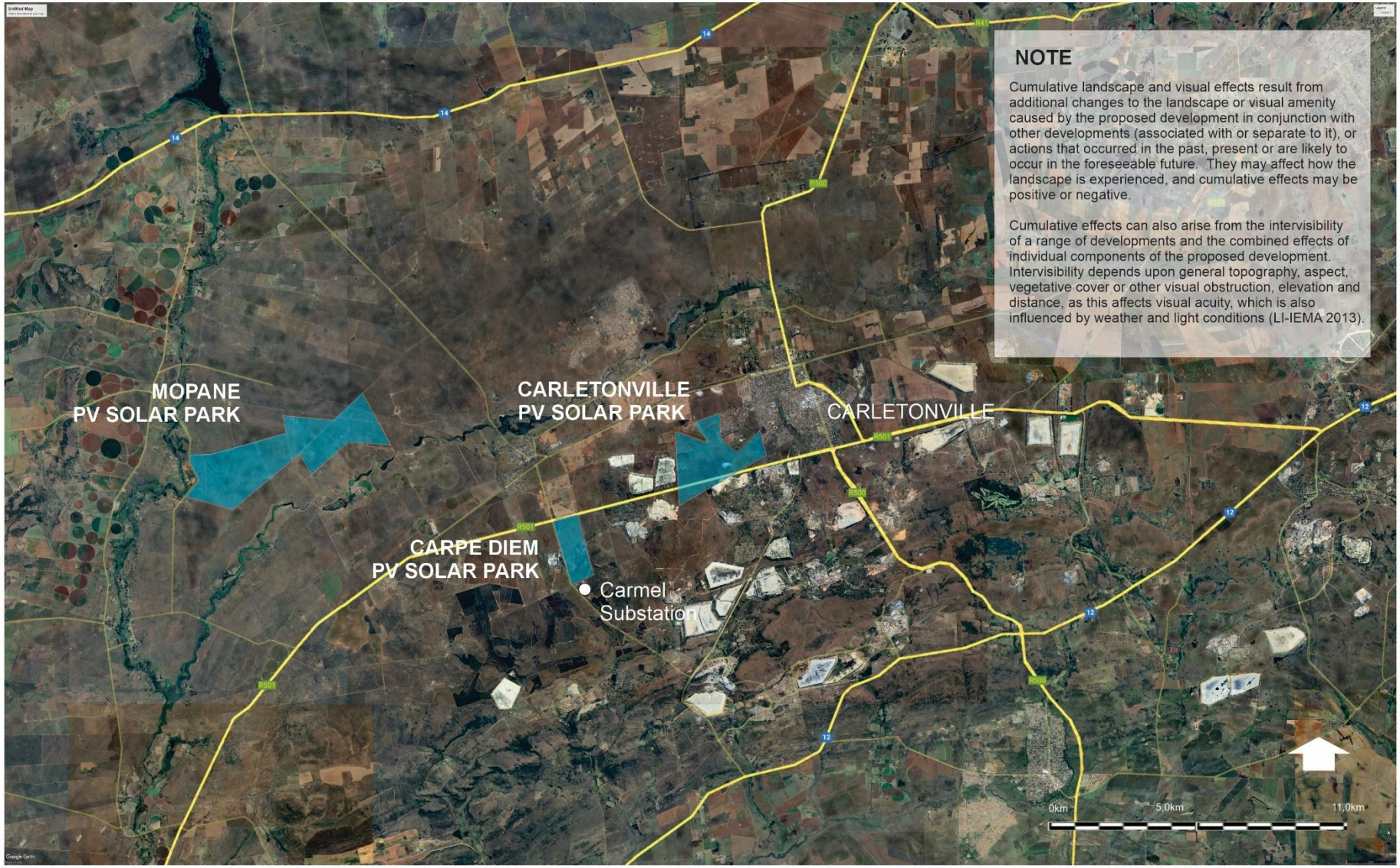


Figure 08: CUMULATIVE EFFECT Proposed PV Solar Parks

13. CONCLUSION

The existing visual condition of the landscape that may be affected by the proposed Carpe Diem North PV Solar Power Project has been described. The study area's scenic quality has been rated *low* to *high* within the context of the sub-region. Sensitive viewing areas have been identified and mapped, indicating potential sensitivity to the Project, mainly for new residential areas (not yet occupied) to the immediate north of the site and for users of the R501 and local connector road west of the site.

Impacts on views are the highest when receptors are sensitive to change in the landscape and the view is focused on and dominated by the change. The Project's visual impact will cause noticeable changes in the landscape to sensitive viewers, as described above.

13.1 The Visual Impact of the Project

The impact on the visual environment during construction is assessed as low intensity over a localised area. It would occur over the short term (less than five years). The significance of the unmitigated impact would be localised but extend beyond the site boundary (to at least 3,0km in some areas) and is predicted to be MODERATE. Implementing mitigation measures would not significantly reduce the anticipated impact, remaining MODERATE.

