PROPOSED KIARA PV 4 FACILITY AND ASSOCIATED GRID CONNECTION INFRASTRUCTURE, NORTH WEST PROVINCE

VISUAL IMPACT ASSESSMENT – INPUT FOR EIR

Produced for:

Voltalia South Africa (Pty) Ltd

On behalf of:

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1. STUDY APPROACH

1.1. Qualification and experience of the practitioner

Lourens du Plessis (t/a LOGIS) is a *Professional Geographical Information Sciences (GISc) Practitioner* registered with The South African Geomatics Council (SAGC), and specialises in Environmental GIS and Visual Impact Assessments (VIA).

Lourens has been involved in the application of Geographical Information Systems (GIS) in Environmental Planning and Management since 1990. He has extensive practical knowledge in spatial analysis, environmental modelling and digital mapping, and applies this knowledge in various scientific fields and disciplines. His GIS expertise are often utilised in Environmental Impact Assessments, Environmental Management Frameworks, State of the Environment Reports, Environmental Management Plans, tourism development and environmental awareness projects.

He holds a BA degree in Geography and Anthropology from the University of Pretoria and worked at the GisLAB (Department of Landscape Architecture) from 1990 to 1997. He later became a member of the GisLAB and in 1997, when Q-Data Consulting acquired the GisLAB, worked for GIS Business Solutions for two years as project manager and senior consultant. In 1999 he joined MetroGIS (Pty) Ltd as director and equal partner until December 2015. From January 2016 he worked for SMEC South Africa (Pty) Ltd as a technical specialist until he went independent and began trading as LOGIS in April 2017.

Lourens has received various awards for his work over the past two decades, including EPPIC Awards for ENPAT, a Q-Data Consulting Performance Award and two ESRI (Environmental Systems Research Institute) awards for *Most Analytical* and *Best Cartographic Maps*, at Annual International ESRI User Conferences. He is a co-author of the ENPAT atlas and has had several of his maps published in various tourism, educational and environmental publications.

He is familiar with the "Guidelines for Involving Visual and Aesthetic Specialists in EIA Processes" (Provincial Government of the Western Cape: Department of Environmental Affairs and Development Planning) and utilises the principles and recommendations stated therein to successfully undertake visual impact assessments. Although the guidelines have been developed with specific reference to the Western Cape Province of South Africa, the core elements are more widely applicable (i.e. within the Northern Cape Province).

1.2. Introduction

This visual impact assessment (VIA) report forms part of the scoping and environmental impact assessment for the Proposed **Kiara PV 4** Facility and Associated Grid Connection Infrastructure in the North West Province.

This VIA has been compiled for inclusion in the environmental impact report (EIR) following the approval of the Scoping report.

1.3. Assumptions and limitations

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

1.4. Level of confidence

Level of confidence[1] is determined as a function of:

- The information available, and understanding of the study area by the practitioner:
    - 3: A high level of information is available of the study area and a thorough knowledge base could be established during site visits, surveys etc. The study area was readily accessible.
    - 2: A moderate level of information is available of the study area and a moderate knowledge base could be established during site visits, surveys etc. Accessibility to the study area was acceptable for the level of assessment.
    - 1: Limited information is available of the study area and a poor knowledge base could be established during site visits and/or surveys, or no site visit and/or surveys were carried out.

- The information available, understanding of the study area and experience of this type of project by the practitioner:
    - 3: A high level of information and knowledge is available of the project and the visual impact assessor is well experienced in this type of project and level of assessment.
    - 2: A moderate level of information and knowledge is available of the project and/or the visual impact assessor is moderately experienced in this type of project and level of assessment.
    - 1: Limited information and knowledge is available of the project and/or the visual impact assessor has a low experience level in this type of project and level of assessment.

These values are applied as follows:

Table 1: Level of confidence.

	Information on the project & experience of the practitioner			
Information on the study area		**3**	**2**	**1**
	3	9	6	3
	2	6	4	2
	1	3	2	1

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:*

- The information available, and understanding of the study area by the practitioner is rated as **3** and
- The information available, understanding and experience of this type of project by the practitioner is rated as **3**.

1.5. Scope of Work

During the Scoping Phase (i.e. first phase of the assessment) the scope of work included:

[1] Adapted from Oberholzer (2005).

- Creation of a detailed Digital Terrain Model (DTM) for the potentially affected environment. This constituted the study area and area of analysis for the subsequent VIA (this report).
- Sourcing of relevant spatial data. This included cadastral features, land use categories, natural and topographical features, site placement, design, etc.
- Identification of sensitive environments or areas upon which the activities/infrastructure could have a potential visual impact. Critical areas were highlighted during this phase. These would be identified through, mainly (but not restricted to), the inputs from interested and affected parties.
- Undertake viewshed analyses from proposed site placement or alternatives in order to determine the visual exposure. The viewshed analysis will take into account the dimensions of the relevant structures.
- Stipulate the potential visual impacts of the project and identify issues related to the visual impact that should be addressed during the visual impact assessment phase.
- Make recommendations to inform the design process or alternative selection.
- Provide a Plan of Study for the VIA to be undertaken during the EIA phase of the project.

During the Impact Assessment Phase (i.e. second phase of the assessment) issues that weren’t resolved during scoping phase and that require further investigation are taken forward. The determination of the potential visual impacts is undertaken in terms of nature, extent, duration, magnitude, probability and significance of the construction and operation of the proposed infrastructure.

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

The study area for the visual assessment encompasses a geographical area of approximately **466km²** (the extent of the full-page maps displayed in this report) and includes a minimum 6km buffer zone (area of potential visual influence) from the proposed project site.

The study area includes the town of Lichtenburg, sections of the R52 and R505 arterial roads as well as a number of major secondary (local) roads.

The scope of works for this report include:

- Identify potentially sensitive visual receptors within the receiving environment.
- Determine the Visual Absorption Capacity of the landscape.
- Determine Visual Distance/Observer Proximity to the facility.
- Determine Viewer Incidence/Viewer Perception.
- Determine Significance of identified impacts.
- Propose mitigation to reduce or alleviate potential adverse visual impacts (to be structured as an EMPr).
- Assess the glint and glare of the PV panels
- Conclude with an Impact Statement of Significance and a project recommendation.

1.6. Methodology

The study was undertaken using Geographical Information Systems (GIS) software as a tool to generate viewshed analyses and to apply relevant spatial criteria to the proposed facility. A detailed Digital Terrain Model (DTM) for the study area was created from topographical data provided by the Japan Aerospace Exploration Agency (JAXA), Earth Observation Research Centre, in the form of the ALOS Global Digital Surface Model "ALOS World 3D - 30m" (AW3D30) elevation model.

Visual Impact Assessment (VIA)

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 facility layout/position.

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.

The following VIA-specific tasks were undertaken:

- **Determine potential visual exposure**

The visibility or visual exposure of any structure or activity is the point of departure for the visual impact assessment. It stands to reason that if (or where) the proposed facility and associated infrastructure were not visible, no impact would occur.

The viewshed analyses of the proposed facility and the related infrastructure are based on a 30m resolution AW3D30 digital terrain model of the study area.

The first step in determining the visual impact of the proposed facility is to identify the areas from which the structures would be visible. The type of structures, the dimensions, the extent of operations and their support infrastructure are taken into account.

- **Determine visual distance/observer proximity to the facility**

In order to refine the visual exposure of the facility on surrounding areas/receptors, the principle of reduced impact over distance is applied in order to determine the core area of visual influence for this type of structure.

Proximity radii for the proposed infrastructure are created in order to indicate the scale and viewing distance of the facility and to determine the prominence of the structures in relation to their environment.

The visual distance theory and the observer's proximity to the facility are closely related, and especially relevant, when considered from areas with a high viewer incidence and a predominantly (anticipated) negative visual perception of the proposed facility.

- **Determine viewer incidence/viewer perception (sensitive visual receptors)**

The next layer of information is the identification of areas of high viewer incidence (i.e. main roads, residential areas, settlements, etc.) that may be exposed to the project facility.

This is done in order to focus attention on areas where the perceived visual impact of the facility will be the highest and where the perception of affected observers will be negative.

Related to this data set, is a land use character map, that further aids in identifying sensitive areas and possible critical features (i.e. tourist facilities, protected areas, etc.), that should be addressed.

