Visual Impact Assessment for Klipkoppie Solar PV Facility, Malmesbury, Western Cape Province

SUBMITTED FOR ENVIRONMENTAL AUTHORISATIONS IN TERMS OF THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998 (ACT NO. 107 OF 1998) (NEMA)

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	Date:	8th January 2024
Applicant:	EnviroAfrica CC	
Revision Number:	001	
Date Issued:	15th January 2024	

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EXECUTIVE SUMMARY

The Klipkoppie Solar PV Facility, proposed in the Western Cape near Malmesbury, marks a vital step towards advancing sustainable energy solutions in South Africa. This Executive Summary provides an overview of the Visual Impact Assessment (VIA) conducted for the facility, highlighting the principal findings and recommendations.

Positioned in a landscape noted for its rolling hills, agricultural vitality, and natural beauty, the Klipkoppie Solar PV facility aims to seamlessly integrate renewable energy infrastructure within this diverse setting. The VIA was meticulously conducted, considering various criteria including visual intrusion, visibility, visual exposure, and viewer sensitivity. The assessment utilized advanced tools and methodologies, including viewshed analysis, to gauge the potential visual implications of the development.

Topography and Landscape: The site's varied topography presents opportunities for sustainable development, balancing visual sensitivity with the adaptability of the landscape, which is steeped in agricultural history and natural charm.

Natural Landscapes: The region's distinct geological and ecological features form a backdrop that supports diverse agricultural practices and natural habitats. Key environmental features, including local rivers, such as the Diep River and various biodiversity areas, contribute to the area's visual and ecological richness.

Land Management: The project's conception has been guided by the diverse land use patterns within the Swartland Local Municipality, striving for a balance among natural settings, farming activities, and residential zones.

Visual Absorption Capacity (VAC): The area surrounding the Klipkoppie Solar PV Facility has a moderate VAC, indicating its capacity to absorb the proposed development without drastically altering its character.

Recommendations:

Design and Layout: The facility should aim to minimize visual intrusion, ensuring that the development complements the existing landscape. The use of low-reflectivity panels, appropriate landscape screening, and careful site planning are recommended.

Stakeholder Engagement: Continuous engagement with local communities, especially the residents of nearby towns like Malmesbury, is crucial. Their feedback and concerns should be factored into the facility's final design and operational plans.

Based on the VIA, no fatal flaws have been identified that would prevent the project from being authorized. The project, while introducing a new visual element, has the potential to be designed to incorporate seamlessly into this landscape, preserving the visual quality of the area for residents and visitors alike. The project's commitment to implementing the recommended mitigation measures and buffers demonstrates a proactive approach to minimizing potential visual impacts and preserving the region's visual and natural assets.

The Klipkoppie Solar PV facility, once operational, promises to be a beacon of sustainable development in the region. The VIA underscores the facility's potential to not only introduce renewable energy but also rejuvenate the visual landscape. Through meticulous planning, stakeholder engagement, and sustainable interventions, the facility is poised to enhance the visual and environmental quality of the Klipkoppie Solar PV facility site.

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LIST OF ABBREVIATIONS

Abbreviation	Description
AfDB	African Development Bank
BAR	Basic Assessment Report
BESS	Battery Energy Storage System
CA	Competent Authority
CBA	Critical Biodiversity Area
DFFE	Department of Forestry, Fisheries and Environment
EA	Environmental Authorisation
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme Report
ESA	Ecological Support Area
ETC	Eco Thunder Consulting (Pty) Ltd
EnviroAfrica	EnviroAfrica CC
GIS	Geographical Information Systems
HA	Hectares
IFC	International Finance Corporation
MEA	Millennium Ecosystem Assessment
MW	Megawatts
NEMA	National Environmental Management Act
O&M	Operation and Maintenance

Abbreviation	Description
OHL	Overhead Line
PV	Photovoltaic
REDz	Renewable Energy Development Zone/s
SACLAP	South African Council for the Landscape Architectural Profession
SLA	Service Level Agreement
SOLAR PV FACILITY	Solar Energy Facility
UNESCO	United Nations Educational, Scientific and Cultural Organisation
VAC	Visual Absorption Capacity
VIA	Visual Impact Assessment
WHC	World Heritage Convention

GLOSSARY LIST

Glossary Item	Description
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).

Glossary Item	Description
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 localized 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.

Glossary Item	Description
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 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 (VAC)	VAC 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 or collectively 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.

SPECIALIST CHECKLIST

No.	NEMA 2014 (as amended) Regs - Appendix 6(1) Requirement	Report Section
	A specialist report prepared in terms of these Regulations must contain -	

No.	NEMA 2014 (as amended) Regs - Appendix 6(1) Requirement	Report Section
a	details of - • the specialist who prepared the report; and • the expertise of that specialist to compile a specialist report including a curriculum vitae.	Specialist Details and Appendix A
b	a declaration that the specialist is independent in a form as may be specified by the competent authority (CA);	Specialist Declaration
c	an indication of the scope of, and the purpose for which, the report was prepared;	Section 5.1
	an indication of the quality and age of base data used for the specialist report	Section 1.3
	a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change	Section 7 and Section 8
d	the duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Section 5.4
e	a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Section 5
f	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, inclusive of a site plan identifying site alternatives;	Section 7
g	an identification of any areas to be avoided, including buffers;	Section 7.1.1
h	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;	Section 7.1.1
I	a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 0
j	a description of the findings and potential implications of such findings on the impact of the proposed activity or activities;	Section 8.2
k	any mitigation measures for inclusion in the EMPr;	Section 0
l	any conditions for inclusion in the EA;	Section 8.4
m	any monitoring requirements for inclusion in the EMPr or EA;	Section 0

No.	NEMA 2014 (as amended) Regs - Appendix 6(1) Requirement	Report Section
n	a reasoned opinion - • whether the proposed activity, activities or portions thereof should be authorised; • regarding the acceptability of the proposed activity or activities; and • if the opinion is that the proposed activity, 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.	Section 8.4
o	a description of any consultation process that was undertaken during the course of preparing the specialist report;	N/A
p	a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	N/A
q	any other information requested by the CA.	N/A

SPECIALIST DETAILS

ETC is a privately owned company fully owned by women. We specialize in a wide range of specialized studies, including Visual Impact Assessment (VIA), socio-economic research, economic development planning, development program design and implementation, as well as community trust management. Our expertise extends to conducting VIAs across Africa and optimizing projects in the environmental sector. Our work encompasses landscape characterization studies, end-use studies for quarries, and computer modelling and visualization.

Based across South Africa, Eco Thunder has built a reputation as a leading authority on the conditions, needs, and assets of communities associated with independent power generation facilities. Additionally, ETC actively implements development programs in energy communities, ensuring a comprehensive understanding of how to drive positive social impact.

SPECIALIST DECLARATION

Full Name	Title/Position
Brogan Geldenhuys	Director
Telephone Number	**Email Address**

064 655 2752	brogan@eco-thunder.co.za
Qualification(s):	BEng
Registration(s):	ILASA, IAIAsa, GISSA, IAP2

I, **Brogan Geldenhuys**, declare that: –

- I act as an independent specialist in this application;
- I will perform the work relating to the application objectively, 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 expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- 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 CA 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 CA; and - the objectivity of any report, plan or document to be prepared by myself for submission to the CA;
- All the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offense and is punishable by law.

10/01/2024

Signature of the Specialist *Date*

Eco Thunder Consulting, acting as an independent specialist in the field of visual impact assessment within the renewable energy sector, hereby affirms its professional standing and expertise. Appointed by EnviroAfrica for the specific purpose of conducting an independent and unbiased assessment, our firm leverages approaches and methodologies that have been meticulously refined and successfully applied across various projects.

Our engagement with this project is characterized by a commitment to maintaining the highest standards of integrity and professionalism. The opinions and viewpoints expressed within this report are solely those of Eco Thunder Consulting and reflect our extensive experience and specialized knowledge in visual impact assessment within the renewable energy sector.

This assessment is conducted in accordance with the best practices and industry standards, ensuring a comprehensive and objective analysis. It is our firm belief that the methodologies employed are robust and have established precedence in maintaining the quality and accuracy required for such evaluations.

In fulfilling our role as an independent specialist, we have adhered to all relevant legal and regulatory requirements, ensuring that our assessment is both transparent and accountable. We affirm that our relationship with Savannah Environmental and all other parties involved in this project is free from any conflict of interest or undue influence, thereby safeguarding the impartiality of our findings and recommendations.

Eco Thunder Consulting remains dedicated to providing an assessment that is not only thorough and precise but also contributes positively to the renewable energy sector, reflecting our ongoing commitment to environmental sustainability and responsible development.

The author of this report, however, accepts no liability for any actions, claims, demands, losses, liabilities, costs, damages, and expenses arising from or in connection with services rendered, and by the use of the information contained in this document.

No form of this report may be amended or extended without the prior written consent of the author and/or a relevant reference to the report by the inclusion of an appropriately detailed citation.

Any recommendations, statements, or conclusions drawn from or based on this report must cite or refer to this report. Whenever such recommendations, statements or conclusions form part of the main report relating to the current investigation, this report must be included in its entirety.

1 Background

1.1 Scope and Objective of the Specialist Study

The main aim of the study is to document the baseline and to ensure that the visual/aesthetic consequences of the proposed Klipkoppie Solar PV Facility Project are understood. The report therefore aims to identify scenic resources, and visually sensitive areas or receptors. It also aims to identify key concerns or issues relating to potential visual impacts arising from the Project, and which must be addressed in the assessment phase.

1.2 Structure of the Report

The report is organised into six sections:

- Section 1: Background;
- Section 2: Project Description;
- Section 3: Requirement for a VIA;
- Section 4: Legislation and Policy Review;
- Section 5: Approach and Methodology;
- Section 6: Baseline Environmental Profile;
- Section 7: Identification of Visual Impacts;
- Section 8: Impacts and Risks Identified;
- Section 9: Environmental Impact Statement Conclusion; and
- Section 10: References.

1.3 Information Base

The following information was used to conduct the VIA:

- Documentation and KML files supplied by the client;
- ToR for the visual specialist;
- Photographs and information captured during the site visit;
- Google Earth software and data;
- Sentinel-2 Satellite Imagery;
- SRTM Digital Elevation Model;
- South African National Landcover dataset;

- Local zoning and planning documents;
- Historical maps and aerial photographs;
- Stakeholder input and feedback;
- Meteorological data;
- Landscape character assessments;
- Relevant environmental impact assessment (EIA) reports;
- Geographic Information System (GIS) data;
- Local biodiversity data; and
- Regulatory and policy documents.

1.4 Terms and Reference

A specialist study is required to establish the visual baseline and to identify and potential visual impacts arising from the proposed development based on the general requirements for a comprehensive VIA.

The following terms of reference were established:

- Data collected allows for a description and characterization of the receiving environment;
- Describe the landscape character, quality and assess the visual resource of the study area;
- Describe the visual characteristics of the components of the Project;
- Identify issues that must be addressed in the impact assessment phase; and
- Propose mitigation options to reduce the potential impact of the Project.

1.5 Level of Confidence

The level of confidence in the assessment is determined by two key factors: the availability of information and the practitioner's understanding of the study area and experience with similar projects. These factors are rated on a scale of 1 to 3, as follows:

- Availability of Information of the Study Area /Project:
  - **3: High level of information available; thorough knowledge base established through accessible site visits, surveys, etc.**
  - 2: Moderate level of information available; moderate knowledge base established, with acceptable accessibility to the study area.

  - 1: Limited information available; poor knowledge base established, or no site visits and/or surveys carried out.
- Understanding of the Study Area, and Experience with Similar Projects:
  - **3: High level of information and knowledge available; visual impact assessor is highly experienced with this type of project and level of assessment.**
  - 2: Moderate level of information and knowledge available; visual impact assessor has moderate experience with this type of project and level of assessment.
  - 1: Limited information and knowledge available; visual impact assessor has low experience with this type of project and level of assessment.

The level of confidence for this assessment is determined to be 9 and indicates that the author's confidence in the accuracy of the findings is high.

1.6 Limitations and Assumptions

The following assumptions and limitations are applicable to this Report:

- The assessment has been based on the requirements of the Western Cape Department of Environmental Affairs & Development Planning Guidelines.
- The assessment assumes that all necessary consultations with stakeholders, including local communities, authorities, and other interested parties, have been / will be conducted in accordance with legal requirements, and that their views and concerns have been duly considered.
- Whilst most homesteads and housing areas were visited during the site visit in order to confirm their nature and likely visibility of the development, it was not possible to visit all homesteads and housing areas.
- The information and analysis provided in this report is based on the details available during the undertaking of the Visual Impact Assessment (VIA). As the VIA specialists we have, to the best of our ability analysed and interpreted the data provided.
- We operate under the assumption that all information supplied by the client is accurate, current, and reflective of the agreements made with relevant landowners. Any decisions regarding development on specific portions of land, including agreements on relocations, demolitions, or other alterations, should be confirmed, and discussed directly with the relevant landowners. Our assessments and recommendations are based on the information provided to us, and we rely on the client to ensure that this information is complete and up to date.
- The Project report uses the concept of 'worst case scenario' to identify issues and rate visual impacts. This scenario assumes that all facilities along with the associated grid

infrastructure and sub-stations would be constructed at the same time. At the time of writing the VIA Report, there was no evidence to the contrary.

- The assessment of cumulative impacts is partly based on information provided by the Department of Forestry, Fisheries and Environment (DFFE) Website. This source provides detail of all other renewable energy applications and has been used to indicate other possible solar energy sites within 30km of the application site.
- The findings, assessments, and recommendations contained in this report represent the professional judgment of the Visual Impact Assessment (VIA) practitioners. They are based on the information provided, standard industry practices, and applicable regulations at the time of the assessment. While every effort has been made to ensure accuracy and completeness, this report does not constitute legal, financial, or other specialized advice. Any reliance on this report for purposes other than those explicitly stated herein is at the reader's own risk.
- The responsibility for implementing the recommendations, mitigation measures, and any other actions outlined in this report lies solely with the client or project proponent. The VIA practitioners are not responsible for monitoring, enforcing, or ensuring compliance with these measures. It is the client's duty to ensure that all necessary permits, approvals, and consents are obtained, and that the project is carried out in accordance with all applicable laws, regulations, and standards. Any deviations from the recommendations or failure to implement the suggested measures may result in different impacts and outcomes than those described in this report.

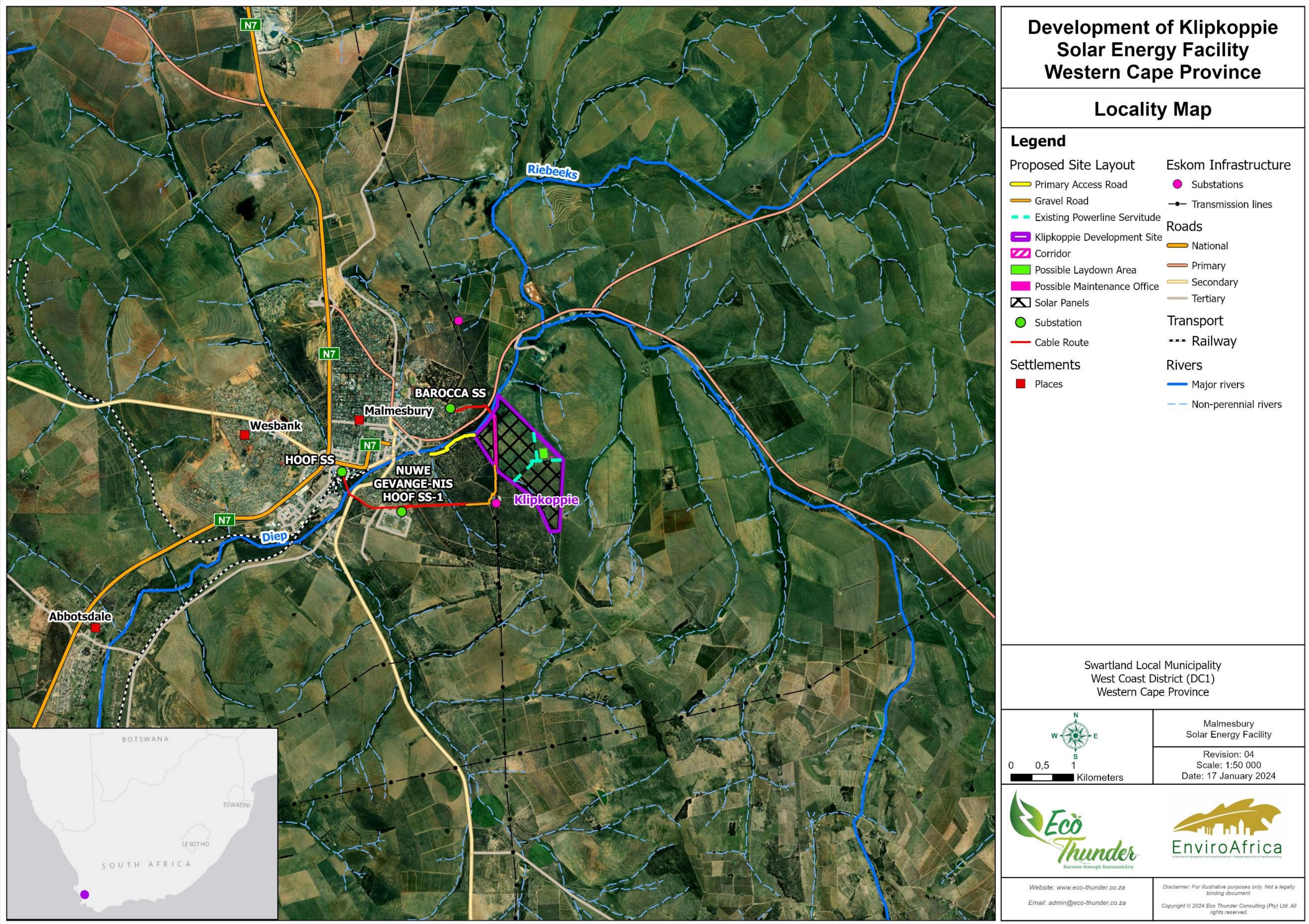

Figure 1: Locality Map

2 Project Description

Madelaine Terblanche, on behalf of Swartland Municipality and the owners of Erf 327, Malmesbury, has enlisted the services of EnviroAfrica CC (referred to as "EnviroAfrica") to carry out the necessary EIA Process for the proposed construction of the Klipkoppie Solar PV facility, Malmesbury, Western Cape, South Africa.

EnviroAfrica has further commissioned ETC to conduct a VIA for the proposed construction of the Solar PV facility. The VIA is an integral part of the overall EIA process, aimed at identifying and evaluating the potential visual impacts associated with the proposed development.

The goal of the VIA is not to predict whether individual receptors will find the project attractive or not. Instead, the goal is to identify important visual characteristics of the surrounding landscape, especially the features and characteristics that contribute to scenic quality, as the basis for determining how and to what degree the proposed project will affect those scenic values.

The primary aim of the impact assessment phase is to ensure that visual impacts are adequately assessed and considered so that the relevant environmental authorities can decide if the proposed project has unreasonable or undue visual impacts. The secondary aim is to identify effective and practical mitigation measures, where possible.

The VIA process involves several key steps, including:

- Identifying and mapping existing sensitive receptors, buffers, important viewpoints, and view corridors;
- Identifying and screening potential visual concerns;
- Ensuring that the visual assessment will be in compliance with relevant standards, policies, laws, and regulations; and
- Providing recommendations for the impact assessment phase.

The VIA is conducted in accordance with the guidelines provided by relevant authorities, and while there is little legislation relating directly to VIAs, there are guidelines that provide direction for visual assessment as well as a number of laws which aim to protect visual resources.

2.1 Project Location

The proposed development of a Solar PV facility with a generating capacity of approximately 20MW is strategically situated southeast of the town of Malmesbury. Specifically, the project is located on a portion of Erf 327 Malmesbury, which lies south of the R45, within the Swartland Local Municipality and within the West Coast District Municipality, Western Cape Province. The solar energy development will be known as the Klipkoppie Solar PV facility.

2.2 Project Technical Details

Table 1, Table 2 and Figure 1 provides the details of the project, including the main infrastructure components and services that will be required during the project life cycle.

Table 1: Details of the Study Area

Component	Description/Dimensions
District Municipality	West Coast District Municipality
Local Municipality	Swartland Local Municipality.
Ward Number(s)	Ward 8
Farm name(s) and number(s) of properties affected by the PV Facility, incl SG 21 Digit Code (s)	Portion of Re/Erf 327, Malmesbury (commonage land) (MMF4-6/1918)
Nearest Town(s)	Malmesbury

Table 2: Technical Details of the Proposed Project

Component	Description/Dimensions
Current zoning	Split Zoning: Commonage land
Site Coordinates (centre of development area)	Lat: 33°28'6.99"S Long: 18°45'8.32"E
Total extent of the Affected Properties, also referred to as the project site[1]	~ 429.2975ha
Total extent of the Development area[2]	Up to ~135ha
Total extent of the Development footprint[3]	~ 60ha
Contracted capacity of the PV facility	Up to 20MW
PV panels	Height: up to 5m from ground level (installed)
Power line capacity	132kV
Container Solar Facility	• Located within the development area. • Inside the container, you typically find solar panels, inverters, batteries (if applicable), and the necessary control and container, and the necessary control and container, monitoring systems.

[1] *The project site is that identified area within which the development area and development footprint are located. It is the broader geographic area assessed as part of the EIA process, within which indirect and direct effects of the project may occur. The project site is ~ 429.2975ha in extent.*

[2] *The development area is that identified area where the 20MW PV facility is planned to be located. This area has been selected as a practicable option for the facility, considering technical preference and constraints. The development area is ~135ha in extent.*

[3] *The development footprint is the defined area (located within the development area) where the PV panel array and other associated infrastructure for the Klipkoppie Solar PV facility is planned to be constructed. This is the actual footprint of the facility, and the area which would be disturbed. The development footprint is ~60ha in extent.*

Component	Description/Dimensions
	• The container's roof or sides are equipped with solar panels that capture sunlight and convert it into direct current (DC) electricity using photovoltaic (PV) cells.
Access roads and internal roads	• Existing roads will be used, wherever possible, to access the project site and development area. • Access to the proposed facility will be via Smuts Street, extending from the western boundary and continuing along an existing gravel road leading to the facility. • An internal gravel road network will be used by construction vehicles and will be retained throughout the lifetime of the facility for use by maintenance vehicles.

The operational requirements of the proposed facility include nominal electrical usage supplied on-site, water sourcing from the local municipality for sanitation, panel washing, and dust control, and minimal sanitation needs for a small operational staff. If municipal approval or capacity is not available, alternative water sourcing and sewage disposal methods such as storage tanks or contracted services will be explored. During the construction phase, water and sanitation responsibilities would primarily fall on the contractor, preferably utilizing municipal resources if feasible, and solid waste management would adhere to Environmental Management Programme Report (EMPr) requirements.

2.3 Assessment Alternatives

2.3.1 Location Alternatives

No other location alternatives are being considered[4]. The land has been confirmed as available in the form of private landowners who have made the development possible on the site. Renewable Energy development in South Africa is highly desirable from a social, environmental and development point of view and a solar energy installation is more suitable for the site due to the high solar resource.

2.3.2 Technology Alternatives

The choice of technology selected for the proposed Klipkoppie Solar PV facility is based on environmental constraints, technical and economic considerations. The size and type of the of PV array will depend on the development area and the total generation capacity that can be produced as a result. Two technology alternatives will be considered. The number of panels comprising the array will depend on the solar resource at the site, the installed capacity and the choice of panels.

Solar PV: Standard solar PV arrays, with panels mounted on frames, cover a large surface area and are typically spread across the landscape. This layout can significantly alter the visual character of an area, especially in landscapes like Malmesbury, which may have previously been

[4] *: This statement refers specifically to the location alternatives for the proposed facility itself.*

open or agricultural. The uniform appearance of the panels, their height, and arrangement create a distinct industrial aesthetic. However, due to their spread-out nature, they can be integrated more seamlessly into the landscape with strategic planning and landscaping.

Container Solar Facility: While more compact and potentially easier to deploy, these structures could have a more concentrated visual impact in a specific area. The containers, essentially repurposed shipping containers with solar panels mounted on them, introduce a new structural element into the landscape. They may be perceived as more industrial or out of character, especially in natural or rural settings. Their blocky, utilitarian appearance could stand out more starkly against a natural backdrop compared to the relatively low profile and open design of standard solar arrays.

BESS Technology: With regard to the proposed BESS, the technology thereof is dynamic and so the specific type/technology to be developed would be selected based on market demands and technology availability at the time of construction. Therefore, both Lithium-ion and redox-flow are assessed as technology alternatives, with Lithium-ion being the current preferred technology.

2.3.3 No-Go Alternative

The ‘no-go’ alternative is the option of not undertaking the proposed Solar PV facility project. Hence, if the ‘no-go’ option is implemented, there would be no development. This alternative would result in no environmental impacts from the proposed project on the site or surrounding local area. It provides the baseline against which other alternatives are compared and will be considered throughout the report.

2.4 Technology Identified

The objective of this section is to illuminate the inherent visual characteristics of solar photovoltaic (PV) installations, particularly within the context of the Southern African landscape.