The impact on the visual environment during the operational phase is assessed to have a moderate intensity and would occur over the long term (anticipated to be thirty years). The unmitigated impact would be localised but extend beyond the site boundary (to at least 3,0km) and is considered MODERATE. The significance of a moderate impact is that it could influence the decision, and the effect will not be avoided unless it is mitigated. With effective mitigation, the impact could be reduced to LOW.

At decommissioning, the impact is expected to be low intensity over a localised area and occur over the short term (less than five years). The significance of the unmitigated impact would be localised but extend beyond the site boundary (to at least 2,0 km in some areas) and is predicted to be LOW. Implementing mitigation measures would not significantly reduce the anticipated impact during this phase and remain LOW.

The degree of confidence in the significance assessment might change if the results of the I&AP process indicate very high sensitivity to the development. The assessment has assumed a moderate receptor sensitivity to the Project.

After decommissioning, the site will be rehabilitated back to its original topography and vegetative cover.

13.2 Cumulative Effects

The cumulative impact of the Project, along with other PV solar projects proposed in the subregion during their operational phase, is assessed to be moderate intensity over the long term, with an unmitigated subregional impact extending beyond the site. The significance of the impact is MODERATE.

13.3 Author's Opinion

GYLA believes that the proposed project's visual impacts are acceptable from a visual perspective, given a predicted moderate negative impact without mitigation and a low negative impact with management measures.

****GYLA****

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APPENDIX A: DETERMINING THE VISUAL RESOURCE VALUE OF A LANDSCAPE

To reach an understanding of the effect of development on a landscape resource, it is necessary to consider the distinct aspects of the landscape as follows:

Landscape Elements and Character

The individual elements that make up the landscape, including prominent or eye-catching features such as hills, valleys, savannah, trees, water bodies, buildings and roads are generally quantifiable and can be easily described.

Landscape character is therefore the description of pattern, resulting from combinations of natural (physical and biological) and cultural (land use) factors and how people perceive these. The visual dimension of the landscape reflects the way in which these factors create repetitive groupings and interact to create areas that have a specific visual identity. The process of landscape character assessment can increase appreciation of what makes the landscape distinctive and what is important about an area. The description of landscape character thus focuses on the *nature of the land*, rather than the response of a viewer.

Landscape Value – all encompassing (Aesthetic Value)

Aesthetic value is the emotional response derived from the experience of the environment with its natural and cultural attributes. The response can be either to visual or non-visual elements and can embrace sound, smell and any other factor having a strong impact on human thoughts, feelings, and attitudes (Ramsay 1993). Thus, aesthetic value encompasses more than the seen view, visual quality, or scenery, and includes atmosphere, landscape character and sense of place (Schapper 1993).

Aesthetic appeal (value) is considered high when the following are present (Ramsay 1993):

- *Abstract qualities*: such as the presence of vivid, distinguished, uncommon or rare features or abstract attributes.
- *Evocative responses*: the ability of the landscape to evoke particularly strong responses in community members or visitors.
- *Meanings*: the existence of a long-standing special meaning to a particular group of people or the ability of the landscape to convey special meanings to viewers in general.
- *Landmark quality*: a particular feature that stands out and is recognised by the broader community.

Sense of Place

Central to the concept of a sense of place is that the place requires uniqueness and distinctiveness. The primary informant of these qualities is the spatial form and character of the natural landscape together with the cultural transformations and traditions associated with historic use and habitation. According to Lynch (1992) sense of place "is the extent to which a person can recognise or recall a place as being distinct from other places - as having a vivid, or unique, or at least particular, character of its own". Sense of place is the unique value that is allocated to a specific place or area through the cognitive experience of the user or viewer. In some cases, these values allocated to the place are similar for a wide spectrum of users or viewers, giving the place a universally recognised and therefore, strong sense of place.

Scenic Quality

Assigning values to visual resources is a subjective process. The phrase, "beauty is in the eye of the beholder," is often quoted to emphasise the subjectivity in determining scenic values. Yet, researchers have found consistent levels of agreement among individuals asked to evaluate visual quality.

Studies for perceptual psychology have shown human preference for landscapes with a higher visual complexity particularly in scenes with water, over homogeneous areas. Based on contemporary research

landscape quality increases when:

- Topographic ruggedness and relative relief increase.
- Where water forms are present.
- Where diverse patterns of grasslands and trees occur.
- Where natural landscape increases and man-made landscape decreases.
- And where land use compatibility increases, and land use edge diversity decreases (Crawford 1994).

Scenic Quality - Explanation of Rating Criteria:

(After The Visual Resource Management System, Department of the Interior of the USA Government, Bureau of Land Management)

Landform: Topography becomes more interesting as it gets steeper or more massive, or more severely or universally sculptured. Outstanding landforms may be monumental, as the Fish River or Blyde River Canyon, the Drakensberg or other mountain ranges, or they may be exceedingly artistic and subtle as certain pinnacles, arches, and other extraordinary formations.

Vegetation: (Plant communities) Give primary consideration to the variety of patterns, forms, and textures created by plant life. Consider short-lived displays when they are known to be recurring or spectacular (wildflower displays in the Karoo regions). Consider also smaller scale vegetational features, which add striking and intriguing detail elements to the landscape (e.g., gnarled or wind beaten trees, and baobab trees).