- **Determine the visual absorption capacity of the landscape**

This is the capacity of the receiving environment to absorb the potential visual impact of the proposed facility. The VAC is primarily a function of the vegetation, and will be high if the vegetation is tall, dense and continuous. Conversely, low growing, sparse and patchy vegetation will have a low VAC.

The VAC would also be high where the environment can readily absorb the structure in terms of texture, colour, form and light / shade characteristics of the structure. On the other hand, the VAC for a structure contrasting markedly with one or more of the characteristics of the environment would be low.

The VAC also generally increases with distance, where discernible detail in visual characteristics of both environment and structure decreases.

- **Calculate the visual impact index**

The results of the above analyses are merged in order to determine the areas of likely visual impact and where the viewer perception would be negative. An area with short distance visual exposure to the proposed infrastructure, a high viewer incidence and a predominantly negative perception would therefore have a higher value (greater impact) on the index. This focusses the attention to the critical areas of potential impact and determines the potential **magnitude** of the visual impact.

Geographical Information Systems (GIS) software is used to perform all the analyses and to overlay relevant geographical data sets in order to generate a visual impact index.

- **Determine impact significance**

The potential visual impacts are quantified in their respective geographical locations in order to determine the significance of the anticipated impact on identified receptors. Significance is determined as a function of extent, duration, magnitude (derived from the visual impact index) and probability. Potential cumulative and residual visual impacts are also addressed. The results of this section are displayed in impact tables and summarised in an impact statement.

- **Propose mitigation measures**

The preferred alternative (or a possible permutation of the alternatives) will be based on its potential to reduce the visual impact. Additional general mitigation measures will be proposed in terms of the planning, construction, operation and decommissioning phases of the project.

- **Reporting and map display**

All the data categories, used to calculate the visual impact index, and the results of the analyses will be displayed as maps in the accompanying report. The methodology of the analyses, the results of the visual impact assessment and the conclusion of the assessment will be addressed in this VIA report.

2. BACKGROUND

Voltalia South Africa (Pty) is proposing the development of a Photovoltaic (PV) Solar Energy Facility and associated infrastructure on Portion 2 of Farm Hollaagte No. 8, located on a site approximately 16km north-east of the town of Lichtenburg in the North West Province. The solar PV facility will comprise several arrays of PV panels and associated infrastructure and will have a contracted capacity of up to **100MW**. It will be known as **Kiara PV 4**.

Six additional PV facilities (*Kiara PV 1, Kiara PV 2, Kiara PV 3, Kiara PV 5, Kiara PV 6, Kiara PV 7*) are concurrently being considered on the project site (within Portion 2 of the Farm Hollaagte 8 and the Remaining Extent of the Farm Hollaagte No. 8) and are assessed through separate Environmental Impact Assessment (EIA) processes.

A facility development area (approximately **176ha**), as well as grid connection infrastructure, have been considered in the Scoping phase.

The infrastructure associated with this PV facility includes:

- PV modules and mounting structures
- Inverters and transformers
- Battery Energy Storage System (BESS)
- Site and internal access roads (up to 8m wide)
- Site offices and maintenance buildings, including workshop areas for maintenance and storage.
- Temporary and permanent laydown area
- Grid connection solution will include:
    - Facility Substation
    - Eskom Switching Station
    - A 275kV powerline (16.6km in length) (either single or double circuit), to connect the PV facility to the Watershed MTS.

Figure 1: Regional locality of the study area.

The PV facility will take approximately 1 year to construct and the operational lifespan of the facility is estimated from 20 - 30 years.

The proposed properties identified for the PV facility and associated infrastructure are indicated on the maps within this report. Sample images of similar PV technology and Battery Energy Storage System (BESS) facilities are provided below.

Figure 2: Photovoltaic (PV) solar panels. (*Photo: SunPower Solar Power Plant – Prieska)*.

Figure 3: Aerial view of PV arrays. (*Photo: Scatec Solar South Africa*).

Figure 4: Aerial view of a BESS facility (*Photo: Power Engineering International)*.

Figure 5: Close up view of a BESS facility *(Photo: Greenbiz.com).*

3. RELEVANT LEGISLATION AND GUIDELINES

The following legislation and guidelines have been considered in the preparation of this report:

- National Environmental Management Act 107 of 1998 (NEMA);
- The Environmental Impact Assessment Regulations, 2014 (as amended);
- Guideline on Generic Terms of Reference for EAPS and Project Schedules (DEADP, Provincial Government of the Western Cape, 2011); and

- Guideline for involving visual and aesthetic specialists in EIA processes: Edition 1.

4. THE AFFECTED ENVIRONMENT

The properties for the Kiara PV Cluster are located on a site approximately 16km north-east of the town of Lichtenburg in the North West Province. The development area is situated within the Ditsobotla Local Municipality within the Ngaka Modiri Molema District Municipality. The site is accessible via an existing gravel road which provides access to the development area, on Portion 2 of the Farm *Hollaagte No. 8*.

Regionally, the study area is located about 15km east of Bakerville, 10km south east of Carlisonia, about 27km west of Ga-Motlala, about 28km north west of Putfontein, and approximately 30 km north east of Twycross within the North West Province.

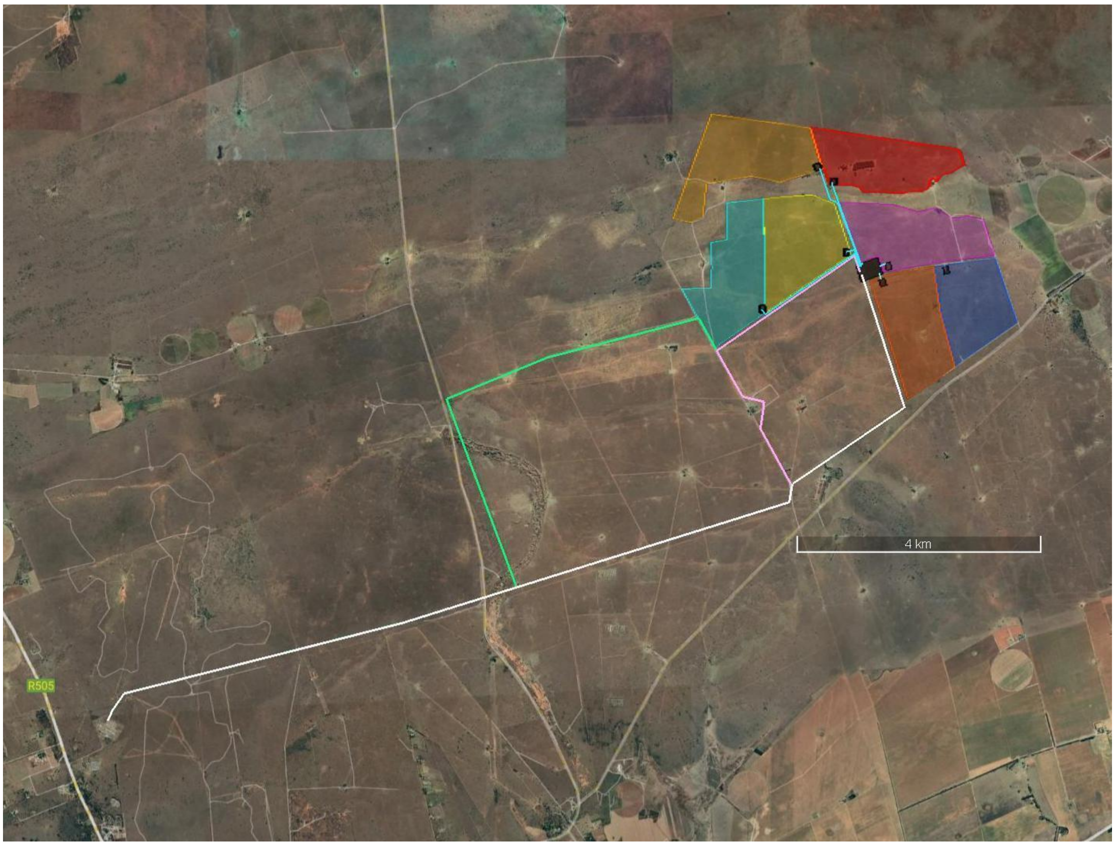


Figure 6: Aerial view of the Kiara PV cluster.