To facilitate comprehension, we will incorporate illustrative images and generic examples that accurately represent the common visual impacts observed in South African solar PV installations. These visual impacts are primarily due to the presence of large arrays of solar panels, which can be visible from considerable distances. The understanding gained from this section will be instrumental in subsequent sections of the report, where we will evaluate the specific visual impacts of the proposed Solar PV facility.

By drawing from various resources, including studies on solar visual impacts, planning guidance for solar developments, and best practices for reducing visual impacts of renewable energy, we aim to provide a comprehensive overview that aligns with both international standards and the local context.

2.4.1 Standard Solar PV Arrays

Solar PV technology has emerged as a key player in the renewable energy sector, transforming sunlight into electricity through the use of solar cells.

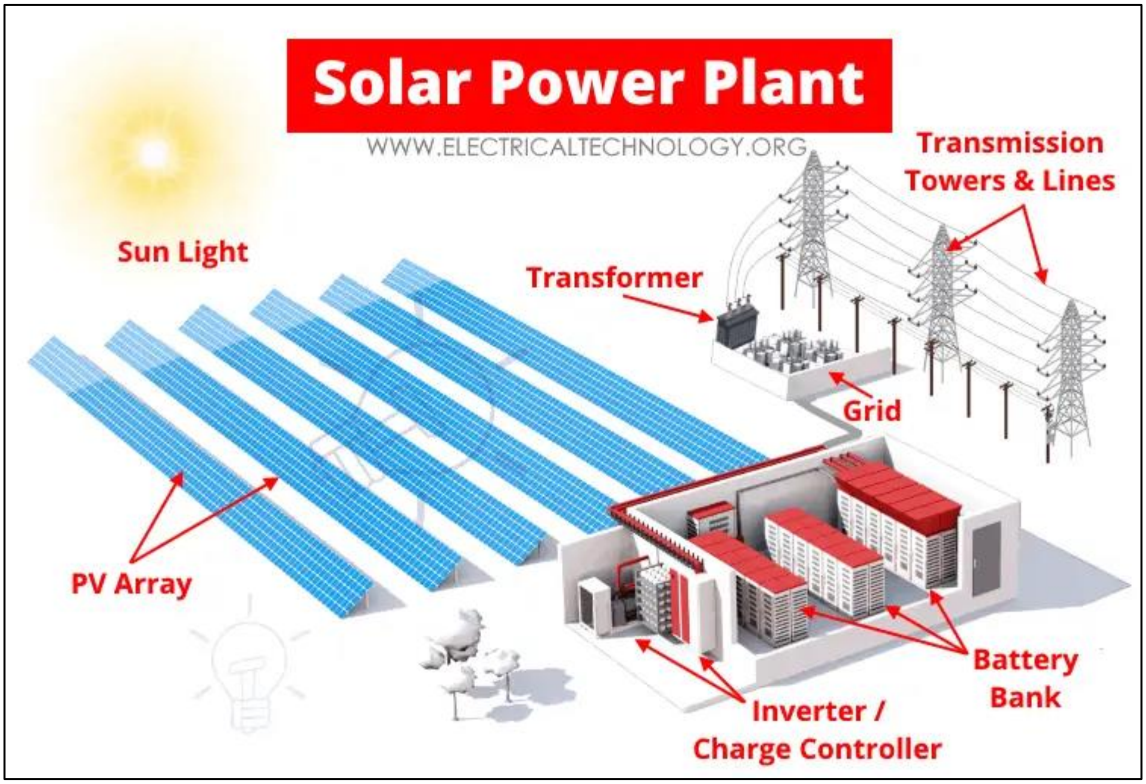

Figure 2: Layout of a Solar Power Plant

Source: Electrical Technology (2021)

Figure 2 presents a high-level overview of the fundamental principles governing a Solar PV facility. This facility is distinguished by its large arrays of solar panels, typically mounted on durable metal frames and strategically angled to optimize sunlight. Arranged in a grid-like pattern, these panels create a distinct visual impact on the surrounding landscape. Furthermore, the overall visual appearance of the facility is influenced by additional infrastructure components such as inverters, transformers, and electrical wiring.

Figure 3: A Solar PV Facility Example

Solar arrays, as the primary components of a Solar PV facility, can significantly shape the visual aesthetics of the landscape. Comprised of multiple solar panels, each containing PV cells, these arrays are commonly affixed to sturdy metal frames designed to withstand various environmental conditions. Particularly notable is their visual prominence when mounted at heights exceeding 3 meters to enhance sunlight absorption.

The tilt angle of the panels, meticulously optimized for maximum sunlight capture, further contributes to their visual impact. Depending on the angle and the sun's position, the panels may reflect sunlight, potentially causing glare.

When solar arrays are organized into large groups, often referred to as solar farms or solar parks, they can profoundly alter the visual character of the landscape. The size and layout of these arrays create a geometric pattern that contrasts with the natural environment, especially in rural or semi-rural settings.

The visual impact of solar arrays can be influenced by various factors, including the size, shape, topography, and solar exposure of the site. For instance, flat topography may render the arrays more visible from a distance, while undulating topography offers opportunities to minimize visual impact by strategically placing arrays in lower-lying areas.

Additionally, the choice of PV array technology significantly affects the visual impact. Arrays utilizing tracking systems to follow the sun's movement yield a different visual effect compared to fixed-tilt arrays. Furthermore, the colour and material composition of the panels impact their visibility and light reflectivity.

It is important to note that while solar arrays are vital components of solar PV facilities, their visual impact can be effectively managed and mitigated through meticulous planning and thoughtful design considerations.

2.4.2 Container Solar Facility

Another notable aspect within solar PV technology is the concept of Container Solar Facilities, often termed as 'solar power containers' or 'solar farms in a box'. These are innovative, self-contained units that house solar power generation equipment within standardized shipping containers. Their design is centred around modularity and portability, simplifying the deployment process of solar installations. The containers feature solar panels mounted on their exteriors, efficiently harnessing sunlight through photovoltaic cells. Inside, they contain inverters, batteries (if applicable), and control systems, making them a comprehensive solution for solar power generation. The integration of energy storage systems in these containers ensures a stable and reliable energy supply, even during periods without sunlight. These solar containers represent a significant advancement in solar technology, offering a flexible, efficient, and visually unobtrusive method for establishing solar energy capacity, particularly in remote or temporary setups.

Unlike standard solar arrays, container solar facilities have a more concentrated visual presence. The block-like structure of the containers may stand out more in the landscape, potentially seen as more industrial or incongruous in natural settings. These facilities could have a more significant physical footprint than the more spread-out and open design of standard solar arrays. They block views rather than blend into the background, creating a more prominent visual barrier. The modular and portable nature of these containers allows for flexibility in placement, which can be used to mitigate visual impact to some extent. The motivation for considering this technology lies in its logistical benefits. The ease of installation and portability make it suitable for scenarios requiring rapid deployment, temporary installations, or minimal ground disturbance.

Figure 4: Example Solar Container

2.4.3 Infrastructure and Services

In addition to the primary components of a Solar PV facility, several other infrastructural elements play crucial roles in its operation and visual appearance. These include the primary or main access roads, auxiliary buildings, and perimeter fencing.

Figure 5: Perimeter Fencing around a Solar PV Facility

Source: Wells Croft (2021)

Primary or main access roads are vital for the transportation of materials during the construction phase and for ongoing maintenance activities. Their design and layout can significantly influence the visual impact of the facility. Access to the facility will be primarily via Smuts Street, extending from the western boundary and utilizing an existing gravel road. This existing infrastructure minimizes the need for additional road construction, thereby reducing potential visual disturbance. An internal gravel road network for construction and maintenance vehicles will be retained, offering opportunities for visual mitigation through landscaping along these routes.

Auxiliary buildings house control systems, monitoring equipment, and maintenance facilities. These structures are integral to the operation of the Solar PV facility and contribute to its visual profile.[5]

The developer, upon identification, will decide on the approach to acquiring necessary electrical services. This may involve requesting temporary power connections from Swartland Municipality or providing these services independently throughout the construction period. The choice of service provision method could influence the visual profile of the facility, especially during the construction phase.

Perimeter fencing, installed for security purposes, helps prevent unauthorized access and potential damage to the solar arrays and other infrastructure. Beyond its protective function, the fencing can also potentially serve as a visual barrier if design and placement of the fencing is carefully considered. This can help to reduce the facility's visual impact on the surrounding landscape, if incorporated correctly.

The design of the stormwater system, including overland discharge channels, will be an integral visual element, especially during significant rainfall events. The landscape design can incorporate these features to enhance the aesthetic appeal while fulfilling functional requirements. The facility will not utilize municipal drinking water for cleaning solar panels. Water will be transported by trucks, reducing the need for permanent water infrastructure on-site and thus minimizing visual impact.

The modest sewage flow and reliance on the municipality's regulated collection system for solid waste suggest minimal infrastructural requirements for waste management on-site. This approach aids in maintaining the visual integrity of the facility.

Each of these components significantly influences the visual impact of the facility. Therefore, their design and layout should be carefully considered during the planning and design stages of the project. The visual impact can be mitigated through careful design and landscaping, ensuring the facility harmoniously integrates with its environment while maintaining operational efficiency.

A Solar PV facility is a complex system composed of several key components, each contributing to its operation and visual profile. Their design, layout, and visual impact should be carefully considered during the planning and design stages of a project. With careful site selection, design, and landscaping, the visual impact of a Solar PV facility can be effectively managed and mitigated,

[5] Auxiliary buildings are only applicable to the Standard Solar PV technology.

ensuring that the facility harmoniously integrates with its environment while maintaining operational efficiency.

This comprehensive understanding of the visual aspects of a Solar PV facility will serve as a foundation for the subsequent sections of this report, where we will assess the specific visual impacts of the proposed Solar PV facility.

3 Requirement for a VIA

As outlined in Table 3, the requirement for visual input may arise from the characteristics of both the receiving environment and the project itself. The following indicators are identified as potential signals for the necessity of visual input:

The nature of the receiving environment:

- Areas with protection status, such as national parks or nature reserves;
- Areas with proclaimed heritage sites or scenic routes;
- Areas with intact wilderness qualities, or pristine ecosystems;
- Areas with intact or outstanding rural or townscape qualities;
- Areas with a recognized special character or sense of place;
- Areas lying outside a defined urban edge line;
- Areas with sites of cultural or religious significance;
- Areas of important tourism or recreation value;
- Areas with important vistas or scenic corridors; and
- Areas with visually prominent ridgelines or skylines.

The nature of the project:

- High intensity type projects including large-scale infrastructure;
- A change in land use from the prevailing use;
- A use that is in conflict with an adopted plan or vision for the area;
- A significant change to the fabric and character of the area;
- A significant change to the townscape or streetscape;
- Possible visual intrusion in the landscape; and
- Obstruction of views of others in the area.

These indicators can help determine whether a visual impact assessment is necessary for a particular project. It's important to note that this list is not exhaustive and other factors may also suggest the need for visual input.

3.1 Components of Visual Studies

As per Western Cape Department of Environmental Affairs & Development Planning: Guideline for Involving Visual and Aesthetic Specialists in EIA Processes Edition 1 (CSIR, 2005), the typical components of visual studies according to Box 8 are as follows:

Table 3: Typical Components of Visual Studies

Box 8: Typical Components of Visual Studies
• Identification of issues and values relating to visual, aesthetic and scenic resources through involvement of I&APs and the public. • Identification of landscape types, landscape character and sense of place, generally based on geology, landforms, vegetation cover and land use patterns; • Identification of viewsheds, view catchment area and the zone of visual influence, generally based on topography; • Identification of important viewpoints and view corridors within the affected environment, including sensitive receptors; • Indication of distance radii from the proposed project to the various viewpoints and receptors; • Determination of the VAC of the landscape, usually based on topography, vegetation cover or urban fabric in the area; • Determination of the relative visibility, or visual intrusion, of the proposed project. • Determination of the relative compatibility or conflict of the project with the surroundings; • A comparison of the existing situation with the probable effect of the proposed project, through visual simulation, generally using photomontages.

The approach to visual assessment should be based on both quantitative and qualitative aspects. Quantitative aspects often make use of landscape resource classification methods. These may include combinations of landforms (geomorphology), vegetation cover, and land use mapping.

The actual approach and method used would depend on the level of visual input required in the EIA process. Effective interaction with other specialists should be facilitated by the EIA practitioner to ensure that an integrated approach is adopted, where the various components of the environment are seen.

This visual guideline document is therefore an attempt to develop a 'best practice' approach for visual specialists, EIA practitioners and authorities involved in the EIA process.

4 Legislation and Policy Review

A vital aspect of this process involves assessing the suitability of a proposed development in relation to key planning and policy documents.

It is worth noting the following points:

- The African Development Bank (AfDB) do not provide guidelines for VIAs.

Although there is limited legislation specifically addressing VIAs, there exist guidelines that offer guidance for conducting visual assessments. Additionally, several laws are in place to safeguard visual resources, as well as regulations applicable to specialists in various fields.

This report adheres to the following legal requirements and guideline documents:

- International Good Practice.
- National Legislation and Guidelines; and
- Policy Fit.

4.1 International Good Practice

The following documentation provides good practice guidelines, specifically:

- Guidelines for Landscape and VIA[6].
- International Finance Corporation (IFC);
- Millennium Ecosystem Assessment (MEA);
- United Nations Educational, Scientific and Cultural Organisation (UNESCO);
- World Heritage Convention (WHC); and
- AfDB - While they do not provide specific guidelines for VIAs, their general environmental and social guidelines may be relevant.

4.1.1 Guidelines for Landscape and Visual Impact Assessment, Second Edition

These guidelines establish principles that promote consistency, credibility, and effectiveness in landscape and VIA within the EIA process. According to the guidelines, landscape encompasses the entirety of our external environment, whether in urban or rural areas, including buildings, streets, open spaces, trees, and their interconnected relationships. The guidelines highlight the importance of landscape for various reasons, including being a natural resource, containing archaeological and historical evidence, providing habitats for plants and animals (including humans), evoking sensual, cultural, and spiritual responses, and contributing to our quality of life

6 The Western Cape Guidelines are the only official guidelines for VIA reports in South Africa and can be regarded as best practice throughout the country.

in urban and rural settings. Additionally, landscapes offer valuable opportunities for recreation and resources.

4.1.2 International Finance Corporation

The IFC Performance Standards (IFC, 2012) related to VIAs:

- **IFC Performance Standard 1:** Assessment and Management of Environmental and Social Risks and Impacts: This standard requires the identification and assessment of potential visual impacts as part of the overall environmental and social risks and impacts of a project. From a VIA perspective, this could involve identifying potential changes to the visual character of the landscape, assessing the visual sensitivity of the area, and evaluating the magnitude of the visual impact. This process should consider both adverse and beneficial impacts and involve consultation with affected communities.
- **IFC Performance Standard 3:** Resource Efficiency and Pollution Prevention: This standard defines pollution to include the creation of potential for visual impacts, including light. Therefore, a VIA under this standard would need to assess potential visual pollution, such as excessive or intrusive lighting, and propose measures to avoid, minimize, or mitigate these impacts. This could involve, for example, designing lighting to minimize light spill, using lower intensity lighting, or using directional lighting to focus light where it is needed.
- **IFC Performance Standard 6:** Biodiversity Conservation and Sustainable Management of Living Natural Resources: While this performance standard does not specifically address VIAs, it recognizes the importance of biodiversity and ecosystem services. Visual impacts on natural landscapes can have implications for biodiversity and ecosystem functions. Therefore, when conducting a VIA under IFC Performance Standard 6, it is important to consider the potential effects of visual impacts on biodiversity and incorporate appropriate mitigation measures to conserve biodiversity and sustainably manage living natural resources.
- **IFC Performance Standard 8:** Cultural Heritage: This standard requires the assessment of potential visual impacts on cultural heritage sites. This could involve assessing changes to the visual character or setting of the site and considering how these changes could impact the cultural heritage values of the site. The VIA would need to propose measures to avoid, minimize, or mitigate these impacts, and these measures should be developed in consultation with affected communities. It is worth noting that cultural heritage includes both tangible forms (such as objects, sites, and structures) and unique natural features that embody cultural values.
- **The IFC Environmental Health and Safety Guidelines** for Electric Power Transmission and Distribution (IFC, 2007) specifically identify the risks posed by power generation and distribution projects to create visual impacts on Housing/farming communities. It recommends mitigation measures to minimize visual impact. These should include the placement of powerlines and the design of substations with due consideration to

landscape views and important environmental and community features. Prioritizing the location of high-voltage transmission and distribution lines in less populated areas, where possible, is also promoted.

4.1.3 Millennium Ecosystem Assessment

According to the Ecosystems and Human Well-being document compiled by the MEA in 2005, ecosystems play a vital role in supporting human well-being through their provisioning, regulating, cultural, and supporting services. The document highlights the increasing evidence of human activities negatively impacting ecological systems globally, raising concerns about the potential consequences of these ecosystem changes on human well-being.

The MEA defined the following non-material benefits that can be obtained from ecosystems.

- **Inspiration:** Ecosystems provide a rich source of inspiration for art, folklore, national symbols, architecture, and advertising.
- **Aesthetic values:** Many people find beauty or aesthetic value in various aspects of ecosystems, as reflected in the support for parks, scenic drives, and the selection of housing locations.
- **Sense of place:** Many people value the "sense of place" that is associated with recognised features of their environment, including aspects of the ecosystem.
- **Cultural heritage values:** Many societies place high value on the maintenance of either historically important landscapes ("cultural landscapes") or culturally significant species; and
- **Recreation and ecotourism:** People often choose where to spend their leisure time based in part on the characteristics of the natural or cultivated landscapes in a particular area. (MEA, 2005)

The MEA Ecosystems and Human Well-being: Synthesis report indicates that there has been a "rapid decline in sacred groves and species" in relation to spiritual and religious values, and aesthetic values have seen a "decline in quantity and quality of natural lands". (MEA, 2005).

4.2 National Legislation and Guidelines

To comply with the Visual Resource Management requirements, it is necessary to clarify which National and Regional planning policies govern the proposed development area to ensure that the scale, density and nature of activities or developments are harmonious and in accordance with the sense of place and character of the area.

4.2.1 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 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 EMPr and will be in support of the EIA and Appendix 6 of the EIA Regulations 2014, as amended on 7 April 2017.

Specialist Screening Protocols are also required by the 2014 EIA Regulations. These were taken into consideration for this project. However, the Landscape (Solar) Theme Sensitivity was referenced as there is no specific 'visual' protocol.

4.2.2 NEMA: Protected Areas Act 57 of 2003

- Management of declared World Heritage Sites (WHS) and buffer areas within South Africa;
- The purpose of the National Environmental Management: Protected Areas Act (Act 57 of 2003) (NEMPAA) is to, inter alia, provide for the protection and conservation of ecologically viable areas representative of South Africa's biological diversity and its natural landscapes and seascapes. To this end, it provides for the declaration and management of various types of protected areas;
- Section 39 of NEMPAA requires the preparation and submission of a management plan for a protected area declared in terms of the Act. The objective of a management plan, as stated in Section 41 of NEPAA, is to ensure the protection, conservation and management of the protected area concerned in a manner that is consistent with the objectives of NEMPAA and for the purpose it was declared;
- Section 50(5) of NEMPAA states that "no development, construction or farming may be permitted in a nature reserve or world heritage site without the prior written approval of the management authority;
- The management authority for a WHS is established through a NEMPAA process. The Management Authority (MA) is located within and funded by the DFFE; and
- The MA is tasked with ensuring that activities within the WHS and its buffer area comply with the approved Conservation Management Plan developed for the WHS.

4.2.3 Western Cape DEA: 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. According to the Western Cape Department of Environmental Affairs & Development Planning's guideline on involving visual and aesthetic specialists in EIA processes, the following information is relevant for our visual impact assessment report:

- Current South African environmental legislation governing the EIA process includes the National Environmental Management Act (NEMA) (Act No. 107 of 1998) and the EIA regulations under the Environment Conservation Act (Act No. 73 of 1989).

- The Protected Areas Act (NEMA) (Act 57 of 2003, Section 17) aims to protect natural landscapes.
- The National Heritage Resources Act (Act No. 25 of 1999) and associated provincial regulations provide legislative protection for listed or proclaimed sites, such as urban conservation areas, nature reserves, and scenic routes.
- Visual pollution is controlled, to a limited extent, by the Advertising on Roads and Ribbons Act (Act No. 21 of 1940), which deals mainly with signage on public roads.
- The Municipal Systems Act (Act 32 of 2000) requires municipalities to undergo an Integrated Development Planning (IDP) process, including the preparation of a five-year strategic development plan. The IDP process, particularly the spatial component known as the Spatial Development Framework, follows a bioregional planning approach in the Western Cape Province. Bioregional planning aims to achieve landscape continuity, protect natural areas, and integrate social, environmental, and economic criteria in local planning initiatives.

Specialists should refer to the relevant provincial or local authority to determine the existence of policies, by-laws, or other restrictions regarding visual impact or the protection of scenic, rural, or cultural resources.

4.2.4 Renewable Energy Development Zone and Strategic Power Corridors

The Klipkoppie Solar PV Development project is not located within a REDZs.

4.2.5 Strategic Transmission Corridor

On the 16 February 2018, Minister Edna Molewa published Government Notice No. 113 in Government Gazette No. 41445 which identified 5 strategic transmission corridors important for the planning of electricity transmission and distribution infrastructure as well as procedure to be followed when applying for environmental authorisation for electricity transmission and distribution expansion when occurring in these corridors.

In March 2019, a generic environmental management programme (EMPr) relevant to an application for environmental authorisation for substations and overhead transmission and distribution electricity transmission infrastructure was published in Government Notice No. 435 in Government Gazette No, 42323. The EMPr is relevant to substations or overhead transmission and distribution infrastructure when developed within or outside of the strategic transmission corridors.

On 29 April 2021, Minister Barbara Dallas Creecy published Government Notice No. 383 in Government Gazette No. 44504, which expanded the eastern and western transmission corridors and gave notice of the applicability of the application procedures identified in Government Notice No. 113, to these expanded corridors.

The strategic power corridor, as identified by the Department of Energy and Eskom, plays a key role in expanding the electricity grid in line with the Integrated Resource Plan (IRP). The IRP outlines South Africa's strategy for developing electricity generation infrastructure, emphasizing the integration of renewable energy sources.

The Klipkoppie Solar PV Development falls within an area categorized as Energy Generation Infrastructure (EGI). The EGI classification recognizes the area's potential for contributing to renewable energy objectives. This strategic placement aligns with the broader goals of REDZs, facilitating and streamlining renewable energy projects. The project's proximity to strategic power corridors supports the national agenda for sustainable and renewable energy development, aligning with the objectives and framework of the IRP.

By positioning the Klipkoppie project within an EGI area, it contributes to South Africa's renewable energy goals, akin to projects situated in REDZs, thus playing a vital role in the country's transition to sustainable energy sources.

4.3 Policy Fit

Policy fit refers to the extent to which the proposed changes to the landscape align with planning and policy at the International, National, Provincial, and Local levels.

Regarding international best practices, the proposed landscape modifications do not meet the criteria for triggering best practice guidelines, as there are no significant cultural or landscape resources within the site or its immediate surroundings.

ETC followed the United States Bureau of Land Management's Visual Resource Management method (USDI, 2004) to determine the significance of the landscape. This method, based on mapping and Geographical Information System (GIS) techniques, enhances objectivity and consistency by utilizing standardized assessment criteria.

5 Approach and Methodology

5.1 Purpose of the Study

The purpose of the study is to document the baseline and to ensure that the visual/aesthetic consequences of the proposed Project are understood. The report therefore aims to identify scenic resources, and visually sensitive areas or receptors. It also aims to identify key concerns or issues relating to potential visual impacts arising from the Project, and which must be addressed in the assessment phase.

5.2 Approach to Study

Assessing the effects of the development on landscape resources and visual amenity involves a combination of quantitative and qualitative evaluations. Visual impact is evaluated based on the worst-case scenario, while landscape and visual assessments are distinct but interconnected processes. The landscape analysis and assessment of impacts contribute to the baseline for Visual Impact Assessment (VIA) studies. The assessment of potential landscape impacts focuses on the physical landscape as an environmental resource. In contrast, visual impacts are evaluated as the effects on viewers when an object is introduced into a view or scene.

To conduct the study, Geographic Information System (GIS) software was utilized as a tool for generating viewshed analysis and applying relevant spatial criteria to the proposed infrastructure. A detailed Digital Terrain Model (DTM) of the study area was created using topographical data provided by the Japan Aerospace Exploration Agency (JAXA), specifically the ALOS Global Digital Surface Model "ALOS World 3D - 30m" (AW3D30) elevation model.

The scope of work for this report includes.

- Identify the scope of work/assessment required;
- Establish the baseline profile of the Environment;
- Identify potentially sensitive visual receptors within the receiving environment;
- Determine visual distance/observer proximity to the facility;
- Determine viewer incidence/viewer perception;
- Determine the VAC of the landscape;
- Determine significance of identified impacts;
- Assess the glint and glare of the PV panels;
- Comparison of visual impacts: Ground-Mounted vs. Container Solar Facilities;
- Propose mitigation to reduce or alleviate potential adverse visual impacts;
- Conclude with an impact statement of significance and a project recommendation; and
- Comply with the IFC standards.