Water: That ingredient which adds movement or serenity to a scene. The degree to which water dominates the scene is the primary consideration in selecting the rating score.

Colour: Consider the overall colour(s) of the basic components of the landscape (e.g., soil, rock, vegetation, etc.) as they appear during seasons or periods of high use. Key factors to use when rating "colour" are variety, contrast, and harmony.

Adjacent Scenery: Degree to which scenery outside the scenery unit being rated enhances the overall impression of the scenery within the rating unit. The distance which adjacent scenery will influence scenery within the rating unit will normally range from 0-8 kilometres, depending upon the characteristics of the topography, the vegetative cover, and other such factors. This factor is generally applied to units which would normally rate extremely low in score, but the influence of the adjacent unit would enhance the visual quality and raise the score.

Scarcity: This factor provides an opportunity to give added importance to one or all the scenic features that appear to be relatively unique or rare within one physiographic region. There may also be cases where a separate evaluation of each of the key factors does not give a true picture of the overall scenic quality of an area. Often it is several not so spectacular elements in the proper combination that produces the most pleasing and memorable scenery - the scarcity factor can be used to recognise this type of area and give it the added emphasis it needs.

Cultural Modifications: Cultural modifications in the landform / water, vegetation, and addition of structures should be considered and may detract from the scenery in the form of a negative intrusion or complement or improve the scenic quality of a unit.

Scenic Quality Inventory and Evaluation Chart

(After The Visual Resource Management System, Department of the Interior of the USA Government, Bureau of Land Management)

Key factors	Rating Criteria and Score

Landform	High vertical relief as expressed in prominent cliffs, spires, or massive rock outcrops, or severe surface variation or highly eroded formations including major Badlands or dune systems; or detail features dominant and exceptionally striking and intriguing such as glaciers. **5**	Steep canyons, mesas, buttes, cinder cones, and drumlins; or interesting erosional patterns or variety in size and shape of landforms; or detail features which are interesting though not dominant or exceptional. **3**	Low rolling hills, foothills, or flat valley bottoms; or few or no interesting landscape features. **1**
Vegetation and landcover	A variety of vegetative types as expressed in interesting forms, textures, and patterns. **5**	Some variety of vegetation, but only one or two major types. **3**	Little or no variety or contrast in vegetation. **1**
Water	Clear and clean appearing, still, or cascading white water, any of which are a dominant factor in the landscape. **5**	Flowing, or still, but not dominant in the landscape. **3**	Absent, or present, but not noticeable. **0**
Colour	Rich colour combinations, variety, or vivid colour; or pleasing contrasts in the soil, rock, vegetation, water, or snow fields. **5**	Some intensity or variety in colours and contrast of the soil, rock, and vegetation, but not a dominant scenic element. **3**	Subtle colour variations, contrast, or interest; generally mute tones. **1**
Influence of adjacent scenery	Adjacent scenery greatly enhances visual quality. **5**	Adjacent scenery moderately enhances overall visual quality. **3**	Adjacent scenery has little or no influence on overall visual quality. **0**
Scarcity	One of a kind; or unusually memorable, or exceedingly rare within region. Consistent chance for exceptional wildlife or wildflower viewing, etc. National and provincial parks and conservation areas *** 5+**	Distinctive, though somewhat like others within the region. **3**	Interesting within its setting, but common within the region. **1**
Cultural modifications	Modifications add favourably to visual variety while promoting visual harmony.	Modifications add little or no visual variety to the area and introduce no discordant elements.	Modifications add variety but are very discordant and promote strong disharmony.

2	**0**	**4**

Scenic Quality (i.e. value of the visual resource)

In determining the quality of the visual resource both the objective and the subjective or aesthetic factors associated with the landscape are considered. Many landscapes can be said to have a strong sense of place, regardless of whether they are scenically beautiful but where landscape quality, aesthetic value and a strong sense of place coincide - the visual resource or perceived value of the landscape is very high.

When considering both objective and subjective factors associated with the landscape there is a balance between landscape character and individual landscape features and elements, which would result in the values as follows:

Value of Visual Resource – expressed as Scenic Quality
(After The Landscape Institute with the Institute of Environmental Management and Assessment (2002))

High	Moderate	Low
Areas that exhibit an incredibly positive character with valued features that combine to give the experience of unity, richness, and harmony. These are landscapes that may be of particular importance to conserve, and which may be sensitive change in general and which may be detrimental if change is inappropriately dealt with.	Areas that exhibit positive character, but which may have evidence of alteration to /degradation/erosion of features resulting in areas of more mixed character. Potentially sensitive to change in general; again, change may be detrimental if inappropriately dealt with, but it may not require special or diligence.	Areas generally negative in character with few, if any, valued features. Scope for positive enhancement frequently occurs.

APPENDIX B: METHOD FOR DETERMINING THE *MAGNITUDE / INTESITY* OF LANDSCAPE AND VISUAL IMPACT

A visual impact study analysis addresses the importance of the inherent aesthetics of the landscape, the public value of viewing the natural landscape, and the contrast or change in the landscape from the Project.