The study area occurs on land that ranges in elevation from approximately 1,480m above sea level (within Manana farmstead, south of the Kiara PV Cluster) to 1,550m; representing the *koppies* (small hills) surrounding the Rall Broers Private Nature Reserve North West of the PV Cluster, as well as the *Doringkop* hill, lying north east of the PV Cluster. The terrain surrounding the proposed properties is generally flat, sloping gently to the north and gradually decreasing in elevation towards the south west of the study area. The Manana farmstead dam is also represented in the broader area.

No water bodies are located within or near the property boundaries. The terrain type of the region is relatively homogenous and is described as *Plains and Pans* or *Slightly Undulating Plains* of the *Central Interior Plain*. The slope of the entire study area is extremely even (flat) with slight undulations of no more than 5m. As described, a few *koppies* lie north east and north west of the study area- refer to **Map 1.**

Originally a town that endured a ten-year diamond rush from the late 1920's, Lichtenburg's main economic activity today is the production of maize (including groundnuts and sunflower seeds), as well as meat. Predominately a farming town that owes its existence to the presence of natural water resources in the area, Lichtenburg lies in the heart of the maize triangle, which is the main maize growing area in South Africa. Another major economic activity is the production of cement, and within an 80-kilometre radius of Lichtenburg three major cement producers can be found.

The study area is sparsely populated outside of the Lichtenburg urban area (i.e. 26.13 people per km2 within the Ditsobotla Municipality). Lichtenburg (lying approximately 16km away from the Kiara Cluster) is the largest town that is closeby in the study area, with a population density of 241.86 people per km^2. In addition to Lichtenburg, a number of isolated homesteads occur throughout the study area. Some of these in the study area include:

- Hollaagte 1,2,3 and 4
- Witstinkhoutboom 1, 2, 3, 4 and 5
- Rooipan 1,2, 3, and 4
- Vlakpan 1,2,3 and 4
- Samekoms 1,2 and 3
- Welverdiend 1 and 2
- Klipkuil 1 and 2
- Doornkop

Figures 7 & 8: Topography and vegetation of the region.
Note the flat terrain, the natural Grassland in Figure 7 and farmed land in Figure 8.

Access to the proposed development area (from Lichtenburg) is provided by the Manana secondary road that joins the R52 arterial road near Lichtenburg.

The Watershed MTS substation is located at a distance of **15km** south-west of the proposed site. A great number of power lines, associated with this substation, are located south and west of the site.

The power lines traversing the site to the south include:

- Pluto / Watershed 1275kV
- Hera / Watershed 1275kV

The power lines traversing the site to the south-west include:

- Halfpad Traction-Watershed 1132kV

The power lines traversing the site to the west include:

- Watershed-Mmabatho 1 & 2 88kV
- Slurry PPC-Watershed 188kV
- Watershed- Zeerust 1 13

Figure 9: Power line infrastructure along the R505 arterial / main road.

The climate within the region is semi-arid, with the region receiving approximately 609mm of rainfall per annum. The natural vegetation or land cover types of the region are described as *Grassland* (including old fields), with large tracts of agricultural fields (altered vegetation) consisting of mostly dryland agriculture towards the east and south of the site. Some irrigated agricultural land is found towards the west of the site.

The majority of the remaining natural vegetation within the study area is indicated as *Carltonville Dolomite Grassland.* Limited sections of *Western Highveld Sandy Grassland*, which in turn envelop small portions of Highveld Salt Pans within Vaal-Vet Sandy Grassland lie further south beyond the site boundaries.

Exotic plantations are limited and are dotted towards the east, south, and north-west of the study area.

Bushland (fallow land, including old fields) is very limited and is dotted towards the south-east, south-west and north-west of the study area.

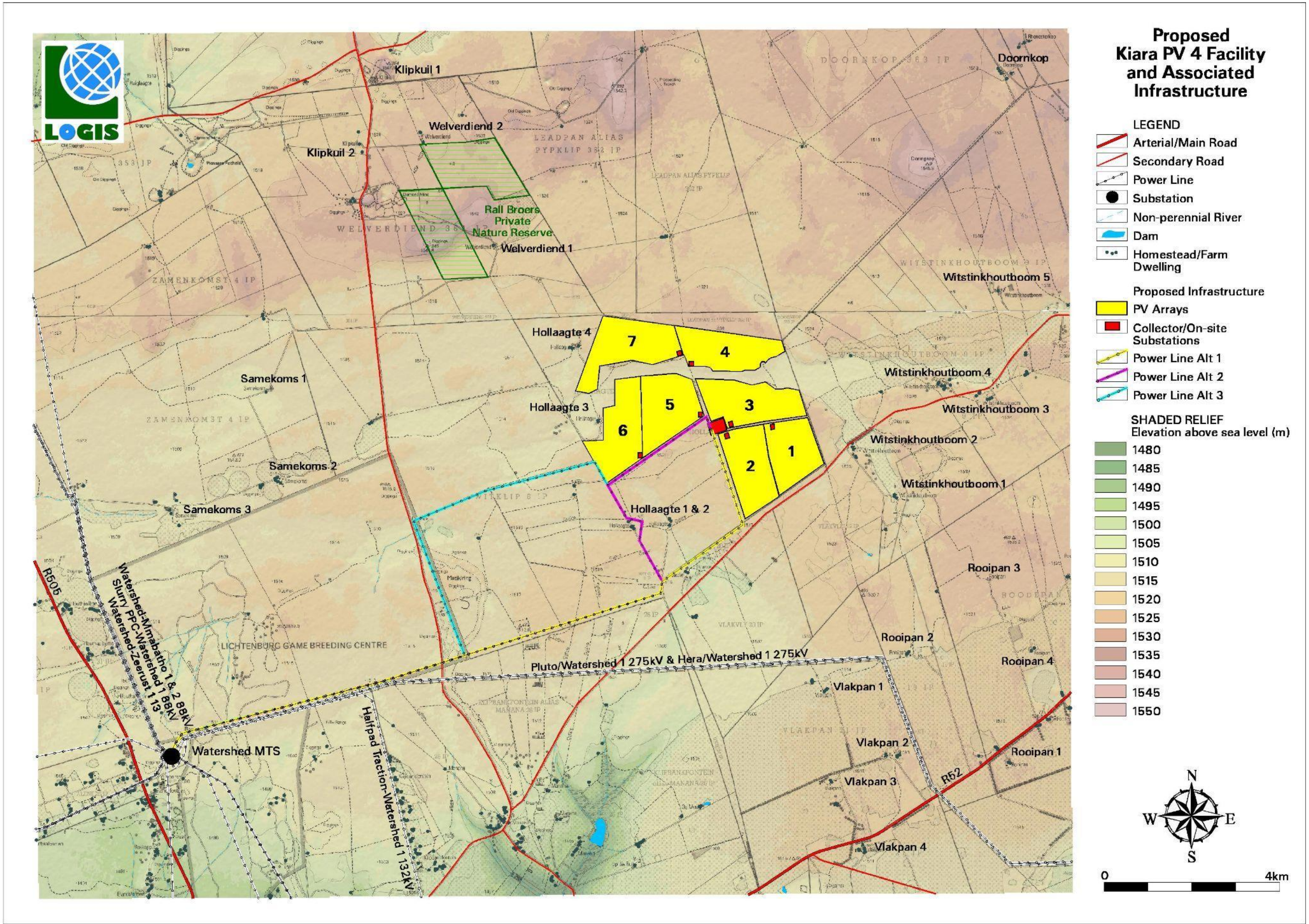
Wetlands are scarce- but have been located in small areas towards the east and south-west of the site.

Land use activities within the broader region are predominantly described as undeveloped (vacant open space or farmland), with mining/quarrying activity evident towards the north-west (diamond mining) and informal digging south-west of the proposed site.