The VIA is determined according to the nature, extent, duration, intensity or magnitude, probability, and significance of the potential visual impacts, and will propose management actions and/or monitoring programs and may include recommendations related to the proposed Solar PV facility.

The visual impact is determined for the highest impact-operating scenario (worst-case scenario) and varying climatic conditions (i.e., different seasons, weather conditions, etc.) are not considered.

The VIA considers potential cumulative visual impacts, or alternatively the potential to concentrate visual exposure/impact within the region.

5.3 Site Verification and Specific VIA Approach

Selecting the appropriate approach for a VIA is a crucial step in the process. The method and input for a VIA should be determined based on the expected level of visual impact, the nature of the project, and the characteristics of the receiving environment– that is the baseline landscape and visual conditions.

This in turn will form the basis from which the magnitude and significance of the landscape and visual effects of the development may be identified and assessed.

Table 4 provides the site verification report for an analysis of the existing landscape features, characteristics, the way the landscape is experienced, and the condition and the value or importance of the landscape and visual resources in the vicinity of the proposed development as well as the level of assessment deemed suitable for the Klipkoppie Solar PV facility development.

Based on the evaluation conducted, the findings from the site verification report indicate that a Level 4 Visual Assessment will be required.

Table 4: Categorisation of Approaches and Methods Used for Visual Assessment

Approach and Method	**Type of Issue**				
	Little or No Visual Impact Expected	**Minimal Visual Impact Expected**	**Moderate Visual Impact Expected**	**High Visual Impact Expected**	**Very High Visual Impact Expected**
Level of Visual Assessment Recommended	Level 1 Visual Assessment	Level 2 Visual Assessment	Level 3 Visual Assessment	Level 4 Visual Assessment	

5.4 Significance of Visual Impact

Having established the specific type of VIA required, it is now crucial to delve into the generic aspects and themes associated with a VIA. These elements will be examined at a site-specific level within this report, enabling us to accurately identify and understand the unique impacts associated with the site under consideration[7].

A combined quantitative and qualitative methodology, as supplied by the Environmental Practitioner, was used to describe the significance of impacts.

- **Significance** of impact is rated as consequence of impact multiplied by the probability of the impact occurring; and
- **Consequence** is determined using intensity, spatial scale, and duration criteria.

A summary of each of the qualitative descriptions along with the equivalent quantitative rating scale is given in Figure 6 below.

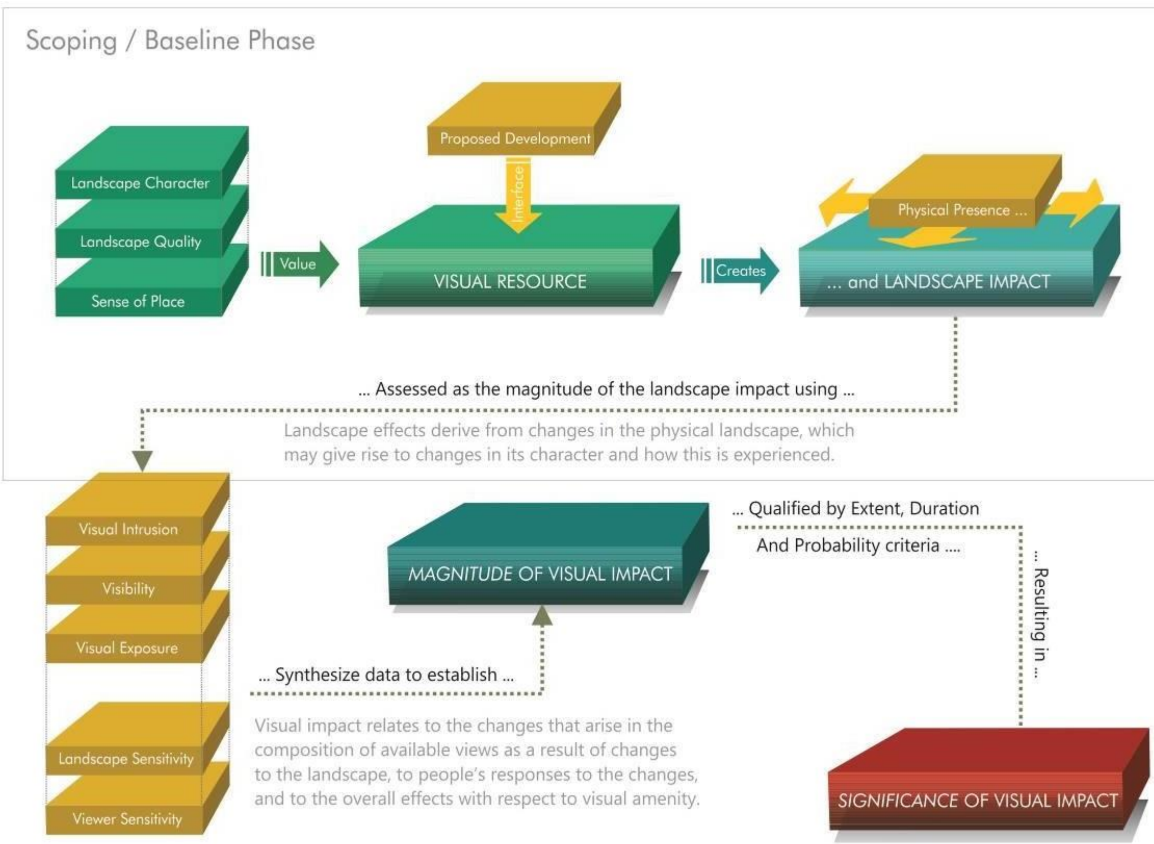

Figure 6: VIA Process

5.4.1 Landform (Topographical) and Micro-Topographical Context

The visibility of a feature within a landscape is significantly influenced by its landform context. Factors such as the feature's placement (e.g., valley bottom or ridge top), the viewer's location, and the slope's morphology can either enhance or obstruct visibility. Micro-topographical elements

[7] *Themes and Elements discussed in 5.4.1 to 5.4.9 will be site specifically addressed in Section 6.*

like buildings or vegetation can also screen views, potentially eliminating visual impact. Therefore, a comprehensive understanding of the topographical context is crucial in assessing visual impact.

5.4.2 Landscape Development Context

The presence/existence of other anthropogenic objects associated with the built environment may influence the perception of whether a new development is associated with a visual impact. Where buildings and other infrastructure exists, the visual environment could be already altered from a natural context and thus the introduction of a feature into this setting may be considered to be less of a visual impact than if there was no existing built infrastructure visible.

5.4.3 Receptor Type and Nature of the View

Visual impacts can be perceived by various types of receptors, including individuals driving along roads or residing/working in the vicinity where the structural feature is visible. The type of receptor influences the typical "view" of a potential source of visual impact, with views being constant in the case of residences or permanent human habitats, and transient in the case of vehicles moving along a road. The nature of the view encountered directly influences the intensity of the visual impact experienced.

5.4.4 Presence of Receptors

It is important to note that visual impacts are only experienced when there are receptors present to experience the impact; thus, in a context where there are no human receptors or viewers present there are not likely to be any visual impacts experienced.

5.4.5 Viewing Distance

The distance between the viewer or receptor location and an object is the primary factor influencing the perception of visual impacts. Beyond a certain distance, even large structural features become less visible and blend into the surrounding landscape. The visibility of an object tends to decrease exponentially as the distance from the object increases. The maximum impact is typically felt by receptors within a distance of 500 meters or less.

As one moves away from the source of impact, the visual impact diminishes exponentially. At a distance of 1000 meters, the impact is approximately one-quarter of that experienced at 500 meters. At distances of 5000 meters or more, the impact becomes negligible.

5.4.6 Sense of Place

According to Lynch (1992), a sense of place is the extent to which a person can recognize or recall a place as being 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 a combination of the local landscape types described above, their relative ‘intactness’, and their impact on the senses.

Sense of place goes hand in hand with place attachment, which is the sense of connectedness a person/community feels towards certain places. Place attachment may be evident at different geographic levels, e.g., site specific (e.g., a house, burial site, or tree where religious gatherings take place), area specific (e.g., Zululand), and physiography specific (e.g., wetlands). Territorial behaviour is viewed as a set of behaviours and cognition a group exhibits based on perceived ownership. The concept of sense of place attempts to integrate the character of a setting with the personal emotions and memories associated with it.

Much of what is valuable in a culture is embedded in place, which cannot be measured in monetary terms. It is because of a sense of place and belonging that people loath to be moved from their dwelling place, despite the fact that they will be compensated for the inconvenience and impact on their lives. Places/natural resources should be assessed in terms of its cultural value by studying visiting and consumption patterns, behaviour patterns, etc.

5.4.7 Viewer Perception

The perception of visual impact by viewers is subjective and influenced by various factors, including the aesthetic value, identity, and sense of place associated with a landscape. The way development is perceived can vary; it may be viewed positively if it is seen as linked to progress or human upliftment, or negatively if it disrupts a cherished landscape.

The character of the landscape, its scenic value, and the surrounding land use context all play a role in determining whether new developments are seen as unwelcome intrusions. Areas of natural conservation or scenic beauty are often more sensitive to visual impacts since the natural or scenic character of the landscape contributes to its overall appeal. In such areas, structural features like high voltage power lines may be perceived as incongruous within a natural setting, often resulting in a perceived visual impact.

5.4.8 Visual Character

Visual character is shaped by human perception and the observer's response to the relationships and composition of the landscape, including the land uses and identifiable elements within it. The assessment of visual character involves describing the scenic attractiveness of the landscape, considering the landscape attributes that hold aesthetic value and make significant contributions to the visual quality of the views, vistas, and viewpoints within the study area (ALA, 2013).

5.4.9 Weather and Visibility

Meteorological factors, such as weather conditions like haze or heavy mist, can influence the nature and intensity of a potential visual impact associated with a structural feature. These factors directly impact visibility, potentially altering the way the structural feature is perceived and affecting the extent of its visual impact.

Vegetation, particularly trees and shrubs, can serve as an effective visual screen for solar facilities, helping to mitigate the visual impact on surrounding receptors. By strategically placing vegetation around the facility, it can obscure or soften the view of the solar panels, blending the facility more harmoniously into the natural landscape. However, it's crucial to ensure that the vegetation is positioned at an appropriate distance from the solar panels. This is to prevent potential shading effects that could reduce the panels' energy output. Therefore, while vegetation can significantly contribute to visual impact mitigation, its placement requires careful planning to balance aesthetic considerations with the operational efficiency of the solar facility.

5.5 Methodology

The following methodology was employed for the assessment:

- A comprehensive field survey was conducted to accurately document and describe the receiving environment. **Refer to Section 6.**
- The physical characteristics of the project components were described and depicted based on information provided by Savannah Environmental. **See Section 2 and Section 6 for a detailed overview.**
- The visual resource general landscape characterisation, representing the receiving environment, was mapped using data from the field survey, Google Earth imagery, and Mucina and Rutherford's (2006) reference book, *"The Vegetation of South Africa, Lesotho, and Swaziland"*. The landscape description focused on the natural features of the land rather than subjective viewer responses **(refer to Appendix A).**
- The landscape's character was evaluated and rated based on its aesthetic appeal, utilizing established research in perceptual psychology as the foundation, and its sensitivity as a landscape receptor. **See Section 6 for a detailed overview.**
- The unique and distinct sense of place in the study area was described, considering the spatial form and character of the natural landscape, as well as the cultural transformations associated with the historical and current land use. **Section 6.1.5 for a detailed overview.**
- Viewshed analysis was conducted from the proposed project site to determine visual exposure and assess the topography's capacity to absorb potential visual impacts. The analysis considered the dimensions of the proposed structures and activities. **See Sections 7.1 and 7.1.1. for a detailed overview.**
- The potential impacts of the proposed projects on the visual environment were identified and rated using **Savannah Environmental 's** significance rating criteria. **More information can be obtained in Section 8.2.**
- Recommendations were provided for mitigating the negative impacts of the proposed projects. **See Section 8.2 and 0 for a detailed overview.**

5.6 Project Phases and Activities

Activities to be undertaken during each of the phases are described in the following sections.

5.6.1 Environmental Authorization and Public Participation

The stakeholder consultation process is an essential component of this Visual Impact Assessment (VIA). Rather than conducting a separate consultation, we will integrate this process with the public participation for the environmental authorization documents. This integrated approach provides stakeholders, government authorities, and other interested parties with a 30-day period to review the VIA document and provide feedback.

All comments received during this consultation period will be carefully considered and incorporated into the final VIA report. This ensures that the assessment is comprehensive, accurate, and addresses stakeholder concerns effectively.

5.6.2 Design Phase

This phase would include the clearance of vegetation, installation of perimeter fencing and levelling of the site and preliminary earthworks. Thereafter the Project site will be marked out, a construction camp set up and the access road to the site is constructed. The clearance of vegetation is not anticipated to be site wide and will depend on the detailed layout of the proposed Project[8].

5.6.3 Construction Phase

During the construction phase of the Klipkoppie Solar PV facility project, a systematic and comprehensive approach to facility construction is followed[9], encompassing a variety of activities:

- Final design and micro-siting of infrastructure based on topographical conditions and environmental permits.
  - Vegetation clearance and construction of access roads, if required.
- Assembly and erection of infrastructure on site.
- Excavation of cable trenches.
  - Ramming or drilling of the mounting structure frames.
  - Installation of PV modules onto the frames.
  - Installation of measuring equipment.
  - Laying of cables between the module rows to the inverter stations.
  - Optional laying of gravel or aggregate from nearby quarries placed in the rows between the PV panel array for enhanced reflection onto the panels, assisting in vegetation control and drainage.
- Stringing of inverters.
- Construction of operations and maintenance buildings.
- Undertaking of rehabilitation on disturbed areas, as required.
- Testing and commissioning.

[8] During the design phase it is advisable that landowners and occupiers be engaged to ensure structures are adequately avoided
[9] Please note that the specific sequence and activities may be subject to adjustment based on the project's unique requirements and conditions.

    - Thorough testing of the solar facility to ensure proper functionality.
- Continued maintenance.
    - Ongoing maintenance activities to ensure the optimal performance of the facility.
- Removal of equipment.
    - Removal of any construction equipment that is no longer needed.

The construction phase of the proposed project is expected to span a period of 12 to 18 months. However, this timeline can be influenced by factors such as weather conditions and unforeseen challenges encountered during construction.

5.6.4 Operational Phase

The proposed Project will be operated on a 24 hour, 7 days a week basis. The operation phase of the proposed Project will comprise the following activities:

- Regular cleaning of PV modules;
- Vegetation management for optimal operation;
- Maintenance of office and operational buildings;
- Supervision of Solar PV facility operations;
- Continuous site security monitoring;
- Minimal facility servicing with on-site electrical supply;
- Water usage for sanitation, panel washing, and dust control;
- Temporary water storage, if required;
- Sanitation requirements met with municipal sewage system or alternatives; and
- Management of minimal refuse/solid waste, removed by municipality or private contractor.

5.6.5 Decommissioning Phase

The proposed Project is expected to operate for at least 25 years. Once the Solar PV facility reaches the end of its life, the facility and the grid connection infrastructure will be decommissioned or continue to operate following the issuance of a new Power Purchase Agreement (PPA) by Eskom. If decommissioned, all components will be removed, and the site rehabilitated. Where possible all materials will be recycled, otherwise they will be disposed of in accordance with local regulations and international best practice.

6 Baseline Environmental Profile

6.1 Character and Nature of Environment

The proposed Klipkoppie Solar PV facility and associated infrastructure is strategically situated south-east of Malmesbury, within the jurisdictions of the Swartland Local Municipality, under the larger West Coast District Municipality in the Western Cape Province.

This region is currently experiencing a significant demand for electricity and grid enhancements, a need that is further amplified by Western Cape's abundant solar resource availability. This presents a prime opportunity for the development and operation of solar renewable projects.

Moreover, the region is in dire need of job creation, further underscoring the importance of such projects. Therefore, the implementation of the proposed solar facilities is not only beneficial but also necessary for the area's socio-economic development and energy sustainability.

6.1.1 Climate Conditions

Malmesbury is situated in the Fynbos region, is characterized by a Mediterranean climate, distinct for its wet winters and dry summers. The climate profile significantly influences the character and nature of the local environment with distinct seasons:

Summer: The summer months in Malmesbury are typically dry and warm, with temperatures reaching an average high of around 30°C. Unlike many other regions in South Africa, the area experiences minimal rainfall during these months, contributing to the dry conditions prevalent in the summer.

Winter: Winters in Malmesbury are marked by moderate to heavy rainfall, with the region receiving the majority of its annual precipitation during this season. Temperatures in winter can be relatively cool, with average lows dipping to about 7°C. The coldest months are usually between June and August, with occasional frost occurrences.

The region's vegetation is influenced by its climate, with the Swartland Shale Renosterveld and Swartland Granite Renosterveld being the predominant types. These vegetation types are adapted to the winter rainfall pattern and dry summer conditions. The area's topography, coupled with its climate, creates a unique environment that supports a diverse range of flora and fauna. Malmesbury's altitude, which ranges from 100 to 300 meters above sea level, further influences its climatic conditions. The vegetation type is marked by a mean annual precipitation of 34.3mm and mean monthly maximum and minimum temperatures of approximately 23.59°C and 10.61°C for February and July, respectively.

The closest weather station to the project site provides data that aligns with these general climatic patterns. The area's evaporation levels are notably less than the inland Highveld regions, with a mean annual evaporation rate lower than areas with a summer rainfall climate. Malmesbury receives an average of 34.3 mm rainfall per annum. The region's evaporation levels are notable, with a mean annual evaporation of approximately 1400 – 1600 mm per annum. Furthermore, southerly winds are dominant in the Malmesbury area.

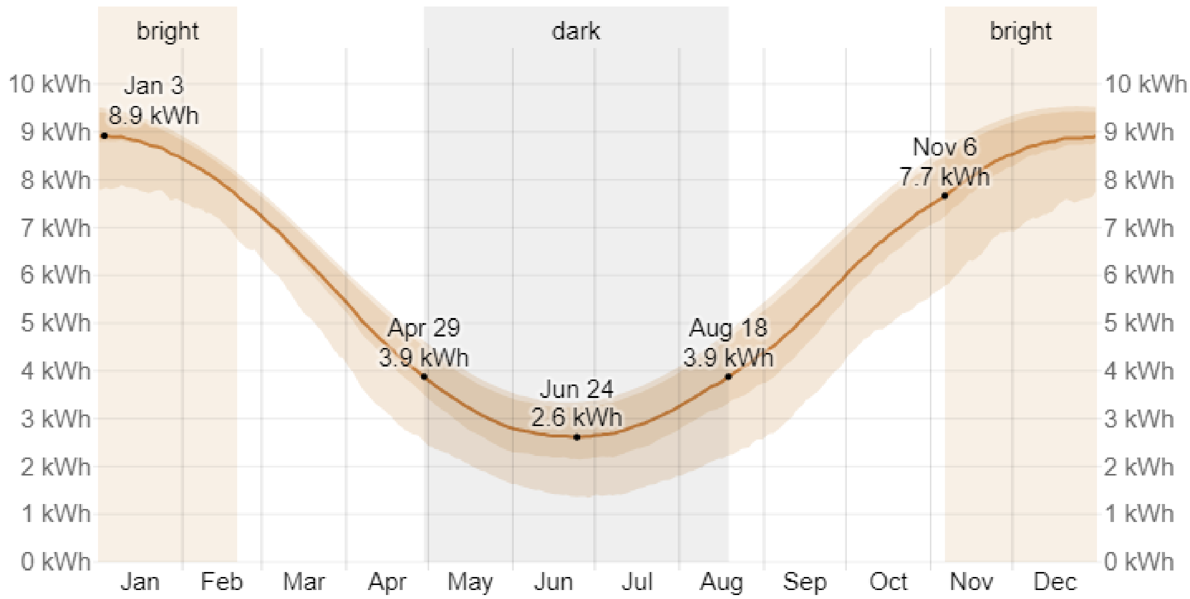

Figure 7: Average Daily Shortwave Solar Energy per square meter (kWh/m²) for the Malmesbury Area.

6.1.2 Topography and Landscape

The Klipkoppie site, situated near Malmesbury, is embedded within the Renosterveld region. This site is characterized by its gently rolling topography, revealing a landscape that undulates subtly across the project area. The development area exhibits varying elevations, with heights peaking at 217,62m to the south, descending to 172,52m towards the centre, and descending to 114,3m in the south. This gradient is indicative of a natural, gentle slope that could influence the visual impact of the proposed solar arrays, potentially offering natural screening from certain viewpoints. The average slope in this direction maintains a modest 6.69%, allowing for a relatively uniform visual presentation of the solar facility across the horizon.

Conversely, the West-East elevation profile presents a more dramatic slope, descending sharply from an initial elevation of 196.50 meters to 146.20 meters. This drop represents a significant change in elevation over a shorter distance, with the maximum slope reaching a steep 35.79%. This topographical variation provides a diverse visual context, with the steeper slopes offering a contrast to the flatter northern sections. The presence of this steeper terrain could serve as a natural backdrop to the development, potentially minimizing the visual impact when viewed from the east and enhancing the facility's integration into the landscape.

Historical imagery from Google Earth unveils that a significant portion of this land has previously been under cultivation. Some areas, having been left fallow for extended periods, have witnessed the intrusion of secondary bushveld vegetation into what was once grassland territory. This region predominantly falls under the Granite Renosterveld vegetation type, characterized by shrubland and heathland vegetation.

The overarching landscape character is a blend of rural and urban elements, with the latter influenced by the proximate town of Malmesbury. This town exhibits typical small-town and township architectural styles. Interspersed within this landscape are a few farmsteads, indicative of active agricultural practices. The landscape's human-made features are further accentuated by an OHL running directly through the development area (Klipfontein/Malmesbury 1 132Kv OHL) running north past Malmesbury and the Klipfontein Substation. While the site predominantly showcases open grasslands, it bears the marks of various anthropogenic activities and structures, including wheat fields, Eskom infrastructure, and evidence of human utilization such as litter, actively used roads, and fencing. These elements indicate not only the presence of agricultural and utility infrastructure but also the active interaction of people with the landscape, as evidenced by the litter scattered across the fence line.

The elevation profiles below illustrate the fluctuating topography of the area.

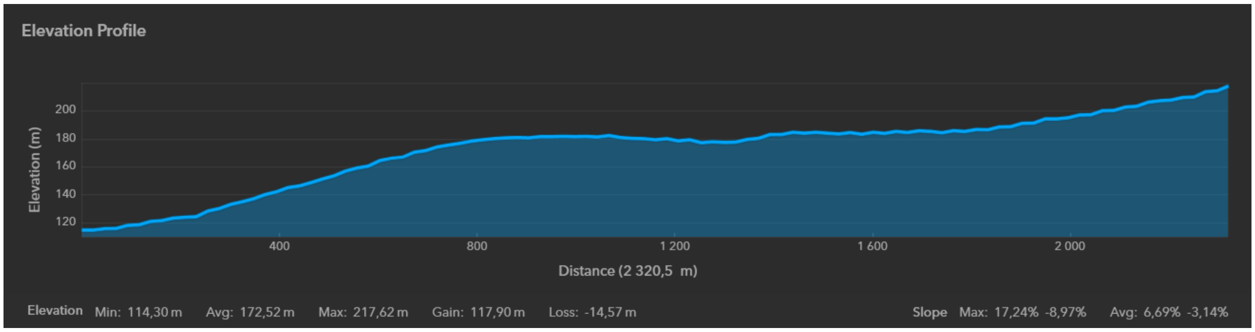

Figure 8: North to South Elevation Profile (captured from the site's midpoint)

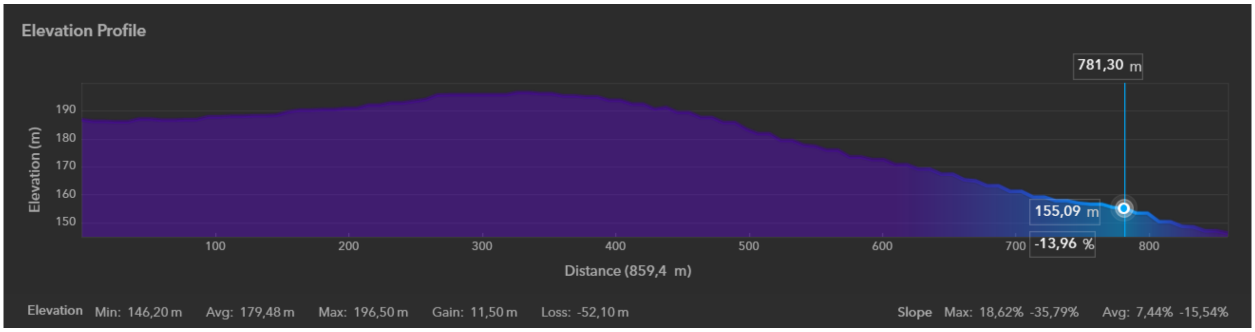

Figure 9: West to East Elevation Profile (captured from the site's midpoint)

The Klipkoppie site, earmarked for the proposed Solar PV facility, presents a unique juxtaposition of inherent landscape characteristics and evident anthropogenic degradation. Both elevation profiles collectively define a landscape that is not uniformly flat but instead offers a mix of gradients and elevations. The project's integration into this variegated terrain will require careful planning to ensure that the solar PV arrays are sited in a manner that respects the natural contours of the land, optimizing the visual absorption of the technology within the existing topographical framework. The ability of the landscape to provide natural screening and the careful siting of infrastructure will be key to minimizing visual impacts and preserving the inherent visual quality of the Klipkoppie area.