For some topics, such as water or air quality, it is possible to use measurable, technical international or national guidelines or legislative standards, against which potential effects can be assessed. The assessment of likely effects on a landscape resource and on visual amenity is more complex since it is determined through a combination of quantitative and qualitative evaluations. (The Landscape Institute with the Institute of Environmental Management and Assessment (2002).

Landscape impact assessment includes a combination of objective and subjective judgements, and it is therefore important that a structured and consistent approach is used. It is necessary to differentiate between judgements that involve a degree of subjective opinion (as in the assessment of landscape value) from those that are normally more objective and quantifiable (as in the determination of magnitude of change). Judgement should always be based on training and experience and be supported by clear evidence and reasoned argument. Accordingly, suitably qualified, and experienced landscape professionals conduct landscape and visual impact assessments (The Landscape Institute with the Institute of Environmental Management and Assessment (2002),

Landscape and visual assessments are separate, although linked, procedures. The landscape baseline, its analysis and the assessment of landscape effects all contribute to the baseline for visual assessment studies. The assessment of the potential effect on the landscape is conducted as an effect on an environmental resource, i.e. the landscape. Visual effects are assessed as one of the interrelated effects on population.

Landscape Impact

Landscape impacts derive from changes in the physical landscape, which may give rise to changes in its character and from effects to the scenic values of the landscape. This may in turn affect the perceived value ascribed to the landscape. The description and analysis of effects on a landscape resource relies on the adoption of certain basic principles about the positive (or beneficial) and negative (or adverse) effects of change in the landscape. Due to the inherently dynamic nature of the landscape, change arising from a development may not necessarily be significant (Institute of Environmental Assessment & The Landscape Institute (2002)).

Visual Impact

Visual impacts relate to the changes that arise in the composition of available views because of changes to the landscape, to people's responses to the changes, and to the overall effects with respect to visual amenity. Visual impact is therefore measured as the change to the existing visual environment (caused by the physical presence of a new development) and the extent to which that change compromises (negative impact) or enhances (positive impact) or maintains the visual quality of the area.

To assess the magnitude of visual impact four main factors are considered.

Visual Intrusion:	The nature of intrusion or contrast (physical characteristics) of a project component on the visual quality of the surrounding environment and its compatibility/discord with the landscape and surrounding land use.
Visibility:	The area/points from which project components will be visible.
Visual exposure:	Visibility and visual intrusion qualified with a distance rating to indicate the degree of intrusion.
Sensitivity:	Sensitivity of visual receptors to the proposed development

Visual Intrusion / contrast

Visual intrusion deals with the notion of contextualism i.e. how well does a project component fit into the ecological and cultural aesthetic of the landscape as a whole? Or conversely what is its contrast with the receiving environment. Combining landform / vegetation contrast with structure contrast derives overall visual intrusion/contrast levels of high, moderate, and low.

Landform / vegetation contrast is the change in vegetation cover and patterns that would result from construction activities. Landform contrast is the change in landforms, exposure of soils, potential for erosion scars, slumping, and other physical disturbances that would be noticed as uncharacteristic in the natural landscape. Structure contrast examines the compatibility of the proposed development with other structures in the landscape and the existing natural landscape. Structure contrast is typically strongest where there are no other structures (e.g., buildings, existing utilities) in the landscape setting.

Photographic panoramas from key viewpoints before and after development are presented to illustrate the nature and change (contrast) to the landscape created by the proposed development. A computer simulation technique is employed to superimpose a graphic of the development onto the panorama. The extent to which the component fits or contrasts with the landscape setting can then be assessed using the following criteria.

- Does the physical development concept have a negative, positive, or neutral effect on the quality of the landscape?
- Does the development enhance or contrast with the patterns or elements that define the structure of the landscape?
- Does the design of the Project enhance and promote cultural continuity, or does it disrupt it?

The consequence of the intrusion / contrast can then be measured in terms of the sensitivity of the affected landscape and visual resource given the criteria listed below. For instance, within an industrial area, a new sewage treatment works may have an insignificant landscape and visual impact, whereas in a *valued* landscape it might be an intrusive element. (Institute of Environmental Assessment & The landscape Institute (1996)).

Visual Intrusion

High	Moderate	Low	Positive
If the Project: - Has a substantial negative effect on the visual quality of the landscape. - Contrasts dramatically with the patterns or elements that define the structure of the landscape. - Contrasts dramatically with land use, settlement, or enclosure patterns. - Is unable to be 'absorbed' into the landscape.	If the Project: - Has a moderate negative effect on the visual quality of the landscape. - Contrasts moderately with the patterns or elements that define the structure of the landscape. - Is partially compatible with land use, settlement, or enclosure patterns. - Is partially 'absorbed' into the landscape.	If the Project: - Has a minimal effect on the visual quality of the landscape. - Contrasts minimally with the patterns or elements that define the structure of the landscape. - Is mostly compatible with land use, settlement, or enclosure patterns. - Is 'absorbed' into the landscape.	If the Project: - Has a beneficial effect on the visual quality of the landscape. - Enhances the patterns or elements that define the structure of the landscape. - Is compatible with land use, settlement, or enclosure patterns.