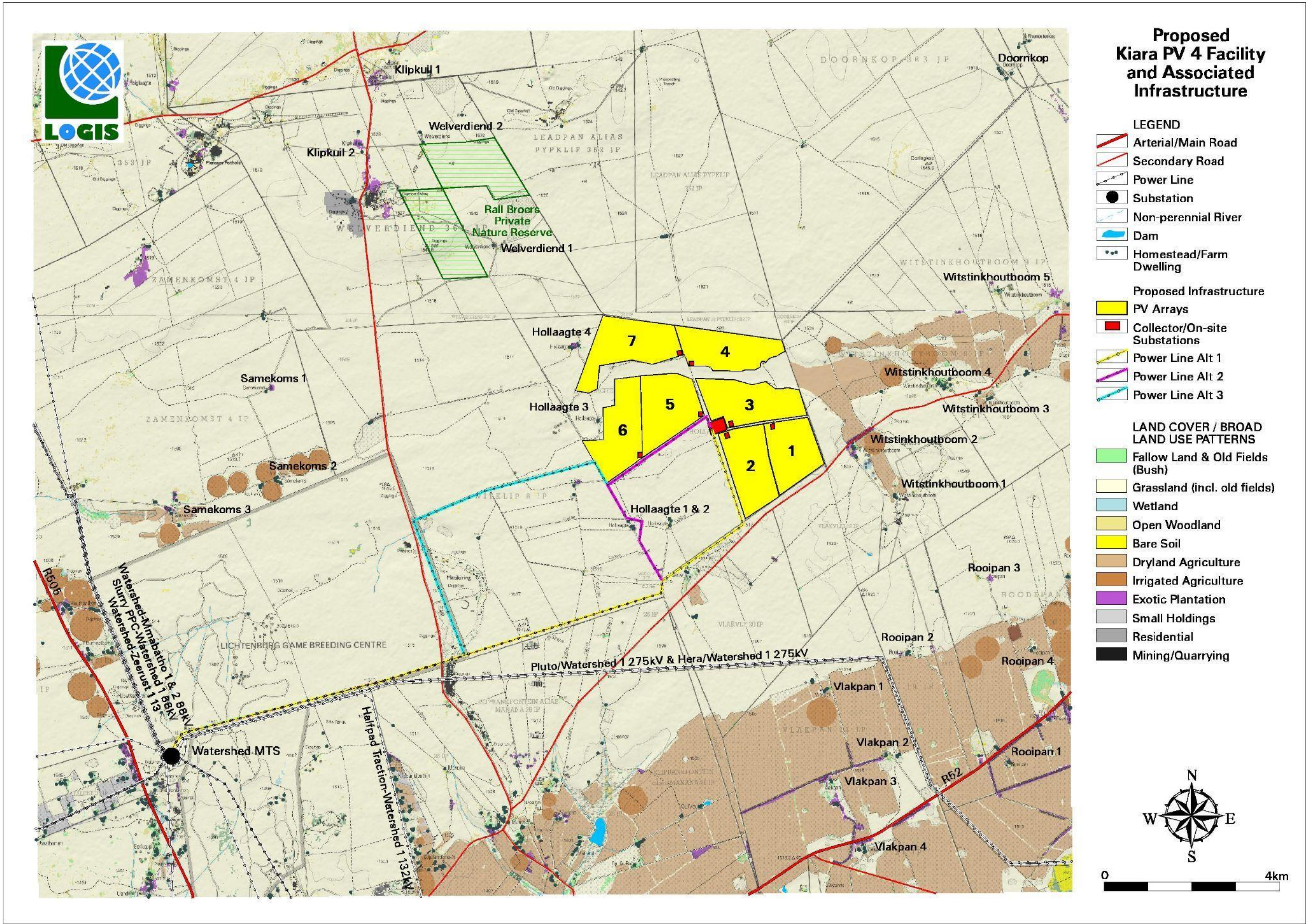
The Rall Broers Private Nature Reserve is located north-west of the site at a distance of approximately **15.85km** at the closest. Refer to **Map 2.**

Despite the infrastructure in and around the town of Lichtenburg and the industrial type infrastructure at the Watershed MTS with its associated powerlines, the greater landscape of the study area is characterised by wide-open spaces, with otherwise very limited development. It should however be noted that there are two approved renewable energy projects within the study area (namely, Lichtenburg 1 Solar PV towards the south west of the Kiara Solar PV Cluster, as well as an unknown / 'incorrectly specified project' falling within the homestead areas of Vlakpan 1, 2, 3 and 4 which lie south east of the Kiara Solar PV Cluster), that may change the landscape to some degree in the future.

Figure 10: Landscape character of the study area showing undeveloped wide-open spaces interspersed with power lines (from the R52)



Map 1: Shaded relief map of the study area.



Map 2: Land cover and broad land use patterns.

5. ANTICIPATED ISSUES RELATED TO THE VISUAL IMPACT

Anticipated issues related to the potential visual impact of the proposed PV facility were identified during the Scoping Phase and included the following:

- The visibility of the facility to, and potential visual impact on, observers travelling along the Manana secondary road in closer proximity to the proposed infrastructure.
- The visibility of the facility to, and potential visual impact on residents of dwellings within the study area, with specific reference to the farm residences in closer proximity to the proposed development.
- The potential visual impact of the facility on the visual character or sense of place of the region.
- The potential visual impact of the facility on tourist routes or tourist destinations/facilities (if present).
- The potential visual impact of the construction of ancillary infrastructure (i.e. internal access roads, buildings, power line, etc.) on observers in close proximity to the facility.
- The visual absorption capacity of the natural vegetation (if applicable).
- Potential cumulative visual impacts (or consolidation of visual impacts), with specific reference to the placement of the PV facility within an area where various solar energy generation applications have been authorised, or are still being assessed.
- The potential visual impact of operational, safety and security lighting of the facility at night on observers residing in close proximity of the facility.
- Potential visual impact of solar glint and glare as a visual distraction and possible air/road travel hazard.
- Potential visual impact of solar glint and glare on static ground-based receptors (residents of homesteads) in close proximity to the PV facility.
- Potential visual impacts associated with the construction phase.
- The potential to mitigate visual impacts and inform the design process.

It is envisaged that the issues listed above may potentially constitute a visual impact at a local and/or regional scale. These have been assessed in greater detail in the sections below.

6. RESULTS

6.1. Potential visual exposure

The result of the viewshed analysis for the proposed facility is shown on the map below (**Map 3**). The viewshed analysis was undertaken from a representative number of vantage points within the development footprint at an offset of 5m above ground level. This was done in order to determine the general visual exposure (visibility) of the area under investigation, simulating the maximum height of the proposed structures (PV panels, inverters, BESS, etc.) associated with the facility.

Map 3 also indicates proximity radii from the development footprint in order to show the viewing distance (scale of observation) of the facility in relation to its surrounds.

The viewshed analysis includes the effect of vegetation cover and existing structures on the exposure of the proposed infrastructure.

Results

It is clear that the relatively constrained dimensions of the PV4 facility would amount to a fairly limited area of potential visual exposure. The visual exposure would largely be contained within a 6km radius of the proposed development site.

The following is evident from the viewshed analyses:

0 – 1km

The potential visual exposure of the facility is contained to a core area on the site itself and within a 1km radius thereof. There are no residences or secondary roads indicated within this zone.

1 – 3km

Potential visual exposure in the short to medium distance (i.e. between 1 and 3km), is scattered throughout this radius but is more concentrated towards the north and east of the Kiara PV 4 facility. Homesteads Witstinkhoutboom 2 (south east of the PV 4 Facility), as well as Hollaagte 3 (south west of the PV4 Facility) are found within this zone and do not appear to show any potential visibility. However, homestead Hollaagte 4 (west of the PV4 Facility) lies within an area that may be prone to potential visibility in patches due to the undulating nature of the topography. The Manana secondary road south east of the site shows some potential visibility in sporadic and intermittent patches towards the eastern end of this zone.