In conclusion, the introduction of the Solar PV facility at the Klipkoppie site represents a strategic opportunity to not only harness sustainable energy but also to ameliorate existing visual degradation. Through meticulous planning and design, the facility can serve as a catalyst for visual and environmental rejuvenation, enhancing the overall visual quality and sustainability of the Klipkoppie site.

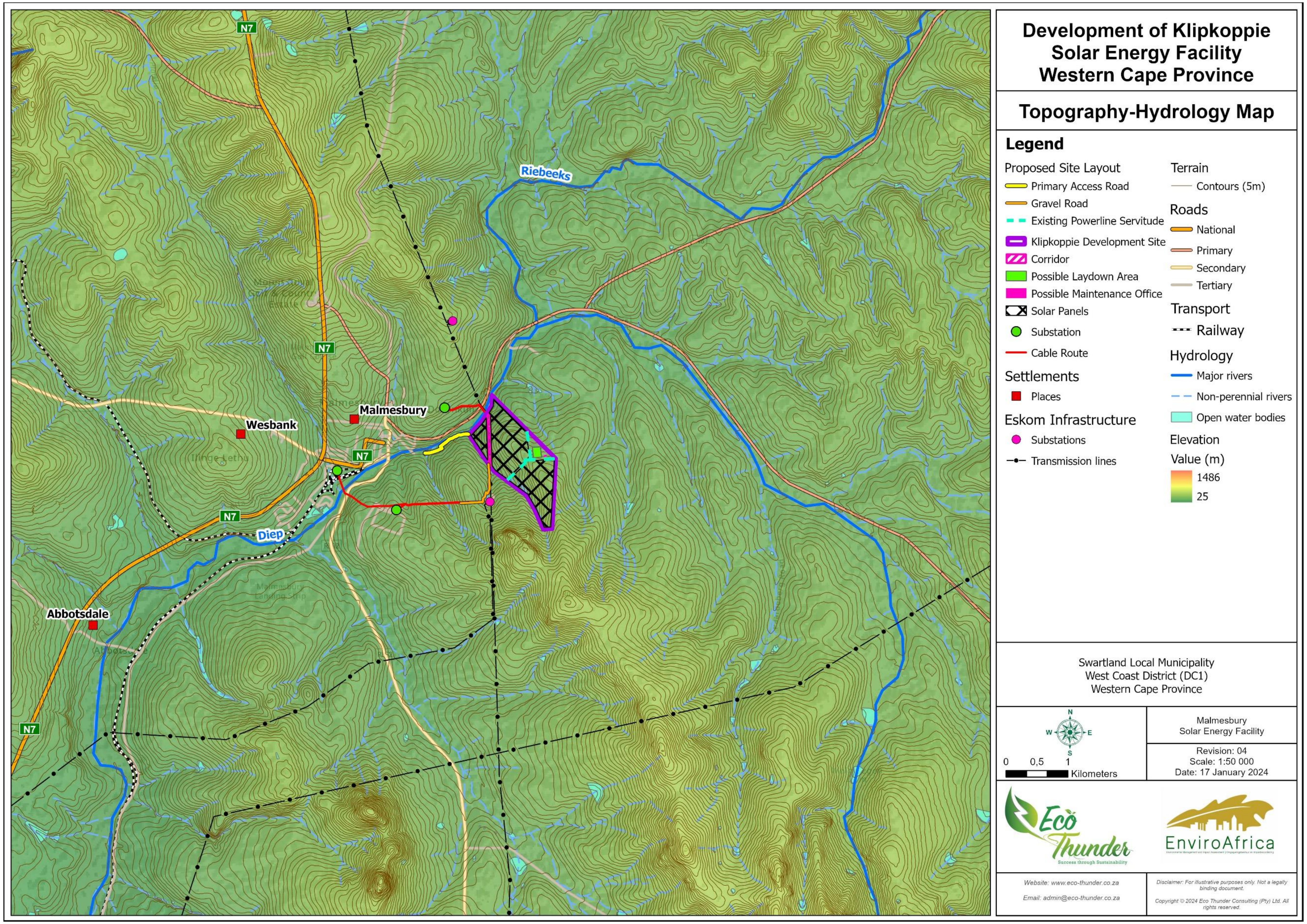

Figure 10: Map of Topographical Profile of the Site

6.1.3 Natural Landscapes

The landscape encompassing the Klipkoppie Solar PV Facility project is a mosaic of natural terrain shaped by its agrarian legacy and the distinctive climatic influences of the Western Cape. The topsoil in the area, subject to the seasonal rhythms of the Mediterranean climate, supports a variety of hardy, indigenous vegetation adapted to the winter-wet, summer-dry patterns. The soils, varying in depth and fertility, are characteristic of the Swartland region, historically cultivated for wheat, supporting both rainfed agriculture and pastureland.

Geologically, the project area is defined by a combination of Table Mountain sandstone and Malmesbury Group shales, imparting resilience and diversity to the landscape. This geological diversity underpins the region's agricultural productivity and contributes to the distinctive rolling hills that typify the area.

Hydrologically, the proposed development area's northern border intersects the Diep River, and includes smaller watercourses that are vital during the rainy season. These intermittent streams and the natural retention of water in the soil contribute to the verdant character of the local vegetation during the wet months, creating a visually appealing patchwork of greenery against the backdrop of more arid surroundings.

Ecologically, the site sits within a Fynbos biome, a unique and biodiversity-rich landscape endemic to the Western Cape. This biome is composed of shrubland and heathland vegetation, renowned for its ecological importance and spectacular floral diversity. While the fynbos is not as extensive within the immediate vicinity of the proposed development, the natural landscape still offers a rich tapestry of indigenous flora, with the potential for restoration and enhancement through careful management.

In terms of visual characteristics, the Klipkoppie area presents a diverse landscape. This diversity is evident in the transition from cultivated fields to the indigenous fynbos vegetation. The visual quality of the landscape is characterized by the seasonal variations in vegetation color, which are indicative of the region's specific climatic conditions.

As the proposed site for the Klipkoppie Solar PV Facility, this landscape presents both opportunities and responsibilities. The development must be conscientiously integrated to preserve the visual integrity and ecological function of the region, maintaining the balance between energy generation and natural beauty. This synergy will ensure that the project not only contributes to the region's renewable energy capacity but also respects and enhances the inherent character of the Western Cape's natural landscapes.

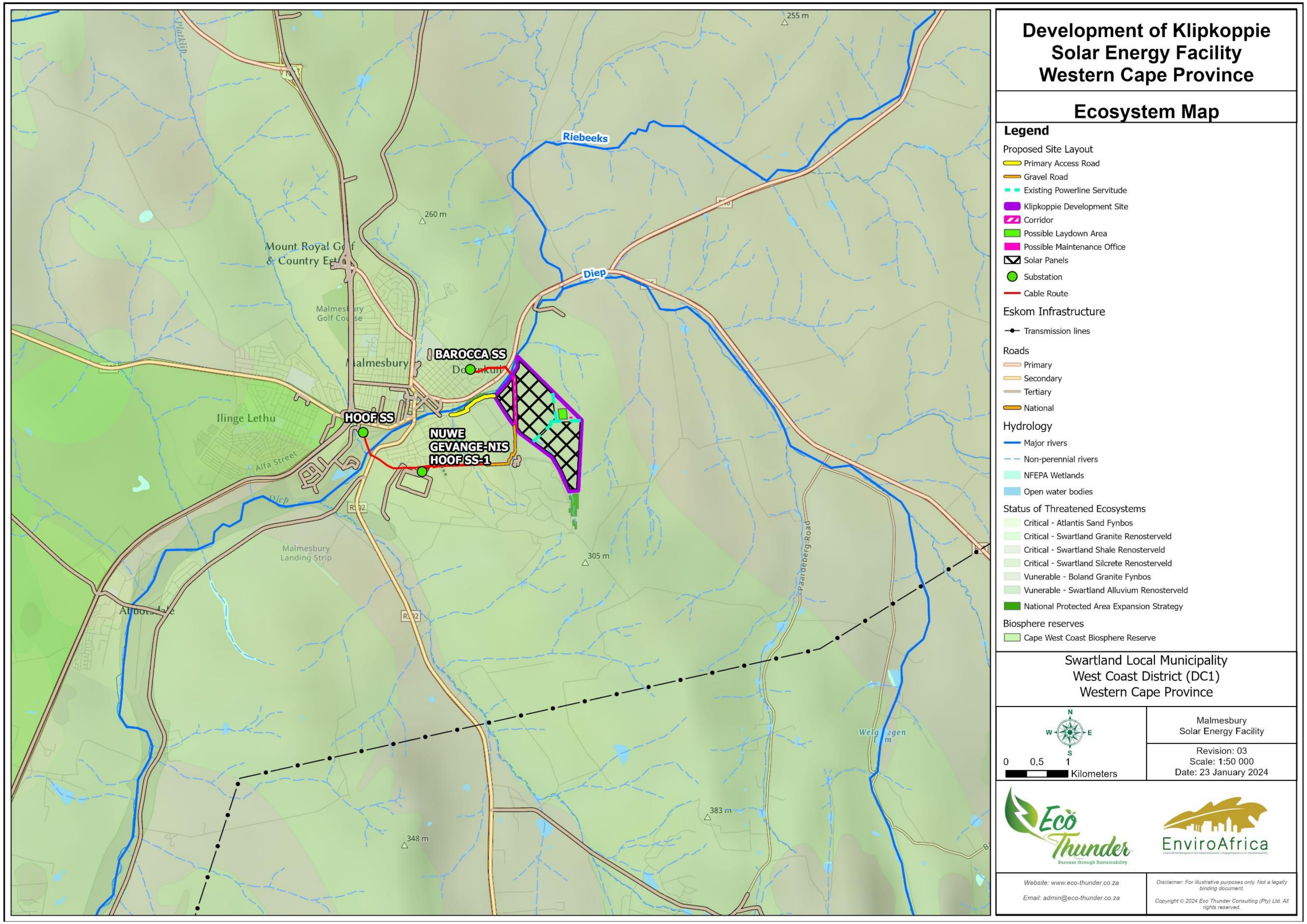

Figure 11: Protected Ecosystems Map

Photograph 1: Existing Medium Voltage OHLs surrounding the Klipkoppie Solar PV facility Development Area

Photograph 2: Vegetation Profile within the Klipkoppie Solar PV facility Development Area

Photograph 3: Agriculture infrastructure within the KlipkoppieSolar PV facility Development Area

Photograph 4: Scenic View within the Klipkoppie Solar PV facility Development Area

Photograph 5: Roads within the Klipkoppie Solar PV facility Development Area

Photograph 6: Residential Area near the Klipkoppie Solar PV facility Development Area

Photograph 7: Road and Infrastructure near the Klipkoppie Solar PV facility Development Area

Photograph 8: Residential Infrastructure near the Klipkoppie Solar PV facility Development Area

6.1.4 Cultural and Tourism Resource

The Klipkoppie site, while not a primary tourist attraction, is imbued with a rich tapestry of cultural heritage and historical significance. The landscape bears witness to the Swartland's agricultural roots, with Malmesbury itself being a hub for wheat and wine production, indicative of the Western Cape's farming culture. Historical wine estates and rustic architecture dot the landscape, reflecting the region's colonial and post-colonial agrarian history.

Game lodges and nature reserves such as Cape West Coast Biosphere Reserve, approximately 2,5km west and the Klipkoppie Nature Reserve, less than 1km west of the proposed development area However, the predominant character of the area is shaped by agricultural activities. The Klipkoppie Nature Reserve harbors a range of flora species categorised as threatened, including Eucalyptus cladocalyx (Sugar Gum), Lampranthus filicaulis (Threadleaf Brightfig), and Arctopus dregei (Ridged Bearpaw), among others[10].

Malmesbury and the greater Swartland area are also recognized for their contribution to South Africa’s natural and cultural tourism through vineyards and local festivals that celebrate the unique heritage and bounty of the region.

While the immediate vicinity of the solar project does not contain nationally recognized monuments or archaeological sites, the broader region holds significant historical value. The town of Malmesbury, established in the 17th century, is one of the oldest in the Republic of South Africa and boasts a number of heritage sites and buildings. Its cultural landscape is marked by the synthesis of Khoi and Dutch influences, visible in the town's layout, historical structures, and the enduring practice of traditional farming techniques.

Further enhancing the cultural depth of the area are the annual local festivals that celebrate the agricultural heritage and offer an immersive experience into the Swartland's community spirit and traditions. These events not only draw visitors but also serve as a reminder of the region’s living history and the importance of sustainable development practices that respect the cultural fabric.

In light of the rich cultural context, the integration of the Klipkoppie Solar PV Facility into this environment demands a sensitive approach to preserve the historical and cultural narrative of the region. While the development itself may not directly promote tourism, it resides within a context that values the preservation of its cultural resources. The project offers a chance to explore the integration of renewable energy within the cultural and historical context of the region, potentially contributing to the Western Cape's ongoing narrative of innovation and sustainability.

6.1.5 Land Management

The land use in Malmesbury, Western Cape, reflects a combination of urban development, industrial zones, agricultural areas, and natural landscapes.

[10] Source: https://www.inaturalist.org/places/klipkoppie-nature-reserve

6.1.5.1 Land Use

Malmesbury, a town with a rich agrarian heritage, epitomizes the diverse land use patterns that characterize the Swartland region of the Western Cape. The town is a confluence of urban expansion, industrial development, robust agricultural practices, and preserved natural environments.

The proposed site for the Klipkoppie Solar PV Facility project is emblematic of this mixed land use. Currently earmarked as commonage land owned by the municipality, the project area is representative of the transition between human activity and natural landscapes. The vicinity is a patchwork where cultivated fields give way to expanses of natural fynbos, indicative of the Western Cape's unique biodiversity.

Agricultural activities, particularly wheat cultivation, are prevalent and reflect the historical use of the land which has been shaped by the Mediterranean climate of the region. This agricultural landscape is interspersed with infrastructure that supports both the local community and the broader region. The presence of such infrastructure illustrates the area’s evolving role in meeting the contemporary needs of the Western Cape.

The proximity of the project to urban development introduces a residential component to the land use dynamic. The visual impact of the proposed solar facility on the local community is therefore a key consideration, given the direct implications for the residents in terms of both visual amenity and the utility of the land.

Despite the ongoing development, the area maintains a distinctly rural atmosphere. The introduction of a solar facility is expected to contribute to the visual diversity of the landscape. The physical infrastructure associated with solar facilities, such as service buildings, access roads, and security fencing, will introduce new visual elements. However, the natural undulations of the topography and the presence of existing structures provide opportunities for visual assimilation, facilitating the integration of the solar facility into the existing landscape fabric.

Mitigation of visual impacts will be paramount, requiring strategic land management planning. The implementation of design techniques such as the selection of low-reflectivity panels and the incorporation of natural landscape screening can significantly reduce the visual presence of the solar facility. Through such measures, the Klipkoppie Solar PV Facility can achieve a seamless visual integration with the Swartland's mosaic of land uses, ensuring the project enhances the local character while contributing to the region's sustainable energy goals.

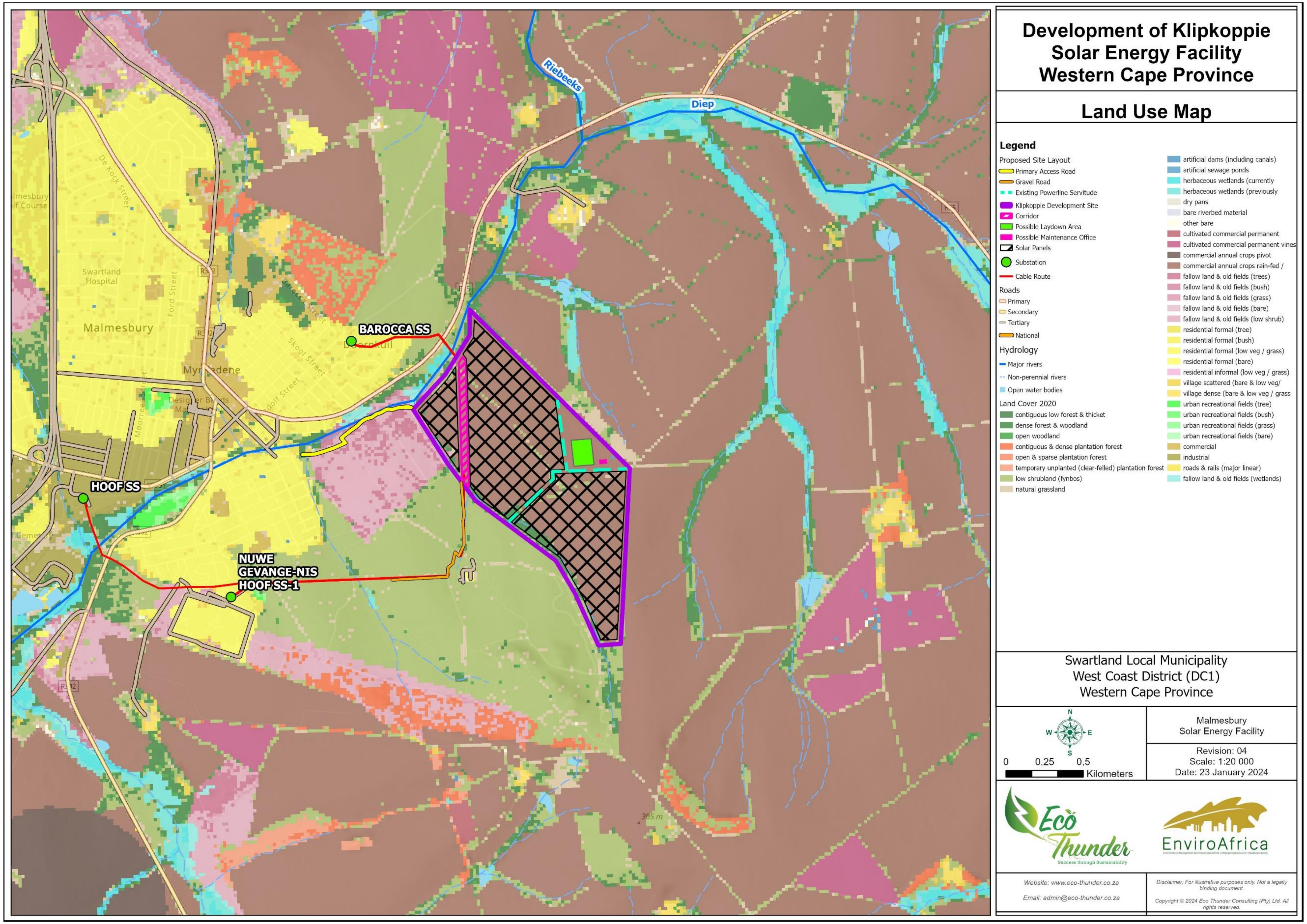

Figure 12: Land Use Map

6.1.5.2 Agricultural Land Use

In the Swartland area of the Western Cape, where Malmesbury is a key locality, agricultural land use is deeply rooted in the identity and economy of the region. Recognized as 'Wheat Country', the surrounding fields of wheat stand as a testament to the region's status as a breadbasket, integral to both local sustenance and the broader South African agricultural output. This extensive cultivation of wheat, along with the production of other crops such as canola and the renowned Swartland olives, underscores the significance of the area as an agricultural stronghold.

The patchwork of farmlands around Malmesbury tells the story of a rich agrarian legacy, with current practices interwoven with traces of historical land use. Even as some plots have been left fallow and nature has begun to reclaim them, the contours and furrows remain as markers of the land's productive past.

Livestock farming also features prominently in the region's agricultural profile. The pastures and fields surrounding the town are dotted with herds of sheep and cattle, evidence of a flourishing livestock sector that complements the arable farming. This diversification of agricultural land use lends a dynamic character to the landscape, contributing to its visual and economic richness.

From the perspective of visual impact assessment, the agricultural lands present a complex canvas. The wheat fields and pastoral vignettes of livestock grazing paint a distinctive scenic quality of the Swartland. The aesthetic and productive qualities of these landscapes necessitate careful consideration in the siting and design of new developments, such as the proposed Solar PV facility. Ensuring that the visual integrity and continuity of these agricultural vistas are preserved is as crucial as safeguarding the functionality of the land. The Klipkoppie project, therefore, calls for a harmonious design approach that not only respects but also potentially enhances the agricultural mosaic of the Swartland.

While developments such as solar facilities bring change, they can also coexist with agricultural land use, offering opportunities for dual land usage and contributing to the sustainability of the region. The integration of renewable energy infrastructure within this agricultural context must be executed with precision to maintain the delicate balance between progress and preservation, ensuring that the visual and productive character of Malmesbury's landscape continues to thrive.

6.1.5.3 Housing/farming Land Use

The agricultural landscape surrounding the Klipkoppie Solar PV Facility is punctuated by the presence of farmsteads, which evidence the longstanding farming tradition in the region. These homesteads, often coupled with expanses of cultivated fields, underscore the land's primary use for agriculture, viticulture, and pastoral farming. The surrounding farmland, characterized by wheat cultivation and viticulture, is a cornerstone of the local economy and plays a pivotal role in shaping the visual landscape of the Swartland area.

In terms of residential land use, the town of Malmesbury itself provides a residential backdrop to the agricultural foreground. As the largest town in the Swartland, it is a hub of socio-cultural activity, blending residential, commercial, and industrial zones. This residential presence contributes to the human dimension of the area and brings a unique visual element to the predominantly natural and agricultural scenery.

The interaction between the residential structures of Malmesbury and the surrounding farmland creates a visually diverse tapestry, marked by the contrast between the orderly rows of vineyards and the varied architecture of the town. The future development of the solar facility must consider its visual impact on both these rural homesteads and the urban edge of Malmesbury. Strategies to mitigate visual intrusion include thoughtful site layout, architectural designs that reflect the rural aesthetic, and natural vegetation buffers that help to integrate the facility into the existing landscape.

By acknowledging the existing land use patterns and their contribution to the visual environment, the Klipkoppie Solar PV Facility project can be developed with a sensitivity that respects both the functional and aesthetic aspects of the region. The goal is to harmonize the new development with the established visual character, ensuring that the facility supports the region's visual identity while contributing to its economic and energy sustainability.

Photograph 9: Existing Substation near the Klipkoppie Solar PV facility Development Area

Photograph 10: Existing OHLs within the Klipkoppie Solar PV facility Development Area

Photograph 11: Nature Reserve located directly west of the Klipkoppie Solar PV facility Development Area

Photograph 12: Accommodation near the Klipkoppie Solar PV facility Development Area

6.1.5.4 Natural and Conservation Areas

The proposed site for the Klipkoppie Solar PV Facility is located within close proximity to several notable conservation areas, underscoring the ecological value and sensitivity of the region. Notably, the Cape West Coast Biosphere Reserve, a designated Conservation Area (CA), is situated approximately 2.4km to the west of the proposed development. This reserve includes the Riverlands Nature Reserve, the Niewepost Conservation Area, Klein Dassenberg Nature Reserve, and the Pela Nature Reserve, which collectively contribute to the conservation of the area's unique biodiversity and ecological processes.

The Klipkoppie Nature Reserve, situated less than 1 km to the west, serves as a habitat for environmental preservation and biodiversity conservation. This reserve is a sanctuary for various species, many of which are of conservation concern. These include the Sugar Gum (Eucalyptus cladocalyx), Threadleaf Brightfig (Lampranthus filicaulis), Cape Cowslip (Lachenalia aloides), and the Ridged Bearpaw (Arctopus dregei), among others[11]. Each species contributes to the regional flora, with several being captured and documented by conservationists and photographers like Dean Nicolle, Carina Lochner, Brian du Preez, and Nick Helme, whose work under Creative Commons licenses helps to raise awareness of these natural assets. The presence of these species must be verified, and any recommendations should be given by the Ecologist. It is essential that the development acknowledges and respects this delicate ecological balance, ensuring that any visual and environmental impacts are carefully considered and mitigated to preserve the integrity of this natural and conservation area.

Furthermore, Driehoekpad, a cherished local hiking area, lies just north of the development site, reinforcing the importance of natural landscapes for both ecological integrity and community recreation.

Given the proximity of these protected areas and recreational spaces, the Klipkoppie project carries the responsibility to ensure that development activities are conscientiously managed to preserve the natural heritage of the region. The presence of sensitive landscapes, such as the ecological corridors that connect these reserves, as well as any streams and wetlands within or adjacent to the project area, requires meticulous planning and the implementation of robust environmental safeguards.

To minimise potential impacts on these natural and conservation areas, the project will incorporate recommended buffers and adhere to mitigation strategies as advised by environmental specialists. Measures may include the establishment of exclusion zones, the careful routing of access roads, and the strategic placement of infrastructure to avoid ecological disturbance.