Result Notable change in landscape characteristics over an extensive area and/or intensive change over a localised area resulting in major changes in key views.	*Result* Moderate change in landscape characteristics over localised area resulting in a moderate change to key views.	*Result* Imperceptible change resulting in a minor change to key views.	*Result* Positive change in key views.

Visual intrusion also diminishes with scenes of higher complexity, as distance increases, the object becomes less of a focal point (more visual distraction), and the observer's attention is diverted by the complexity of the scene (Hull and Bishop (1988)).

Visibility

A viewshed analysis was conducted to define areas, which contain all possible observation sites from which the development would be visible. The basic assumption for preparing a viewshed analysis is that the observer eye height is 1.8m above ground level. Topographic data was captured for the site and its environs at 10 m contour intervals to create the Digital Terrain Model (DTM). The DTM includes features such as vegetation, rivers, roads, and nearby urban areas. These features were 'draped' over the topographic data to complete the model used to generate the viewshed analysis. It should be noted that viewshed analyses are not absolute indicators of the level of significance (magnitude) of the impact in the view, but merely a statement of the fact of potential visibility. The visibility of a development and its contribution to visual impact is predicted using the criteria listed below:

Visibility

High	Moderate	Low
Visual Receptors If the development is visible from over half the zone of potential influence, and/or views are mostly unobstructed and/or most viewers are affected.	*Visual Receptors* If the development is visible from less than half the zone of potential influence, and/or views are partially obstructed and or many viewers are affected	*Visual Receptors* If the development is visible from less than a quarter of the zone of potential influence, and/or views are mostly obstructed and/or few viewers are affected.

Visual Exposure

Visual exposure relates directly to the distance of the view. It is a criterion used to account for the limiting effect of increased distance on visual impact. The impact of an object in the foreground (0 – 800m) is greater than the impact of that same object in the middle ground (800m – 5.0 km) which, in turn is greater than the impact of the object in the background (greater than 5.0 km) of a particular scene.

Distance from a viewer to a viewed object or area of the landscape influences how visual changes are perceived in the landscape. Generally, changes in form, line, colour, and texture in the landscape become less perceptible with increasing distance.

Areas seen from 0 to 800m are considered foreground; foliage and fine textural details of vegetation are normally perceptible within this zone.

Areas seen from 800m to 5.0km are considered middle ground; vegetation appears as outlines or patterns.

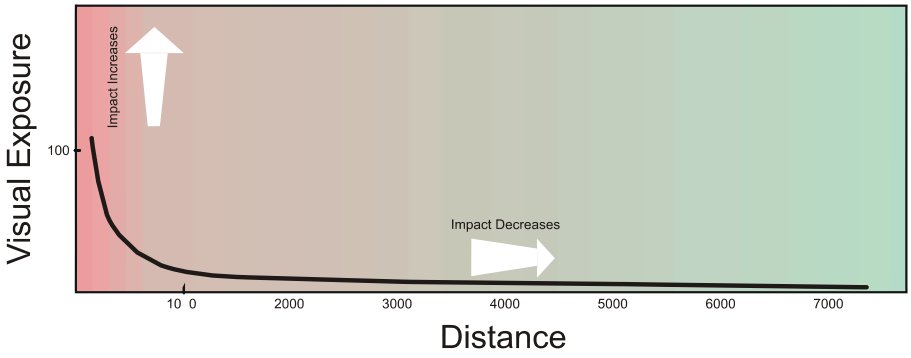
Depending on topography and vegetation, middle ground is sometimes considered to be up to 8.0km.

Areas seen from 5.0km to 8.0km and sometimes up to 16km and beyond are considered background. Landforms become the most dominant element at these distances.

Seldom seen areas are those portions of the landscape that, due to topographic relief or vegetation, are screened from the viewpoint or are beyond 16km from the viewpoint. Landforms become the most dominant element at these distances.

The impact of an object diminishes at an exponential rate as the distance between the observer and the object increases. Thus, the visual impact at 1000 m would be 25% of the impact as viewed from 500 m. At 2000 m it would be 10% of the impact at 500 m. The inverse relationship of distance and visual impact is well recognised in visual analysis literature (e.g.: Hull and Bishop (1988)) and is used as an important criterion for the study. This principle is illustrated in the Figures below.

Effect of Distance on Visual Exposure




View from 10 000 metres


View from 5 000 metres


View from 3 000 metres


View from 1 000 metres

Sensitivity of Visual Receptors

When visual intrusion, visibility and visual exposure are incorporated, and qualified by sensitivity criteria (visual receptors) the magnitude of the impact of the development can be determined.

The sensitivity of visual receptors and views will be depended on:

- The location and context of the viewpoint.
- The expectations and occupation or activity of the receptor.
- The importance of the view (which may be determined with respect to is popularity or numbers of people affected, its appearance in guidebooks, on tourist maps, and in the facilities provided for its enjoyment and references to it in literature or art).

The most sensitive receptors may include:

- Users of all outdoor recreational facilities including public rights of way, whose intention or interest may be focused on the landscape.
- Communities where the development results in changes in the landscape setting or valued views enjoyed by the community.
- Occupiers of residential properties with views affected by the development.
- These would all be high.