3 - 6km

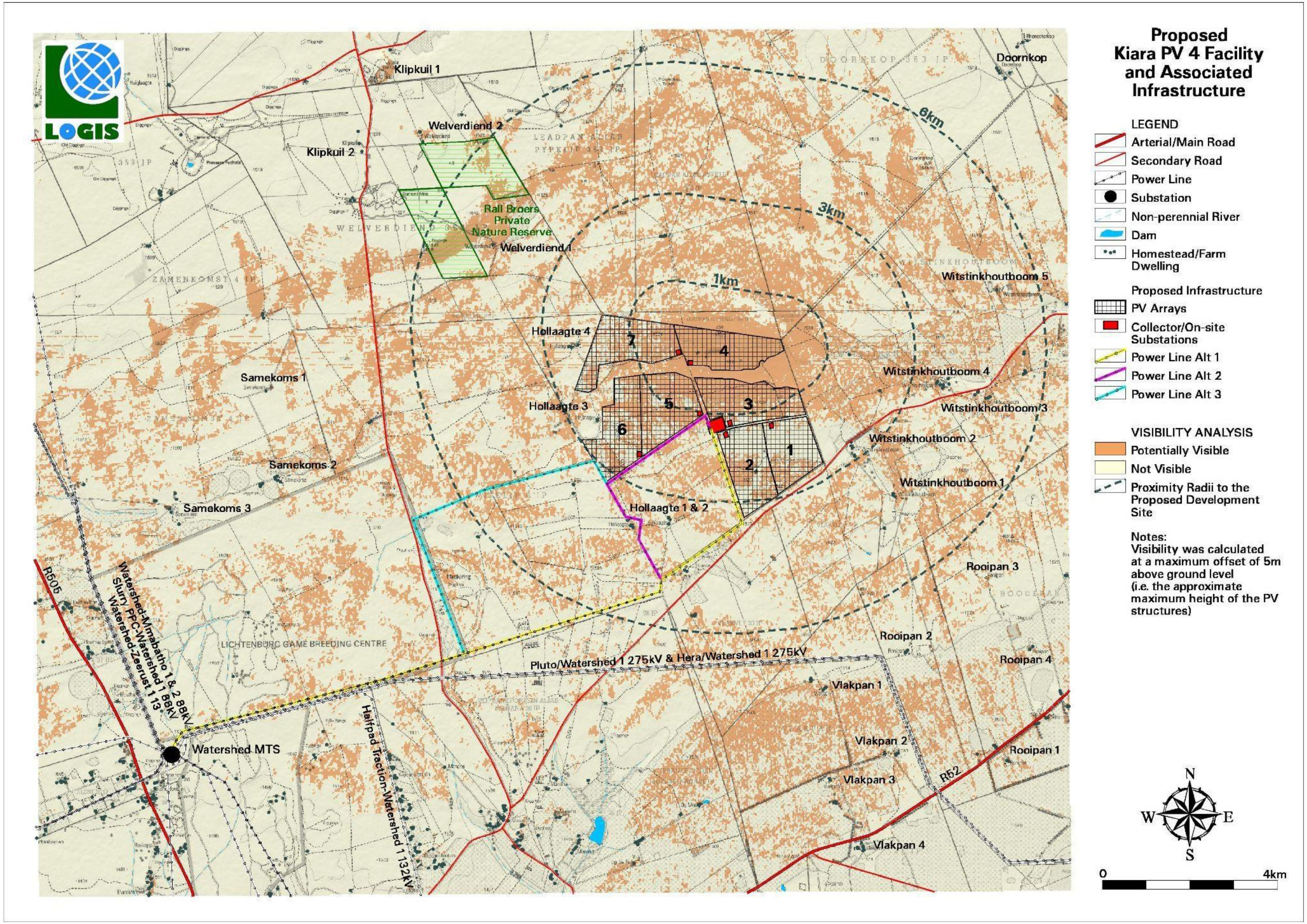
Within a 3 – 6km radius, the visual exposure becomes very scattered and interrupted due to the undulating nature of the topography. Homesteads Witstinkhoutboom 1, 3, 4 and 5 lie towards the east and all show potential visibility, while Hollaagte 1 and 2 are situated towards the south east, with no potential visibility shown, most likely due to the nature of the topography. Moreover, residence of homestead Welverdiend 1, situated towards the north west within this zone will also experience potential visibility. Also, towards the north west of the PV4 Facility within this zone lies more than half of the Rall Broers Private Nature Reserve property- with potential visibility evident in patches within its southern tips of its boundary, also due to the nature of the topography / *koppies* (hills) within the reserve. Other sensitive visual receptors are observers travelling along the Manana secondary road (south and south east of the site), where sporadic visibility is more evident towards the eastern end, but is more visually screened within the southern portion from the PV4 Facility within this zone.

> 6km

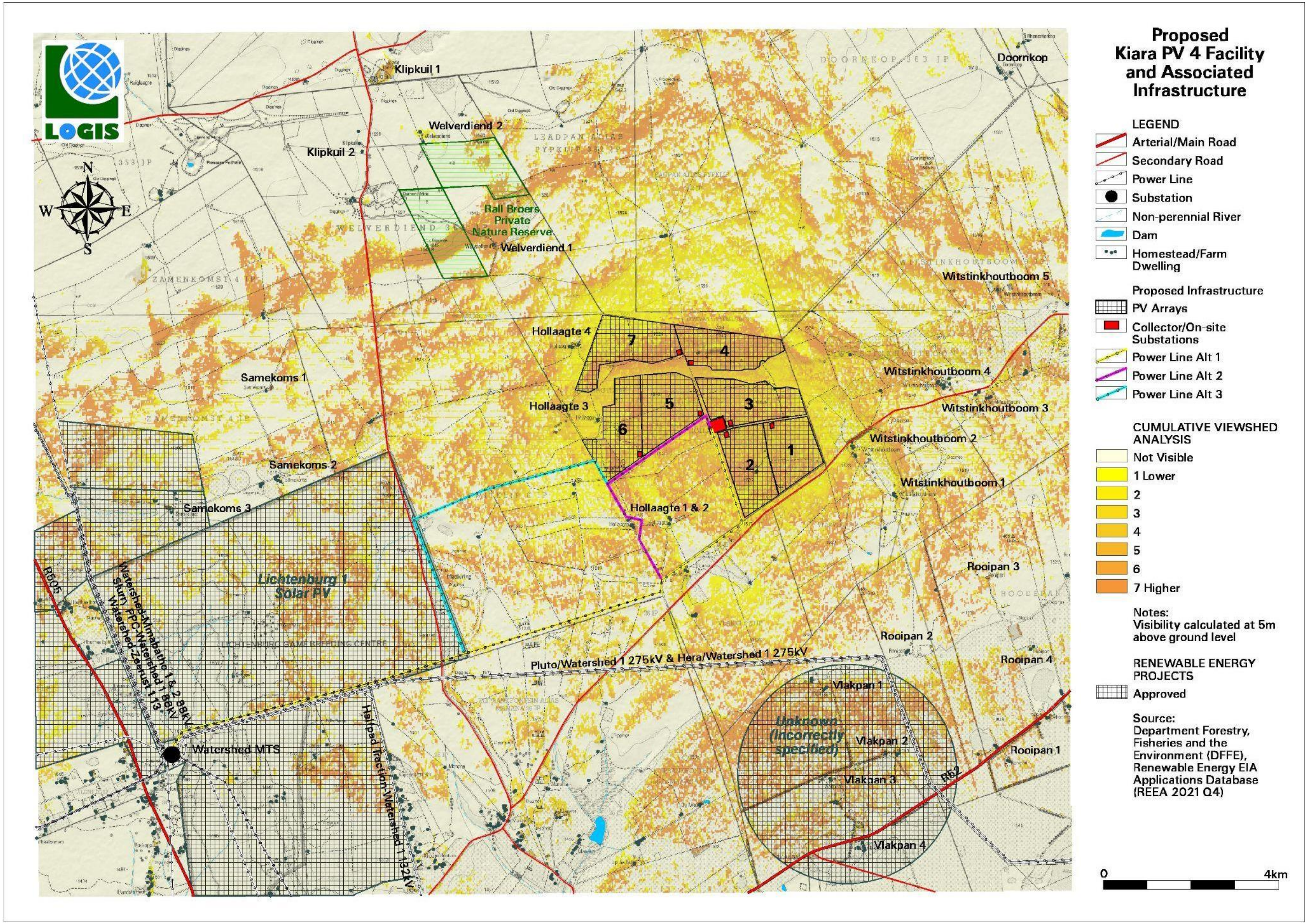
At distances exceeding 6km the intensity of visual exposure is expected to be very low and highly unlikely due to the distance between the object (development) and the observer. Sensitive visual receptors are not likely to be visually exposed to the proposed facility, despite lying within the viewshed.