By aligning development practices with the highest standards of environmental care, the Klipkoppie Solar PV Facility can coexist with the surrounding natural and conservation areas. Through such measures, the project not only upholds the integrity of these vital ecological spaces

[11] Source: https://www.inaturalist.org/places/klipkoppie-nature-reserve

but also contributes positively to the region's reputation as a custodian of natural beauty and biodiversity.

6.1.5.5 Roads

Malmesbury is well-served by an extensive network of roads that accommodate a mix of local, agricultural, and through traffic, reflecting its role as a central hub in the Swartland region. The R45, a major regional route, lies just to the north of the proposed solar facility, functioning as a critical artery for the movement of agricultural products and as a connector between Malmesbury and surrounding towns.

Within close proximity to the project site, local roads such as Smuts Street extend from the urban centre of Malmesbury, providing vital links to the agricultural hinterland. These roads, while less travelled than the regional routes, are essential for local access and will likely serve as one of the nearest viewpoints to the solar facility.

Furthermore, the N7 national road, which is situated further to the east, is a key route for regional and national transit. It connects the northern parts of the Western Cape to the metropolitan area of Cape Town and serves as a major commercial and tourism thoroughfare. Its strategic position ensures that it will act as a significant vantage point for the Klipkoppie Solar PV Facility, particularly for travellers moving to and from the Cape Town area.

The network of roads around the solar facility provides a variety of viewing opportunities, with the potential for both distant and near-field visual experiences. The juxtaposition of arterial highways and pastoral access roads offers a spectrum of perspectives on the landscape, highlighting the need for careful planning in the positioning of the solar facility.

As indicated by the site development plans, the design of the Klipkoppie project is cognizant of its proximity to existing roadways. To preserve the visual quality of the area and maintain a buffer from traffic, it is recommended that the solar facility's components be set back from the road reserves. This setback area may also be enhanced with landscaping or natural vegetation to create a soft transition between the development and the public realm.

Internal roads and service tracks for the facility will be designed to minimize environmental impact, utilizing existing farm roads wherever feasible to reduce the need for new construction. Careful routing and siting of these internal roads will take into account the recommendations of environmental specialists, ensuring compatibility with ecological and aesthetic considerations. By integrating these guidelines into the facility's layout, the project aims to maintain the rural character of the Malmesbury area and ensure that the development complements the existing landscape.

Photograph 13: Klipkoppie Solar PV facility Road View 1

Photograph 14: Klipkoppie Solar PV facility Road View 2

Photograph 15: Klipkoppie Solar PV facility Road View 3

Photograph 16: Klipkoppie Solar PV facility Road View 4

Photograph 17: Klipkoppie Solar PV facility Road View 5

Photograph 18: Klipkoppie Solar PV facility Road View 6

Photograph 19: Klipkoppie Solar PV facility Road View 7

Photograph 20: Klipkoppie Solar PV facility Road View 8

6.2 Visual Resource

6.2.1 Visual Receptors

Visual receptors, also known as viewer groups, are individuals or groups of individuals who have the potential to view or perceive the proposed development. The identification of visual receptors is a crucial step in the visual impact assessment process as it helps to understand who will be affected by the visual changes brought about by the project. Visual receptors that have been identified can be assessed in terms of ''beneficiaries and losers[12]'', resulting from the proposed development.

Beneficiaries may include the following:

- Residents or users of a project, such as a resort in a scenic area;
- Individuals or communities who will benefit from infrastructure development, such as power lines or communication masts provided for an area;
- Poor or unemployed individuals who will benefit from economic-type development and related job opportunities.

Losers may include the following:

- National parks, nature reserves, and other protected or pristine areas that rely on a wilderness experience for their visitors;
- Individuals and organizations who depend on scenic and recreation resources for their livelihood;
- Property owners who may rely on uninterrupted views and the absence of visual intrusions.

This comprehensive identification of visual receptors ensures that the assessment considers both the positive and negative visual impacts of the proposed development, taking into account the specific needs and concerns of various stakeholders. For the Klipkoppie Solar PV facility project, a general recommendation is made to utilize vegetation screening, landscaping techniques, vegetation covers, or barriers, where applicable, to mitigate the visual impact on highly sensitive receptors, specifically those living in close proximity but not on the affected property.

The proposed Klipkoppie Solar PV Facility, being a municipal initiative, does not involve direct ownership of surrounding homes or structures. However, it's important to acknowledge that the relationship and opinions of local residents towards the municipal authority could influence their perception of the project. Therefore, it is vital that the community be thoroughly enegaged throughout the public participation process.

[12] Landowners (those who financial benefit) who have agreed to leasing their land for this development are seen as Beneficiaries and therefore assessed at a lower impact class. Residents, neighbours, tourists, and settlers are identified as losers.

- **Local Residents:** This includes residents of the nearby settlements such as Malmesbury, and surrounding. These residents could potentially view the project from their homes or while moving around their communities.
- **Road Users:** This group includes individuals traveling on the local road network, particularly Smuts Street, which provides access to several of the nearby settlements. Road users could potentially view the project while commuting or traveling for other purposes.
- **Farmers and Agricultural Workers:** Given the agricultural land use in the surrounding area, farmers and agricultural workers are likely to be visual receptors. They could potentially view the project while working on their lands or moving between different agricultural plots.

Each of these visual receptors will have a different level of sensitivity to changes in the visual environment, depending on factors such as their location, the frequency and duration of their views, and their personal or cultural values.

6.2.2 DFFE Screening Tool Results

The Department of Forestry, Fisheries and the Environment (DFFE) Screening Tool is a critical instrument used in South Africa to assess the potential environmental impact of proposed developments. It incorporates a variety of environmental themes, including biodiversity, protected areas, water, air quality, heritage, and landscape, among others. Each theme is associated with a set of datasets that provide detailed information on the environmental sensitivities related to that theme. The tool uses these datasets to generate a sensitivity rating for each theme at a given location.

For the Klipkoppie Solar PV facility project, the DFFE Screening Tool identified a Landscape (Solar PV) Theme of **VERY HIGH**. This rating suggests that the proposed development site and its surroundings have significant landscape sensitivities that could potentially be affected by a solar PV development.

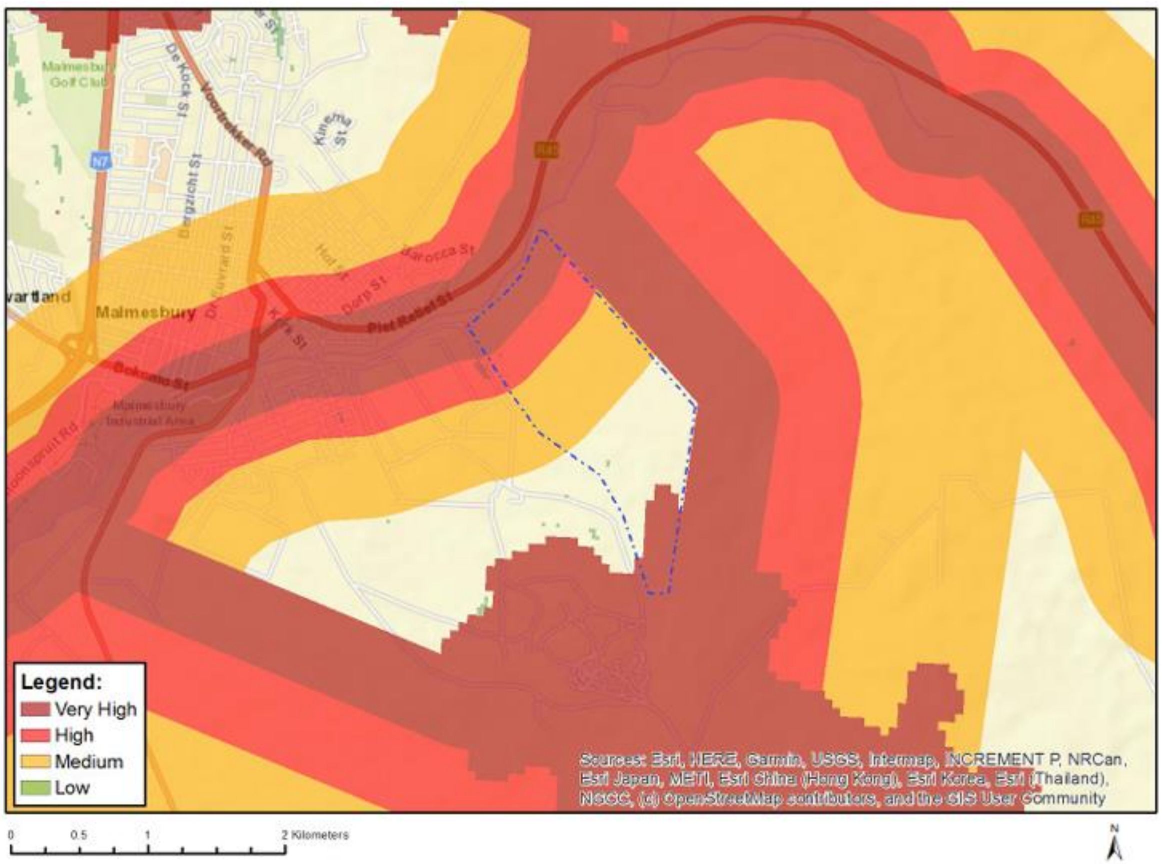

Figure 13: DFFE Screening Tool Identification

The features and their corresponding sensitivity levels, as per the DFFE Screening Tool, are as follows:

- Between 500 and 1000 m of a town or village: High sensitivity
  - The site visit did confirm the presence of Malmesbury within 1km of the proposed development, however, due to the presence of infrastructure and development with the peri-urban environment, the PV facility will most likely be seen as compatible with the surrounding land uses.
- Within 250 and 500 m of a river: Very High to High sensitivity
  - The site visit confirmed the direct presence of the Diep River on the northern border of the proposed development area.
- Areas within 1000 m of a wetland: Medium sensitivity
  - The site is in close proximity to a wetland. Sensitivity to be confirmed by an aquatic specialist.

However, despite the initial classifications, the site verification visit suggests a reduction in the overall sensitivity rating for the proposed Klipkoppie project site. This reduction is motivated by several factors:

- Visual Absorption Capacity (VAC): The site's VAC, which refers to its ability to visually absorb changes without significant alteration to its visual character, is considered moderate. This is due to the site's topography and the existing development and degradation in the surrounding area. The presence of peri-urban settlements, housing structures and linear infrastructure, across the R45 combined with the, and agricultural developments introduce a degree of visual intrusion into the landscape. Although the majority of the area is largely rural, some anthropocentric developments are present. Therefore, the addition of the proposed structures would not represent a significant alteration to the existing visual character of the area.
- Lack of unique visual resources: The site does not contain any unique or irreplaceable visual resources that would be adversely affected by the proposed development. The main anticipated impact relates to the visual intrusion on receptors in the surrounding area, which can be mitigated throughout the life cycle of the development.
- Scenic value and vegetation: The area proposed for development does not have high scenic value, and there are limited tourism or recreational facilities in close proximity. In areas where the site has remained largely natural, the vegetation consists mainly of short grasslands with scattered trees, which can contribute to the visual screening of the facility.
- Considering the site's VAC, lack of unique visual resources, and the presence of existing man-made elements, a rating of Moderate was assigned to the site based on the site visit findings. This rating suggests that a visual impact assessment is recommended to ensure that the proposed development is appropriately managed to minimize visual impacts.

The site visit conducted for the Klipkoppie Solar PV facility project revealed a rural landscape that was noticeably impacted by anthropocentric activities. Prominent features such as high and medium voltage overhead lines, the Malmesbury Substation indicate industrial influence. Therefore, the comparison between the DFFE Screening Tool's rating and the site visit's findings suggests that the landscape sensitivity is not **Very High** and should be adjusted to **High**, additionally the visual impact of the proposed solar installations could potentially be mitigated by the existing land uses and features.

The visual impact assessment of the Klipkoppie Solar PV facility development will be further evaluated in Section 8, taking into account factors such as topography, visual resources, visual receptors, sense of place, and the scope of work proposed for the site.

6.2.3 Visual Absorption Capacity

The landscape around the proposed Klipkoppie site is characterized by its agricultural context, interspersed with natural fynbos vegetation and impacted by existing human-made structures. The presence of agricultural land, primarily used for wheat farming, provides a backdrop of open fields, which contributes to the visual openness of the area. However, this openness is counter-balanced by the presence of existing vegetation and infrastructure such as the Malmesbury Substation and medium voltage overhead lines, indicating a landscape already accustomed to industrial elements.

Despite these interventions, the area retains a largely rural character, marked by the dominance of natural vegetation and undulating topography. The existing landscape features, such as the small hillocks and scattered trees, provide natural screening and help in blending any new development into the surroundings. The rural setting of the area, coupled with the existing infrastructural elements, suggests a moderate VAC, implying that the landscape can absorb additional development without significant alterations to its overall character.

The proximity of human settlements, particularly the town of Malmesbury, adds a residential perspective to the landscape. The visual impact from these populated areas will vary, offering different viewpoints ranging from more immediate, closer views to broader, panoramic perspectives. The diverse viewpoints necessitate a sensitive approach to the placement and design of the solar facility to ensure minimal visual intrusion.

In summary, the VAC of the landscape surrounding the Klipkoppie Solar PV Facility is considered moderate. The existing blend of natural and disturbed landscapes indicates that the area can accommodate the proposed development, provided it is executed with careful consideration for the existing visual character. The project should be designed to harmonize with the existing landscape, utilizing natural topographical features for screening, and aligning with the prevalent rural and agricultural aesthetic. The goal is to ensure that the solar facility integrates seamlessly into the landscape, maintaining the visual integrity of the region while contributing to its sustainable energy goals.

7 Identification of Visual Impacts

The Visual Impact Assessment (VIA) forms a crucial part of the Environmental Impact Assessment for the proposed Klipkoppie Solar PV facility Development project. This assessment entails a meticulous evaluation of various criteria including visual intrusion, visibility, visual exposure, and viewer sensitivity. These factors collectively determine the intensity of potential visual impacts. Once the intensity is ascertained, it is further refined by considering spatial, temporal, and probability criteria to establish the overall significance of the visual impact.

This visual environment is a significant resource that contributes to the quality of life, sense of place, and cultural identity of local communities. Consequently, any alterations to the visual environment as a result of the proposed development necessitate careful assessment and management[13]

[13] *In this assessment, we adopt a worst-case scenario approach, assuming simultaneous construction of the PV facilities and grid connection infrastructure. Given their close proximity, these components are likely to be observed within the same visual range from sensitive viewing areas, albeit to varying degrees.*

7.1 The Viewshed

The viewshed analysis conducted for the Klipkoppie Solar PV Facility presents a meticulous evaluation of the visual exposure of the proposed development within the surrounding landscape. This analysis is rooted in a quantitative assessment of the visual range, considering various factors, including, the local topography, the density and height of existing vegetation, the presence of built structures, and the specific design elements of the solar facility itself.

Within the diverse ecosystem of the Klipkoppie project area, the community's connection to the landscape is multifaceted, reflecting a spectrum of visual preferences and historical ties to the land. The introduction of the solar facility is anticipated to introduce new visual elements, thereby modifying the existing views and potentially affecting the visual landscape to various extents.

Error! Reference source not found. reveals a gradient of visibility zones, indicating a landscape characterized by medium sensitivity, largely attributed to the pre-existing human influence and alterations in the region. While the absence of prominent ridges or distinctive topographical features suggests a generally homogenous visual field, the rolling contours of the land coupled with pockets of vegetation could serve as partial visual buffers, potentially diminishing the visual prominence of the solar installation. To the project area's west, Malmesbury offers a pastoral charm interspersed with residential development. Its inhabitants, alongside those engaged in agricultural pursuits, occupy the 'High' to 'Very High' visibility zones, suggesting a more substantial visual impact due to their closer proximity to the proposed solar arrays. However, with increasing distance, the perceptual impact gradually wanes, mitigated by the interplay of natural contours and the intervening-built environment.

Moreover, the experience of transient observers, such as travellers navigating local thoroughfares including Smuts Street, is expected to be dynamic. Their moving vantage points will yield a variable visual encounter with the solar facility, one that changes with each kilometre travelled. Although the Malmesbury area lacks significant visual landmarks, the introduction of the solar panels will represent an addition to the existing visual narrative, one that is anticipated to integrate without overwhelming dominance.

Throughout the construction phase, the visual character of the locale will face temporary shifts. While initial groundwork and low-level construction may be largely concealed by the existing vegetative screen, those within a proximate range will experience a more immediate visual alteration. The extent of this impact will be moderated by the viewer's distance from the construction activities and the presence of natural and constructed screening elements.

Overall, the viewshed analysis aims to inform the project's design to harmoniously incorporate the Klipkoppie Solar PV Facility into its setting, ensuring a balance between development and the conservation of the visual quality of the landscape.

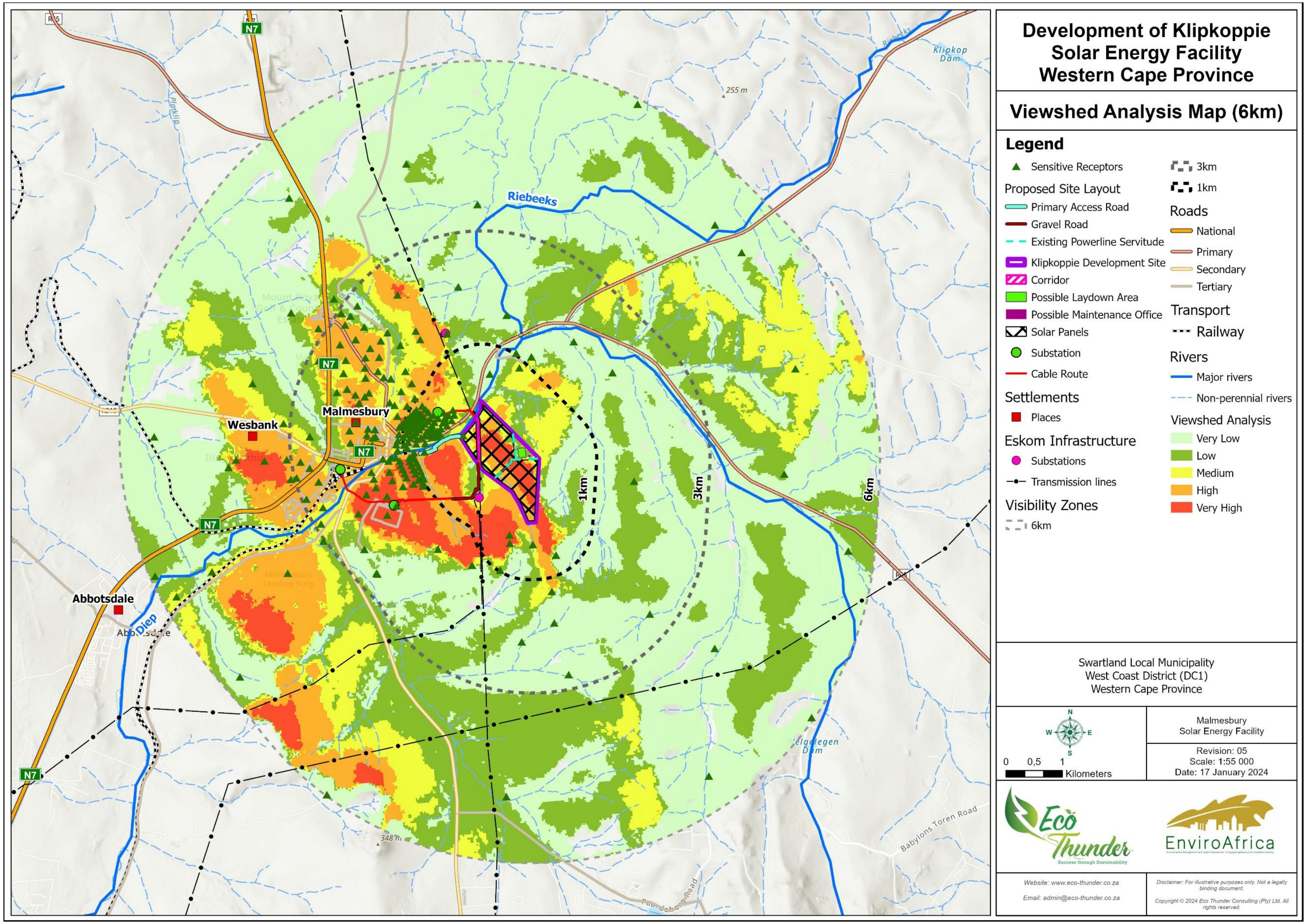

Figure 14: Viewshed analysis for the Klipkoppie Solar PV facility

7.1.1 Observers And Zone of Impact

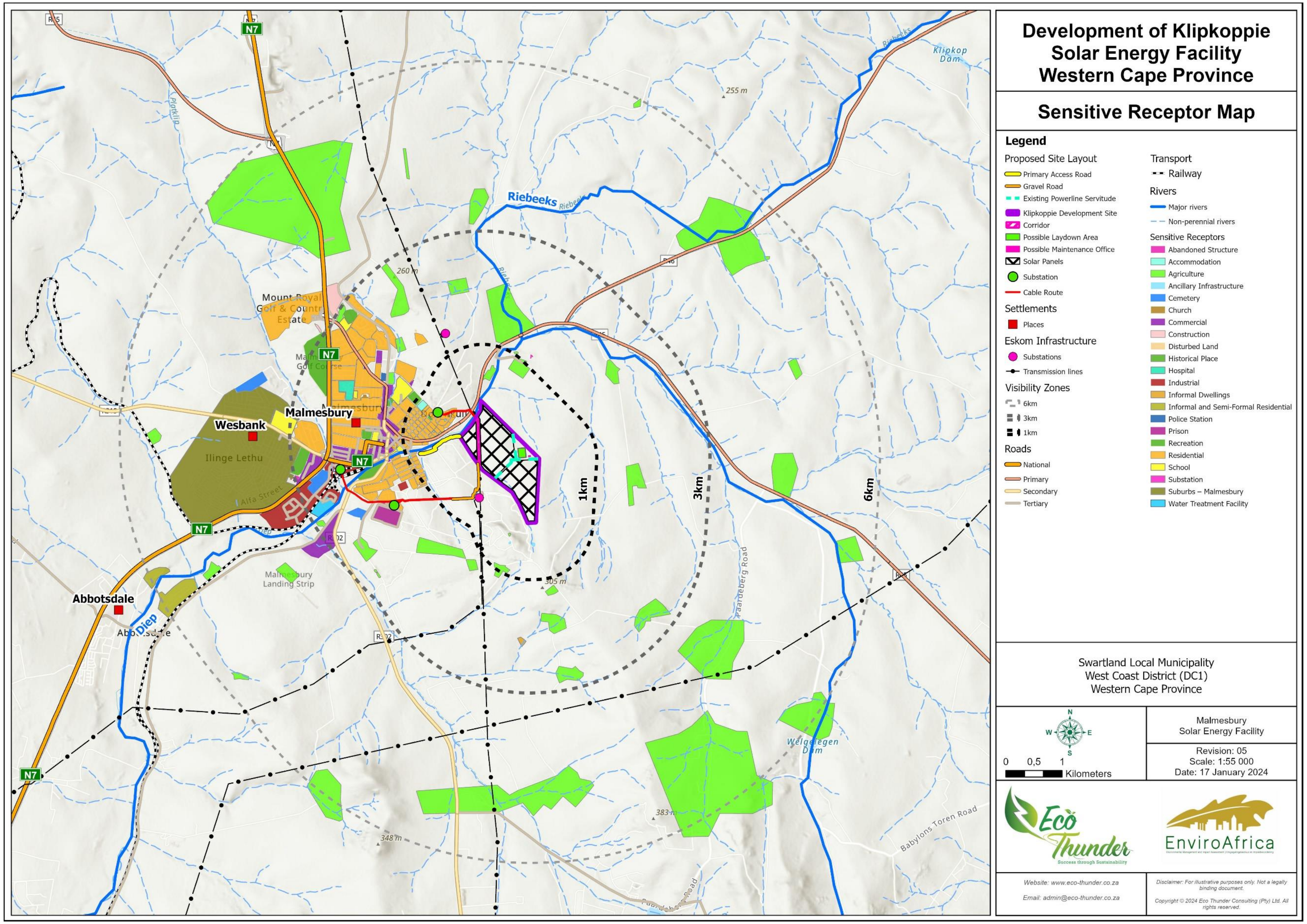

Figure 15: Sensitive Receptor Map

7.2 Visual Exposure within Study Area

The viewshed analysis for the Klipkoppie Solar PV Facility, depicted in the accompanying figures, was conducted from various vantage points around the proposed development area. The analysis was carried out at an elevation of 2 meters above average ground level to represent the observer's view and 4 meters for the solar panels, simulating the maximum height of the proposed structures. This approach aimed to assess the general visual exposure (visibility) of the area under investigation.