Other receptors include:

- People engaged in outdoor sport or recreation (other than appreciation of the landscape, as in landscapes of acknowledged importance or value).
- People travelling through or past the affected landscape in cars, on trains or other transport routes.
- People at their place of work.

The least sensitive receptors are likely to be people at their place of work, or engaged in similar activities, whose attention may be focused on their work or activity and who therefore may be potentially less susceptible to changes in the view.

In this process more weight is usually given to changes in the view or visual amenity which are greater in scale, and visible over a wide area. In assessing the effect on views, consideration should be given to the effectiveness of mitigation measures, particularly where planting is proposed for screening purposes (Institute of Environmental Assessment & The Landscape Institute (1996).

Sensitivity of Visual Receptors

High	Moderate	Low
Users of all outdoor recreational facilities including public rights of way, whose intention or interest may be focused on the landscape.	People engaged in outdoor sport or recreation (other than appreciation of the landscape, as in landscapes of acknowledged importance or value).	The least sensitive receptors are likely to be people at their place of work, or engaged in similar activities, whose attention may be focused on their work or activity and who therefore may be potentially less susceptible to changes in the view (i.e. office and industrial areas).
Communities where the development results in changes in the landscape setting or valued views enjoyed by the community.	People travelling through or past the affected landscape in cars, on trains or other transport routes.	Roads going through urban and industrial areas

Occupiers of residential properties with views affected by the development.	

Magnitude of the Visual Impact

Potential visual impacts are determined by analysing how the physical change in the landscape, resulting from the introduction of a project, are viewed, and perceived from sensitive viewpoints. Impacts to views are the highest when viewers are identified as being sensitive to change in the landscape, and their views are focused on and dominated by the change. Visual impacts occur when changes in the landscape are noticeable to viewers looking at the landscape from their homes or from parks, and conservation areas, highways and travel routes, and important cultural features and historic sites, especially in foreground views.

The magnitude of impact is assessed through a synthesis of visual intrusion, visibility, visual exposure, and viewer sensitivity criteria. Once the magnitude of impact has been established this value is further qualified with spatial, duration and probability criteria to determine the *significance* of the visual impact.

For instance, the fact that visual intrusion and exposure diminishes significantly with distance does not necessarily imply that the relatively small impact that exists at greater distances is unimportant. The level of impact that people consider acceptable may be dependent upon the purpose they have in viewing the landscape. A particular development may be unacceptable to a hiker seeking a natural experience, or a household whose view is impaired, but may be barely noticed by a golfer concentrating on his game or a commuter trying to get to work on time (Ittleson *et al.,* 1974).

In synthesising these criteria, a numerical or weighting system is avoided. Attempting to attach a precise numerical value to qualitative resources is rarely successful and should not be used as a substitute for reasoned professional judgement. (Institute of Environmental Assessment and the landscape Institute (1996)).

Intensity (Magnitude) of Visual Impact

High	Moderate	Low	Negligible
Total loss of or major alteration to key elements/features/characteristics of the baseline.	Partial loss of or alteration to key elements/features/characteristics of the baseline.	Minor loss of or alteration to key elements/features/characteristics of the baseline.	Very minor loss or alteration to key elements/features/characteristics of the baseline.
I.e. Pre-development landscape or view and/or introduction of elements considered to be totally uncharacteristic when set within the attributes of the receiving landscape.	I.e. Pre-development landscape or view and/or introduction of elements that may be prominent but may not necessarily be substantially uncharacteristic when set within the attributes of the receiving landscape.	I.e. Pre-development landscape or view and/or introduction of elements that may not be uncharacteristic when set within the attributes of the receiving landscape.	I.e. Pre-development landscape or view and/or introduction of elements that are not uncharacteristic with the surrounding landscape – approximating the 'no change' situation.

High scenic quality impacts would result.	Moderate scenic quality impacts would result	Low scenic quality impacts would result.	Negligible scenic quality impacts would result.

Cumulative effects

Cumulative landscape and visual effects (impacts) result from additional changes to the landscape or visual amenity caused by the proposed development in conjunction with other developments (associated with or separate to it), or actions that occurred in the past, present or are likely to occur soon. They may also affect the way in which the landscape is experienced. Cumulative effects may be positive or negative. Where they comprise a range of benefits, they may be considered to form part of the mitigation measures.

Cumulative effects can also arise from the intervisibility (visibility) of a range of developments and /or the combined effects of individual components of the proposed development occurring in different locations or over a period. The separate effects of such individual components or developments may not be significant, but together they may create an unacceptable degree of adverse effect on visual receptors within their combined visual envelopes. Intervisibility depends upon general topography, aspect, tree cover or other visual obstruction, elevation, and distance, as this affects visual acuity, which is also influenced by weather and light conditions. (Institute of Environmental Assessment and the landscape Institute (1996)).