Conclusion

In general terms it is envisaged that the structures, where visible from shorter distances (e.g. less than 1km and potentially up to 3km), and where sensitive visual receptors may find themselves within this zone, may constitute a high visual prominence, potentially resulting in a visual impact. This may include residents of the farm dwellings and a small portion of the Rall Broers Nature Reserve mentioned above, as well as observers travelling along the roads in closer proximity to the facility.



Map 3: Viewshed analysis of the proposed Kiara PV 4 Facility



Map 4: Cumulative visual exposure.

6.2. Potential cumulative visual exposure

The **Kiara PV 4** Solar Energy Facility addressed in this report is only one component of a larger solar cluster consisting of 6 other facilities, known as the Kiara PV Cluster. This cluster is made up of a total of 7 PV facilities; namely Kiara PV 1, Kiara PV 2, Kiara PV 3, Kiara PV 5, Kiara PV 6, and Kiara PV 7. These facilities and their Associated Infrastructure lie within the greater area.

Map 4 illustrates the anticipated cumulative visual impact of the **Kiara PV Facility and associated infrastructure**, and specifically the anticipated frequency of visual exposure. Areas shaded dark orange are likely to be exposed to 6-7 facilities, areas shaded light orange are likely to be exposed to 4-5 facilities, areas shaded yellow are likely to be exposed to 1-3 of the facilities. Areas shaded pale yellow / cream do not have any exposure.

Sporadic belts (due to the nature of the topography) of the north east and north west will be exposed to all seven (7) of the facilities, resulting in a high cumulative visual exposure. Sensitive visual receptors within these areas include a small area towards the south of the Rall Broers Private Nature Reserve, as well as Welverdiend 1 south east of the reserve itself. Approximately 80% of the rest of the Nature Reserve will have a low to negligible visibility of the Kiara PV Cluster.

Higher cumulative viewsheds are also evident in sporadic portions of other renewable energy projects in the area; namely Lichtenburg 1 Solar PV towards the south west of the Kiara PV Cluster- where high to moderate cumulative exposure is seen in a small central area within the site; with little to no visibility elsewhere. Furthermore; an unknown (or incorrectly specified) renewable energy project south east of the Kiara PV cluster has a high to moderate cumulative visual exposure towards its northern half; with a negligible to low cumulative visual exposure towards its southern half.

For the purpose of this study, viewshed analyses were undertaken from all seven proposed PV Facilities as part of this development only. Other Authorised Renewable Energy Facilities within a 20km radius of the proposed Kiara PV Facility, were indicated on the map but not included in the analyses as a result of their layouts not being available.

Authorised WEFs not included in this analysis but occurring in the study are:

- Aberdeen Wind (adjacent north to the site)
- Camdeboo Wind (located north-east of the site)
- Aberdeen PV/CPV (located south-east of the site)

Authorised WEFs not included in this analysis but occurring in the study and are included in **Map 4** are:

- Lichtenburg 1 Solar PV
- An unknown (or 'incorrectly specified') renweable energy project that falls across the homesteads of Vlakpan 1,2,3 and 4.

Residents towards the east of the Kiara PV Cluster that show a moderate to low cumulative exposure include Witstinkhoutboom 2, 3, 4 and 5, while Witstinkhoutboom 1 shows a low to negligible cumulative exposure.

South east of the site lies the residents of Rooipan 1 and 3 with a moderate to high cumulative exposure, while Rooipan 2 and 4 have no cumulative exposure at all.

Hollaagte 1 and 2 lie south of the Kiara PV Cluster; with low cumulative exposure.

West of the Kiara PV cluster lies the residence of Hollaagte 3 and 4; where a low cumulative viewshed is evident, while Samekoms 1 and 2 lying further east show no cumulative exposure.

In conclusion, the cumulative visual impact of the Kiara PV Cluster and its associated infrastructure is ultimately expected to be of moderate significance when considered together as a whole cluster development and with the other already authorised Renewable Energy Facilities in the study area. It is expected that the construction of the Kiara PV Facility will contribute to the increased cumulative visual impact of solar energy facilities.

6.3. Visual distance/observer proximity to the PV facility

The proximity radii are based on the anticipated visual experience of the observer over varying distances. The distances are adjusted upwards for larger solar energy facilities/technologies (e.g. more extensive infrastructure associated with power plants exceeding 100MW) and downwards for smaller plants (e.g. smaller infrastructure associated with power plants with less generating capacity such as the proposed 100MW Kiara PV 4). This methodology was developed in the absence of any known and/or accepted standards for South African solar energy facilities.

The principle of reduced impact over distance is applied in order to determine the core area of visual influence for these types of structures. It is envisaged that the nature of the structures and the predominantly rural and natural character of the study area would create a significant contrast that would make the facility visible and recognisable from greater distances.

The proximity radii for the proposed PV facility were created in order to indicate the scale and viewing distance of the facility and to determine the prominence of the structures in relation to their environment.

The proximity radii, based on the dimensions of the proposed development footprint are indicated on **Map 5**, and include the following:

- 0 - 1km. Very short distance view where the PV facility would dominate the frame of vision and constitute a very high visual prominence.
- 1 – 3km. Short distance view where the structures would be easily and comfortably visible and constitute a high visual prominence.
- 3 - 6km. Medium to longer distance view where the facility would become part of the visual environment, but would still be visible and recognisable. This zone constitutes a moderate visual prominence.
- > 6km. Long distance view of the facility where the structures are not expected to be immediately visible and not easily recognisable. This zone constitutes a lower visual prominence for the facility.

The visual distance theory and the observer's proximity to the facility are closely related, and especially relevant, when considered from areas with a high viewer incidence and a potentially negative visual perception of the proposed facility.

6.4. Viewer incidence/viewer perception

The number of observers and their perception of a structure determine the concept of visual impact. If there are no observers or if the visual perception of the structure is favourable to all the observers, there would be no visual impact.

It is necessary to identify areas of high viewer incidence and to classify certain areas according to the observer's visual sensitivity towards the proposed grid connection infrastructure. It would be impossible not to generalise the viewer incidence and sensitivity to some degree, as there are many variables when trying to determine the perception of the observer: regularity of sighting, cultural background, state of mind, purpose of sighting, etc. which would create a myriad of options.

As far as the residences of Witstinkhoutboom 2, as well as Hollaagte 3 and 4 are concerned, the structures would be easily and comfortably visible and constitute a high visual prominence. Viewer incidence of a high visual prominence is also shown along the Manana secondary road within the 1-3km zone- where structures of the PV 4 Facility would also be visible.