Visual exposure is categorized based on the distance from the proposed development, with the sensitivity of the area generally decreasing as the distance increases. The categories are defined as follows:

Very High and High Sensitivity Area (Under 1 KM):

The proximate vicinity, within a 1-kilometer radius from the development, including the western sector of Malmesbury, neighbouring rural communities, and the Klipkoppie Nature Reserve, is categorized under high sensitivity. In these areas, the presence of the solar facility is likely to be clearly visible. Nonetheless, the visibility of the facility should be differentiated from the potential for visual impact. While these areas may experience high visibility, the context of this renewable energy initiative and the pre-existing landscape character might frame the visibility in a positive light. The facility could be seen as a modern addition to the landscape, representative of the region's commitment to sustainable practices.

Medium Significance Zone (1km - 3km):

Extending from 1km to 3km, the visual exposure encompasses the western and northern regions adjacent to the development site. Within this medium sensitivity zone, the visibility of the solar infrastructure is somewhat tempered by the interplay of the landscape's natural and man-made features. The rural backdrop, marked by expansive fields and intermittent agricultural structures, sets a stage for expansive vistas. However, topographical variances and clusters of vegetation can provide selective visual shielding. Residences and agricultural operations, especially those situated on elevated land, may experience less obstructed views. In these zones, the implementation of thoughtful mitigation strategies, such as considered landscaping and intentional site design, is critical to reducing potential visual intrusion.

In summary, the visual exposure of the Klipkoppie Solar PV Facility varies across different zones, influenced by proximity, topography, and existing land use. While closer areas are subject to higher visibility, the impact is not necessarily negative and can be managed through sensitive design and mitigation measures. The project's integration into the landscape should be approached with an understanding of these varying degrees of visual exposure to ensure a balanced and harmonious development.

Very High Sensitivity Area (Under 1 KM)

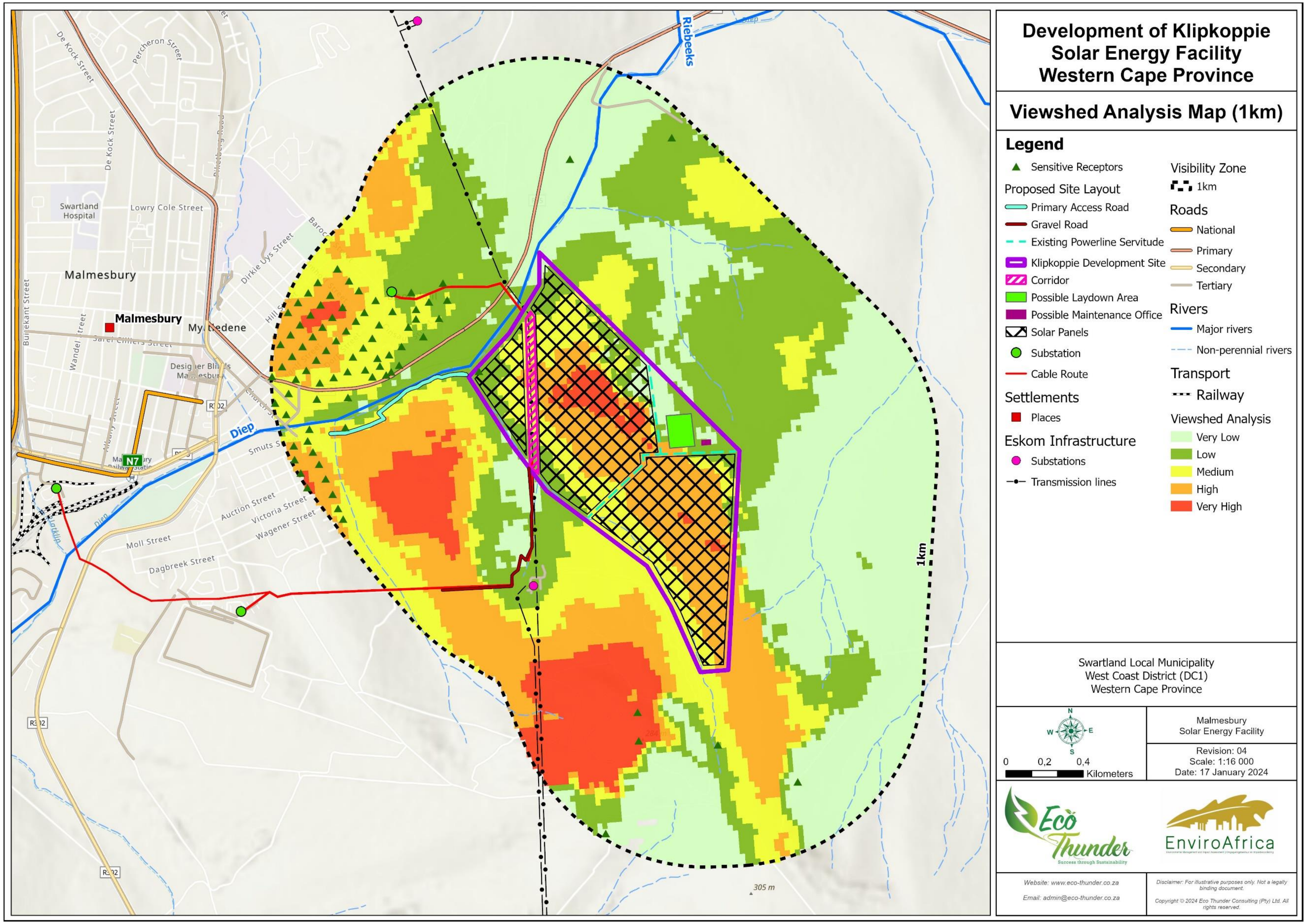

Figure 16: Very High Sensitivity zone (Under 1km from the site) indicating the varied visibility of the facility in this zone

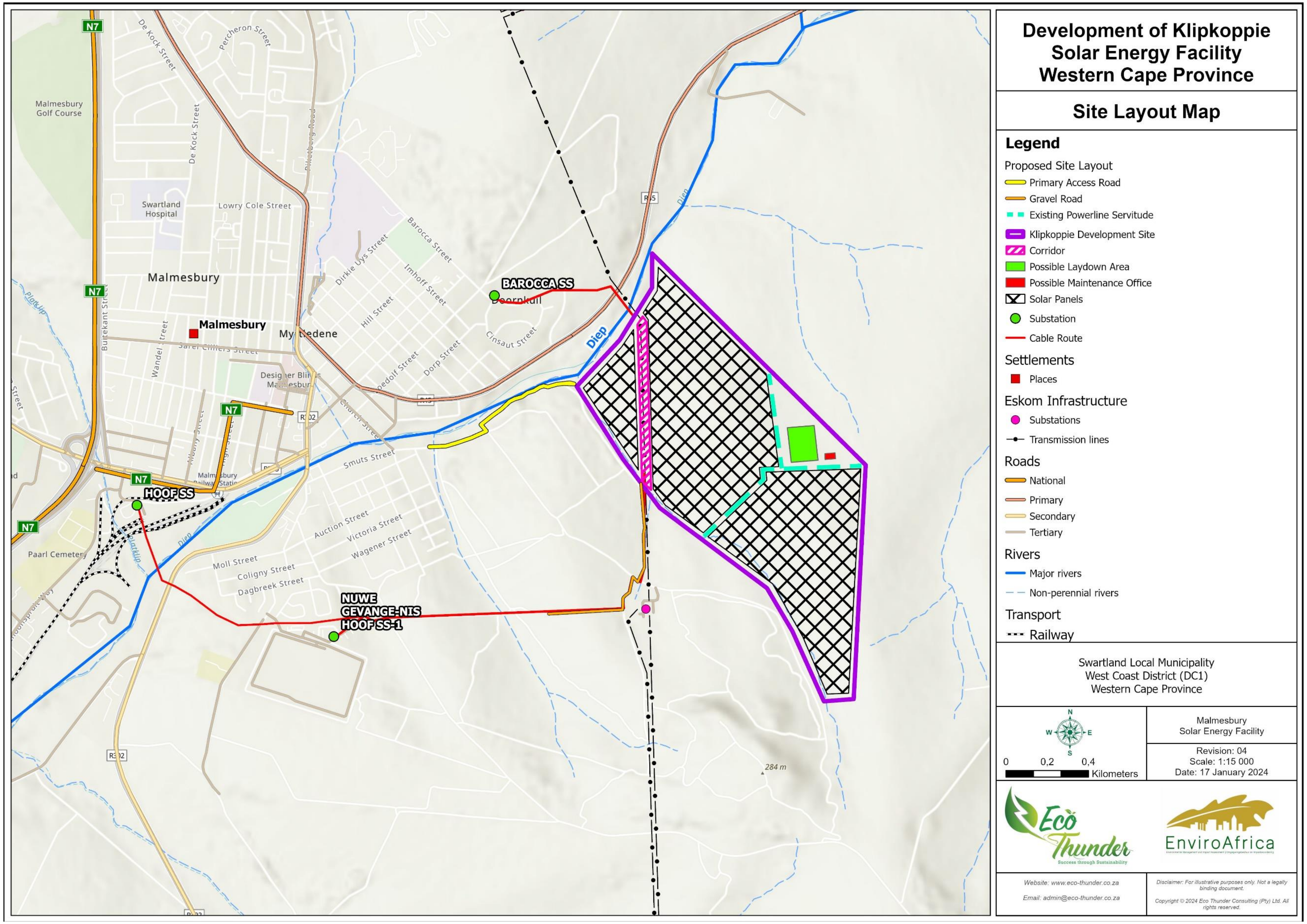

Figure 17: Klipkoppie Solar PV Facility Layout Area

7.3 Glint and Glare

7.3.1 Preliminary Project Status and Future Assessments

As the project is still in its formative stages, specific details about foundations, mounting structures, and module types are pending finalization. Therefore, a comprehensive glint and glare analysis that takes into account various scenarios of PV material, tilt angle, and tracking mechanisms has not yet been conducted. However, if required further assessments on the glint and glare can be undertaken utilising specialized tools like the Solar Glare Hazard Assessment Tool (SGHAT).

7.3.2 Characteristics of Photovoltaic Modules

Central to any solar energy system are the PV modules, which usually feature a top layer made of glass material. This layer is engineered to absorb the maximum amount of sunlight. However, it is inevitable that a portion of the sunlight falling on this surface will be reflected. Solar panels are specifically designed to minimize this reflection, reflecting only a small fraction—about 2-4%—of the incident sunlight, depending on whether an Anti-Reflective Coating (ARC) is applied.

7.3.3 Anti-Reflective Coating (ARC)

ARC serves multiple functions. Primarily, it is designed to enhance the efficiency of solar panels by improving the transmission of sunlight across various angles of incidence and a wide range of wavelengths. While its main goal is to increase the absorption of sunlight, thereby boosting the efficiency of solar PV modules, ARC also serves the secondary purpose of reducing glare. It's crucial to note, however, that the effectiveness of ARC can degrade over time due to factors like natural corrosion and the cleaning processes applied to the modules.

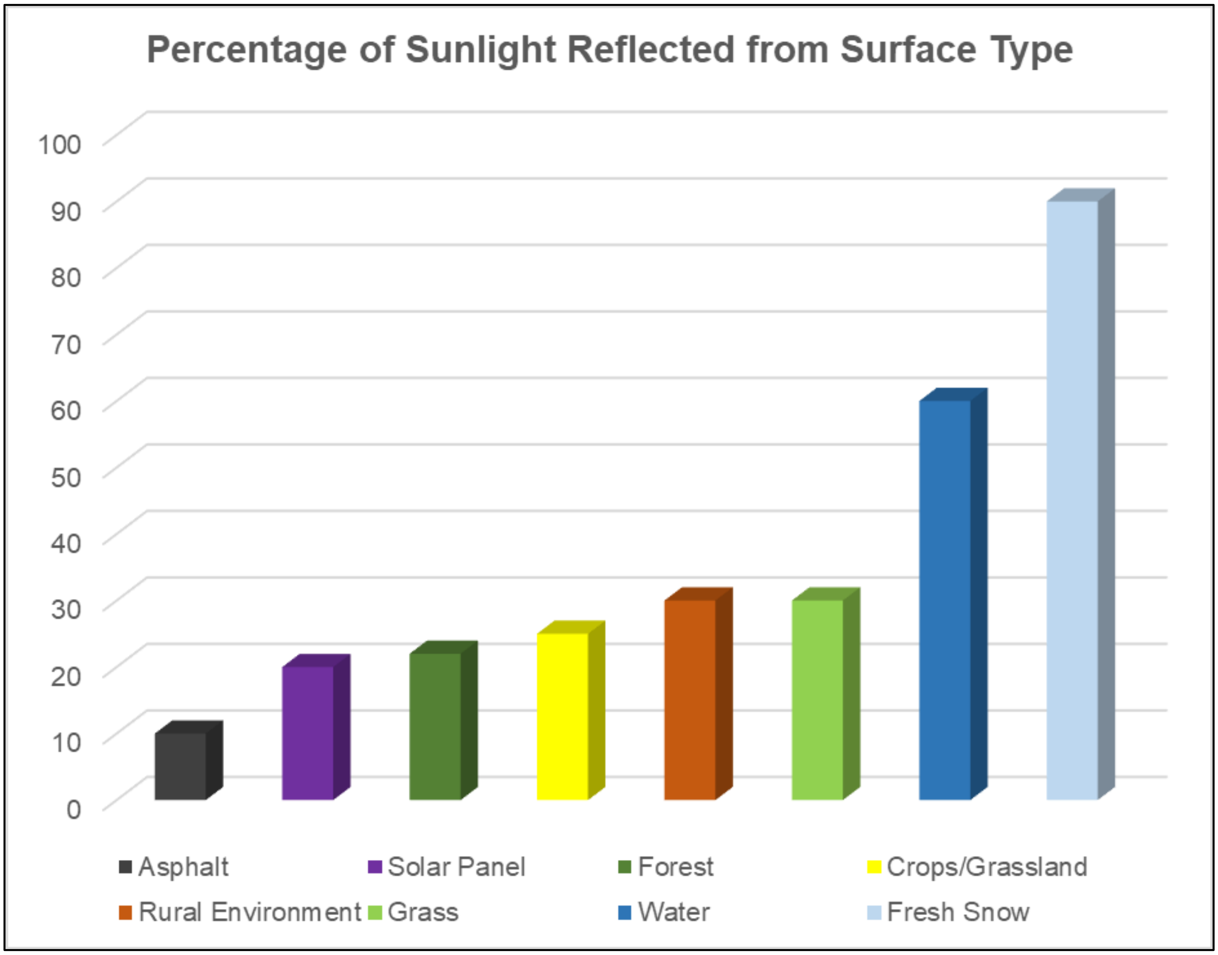

Figure 18: Comparison of most Reflective Surfaces

7.3.4 Fixed-Tilt vs. Single Tracking Systems

Solar PV modules can be installed using either fixed-tilt or single tracking systems. In a fixed-tilt system, the PV modules are installed at a specific tilt and azimuth angle, which remain constant throughout the year. The azimuth angle indicates the direction the top surface of the PV module is facing—usually southward in the northern hemisphere and vice versa. The tilt angle is determined mainly by the latitude of the installation location.

Single tracking systems, although more complex in their design and requiring more intricate site preparation, shading analysis, and cabling design, have the advantage of following the sun's movement. However, these systems are more complex in terms of site preparation, shading analysis, and cabling design, leading to higher initial costs. The dynamic nature of single tracking systems can also introduce variable patterns of glint and glare, requiring more sophisticated assessment methodologies.

7.3.5 Container Solar Facilities

Container solar facilities, which house solar equipment within the confines of a shipping container format, offer a unique approach to solar energy generation. The deployment of solar panels on these containers typically results in an elevated positioning compared to standard ground-mounted arrays. This elevation could potentially increase the angles at which sunlight is reflected, thereby influencing the areas affected by glint and glare.

The design of container solar facilities allows for controlled orientation and tilt of the solar panels. While this can aid in mitigating glint and glare by offering a consistent setup, the elevation of the panels atop the containers may necessitate a more thorough analysis of reflective patterns, particularly during times when the sun is low in the sky.

Furthermore, the modular and portable nature of container solar facilities provides an opportunity for strategic placement, which can be optimized to minimize potential glare. However, the concentration of reflective surfaces in a smaller area may result in localized intensification of glare, which should be carefully evaluated.

Compared to expansive standard arrays, the smaller footprint of container solar facilities can result in a more localized and possibly more intense reflection, though the overall area affected may be smaller. This factor, combined with the potential for higher placement of the panels, could lead to a more pronounced visual impact in specific areas, particularly those at a direct line of sight to the elevated panels.

The application of anti-reflective coatings and the latest photovoltaic technologies can help reduce the potential for glare. Yet, the effectiveness of such measures should be considered in light of the facility's design, orientation, and environmental wear over time.

7.3.6 Types of Reflection and their Safety Implications

Reflection can be categorized as either 'specular' or 'diffuse.' Specular reflection, where light reflects at an angle identical to its angle of incidence, is of primary concern in solar facilities as it can lead to both glint and glare. These phenomena can result in after-images, a visual illusion where an image persists even after the original exposure has ceased. This poses potential safety hazards, particularly for motorists and nearby communities. The orientation of the PV modules relative to the sun plays a significant role in their reflectance properties. A panel that directly faces the sun may absorb up to 90% of the sunlight. However, when not directly aligned with the sun, its reflectance can increase to as much as 60%. This is especially relevant for low-tilt panels during the times of sunrise and sunset.

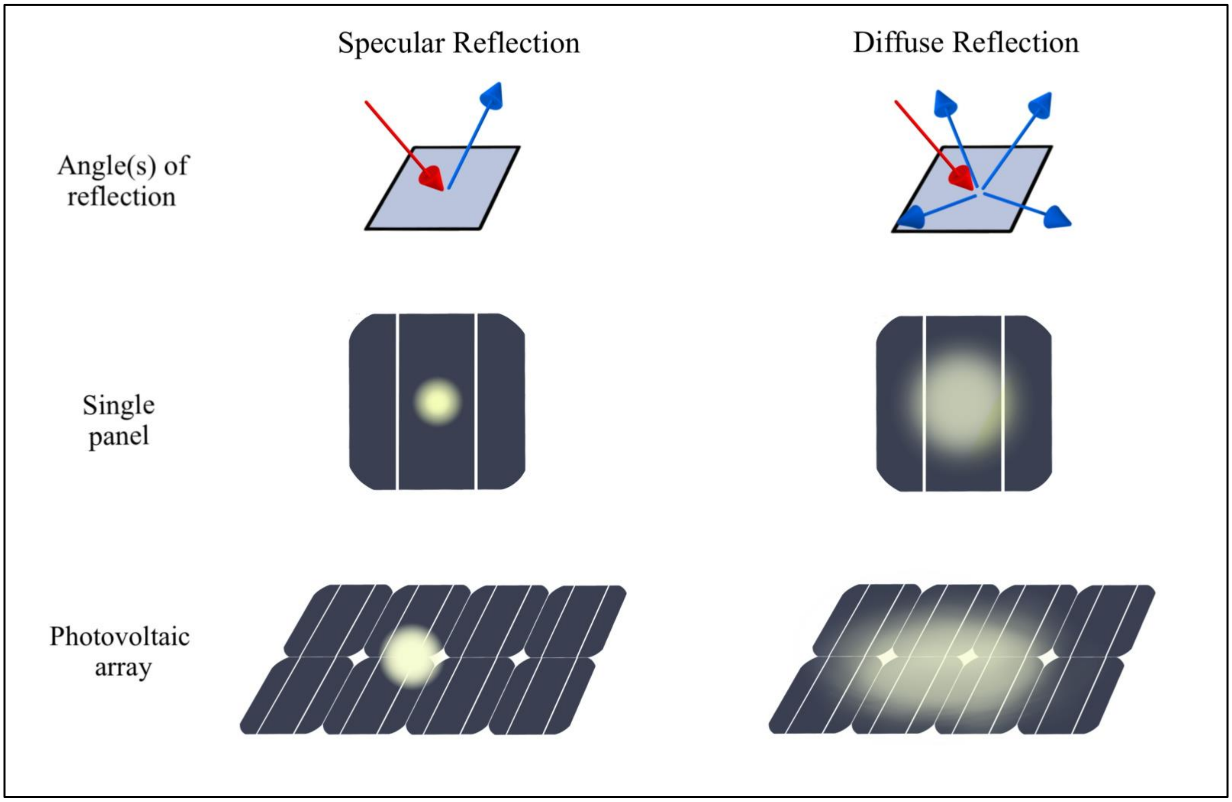

Figure 19: Specular vs Diffuse Reflection

Glint and glare can raise concerns among various stakeholders, including but not limited to aviation authorities, road users, and railway operators. Technical assessments often focus on key receptors, such as:

- Aviation: Including air traffic control personnel and pilots on final approach, taxiways, or in visual circuits.
- Roads and Dwellings: Focusing on road users and residents within a 1 km radius of the solar installation.
- Railway Operators: Including train drivers and signal operators adjacent to the proposed solar panels.

7.3.7 Time and Direction of Glare Occurrence

Glare is most likely to occur during busy morning and late afternoon/early evening hours on public roads or highways. For example, a proposed PV array is expected to produce glare for receptors at sunset, lasting for a maximum of 15 minutes between 4:30 and 6:30 pm during the summer months. Therefore, the time and direction of glare are correlated with the sun's path, and mitigation measures must be carefully planned.

7.3.8 Aviation Safety Context

International analyses indicate that glare from solar panels has not been cited as a contributing factor to aviation accidents. Solar developments en route to an airport are unlikely to warrant a glare analysis due to their low reflectivity. However, if deemed necessary, the low reflectivity of panels and their distance from airfields should be considered (Not applicable to the Klipkoppie Solar PV facility).

7.3.9 Best Practice Guidelines

While no legally specified thresholds for glint and glare exist, international best practice guidelines do provide tolerable exposure thresholds. For instance, exposure exceeding 60 minutes per day for more than three months of the year necessitates the implementation of mitigation measures.

Mitigation Strategies such as the following can assist in reducing general glint and glare:

- Screening: Providing visual barriers between the solar panels and affected receptors can mitigate glint and glare effects. The extent of screening required can be determined through comprehensive analysis.
- Tilt Angle Adjustment: The angle of incidence equals the angle of reflection in specular reflections. Adjusting the vertical tilt angle of the solar panels can, therefore, redirect the path of reflected rays.
- Azimuth Angle Adjustment: Changing the direction that the panels face can also mitigate effects at specific receptor locations.

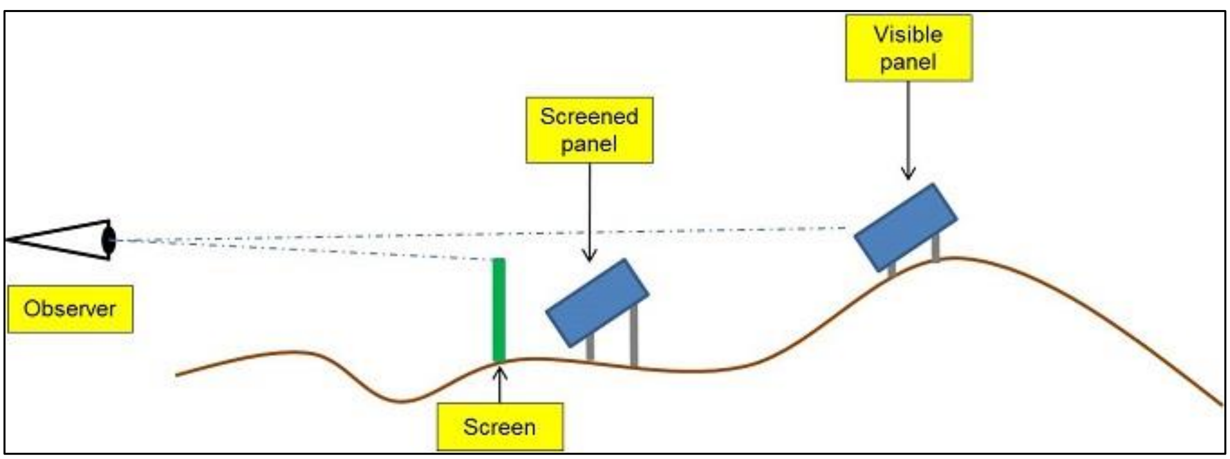

Figure 20: Mitigation against Glint and Glare

The visual impact of glint and glare in photovoltaic (PV) solar farms is a multifaceted issue that requires comprehensive assessment and targeted mitigation strategies. While the project is still in its formative stages, it is crucial to anticipate the potential for glint and glare effects on various receptors, including aviation personnel, road users, and residential communities. Based on the information obtained and the site visit undertaken the Klipkoppie Solar PV facility is anticipated to have a glint and glare impact. The facility is located adjacent to a road and is within close proximity of an informal settlement but is not anticipated to influence major traffic patterns (not located close to a busy road or highway) or airplanes. However, these impacts must be considered as the project progresses and more specific details becomes available.

Implementing proactive mitigation measures will further ensure that glint and glare is mitigated.

7.4 Impact Index

The Visual Impact Index (VII) for the Klipkoppie Solar PV facility project provides a comprehensive measure of the project's visual impact, considering viewer sensitivity, project visibility, and the magnitude of change.