APPENDIX C: CRITERIA FOR SIGNIFICANCE OF IMPACT ASSESSMENT (RISK ASSESSMENT)

The following methodology has been applied to the prediction and assessment of impacts. Potential impacts have been rated in terms of the direct, indirect, and cumulative nature of the impact:

- Direct impacts – are impacts that are caused directly by the activity and generally occur at the same time and at the place of the activity. These impacts are usually associated with an activity's construction, operation or maintenance and are generally evident and quantifiable.
- Indirect impacts of an activity are indirect or induced changes that may occur because of the activity. These types of impacts include all potential impacts that do not manifest immediately when the activity is undertaken or that occur at a different place because of the activity.
- Cumulative impacts – are impacts that result from the incremental impact of the proposed activity on a common resource when added to the impacts of other past, present, or reasonably near future activities. Cumulative impacts can occur from the collective impacts of individual minor actions over a period, including both direct and indirect impacts.

The significance of each potential impact, with and without the implementation of the proposed mitigation measures, will be assessed based on the following variables (evaluation components):

- Spatial extent – The size of the area that will be affected by the impact.
- Intensity (or Magnitude) – The anticipated severity of the impact.
- Duration – The time during which the impact will be experienced.
- Probability – The probability of the impact occurring.
- Reversibility – The “reversibility” of the environmental impacts of the proposed development after project cessation or decommissioning; and
- Irreplaceability – The “irreplaceability” of natural characteristics in the area that may be impacted upon by the proposed development.

Using the criteria above, the impacts will further be assessed with the use of quantifiable values as described below:

Table 11: Evaluation of criteria, by means of quantitative ratings and descriptions.

Criteria	Description	Quantitative Rating
Duration	Temporary (less than a year)	1
	Short term (1 to 6 years)	2
	Medium term (6 to 15 years)	3
	Long term (the impact will cease after the operational life of the activity)	4
	Permanent (mitigation will not occur in such a way or in such a time span than the impact can be considered transient)	5
Spatial extent	Site specific	1
	Local (less than 2 km from the site);	2
	Regional (within 30 km of the site)	3
	National (beyond Provincial boundaries and within National boundaries)	4
	International / Transboundary (Beyond National boundaries)	5
Intensity Applicable to Negative Impacts (at indicated spatial extent)	None (Biophysical and/or social functions and/or processes will remain unaltered)	0
	Very Low (Biophysical and/or social functions and/or processes might be negligibly altered)	2
	Low (Biophysical and/or social functions and/or processes might be slightly altered)	4
	Medium (Biophysical and/or social functions and/or processes might be notably altered)	6
	High (Biophysical and/or social functions and/or processes might be considerably altered)	8
	Very High (Biophysical and/or social functions and/or processes might be severely altered)	10
Intensity Applicable to Positive Impacts (at indicated spatial extent)	None (Biophysical and/or social functions and/or processes will remain unaltered)	0
	Very Low (Biophysical and/or social functions and/or processes might be negligibly enhanced)	2
	Low (Biophysical and/or social functions and/or processes might be slightly enhanced)	4
	Medium (Biophysical and/or social functions and/or processes might be notably enhanced)	6
	High (Biophysical and/or social functions and/or processes might be considerably enhanced)	8
	Very High (Biophysical and/or social functions and/or processes might be substantially enhanced)	10

Criteria	Description	Quantitative Rating
Probability	Improbable (5% to no chance of occurring)	1
	Probable (5% - 25% chance of occurring)	2
	Medium Probability (25% - 75% chance of occurring)	3
	Highly probable (75% - 95% chance of occurring)	4
	Definite (greater than 95% chance of occurring)	5
Reversibility	No impact	0
	Impact will be reversible	1
	High potential that impact might be reversed	2
	Moderate potential that impact might be reversed	3
	Low potential that impact might be reversed	4
	Impact cannot be reversed	5
Irreplaceability	None	0
	Very low potential for loss of irreplaceable resources	1
	Low potential for loss of irreplaceable resources	2
	Moderate potential for loss of irreplaceable resources	3
	High potential for loss of irreplaceable resources.	4
	Definite loss of irreplaceable resources	5
CUMULATIVE impact	High: The activity is one of several similar pasts, present or future activities in the same geographical area, and might contribute to a very significant combined impact on the natural, cultural, and/or socio-economic resources of local, regional, or national concern.	
	Medium: The activity is one of a few similar pasts, present or future activities in the same geographical area, and might have a combined impact of moderate significance on the natural, cultural, and/or socioeconomic resources of local, regional, or national concern.	
	Low: The activity is localised and might have a negligible cumulative impact.	
	None: No cumulative impact on the environment.	

Once the evaluation components have been ranked for each impact, the significance of potential impact are assessed (or calculated) using the following formula:

SP (significance points) = (intensity + duration + spatial extent + irreplaceable + reversibility) x probability.

The maximum value is 150 SP (significance points). The unmitigated and mitigated scenarios for each environmental impact should be rated as per the table below (

Table **22**).