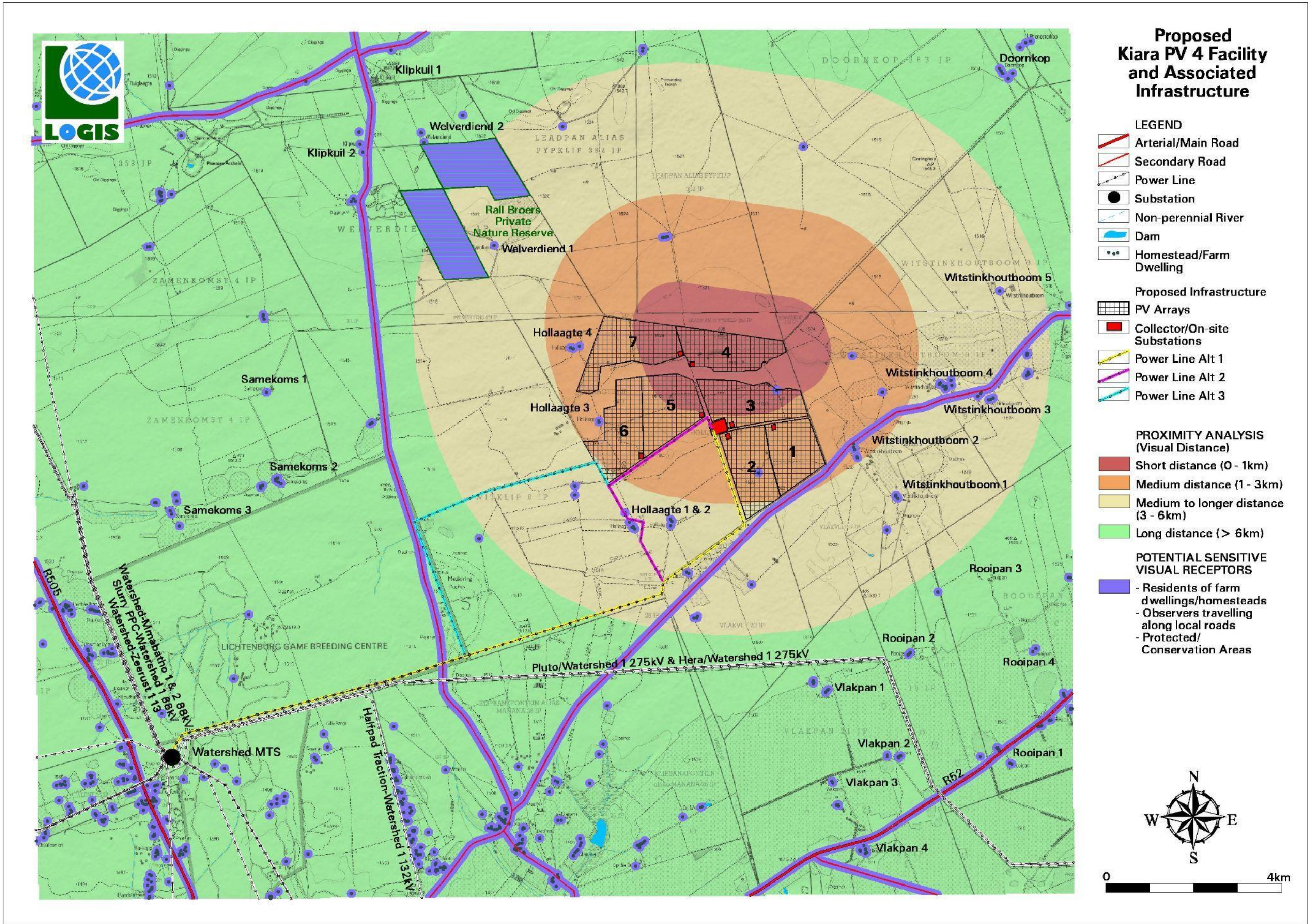
The southern half of the Rall Broers Private Nature Reserve falls within the 3-6km zone (along with homestead Welverdiend 1 which lies just beneath / south of the reserve itself); where a moderate visual prominence will be evident. The remainder of the Reserve, however falls within the >6km zone where structures are not expected to be immediately visible and not easily recognisable, with a lower visual prominence.

Additional sensitive visual receptors are located at the farm residences (homesteads) throughout the study area. It is expected that the viewer’s perception, unless the observer is associated with (or supportive of) the PV facility, would generally be negative.

Due to the generally remote location of the proposed PV4 facility, as well as the ill populated nature of the receiving environment, there are only a limited number of potential sensitive visual receptor sites within close proximity to the proposed development site. These receptor sites were listed in **Section 6.1**.

The potential sensitive visual receptor sites and areas of higher viewer incidence are indicated on **Map 5**.

The author (at the time of the compilation of this report) is not aware of any objections raised against the proposed **Kiara PV 4** Facility.



Map 5: Proximity analysis and potential sensitive visual receptors.

6.5. Visual absorption capacity

Visual Absorption Capacity (VAC) is the capacity of the receiving environment to absorb the potential visual impact of the proposed development. VAC is primarily a function of the vegetation and will be high if the vegetation is tall, dense and continuous. Conversely, low growing sparse and patchy vegetation will have a low VAC. The VAC also generally increases with distance, where discernible detail in visual characteristics of both environment and development decreases.

As previously indicated; the natural vegetation or land cover types of the region are described as Grassland, with large tracts of agricultural fields (altered vegetation) consisting mostly of dryland agriculture towards the east and south of the site. Some irrigated agricultural land is found towards the west of the site.

The majority of the remaining natural vegetation within the study area is indicated as *Carltonville Dolomite Grassland.* Limited sections of *Western Highveld Sandy Grassland*, which in turn envelop small portions of Highveld Salt Pans within Vaal-Vet Sandy Grassland lie further south beyond the site boundaries.

Exotic plantations are limited and are dotted towards the east, south, and north-west of the study area.

Bushland (fallow land, including old fields) is very limited and is dotted towards the south-east, south-west and north-west of the study area.

Wetlands are scarce- but have been located in small areas towards the east and south-west of the site.

Land use activities within the broader region are predominantly described as undeveloped (vacant open space or farmland), with mining/quarrying activity evident towards the north-west (diamond mining) and informal digging south-west of the proposed site.

Overall, the Visual Absorption Capacity (VAC) of the receiving environment is low by virtue of the limited height (or absence) of the vegetation and the overall low occurrence of buildings, structures and infrastructure. In addition, the scale and form of the proposed structures mean that it is unlikely that the environment will visually absorb them in terms of texture, colour, form and light/shade characteristics. Within this area the VAC of vegetation will not be taken into account, thus assuming a worst-case scenario in the impact assessment.

Where homesteads and settlements occur, some more significant vegetation and trees may have been planted, which would contribute to the visual absorption capacity (i.e. shielding the observers from the infrastructure). As this is not a consistent occurrence, however, VAC will not be taken into account for any of the homesteads or settlements, thus assuming a worst-case scenario in the impact assessment.

6.6. Visual impact index

The combined results of the visual exposure, viewer incidence / perception and visual distance of the proposed PV facility are displayed on **Map 6**. Here the weighted impact and the likely areas of impact have been indicated as a visual impact index. Values have been assigned for each potential visual impact per data category and merged to calculate the visual impact index.

The criteria (previously discussed in this report) which inform the visual impact index are:

- Visibility or visual exposure of the structures
- Observer proximity or visual distance from the structures
- The presence of sensitive visual receptors
- The perceived negative perception or objections to the structures (if applicable)
- The visual absorption capacity of the vegetation cover or built structures (if applicable)

An area with short distance visual exposure to the proposed infrastructure, a high viewer incidence and a potentially negative perception (i.e. a sensitive visual receptor) would therefore have a **higher** value (greater impact) on the index. This helps in focussing the attention to the critical areas of potential impact and determining the potential **magnitude** of the visual impact.

The index indicates that **potentially sensitive visual receptors** within a 1km radius of the PV facility may experience a **very high** visual impact. The magnitude of visual impact on sensitive visual receptors subsequently subsides with distance to; **high** within a 1–3km radius (where/if sensitive receptors are present) and **moderate** within a 3–6km radius (where/if sensitive receptors are present). Receptors beyond 6km are expected to have a **low** potential visual impact.

Magnitude of the potential visual impact (Refer to Map 6)

0 – 1km

The majority of the exposed areas in this zone fall within vacant open space, generally devoid of observers or potential sensitive visual receptors that would experience visual impacts of a **high** magnitude.