- Viewer Sensitivity (VS): Viewer sensitivity refers to how different groups or individuals perceive and respond to changes in their visual environment. For the Klipkoppie project, the primary viewer groups include local residents of Malmesbury and nearby rural settlements, travellers on regional roads such as the R45, and those engaged in agricultural activities in the area. The residents of Malmesbury, due to their close proximity and daily exposure to the site, are likely to have a high sensitivity. Travelers on the R45 and other regional roads may exhibit medium sensitivity due to their transient nature, while agricultural workers could display a medium to high sensitivity due to their regular interaction with the landscape.
- Project Visibility (PV): The visibility of the Klipkoppie Solar PV facility project varies. The open agricultural landscapes surrounding the project area, coupled with the undulating terrain, allow for significant visibility from several locations, especially within closer ranges, such as the town of Malmesbury. However, existing natural features such as vegetation and topographical variations provide some screening, moderating visibility in certain areas. Therefore, project visibility can be considered moderate to high, depending on the specific vantage point within the landscape.
- Magnitude of Change (MC): The magnitude of change assesses the degree to which the proposed development will alter the existing visual landscape. The introduction of the Klipkoppie Solar PV facility, with its solar panels and associated structures, will create a noticeable change in the predominantly rural and agricultural setting. The visual character of the landscape will shift from a natural and agricultural scene to one that includes elements of renewable energy infrastructure.

The VII for the Klipkoppie Solar PV facility project suggests a moderate visual impact overall. This assessment stems from the combination of high and medium viewer sensitivity, moderate to high project visibility, and the significant magnitude of change. The most substantial impact is anticipated where these factors intersect, particularly in areas where sensitive viewers have clear views of the development.

However, with careful design, layout, and mitigation measures, the facility can be integrated more harmoniously into the landscape. It's essential to consider the existing visual environment and the perceptions of local viewers when planning and implementing the project. By doing so, the Malmesbury Klipkoppie Solar PV facility can achieve its operational objectives while minimizing its visual impact on the surrounding community and environment.

8 Impacts and Risks Assessment

This section aims to rate the significance of the identified potential impacts pre-mitigation and post-mitigation. The potential impacts identified in this section are a result of both the environment in which the Project activity takes place, as well as the activity itself. The identification of potential impacts is performed by determining the potential source, possible pathways and receptors. In essence, the potential for any change to a resource or receptor (i.e., environmental aspect) brought about by the presence of a Project component or by a Project-related activity has been identified as a potential impact.

The potential impacts are discussed per environmental feature/aspect and according to each phase of the Project i.e., the Construction, Operational and Decommissioning/Post Closure Phases. The significance, probability and duration of these potential impacts have been assessed based on the detailed specialist studies undertaken on the sensitivity of the receiving environment.

8.1 Impacts and Risk Methodology

The EIA Methodology assists in evaluating the overall effect of a proposed activity on the environment. Determining of the significance of an environmental impact on an environmental parameter is determined through a systematic analysis.

8.1.1 Determination of Significance of Impacts

Significance is determined through a synthesis of impact characteristics which include context and intensity of an impact. Context refers to the geographical scale (i.e. site, local, national or global), whereas intensity is defined by the severity of the impact e.g. the magnitude of deviation from background conditions, the size of the area affected, the duration of the impact and the overall probability of occurrence.

Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The total number of points scored for each impact indicates the level of significance of the impact.

8.1.2 Impact Rating System

The impact assessment must take account of the nature, scale and duration of effects on the environment and whether such effects are positive (beneficial) or negative (detrimental). Each issue/impact is also assessed according to the various project stages, as follows:

- Planning;
- Construction;
- Operation; and
- Decommissioning.

The rating system is applied to the potential impact on the receiving environment and includes an objective evaluation of the possible mitigation of the impact. Impacts have been consolidated into one (1) rating. The impact assessment undertaken for the Klipkoppie Solar PV facility was done as per the standardised methodology and is briefly outlined in Table 5 below.

- The **nature**, which shall include a description of what causes the effect, what will be affected and how it will be affected.
- The **extent**, wherein it will be indicated whether the impact will be local (limited to the immediate area or site of development) or regional, and a value between 1 and 5 will be assigned as appropriate (with 1 being low and 5 being high):
- The **duration**, wherein it will be indicated whether:
  - the lifetime of the impact will be of a very short duration (0–1 years) – assigned a score of 1;
  - the lifetime of the impact will be of a short duration (2-5 years) - assigned a score of 2;
  - medium-term (5–15 years) – assigned a score of 3;
  - long term (> 15 years) - assigned a score of 4; or
  - permanent - assigned a score of 5;
- The **consequences (magnitude)**, quantified on a scale from 0-10, where 0 is small and will have no effect on the environment, 2 is minor and will not result in an impact on processes, 4 is low and will cause a slight impact on processes, 6 is moderate and will result in processes continuing but in a modified way, 8 is high (processes are altered to the extent that they temporarily cease), and 10 is very high and results in complete destruction of patterns and permanent cessation of processes.
- The **probability** of occurrence, which shall describe the likelihood of the impact actually occurring. Probability will be estimated on a scale of 1–5, where 1 is very improbable (probably will not happen), 2 is improbable (some possibility, but low likelihood), 3 is probable (distinct possibility), 4 is highly probable (most likely) and 5 is definite (impact will occur regardless of any prevention measures).
- the **significance**, which shall be determined through a synthesis of the characteristics described above and can be assessed as low, medium or high; and
- the **status**, which will be described as either positive, negative or neutral.
- the degree to which the impact can be reversed.
- the degree to which the impact may cause irreplaceable loss of resources.

- the degree to which the impact can be mitigated.

The significance is calculated by combining the criteria in the following formula:

S=(E+D+M)P

S = Significance weighting

E = Extent

D = Duration

M = Magnitude

P = Probability

The **significance weightings** for each potential impact are as follows:

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

8.2 Impacts and Mitigation

8.2.1 Construction Phase

Table 5 to **Table 7** summarise the consequence and significance of the visual impact of the Project. These results are based on worst-case scenario when the impacts of all aspects of the Project are taken together (PV facilities, grid connection and battery systems). Consequence of impact is a function of intensity, duration, and spatial extent. Intensity of impact is taken from the worst-case situation. These facilities are rated together, from a visual impact perspective, as the one would not exist without the other and they must be understood as the collective / cumulative.

Table 5: Potential Impacts during Construction Phase

Impact: Altered Landscape and Sense of Place during Construction		
Nature: The construction phase of the Klipkoppie Solar PV facility will temporarily change the visual character of the landscape. The current agricultural and semi-urban vistas around Malmesbury, characterized by wheat fields and natural fynbos, will be interspersed with construction machinery, temporary structures, and the initial phases of the solar panel installation. This represents a shift in the landscape, introducing elements of renewable energy infrastructure into a traditionally rural and agricultural setting.		
	Before Mitigation	**After Mitigation**
Extent	3 – Local	3 – Local

Duration	2 – Short-Term	2 – Short-Term
Magnitude	6 – Moderate	4 – Low
Probability	4 – Highly Probable	3 – Probable
Significance	**44 – Medium**	**27 – Low**
Status	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	Yes

Mitigation/Enhancement Measures

- Minimise Land Disturbance: Limit the construction footprint to the minimum necessary for the Klipkoppie Solar PV project. Use only the required area to preserve the existing grassland landscape and unique sense of place.
- Use of Natural Colours and Materials: Use materials and colours that blend with the natural grassland landscape for any temporary structures or construction materials. Mimic the texture and colours of the natural environment.
- Vegetative Screens: Plant native vegetation around the construction site's perimeter to act as a natural screen, reducing the visual impact. This would mirror the natural grasslands of the Gauteng Highveld, ensuring a semblance of continuity.
- Localized Construction: Focus construction activities in smaller, localized areas rather than spreading out across the entire site simultaneously. This phased approach can reduce the overall visual disturbance at any given time.
- Construction Timing: Schedule construction activities to avoid period of high visitor use or important cultural events that contribute to the sense of place in the Gauteng area.
- Revegetation for Restoration: Post-construction, prioritize revegetation efforts, especially in areas where native grasslands were disturbed. This can help in restoring the site's original visual character.
- Community Engagement: Engage with the local communities, especially those from Malmesbury, to keep them informed about construction progress and the measures being taken to reduce visual impacts. This can help in managing perceptions and ensuring community buy-in.
- Minimize Night-time Activities: Limit construction activities during the night to reduce light pollution, especially given the proximity to residential areas like Malmesbury.
- Visual Simulations: Before starting construction, provide visual simulations to stakeholders, showcasing the expected changes to the landscape. This can help in setting the right expectations and reducing potential concerns.

Cumulative Impact

Medium - When combined with other existing infrastructure like the Malmesbury Substation and high voltage overhead lines, the cumulative visual impact during construction could be more pronounced. However, with mitigation measures in place, this can be managed.

Residual Risk

Low to Medium - With the proposed mitigation measures, the residual visual impact during the construction phase is expected to be reduced. However, some temporary visual disturbances will be unavoidable.

Impact: Visibility of the Facility to Residents during Construction		
Nature: The Klipkoppie Solar PV facility, during its construction phase, will introduce a variety of structures and activities that will be visible to nearby residents, especially those from the town of Malmesbury. Given the mixed terrain of the region, these construction activities might stand out prominently against the backdrop of open grasslands and wheat fields and vineyards. For residents, especially those in Malmesbury, which is less than 1 km away, this could be akin to watching a new urban development rise in what was once a familiar rural setting. The once uninterrupted horizon might now be dotted with cranes, construction equipment, and the beginnings of solar structures. This change could evoke mixed feelings among residents, ranging from curiosity and anticipation to concern and nostalgia for the unaltered landscape.		
	Before Mitigation	**After Mitigation**
Extent	3 – Local	2 – Local
Duration	2 – Short-Term	2 – Short-Term
Magnitude	8 - High	6 - Moderate
Probability	5 – Definite	3 – Probable
Significance	**65 – High**	**30 – Medium**
Status	Negative	Negative
Reversibility	Medium	Medium
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	Yes

Mitigation/Enhancement Measures

- Construction Scheduling: Schedule construction activities involving visually intrusive structures for times when visibility is reduced, such as outside of regular daylight hours or during poor weather. Comply with local regulations and consider potential noise and light pollution.
- Make use of landscaping techniques and visual screening to reduce the impact as best possible.
- Site Screening: Use natural topography, existing vegetation, or temporary screens to shield construction activities from viewers. Situate construction activities in lower lying areas or behind hills. Use screens made of materials that blend with the natural environment.
- Minimize Structure Heights: Keep temporary structure heights to a minimum to reduce their visibility. Use materials and colours that blend with the surrounding landscape.
- Lighting Control: Minimize light pollution by directing lights downwards, using shields to prevent light spill, and turning off lights when not in use.
- Strategic Placement: Where possible, prioritize the placement of taller construction equipment and initial solar structures in areas less visible to the majority of residents.
- Vegetative Barriers: Enhance and fast-track the planting of native vegetation barriers, especially in areas facing major residential zones, to provide a natural screen.
- Informational Signage: Erect informational signboards around the construction site, explaining the project's benefits and duration, to keep residents informed and manage perceptions.
- Community Workshops: Organize workshops for residents to explain the project's scope, benefits, and visual changes they can expect. This can help in building understanding and reducing potential apprehensions.

- Limit Daytime Activities: If feasible, schedule some of the more visually intrusive construction activities during times when visibility is reduced, such as early morning or late afternoon.
- Visual Mock-ups: Share visual mock-ups or simulations with the community, showcasing the expected landscape changes during and post-construction. This can help residents visualise the end result and understand the temporary nature of certain visual impacts.

Cumulative Impact

Medium - The combined visual impact of the construction activities, along with existing structures like the Malmesbury Substation and overhead lines, could be more noticeable for residents. However, with mitigation measures, this cumulative impact can be managed.

Residual Risk

Medium - Even with mitigation measures, the visibility of certain construction activities to residents will be evident. However, as the construction phase progresses and residents become more accustomed to the changes, the perceived impact may reduce.

Impact: Dust and Construction Impact during Construction

Nature: The construction activities for the Klipkoppie Solar PV facility will inevitably disturb the soil, leading to potential dust generation, especially in an area characterized by open grasslands. This dust can be carried by winds, affecting the immediate surroundings. Residents of nearby towns like Malmesbury might experience a temporary increase in dust levels. This could affect their daily activities, health, and overall quality of life. Additionally, the movement of construction vehicles, machinery operations, and groundwork can cause noise and vibrations, further adding to the disturbances experienced by nearby residents.

	Before Mitigation	After Mitigation
Extent	3 – Local	2 – Local
Duration	2 – Short-Term	2 – Short-Term
Magnitude	4 – Low	3 – Minor
Probability	4 – Highly Probable	3 – Probable
Significance	**36 – Medium**	**21 – Low**
Status	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	Yes

Mitigation/Enhancement Measures

- Dust Suppression: Regularly water down the construction site, especially during dry and windy conditions, to minimize dust generation.
- Windbreaks: Install temporary windbreaks or barriers around the construction site to reduce the spread of dust.
- Vehicle Speed Limits: Implement strict speed limits for construction vehicles within the site to reduce dust kick-up.

• Construction Scheduling: Schedule dust-generating activities for times when wind speeds are low or when wind direction is away from sensitive receptors. Consider nearby residences. • Use of Dust Screens: Install dust screens or barriers around the construction site, particularly in areas close to sensitive receptors, to contain dust within the site. • Rehabilitation of Disturbed Areas: Promptly rehabilitate areas where construction activities have ceased. Re-vegetate with native species or suitable ground cover to stabilize the soil and reduce dust generation. • Regular Monitoring: Implement a monitoring program to assess the effectiveness of dust control measures. This could involve visual inspections and, if necessary, air quality monitoring. • Machinery Maintenance: Ensure construction machinery is well-maintained to minimize excessive noise and vibrations. • Work Hours: Restrict the noisiest construction activities to daytime hours and avoid work during early mornings, late evenings, or weekends when residents are more likely to be at home. • Community Communication: Keep the local community informed about construction schedules, especially during particularly disruptive activities. This allows residents to prepare or adjust their schedules accordingly.
Cumulative Impact Medium - The combined impact of dust, noise, and other construction-related disturbances, along with existing activities in the area, could be more noticeable for residents. However, with mitigation measures, this cumulative impact can be managed.
Residual Risk Low to Medium - With the proposed mitigation measures, the residual impact of dust and construction disturbances should be significantly reduced. However, occasional spikes in dust or noise might still be experienced during certain construction activities.

8.2.2 Operation Phase

Table 6: Potential Impacts during the Operation Phase

Impact: Altered Landscape and Sense of Place during Operation		
Nature: The operational phase of the Klipkoppie Solar PV Facility will permanently alter the visual landscape. The once predominantly agricultural and natural vistas will now include the presence of solar panels and related infrastructure. This change represents a shift in landscape character, where renewable energy infrastructure becomes an integral part of the local setting.		
	Before Mitigation	**After Mitigation**
Extent	3 – Local	2 – Local
Duration	4 – Long-Term	4 – Long-Term
Magnitude	8 – High	6 – Moderate
Probability	4 – Highly Probable	3 – Probable
Significance	**60 – High**	**36 – Medium**
Status	Negative	Negative
Reversibility	Low	Medium

Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	Yes

Mitigation/Enhancement Measures

- Landscaping: Introduce native vegetation around the facility's perimeter to soften the visual impact and blend the facility into the natural surroundings.
- Community Engagement: Engage with the local community to explain the benefits of renewable energy and the necessity of such facilities. This can foster understanding and acceptance.
- Educational Programs: Establish educational programs or visitor centres to educate the public about solar energy, turning the facility into a learning opportunity.
- Design Considerations: Opt for solar panel designs and layouts that minimize visual intrusion. For instance, low-profile mounting systems can reduce the facility's visibility from certain viewpoints.

Cumulative Impact

Medium - The facility, in combination with other developments and infrastructure in the area, contributes to a changing landscape character. However, with mitigation measures, the cumulative visual impact can be managed.

Residual Risk

Low to Medium - With the proposed mitigation measures, the residual impact on the landscape and sense of place should be significantly reduced. However, the presence of the facility will still be a noticeable change in the landscape during its operational phase.

Impact: Visibility of the Facility to Residents during Operation

Nature: During the operational phase, the Klipkoppie Solar PV Facility will be a visible addition to the local landscape. The solar panels and associated structures will be perceptible from various points within the community, particularly from areas in Malmesbury and nearby rural settlements, altering the familiar visual setting.

	Before Mitigation	**After Mitigation**
Extent	2 – Local	2 – Local
Duration	4 – Long-Term	4 – Long-Term
Magnitude	7 – Moderate	6 – Moderate
Probability	4 – Highly Probable	3 – Probable
Significance	**52 – Medium**	**36 – Medium**
Status	Negative	Negative
Reversibility	Low	Medium
Irreplaceable loss of resources?	No	No

Can impacts be mitigated?	Yes	Yes

Mitigation/Enhancement Measures

- Enhanced Landscaping and Screening: Given the constraints on panel placement due to the limited buildable area, focus on implementing landscaping and natural screening methods only where practically feasible to reduce the visibility of the solar panels from residential areas and key viewpoints.
- Vegetative Screening: Plant native trees and shrubs to create natural screens that can obscure or soften the view of the facility from residential areas.
- Community Involvement: Involve the community in decision-making processes related to the facility's design and layout. This can foster a sense of ownership and reduce potential opposition.
- Informational Campaigns: Launch campaigns to educate residents about the benefits of solar energy and the importance of the facility for sustainable energy generation.
- Visual Simulations: Before finalizing the design, provide visual simulations to the community to give them an idea of how the facility will look upon completion. This can help manage expectations and gather feedback.

Cumulative Impact

Medium - The facility's visibility, combined with other infrastructural elements in the area, contributes to a changing visual landscape. However, with mitigation measures in place, the cumulative visual impact can be moderated.

Residual Risk

Low to Medium - Implementing the proposed mitigation measures should significantly reduce the facility's visibility impact on residents. However, some level of visibility will remain, especially from certain vantage points.

Impact: Potential Visual Impact of Operational, Safety, and Security Lighting during Operation

Nature: Operational, safety, and security lighting are essential components of the Klipkoppie Solar PV facility to ensure safe and efficient operations, especially during nighttime hours. However, this lighting can introduce a new source of light in the area, potentially causing light pollution. This can be particularly noticeable in areas that previously had minimal artificial lighting, altering the nocturnal landscape and potentially affecting the night sky visibility for nearby residents and wildlife.

	Before Mitigation	**After Mitigation**
Extent	2 – Local	2 – Local
Duration	4 – Long-Term	4 – Long-Term
Magnitude	6 – Moderate	4 – Low
Probability	3 – Probable	3 – Probable
Significance	**36 – Medium**	**30 – Medium**
Status	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No

Can impacts be mitigated?	Yes	Yes

Mitigation/Enhancement Measures

- Downward-facing Lights: Use fixtures that direct light downwards to minimize upward light spill, preserving the night sky.
- Motion Sensors: Install motion sensors so that lights are only activated when necessary, reducing the duration of light emissions.
- Low-intensity Lighting: Opt for low-intensity lighting that provides sufficient illumination for safety without being overly bright.
- Shielding: Use shields on lights to direct illumination to the intended areas and prevent light spill into unintended areas.
- Educate Staff: Ensure that staff are aware of the importance of minimizing light pollution and are trained to use lighting efficiently.
- Periodic Reviews: Conduct periodic reviews of lighting practices to identify and rectify any unnecessary light emissions.

Cumulative Impact

Medium - The facility's lighting, when combined with other light sources in the area (like from the nearby towns), could contribute to an overall increase in light pollution. However, with effective mitigation, this cumulative impact can be managed.

Residual Risk

Low to Medium - With the proposed mitigation measures in place, the residual risk of significant light pollution from the facility should be minimized. Some localized light spill might still occur, but its impact should be limited.

Impact: Potential Visual Impact of Solar Glint and Glare during Operation

Nature: Solar panels, by design, absorb sunlight to generate electricity. However, under certain conditions, they can reflect sunlight, causing glint (a brief flash of light) and glare (a continuous source of excessive brightness). This reflected light can be visually disruptive for nearby residents, drivers on local roads, and even aviators, depending on the angle of the sun and the orientation of the panels

	Before Mitigation	**After Mitigation**
Extent	2 – Local	2 – Local
Duration	4 – Long-Term	4 – Long-Term
Magnitude	4 – Low	2 – Minor
Probability	3 – Probable	2 – Improbable
Significance	**30 – Medium**	**16 - Low**
Status	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No

Can impacts be mitigated?	Yes	Yes

Mitigation/Enhancement Measures

- Awareness and Communication: While prioritizing the efficiency and technology of the solar panels, ensure that stakeholders and nearby residents are informed about the reasons behind the panel selection and orientation. Highlight the benefits of using the best available technology and the overall low significance of visual impact.
- Vegetative Screening: Plant trees or shrubs to act as natural barriers, helping to block or diffuse potential glare.
- Monitoring and Adjustments: Monitor glare complaints and be prepared to make adjustments in panel orientation if necessary.
- Educate the Community: Inform the local community about the potential for glint and glare and the measures in place to mitigate them. This can help manage expectations and reduce concerns.

Cumulative Impact

Medium - While the facility itself might produce glint and glare, when combined with other reflective surfaces in the area (like water bodies or other infrastructure), there could be a cumulative increase in reflective disturbances. However, with effective mitigation, this cumulative impact can be managed.

Residual Risk

Low - With the proposed mitigation measures in place, the residual risk of significant glint and glare from the facility should be minimised. Some localised reflections might still occur, but their impact should be limited.

Impact: Visual Exposure during Operation

Nature: Once operational, the Klipkoppie Solar PV Facility will be a constant feature in the local landscape. The presence of solar panels and associated infrastructure will be visible from various locations, impacting the visual landscape experienced by residents, travellers, and other viewers in the are

	Before Mitigation	**After Mitigation**
Extent	2 – Local	2 – Local
Duration	4 – Long-Term	4 – Long-Term
Magnitude	6 – Moderate	4 – Low
Probability	3 – Probable	3 – Probable
Significance	**36 – Medium**	**30 – Medium**
Status	Negative	Negative
Reversibility	Low	Medium
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	Yes

Mitigation/Enhancement Measures

- Natural Screening: Introduce vegetative barriers like trees and shrubs around the facility's perimeter to help blend it into the natural environment and reduce its visual prominence.

- Low-Profile Design: Opt for low-profile solar panel mounting systems to minimize the height and visual intrusion of the panels.
- Non-Reflective Materials: Use non-reflective materials for infrastructure to reduce the visual contrast with the surrounding environment.
- Colour Selection: Choose colours for infrastructure that blend with the natural landscape, reducing visual contrast.
- Community Engagement: Engage with the local community to understand their visual preferences and incorporate feedback into the design where feasible.
- Landscaping: Introduce landscaping efforts post-construction to help the facility blend more seamlessly with the surrounding environment.

Cumulative Impact

Medium - The facility will introduce a new visual element to the landscape, and when combined with existing structures and developments, there could be a cumulative visual change. However, with effective mitigation, this cumulative impact can be managed.

Residual Risk

Medium - With the proposed mitigation measures in place, the residual risk of significant visual exposure from the facility should be reduced. However, given the facility's size and the open nature of the landscape, some level of visual exposure will remain.

Impact: Visual Intrusion of Standard Solar PV Arrays during Operation

Nature: The integration of standard solar PV arrays into the landscape will introduce large-scale, flat, reflective surfaces. These arrays will alter the visual dynamics of the area, particularly in landscapes that are otherwise natural or agrarian.

	Before Mitigation	After Mitigation
Extent	2 – Local	2 – Local
Duration	4 – Long-Term	4 – Long-Term
Magnitude	6 – Moderate	4 – Low
Probability	4 – Highly Probable	3 – Probable
Significance	**48 – Medium**	**30 – Medium**
Status	Negative	Negative
Reversibility	Low	Medium
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	Yes

Mitigation/Enhancement Measures

- Design Integration: Use ground-mounted arrays with heights that complement the existing topography to minimize visual intrusion.

- Screening: Implement additional screening through landscaping to obscure direct views of the arrays from sensitive receptors.
- Community Outreach: Continue to engage with local stakeholders to maintain transparency and foster acceptance of the visual changes.
- Energy Education: Promote the visual change as an educational narrative about the transition to renewable energy.

Cumulative Impact

Medium - The visual impact of the arrays will add to the cumulative change in the landscape character, but with thoughtful mitigation and community engagement, the overall visual impact can be reduced.

Residual Risk

Low to Medium - Effective mitigation can significantly lessen the visual intrusion of standard solar PV arrays, though some visual impact will persist due to their inherent physical characteristics.

Impact: Visual Intrusion of Container Solar Facilities during Operation

Nature: The presence of container solar facilities will introduce three-dimensional structures to the landscape, adding vertical elements to areas that may be predominantly flat and open, such as Malmesbury.