Table 22: Definition of significance ratings (positive and negative)

Significance Points	Environmental Significance	Description
125 – 150	Very high (VH)	An impact of high or very-high significance which could influence a decision about whether to proceed with the proposed project, regardless of available mitigation options. Cumulative Impacts: The activity is one of several similar pasts, present or future activities in the same geographical area, and might contribute to a very significant combined impact on the natural, cultural, and/or socio-economic resources of local, regional, or national concern.
100 – 124	High (H)	
75 – 99	Moderate-high (MH)	If left unmanaged, an impact of moderate-high significance could influence a decision about whether to proceed with the proposed project. Mitigation options should be re-evaluated.
40 – 74	Moderate (M)	If left unmanaged, an impact of moderate significance could influence a decision about whether to proceed with the proposed project. Cumulative Impacts: The activity is one of a few similar pasts, present or future activities in the same geographical area, and might have a combined impact of moderate significance on the natural, cultural, and/or socio-economic resources of local, regional, or national concern.
<40	Low (L)	An impact of low significance is likely to contribute to positive decisions about whether to proceed with the proposed project. It will have little real effect and is unlikely to have an influence on project design or alternative motivation. Cumulative Impacts: The activity is localised and might have a negligible cumulative impact.
+	Positive impact (+)	A positive impact is likely to result in a positive consequence/ effect and is likely to contribute to positive decisions about whether to proceed with the proposed project.

APPENDIX D: CRITERIA FOR PHOTO / COMPUTER SIMULATION

To characterise the nature and magnitude of visual intrusion of the proposed Project, a photographic simulation technique was used. This method was used according to Sheppard (in Lange 1994), where a visual simulation is good quality when the following five criteria are met.

Representativeness:	A simulation should represent important and typical views of a project.
Accuracy:	The similarity between a simulation and the reality after the Project has been realised.
Visual clarity:	Detail, parts and overall contents must be clearly recognisable.
Interest:	A simulation should hold the attention of the viewer.
Legitimacy:	A simulation is defensible if it can be shown how it was produced and to what degree it is accurate.

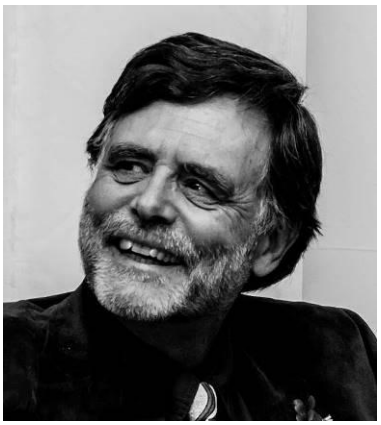
To comply with this standard, it was decided to produce a stationary or static simulation (Van Dortmont in Lange, 1994), which shows the proposed development from a typical static observation point (Critical View Points).

Photographs are taken on site during a site visit with a manual focus, 50mm focal depth digital camera. All camera settings are recorded, and the position of each panoramic view is recorded by means of a GPS. These positions, coordinates are then placed on the virtual landscape (see below).

A scale model of the proposal is built in virtual space, scale 1:1, based on CAD (vector) information as supplied by the architect / designers. This model is then placed on a virtual landscape, scale 1:1, as produced by means of GIS software. The accuracy of this depends on the contour intervals.

The camera views are placed on the points as recorded on the virtual landscape. The respective photographs are overlaid onto the camera views, and the orientation of the cameras adjusted accordingly. The light source is adjusted to suit the view. Each view is then rendered as per the process above.

APPENDIX E: CURRICULUM VITAE



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Graham Young is a professionally registered landscape architect (SACLAP) with an interest and experience in landscape architecture, urban design, and environmental planning. He holds degrees in landscape architecture from the Universities of Toronto (BL) and Pretoria (ML). Graham has conducted visual impact assessments in Canada and Africa. He has served as President of the Institute of Landscape Architects of South Africa (ILASA) and Vice President of the Board of Control for Landscape Architects.

He runs his practice, Graham Young Landscape Architect (GYLA), a Level Four (4) contributor with 100% B-BBEE procurement recognition. The firm focuses on visual impact assessments, for which Graham was awarded an ILASA Merit Award in 1999. This work includes landscape characterisation/sensitivity studies, computer modelling and visualisation. He has completed over 450 visual impact specialist reports for projects in South Africa, Canada and other African countries and conducted several specialist report reviews. Graham has been a specialist witness in legal cases involving visual impact issues. He helped develop the *Guideline for Involving Visual and Aesthetic Specialists in EIA Processes* (with Oberholzer 2005) and produced a research document for Eskom, *The Visual Impacts of Power Lines* (2009). In 2011, he wrote the '*Guidelines for involving visual and aesthetic specialists'* for the Aapravasi Ghat Trust Fund Technical Committee, which manages a World Heritage Site in Mauritius, along with the *Visual Impact Assessment Training Module Guideline Document* for the same client.

During his 40+ year career, he has written widely and presented on landscape architectural and visual impact issues and has had projects published locally and internationally in design journals and books. In 2018, he retired as a Senior Lecturer from the University of Pretoria, Department of Architecture, where he taught landscape architecture and urban design at post and undergraduate levels. He has also lectured at other universities in South Africa and worldwide, including the University of Witwatersrand, the University of Cape Town, Jomo Kenyatta University of Agriculture and Technology, Kenya and the University of Rhode Island and Harvard Graduate School of Design, USA.

Graham is a Fellow of ILASA. In 2022, he was awarded ILASA's Lifetime Achievement Award. He is the managing editor of the online journal African Journal of Landscape Architecture.

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