	Before Mitigation	**After Mitigation**
Extent	2 – Local	2 – Local
Duration	4 – Long-Term	4 – Long-Term
Magnitude	6 – Moderate	4 – Low
Probability	4 – Highly Probable	3 – Probable
Significance	48 – Medium	30 – Medium
Status	Negative	Negative
Reversibility	Low	Medium
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	Yes

Mitigation/Enhancement Measures

- Selective Placement: Position containers to take advantage of natural landforms and existing vegetation that can act as visual buffers.
- Aesthetic Design: Design containers with colours and materials that blend into the surrounding environment to minimize their visual impact.
- Land Use Synergy: Integrate container units within the built environment where possible to align with existing structures, reducing their prominence.
- Community Co-Design: Involve the community in the placement and design of container units to ensure they reflect local aesthetic values and minimize visual impact.

Cumulative Impact
Medium - Container solar facilities add a new dimension to the visual landscape. If combined with the standard solar PV arrays and existing infrastructures, they contribute to a cumulative alteration of the visual environment. Mitigation efforts should aim to harmonize these facilities with the landscape to maintain visual coherence.
Residual Risk
Low to Medium - Although mitigation strategies can considerably alleviate the visual intrusion of container solar facilities, the vertical and modular nature of these structures will inherently alter the visual profile of the area. Ongoing community engagement and adaptive design strategies will be essential in managing the long-term visual impact.

8.2.3 Decommission Phase

Table 7: Potential Impacts during Decommissioning Phase

Impact: Landscape Character and Visual Amenity during Decommissioning		
Nature: The decommissioning phase involves the removal of the solar panels, infrastructure, and any other related structures from the site. This process will temporarily disrupt the landscape, potentially leading to a transient alteration in the visual character of the area. The removal process might expose previously covered or altered grounds, leading to a temporary visual contrast in the landscape.		
	Before Mitigation	**After Mitigation**
Extent	2 – Local	2 – Local
Duration	2 – Short-Term	2 – Short--Term
Magnitude	6 – Moderate	2 – Minor
Probability	3 – Probable	3 – Probable
Significance	**30 – Medium**	**18 – Low**
Status	Negative initially, transitioning to Neutral	Negative initially, transitioning to Neutral
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	Yes
Mitigation/Enhancement Measures • Gradual Dismantling: Instead of removing all infrastructure at once, consider a phased approach. This can help to gradually transition the landscape back to its original state, reducing the shock of sudden change. • Community Engagement: Engage with the local community and stakeholders to understand their views and preferences. This can help to guide the decommissioning process in a way that is sensitive to local visual preferences.		

- Re-use of Infrastructure: Where possible, consider re-using some of the infrastructure for other purposes. For example, access roads could be left in place for use by local landowners, if appropriate and agreed upon.
- Phased Decommissioning: Implement a phased approach to decommissioning to minimize the area of disturbance at any given time.
- • Site Restoration: Prioritize immediate restoration of areas once the infrastructure is removed, including re-vegetation with native species.
- • Minimize Ground Disturbance: Use techniques that minimize ground disturbance during the removal of infrastructure.
- • Waste Management: Ensure all materials, especially non-biodegradable ones, are properly disposed of or recycled, leaving no remnants behind.
- • Community Communication: Keep the local community informed about the decommissioning timeline and restoration efforts to manage expectations and address concerns.
- • Monitoring: Post-decommissioning, monitor the site's recovery and implement any necessary interventions to ensure successful landscape restoration.

Cumulative Impact

Low - Given that the goal of decommissioning is to restore the site, the cumulative visual impact is expected to be minimal, especially when combined with other existing structures and developments.

Residual Risk

Low - With the proposed mitigation measures and a focus on site restoration, the residual risk of significant visual disruption from the decommissioning process should be minimal.

Impact: Site Restoration during Decommissioning		
Nature: Site restoration refers to the process of returning the project site to its original or near-original state after the decommissioning of the solar facility. This involves the removal of infrastructure, remediation of any disturbed soils, and re-establishment of native vegetation. The aim is to ensure that the land can revert to its prior use, whether that be agriculture, natural habitat, or another purpose.		
	Before Mitigation	**After Mitigation**
Extent	2 – Local	2 – Local
Duration	4 – Long-Term	4 – Long-Term
Magnitude	2 – Minor	6 – Moderate
Probability	3 – Probable	3 – Probable
Significance	**24 – Low**	**36 – Medium**
Status	Positive	Positive
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	Yes

Mitigation/Enhancement Measures
• Native Vegetation: Use native and local plant species for re-vegetation to ensure ecological compatibility and enhance biodiversity. • Soil Conservation: Employ techniques to prevent soil erosion and promote soil health during and after restoration. • Water Management: Ensure proper drainage and water management to prevent waterlogging or erosion. • Regular Monitoring: Conduct regular site inspections to assess the success of restoration efforts and intervene where necessary. • Community Engagement: Engage with the local community to gather feedback on restoration efforts and address any concerns. • Waste Management: Ensure all decommissioned materials are properly disposed of or recycled, leaving no remnants behind.
Cumulative Impact Low - The restoration process aims to negate the impacts of the solar facility, resulting in minimal cumulative effects when combined with other developments or natural features.
Residual Risk Low - With diligent restoration efforts and ongoing monitoring, the residual risk of negative impacts from the restoration process should be minimal.

8.3 Cumulative Impact Assessment

The potential cumulative impacts that were identified for the construction, operational and decommissioning phases, are discussed in Table 8.

Table 8: Cumulative Impacts identified for the Construction, Operational and Decommissioning Phases

Impact: Cumulative Impact of Standard Solar PV Arrays		
Nature: The potential cumulative visual impact of the Klipkoppie PV facility on the visual quality of the landscape.		
	Overall impact of the proposed project considered in isolation (with mitigation)	**Cumulative impact of the project and other projects within the area (with mitigation)**
Extent	3 – Local – Regional	2 – Local
Duration	4 – Long-Term	4 – Long-Term
Magnitude	6 – Moderate	4 – Low
Probability	3 – Probable	3 – Probable
Significance	**39 – Medium**	**30 – Medium**
Status (positive, neutral, or negative)	Negative	Negative
Reversibility	Reversible (1)	Reversible (1)

Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No, only best practise measures can be implemented.	
Generic best practise mitigation/management measures		
Planning: • Retain/re-establish and maintain natural vegetation (if present) immediately adjacent to the development footprint where possible. Operations: • Maintain the general appearance of the facility as a whole. Decommissioning: • Remove infrastructure not required for the post-decommissioning use. • Rehabilitate all affected areas. Consult an ecologist regarding rehabilitation specifications.		
Residual Impacts		
The visual impact will be removed after decommissioning, provided the PV facility infrastructure is removed. Failing this, the visual impact will remain.		

Impact: Cumulative Impact of Container Solar Facilities		
Nature: The combined visual impact of the container solar facilities on the landscape's visual quality, in conjunction with other developments in the vicinity.		
	Overall impact of the proposed project considered in isolation (with mitigation)	**Cumulative impact of the project and other projects within the area (with mitigation)**
Extent	3 – Local – Regional	2 – Local
Duration	4 – Long-Term	4 – Long-Term
Magnitude	6 – Moderate	4 – Low
Probability	3 – Probable	3 – Probable
Significance	**39 – Medium**	**30 – Medium**
Status (positive, neutral, or negative)	Negative	Negative
Reversibility	Reversible (1)	Reversible (1)
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No, only best practise measures can be implemented.	
Generic best practise mitigation/management measures		

Planning: • Integrate container units within existing infrastructural layouts to minimize additional visual impact. Operations: • Regularly review and adjust the placement and orientation of containers to align with evolving landscape aesthetics and community feedback. Decommissioning: • Remove infrastructure not required for the post-decommissioning use. • Rehabilitate all affected areas. Consult an ecologist regarding rehabilitation specifications.
Residual Impacts
The visual impact of container solar facilities is expected to be reversible after decommissioning, assuming all components are removed, and the land is successfully restored. However, the visibility of container units during operation may leave a lasting visual imprint that could take time to diminish even after site restoration.

The Klipkoppie Solar PV Facility is a component of a growing ensemble of renewable energy initiatives within the Western Cape region. This collective includes the Riebeek Wind Energy Facility, the Paternoster Solar PV Project, and the Darling Solar Farm. Individually and collectively, these projects contribute to a progressive visual transformation, marking a pivot to renewable energy in the regional landscape.

The Riebeek Wind Energy Facility, located 18 km northeast of Klipkoppie, contributes a dynamic visual element to the regional landscape, its turbines visible from multiple locations due to the area's open fields and rolling topography. The Paternoster Solar PV Project, 22 km to the west, adds a more subtle yet noticeable change to the coastal visual dynamic. The Darling Solar Farm, 30 km to the south, although more distant, collectively impacts the regional visual perception, especially given the area's renown for natural vistas and viticulture.

The shift from traditional agricultural and natural views to a landscape characterized by renewable energy infrastructure necessitates an inclusive visual impact management strategy. This strategy must address the cumulative visual impacts of all developments, ensuring that mitigation efforts are coordinated and effective. This includes judiciously choosing locations, utilizing non-reflective materials, implementing strategic landscaping, and ongoing monitoring of visual impacts throughout the lifespan of the projects.

While the individual visual impacts of renewable energy projects are significant, it is the combined visual presence of these projects that necessitates careful consideration. The challenge is to maintain the visual integrity of the Western Cape while accommodating its emerging identity as a centre for clean energy. The goal is to

achieve a balance between environmental stewardship, economic advancement, and the preservation of the region's distinctive visual qualities. This balancing act is essential for safeguarding the interests of both current residents and future generations, as well as visitors who are drawn to the region's beauty and heritage.

The visual impacts, both of the standard solar PV arrays and the container solar facilities, are expected to be reversible after decommissioning, provided that all infrastructure is removed, and the land is effectively rehabilitated. Throughout their operational life, however, the facilities will constitute a visible change in the landscape, which, despite mitigation efforts, will have a lasting presence.

Cumulative impacts, particularly when viewed in conjunction with other existing or planned projects, underscore the necessity for a regional approach to landscape planning and visual impact assessment. By adopting and implementing best practice measures across all projects, it is possible to minimize adverse visual impacts and facilitate a smoother integration of renewable energy facilities into the Western Cape's visual landscape.

As these renewable energy projects take shape and contribute to the area's visual evolution, it is imperative that continuous dialogue is maintained with local communities. This engagement will not only help in managing the visual impact of these projects but also in fostering a collective sense of ownership and pride in the region's commitment to sustainable and renewable energy sources.

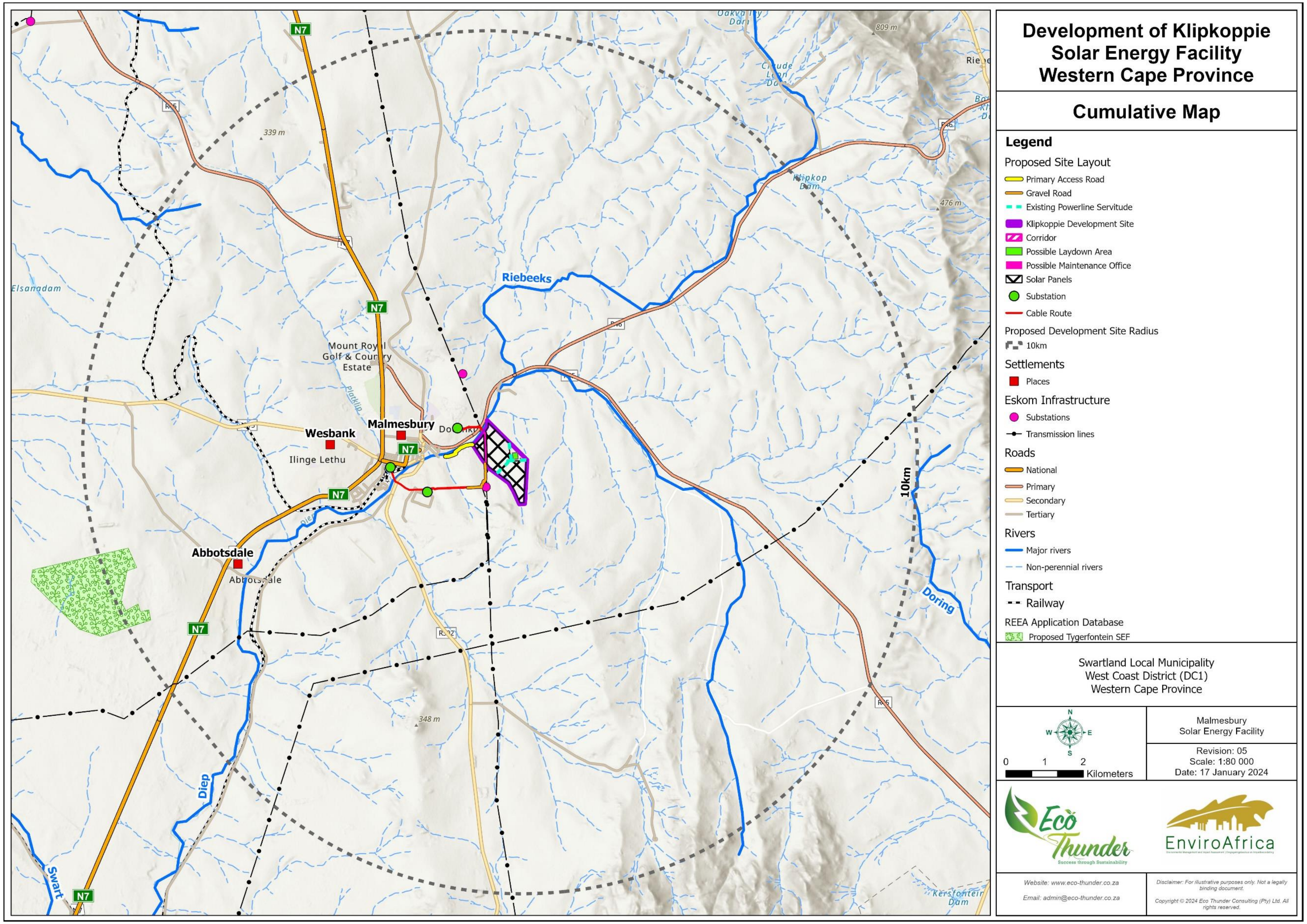

Figure 21: Cumulative Map

8.4 International Finance Corporation

In the Visual Impact Assessment (VIA) for the Klipkoppie Solar PV facility project, as detailed in Section 4.1.2**,** a key requirement was identified to ensure compliance with the IFC Performance Standards and other international guidelines throughout the assessment process. This requirement underscores the commitment to not only identify and assess potential visual impacts but also to adopt a mitigation hierarchy to anticipate, avoid, minimize, and where residual impacts remain, compensate, or offset for risks and impacts to the environment.

The VIA process has been comprehensive, considering the unique characteristics of the Klipkoppie Solar PV facility project, its environment, and the potential visual impacts during the operational phase. Mitigation measures have been proposed based on best practices, international standards, and the specific context of the project.

Now that the Impact Assessment and Mitigation section of the VIA has been completed, we can conclude that the VIA is compliant with the IFC Performance Standards. Table 9 provides a detailed breakdown of how each IFC Performance Standard has been addressed, considered, or resolved in the VIA report. This demonstrates the project's commitment to adhering to international standards and ensuring the minimization of visual impacts to the greatest extent possible.

Table 9: IFC Performance Standard in the VIA report

Performance Standard	Intent and Objective	Requirements	Project Specific Applicability
IFC PS 1	Identify and assess potential environmental and social risks and impacts of the project.	Identification of Risks and Impacts, Management Programmes, Organisational Capacity and Competency, Emergency Preparedness and Response, Monitoring and Review, Stakeholder Engagement, External Communication and Grievance Mechanism, Ongoing Reporting to Affected Communities.	The Klipkoppie Solar PV facility should utilise insights from the VIA to address potential visual impacts on surrounding landscapes, especially the town of Malmesbury. Based on these findings, it is recommended to institute tailored management programs that focus on minimizing visual disruptions. The project should also consider establishing a dedicated communication channel for stakeholders to ensure transparent and prompt addressing of concerns

Performance Standard	Intent and Objective	Requirements	Project Specific Applicability
IFC PS 3	Avoid and minimize adverse impacts on human health and the environment by avoiding or minimizing pollution from project activities.	Resource Efficiency, Pollution Prevention	The Klipkoppie Solar PV facility should be designed to harness optimal solar energy, emphasizing resource efficiency. The VIA has highlighted potential areas of visual pollution, and it is recommended that design modifications prioritize the preservation of the region's visual integrity. The project should adopt advanced technologies and best practices to prevent any form of pollution, ensuring harmonious integration into the landscape.
IFC PS 6	Protect and conserve biodiversity.	Protection and Conservation of Biodiversity, Management of Ecosystem Services, Sustainable Management of Living Resources	The Klipkoppie project is situated in a region with diverse visual characteristics and ecological significance. The VIA suggests that measures should be implemented to protect local biodiversity, ensuring minimal disruption to the natural habitat and ecosystem services. The project should prioritize the preservation of existing grasslands and scattered trees.
IFC PS 8	Protect cultural heritage from adverse impacts of project activities and support its preservation.	Protection of Cultural Heritage in Project Design and Execution, Project's Use of Cultural Heritage	The Klipkoppie Solar PV facility project should consider the cultural heritage of the local area in its planning and design. The project should commit to protecting and preserving any cultural heritage sites found in the project area. Mitigation measures should be implemented to avoid any adverse impacts on cultural heritage. The project should ensure that its activities do not adversely affect cultural heritage sites and should support the preservation of these sites.

Performance Standard	Intent and Objective	Requirements	Project Specific Applicability
IFC EHS Guidelines	Identify the risks posed by power generation and distribution projects to create visual impacts on Housing/farming communities.	Placement of powerlines and the design of substations with due consideration to landscape views and important environmental and community features.	The Klipkoppie Solar PV facility's design should consider the VIA's recommendations to ensure that powerlines and substations are strategically placed to minimize visual impacts. Special attention should be given to nearby housing and farming communities. The project should align with the IFC EHS Guidelines, emphasizing landscape integration, community considerations, and the prevention of visual pollution.

9 Environmental Impact Statement and Conclusion

The Klipkoppie Solar PV Facility, proposed for the Western Cape region near Malmesbury, represents a significant step forward in sustainable development. Its Visual Impact Assessment (VIA) has been meticulously conducted to ascertain that the facility will be integrated into the local environment with due consideration for environmental and aesthetic values.

The site, with its undulating landscape and expansive views, is well-suited to accommodate a solar facility while maintaining the visual integrity of the region. This integration is sensitive to the local Visual Absorption Capacity (VAC), ensuring that the facility is a complement, not a compromise, to the scenery.

Given the mixed-use profile of the Swartland Local Municipality, the VIA has taken into account the varied landscape, from natural areas and agricultural lands to residential zones. Proximity to key locations, visibility from main thoroughfares, and the area's heritage were pivotal in the assessment process, providing a holistic view of the potential visual impact.

The project's approach to sensitive environments is to implement mitigation strategies that safeguard ecological areas and water resources, reinforcing the commitment to ecological preservation alongside renewable energy development.

Considering the cumulative visual impact in the context of regional renewable energy initiatives, the facility has been planned to fit cohesively within this expanding network. The project's decommissioning strategy, which includes site restoration, emphasizes a long-term commitment to maintaining the landscape's natural state.

From a visual perspective, the choice between standard solar PV arrays and container solar facilities warrants careful consideration. Each option presents unique impacts and benefits:

- Standard solar PV arrays, while having a larger footprint, can be designed and sited to minimize visual impact through careful landscaping and design.
- Container solar facilities, on the other hand, offer a modular approach with potentially greater visual intrusion due to their height and structure but may provide a visually less intrusive profile due to their smaller individual footprint and the ability to screen effectively.

From the VIA's standpoint, the preferred choice hinges on the balance between visual impact and the area's character. If the landscape can accommodate the additional vertical elements without significant disruption to the scenic vistas or encroaching on the visual corridors valued by the community, container solar facilities may present a viable option. Their modularity and smaller footprint could allow for more flexibility in mitigating visual impacts through strategic placement and landscaping.

Conversely, standard solar PV arrays offer a more consistent and predictable visual profile that could be deemed less intrusive over larger areas, particularly in landscapes where the horizontal lines of arrays can be aligned with the natural contours of the land.

In conclusion, while both standard solar PV arrays and container solar facilities have the potential to be integrated into the Western Cape's landscape with minimal visual disruption, the choice between the two should be guided by site-specific considerations. These include the topography, existing visual patterns, and the potential for natural and artificial screening. Given the facility's proximity to sensitive visual receptors and the importance of maintaining the aesthetic and ecological values of the region, it is recommended that the option which offers the most substantial mitigation potential while meeting the project's energy production goals be considered the preferred choice.

The Klipkoppie Solar PV Facility is poised to contribute positively to South Africa's renewable energy portfolio. By adopting a forward-thinking approach to its visual impact, the project can serve as a benchmark for integrating renewable energy infrastructure into diverse landscapes. This endeavour underscores a commitment to harmonising technological innovation with the intrinsic values of the environment, ensuring that the visual and ecological diversity of the Western Cape is upheld.

10 References

Australian Government Department of Infrastructure, Transport, Regional Development and Communications. (n.d.). Environmental Assessments.

Civil Aviation Authority, UK. (n.d.). Visual Impact.

Department of Agriculture, Land Reform and Rural Development (n.d.). Department of Agriculture, Land Reform and Rural Development.

Department of Environmental Affairs (DEA), South Africa. (2010). Environmental Impact Assessment Regulations.

Department of Environmental Affairs (2017). Environmental Impact Assessment Regulations, 2017.

Department of Environmental Affairs (2017). Environmental Impact Assessment Regulations Listing Notice 1, 2017.

Department of Environmental Affairs (2017). Environmental Impact Assessment Regulations Listing Notice 2, 2017.

Department of Environmental Affairs (2017). Environmental Impact Assessment Regulations Listing Notice 3, 2017.

Department of Environmental Affairs (DEA), South Africa. (2017). Environmental Impact Assessment Guideline for Renewable Energy Projects.

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

Merafong Local Municipality (n.d.). Merafong Local Municipality.

Merafong Local Municipality (n.d.). Merafong Local Municipality.

Federal Highway Administration. (n.d.). Visual Impact Assessment for Highway Projects.

International Finance Corporation (IFC). (2012). Guidance Notes to Performance Standards on Environmental and Social Sustainability.

International Finance Corporation (IFC). (2012). Performance Standards on Environmental and Social Sustainability.

International Finance Corporation. (2015). Utility-Scale Solar Photovoltaic Power Plants: A Project Developer's Guide.

Landscape Institute and Institute of Environmental Management and Assessment. (2013). Guidelines for Landscape and Visual Impact Assessment. 3rd Edition.

Ministry for the Environment, New Zealand. (n.d.). Quality Planning - Landscape.

Gauteng Tourism & Parks Agency (n.d.). Gauteng Tourism & Parks Agency.

Gauteng Tourism & Parks Agency (n.d.). Gauteng Tourism & Parks Agency.

Scottish Government. (n.d.). Landscape and Visual Impact Assessment.

SolarPower Europe. (n.d.). EPC Best Practice Guidelines Version 2.0.

SolarPower Europe. (n.d.). Operations and Maintenance Best Practice Guidelines Version 5.0.

South African Civil Aviation Authority (n.d.). South African Civil Aviation Authority.

South African Council for the Landscape Architectural Profession (SACLAP). (n.d.). Guidelines and Policies.

South African Heritage Resources Agency (n.d.). South African Heritage Resources Agency.

South African Heritage Resources Agency (2022). Visual Impact Assessment for the Proposed Camden I Wind Energy Facility.

South African Heritage Resources Agency (2022). Visual Impact Assessment for the Proposed Coleskop Solar PV facility.

South African Heritage Resources Agency (2022). Visual Impact Assessment for the Proposed Halfgewonnen Solar PV facility.

South African Heritage Resources Agency (2022). Visual Impact Assessment for the Proposed Serval Solar PV facility.

South African Heritage Resources Agency (2022). Visual Impact Assessment for the Proposed Ummbila Wind Energy Facility.

South African National Biodiversity Institute (n.d.). Vegetation Map of South Africa.

South African National Parks (n.d.). GIS Data.

South African National Parks (n.d.). South African National Parks.

South African Photovoltaic Industry Association (SAPVIA). (n.d.). Guidelines and Best Practices.

South African Wind Energy Association (SAWEA). (n.d.). Guidelines and Best Practices.

South African National Parks (SANParks). (n.d.). GIS Data.

South African Wind Energy Association (SAWEA). (n.d.). Guidelines and Best Practices.

South African Heritage Resources Agency. (2022). Visual Impact Assessment for the Proposed Coleskop Solar PV facility.

South African Heritage Resources Agency. (2022). Visual Impact Assessment for the Proposed Halfgewonnen Solar PV facility.

South African Heritage Resources Agency. (2022). Visual Impact Assessment for the Proposed Serval Solar PV facility.

South African Heritage Resources Agency. (2022). Visual Impact Assessment for the Proposed Ummbila Wind Energy Facility.

South African Heritage Resources Agency. (2022). Visual Impact Assessment for the Proposed Camden I Wind Energy Facility.

U.S. Environmental Protection Agency. (n.d.). National Environmental Policy Act (NEPA) Review Process.

UK Government. (n.d.). Environmental Impact Assessment.

Appendix A: Specialist CV

Appendix B: Site Sensitivity Verification

Appendix C: VIA Best Practice Guideline

Appendix D: IFC Guideline