1 – 3km

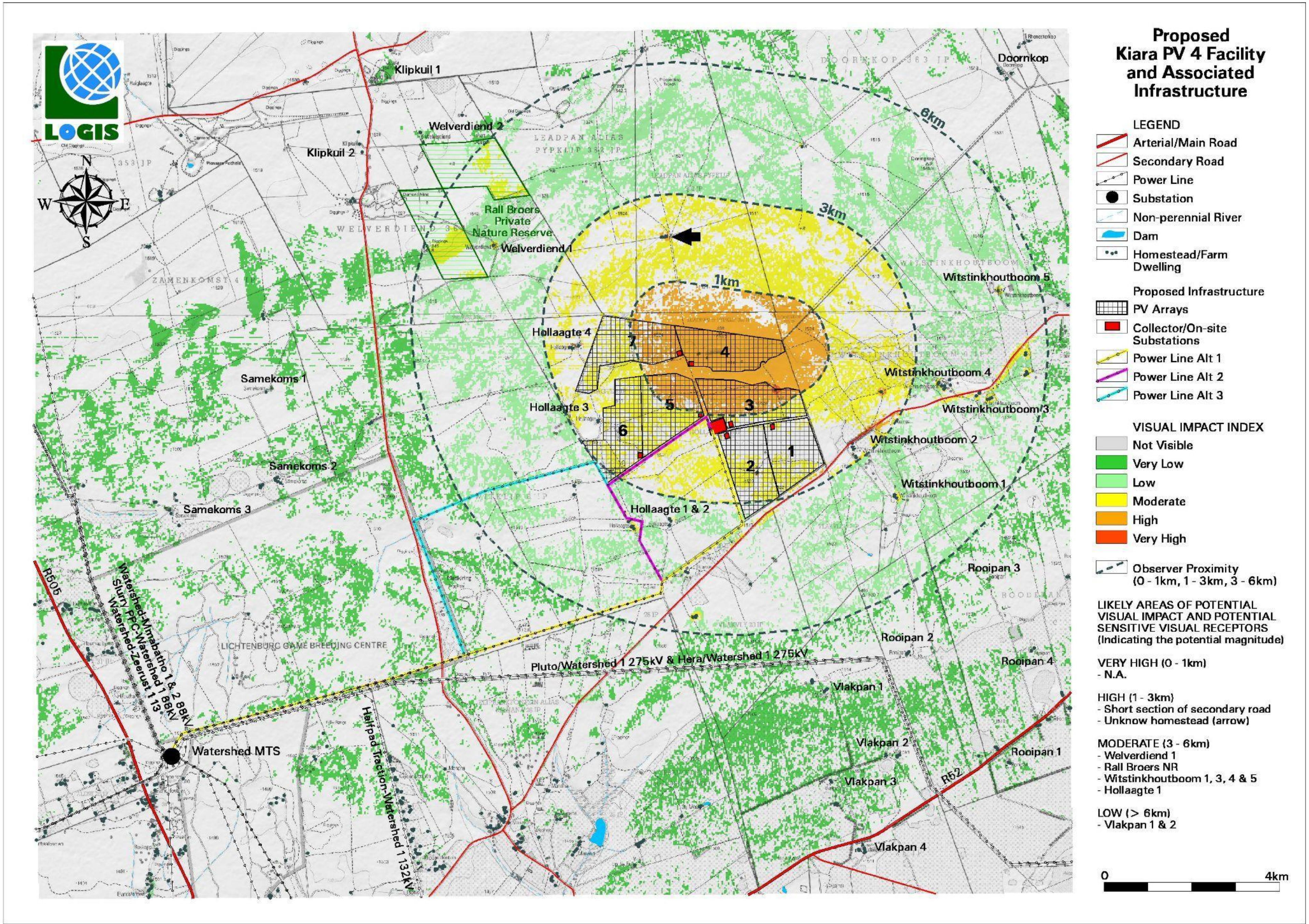
The majority of the exposed areas in this zone fall within natural open space with limited homesteads. The homestead of Witstinkhoutboom 4 (east of the site) may experience visual impacts of **high** magnitude, while Hollaagte 4, situated west of the PV4 Facility will experience visual impacts of a **moderate to high** magnitude. North of the PV4 Facility is an unnamed homestead as indicated by the arrow in Map 6. This too, will have a visual impact of a high magnitude. Moreover, the Manana secondary road towards the south of the PV4 Facility may experience visual impacts of a **high** magnitude in sporadic patches, and more so towards its eastern end within this zone.

3 – 6km

Potential sensitive receptors within this zone include Witstinkhoutboom 1, 3, 4 and 5 (east of the PV4 facility) with a **moderate** visual impact. South west of PV4 lies Hollaagte 1 and 2, also with **moderate** visual impacts. Towards the north west of PV4 within this zone lies homestead Welverdiend 1, as well as the southern half of the Rall Broers Private Nature Reserve- both indicating **moderate** visual impacts in areas that have been influenced by the nature of the topography. Finally, the Manana secondary road within this zone towards the east of the PV4 Facility shows a **moderate** visual impact in sporadic patches, once again depending on the nature of the topography.

>6 Km

Residences of Welverdiend 2 (north west of the site), Rooipan 3 (south east of the site), as well as Vlakpan 1 and 2 (south of the site) show a **very low** visual impact.



Map 6: Visual impact index and potentially affected sensitive visual receptors.

6.7. Visual impact assessment: impact rating methodology

The previous section of the report identified specific areas where likely visual impacts would occur and indicate the expected **magnitude** of potential impact. This section will attempt to quantify these potential visual impacts in their respective geographical locations and in terms of the identified issues (see **Section 3:** SCOPE OF WORK) related to the visual impact.

The methodology for the assessment of potential visual impacts states the **nature** of the potential visual impact (e.g. the visual impact on users of major roads in the vicinity of the proposed PV facility) and includes a table quantifying the potential visual impact according to the following criteria:

- **Extent** - long distance (very low = 1), medium to longer distance (low = 2), short distance (medium = 3) and very short distance (high = 4)[2].
- **Duration** - very short (0-1 yrs. = 1), short (2-5 yrs. = 2), medium (5-15 yrs. = 3), long (>15 yrs. = 4), and permanent (= 5).
- **Magnitude** - None (= 0), minor (= 2), low (= 4), medium/moderate (= 6), high (= 8) and very high (= 10)[3].
- **Probability** – very improbable (= 1), improbable (= 2), probable (= 3), highly probable (= 4) and definite (= 5).
- **Status** (positive, negative or neutral).
- **Reversibility** - reversible (= 1), recoverable (= 3) and irreversible (= 5).
- **Significance** - low, medium or high.

The **significance** of the potential visual impact is equal to the **consequence** multiplied by the **probability** of the impact occurring, where the consequence is determined by the sum of the individual scores for magnitude, duration and extent (i.e. **significance = consequence (magnitude + duration + extent) x probability**).

The significance weighting for each potential visual impact (as calculated above) is as follows:

- <30 points: Low (where the impact would not have a direct influence on the decision to develop in the area)
- 30-60 points: Medium/moderate (where the impact could influence the decision to develop in the area)
- >60: High (where the impact must have an influence on the decision to develop in the area)

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[2] Long distance = > 6km. Medium to longer distance = 3 – 6km. Short distance = 1 – 3km. Very short distance = < 1km (refer to Section 6.3. Visual distance/observer proximity to the PV facility).

[3] This value is read from the visual impact index. Where more than one value is applicable, the higher of these will be used as a worst-case scenario.

6.8. Visual impact assessment

The primary visual impacts of the proposed PV facility infrastructure are assessed below.

6.8.1. Construction impacts

6.8.1.1. Potential visual impact of construction activities on sensitive visual receptors in close proximity to the proposed PV facility and ancillary infrastructure

During construction, there may be a noticeable increase in heavy vehicles utilising the roads to the development site that may cause, at the very least, a visual nuisance to other road users and landowners in close proximity (< 1 km) to the construction activities. No known sensitive receptors occur in this area.

Construction activities may potentially result in a **Low** significance, temporary visual impact, both before and after mitigation.

A mitigating factor within this scenario is the very low occurrence of receptors within the receiving environment. No sensitive receptors are located in close proximity to the proposed PV facility. This essentially negates the probability of this impact occurring.

Table 2: Visual impact of construction activities on sensitive visual receptors in close proximity to the proposed PV facility.

<table>
<tr><td colspan="3">Nature of Impact:
Visual impact of construction activities on users of the secondary road and homesteads in close proximity to the proposed PV facility.</td></tr>
<tr><td></td><td>Without mitigation</td><td>With mitigation</td></tr>
<tr><td>Extent</td><td>Very Short (4)</td><td>Very Short (4)</td></tr>
<tr><td>Duration</td><td>Short term (2)</td><td>Short term (2)</td></tr>
<tr><td>Magnitude</td><td>High (8)</td><td>Low (4)</td></tr>
<tr><td>Probability</td><td>Very Improbable (1)</td><td>Very Improbable (1)</td></tr>
<tr><td>Significance</td><td>Low (14)</td><td>Low (10)</td></tr>
<tr><td>Status (positive or negative)</td><td>Negative</td><td>Negative</td></tr>
<tr><td>Reversibility</td><td>Reversible (1)</td><td>Reversible (1)</td></tr>
<tr><td>Irreplaceable loss of resources?</td><td>No</td><td>No</td></tr>
<tr><td>Can impacts be mitigated?</td><td colspan="2">Yes</td></tr>
<tr><td colspan="3">Mitigation:
<u>Planning:</u>
➢ Retain and maintain natural vegetation (if present) immediately adjacent to the development footprint.
<u>Construction:</u>
➢ Ensure that vegetation cover adjacent to the development footprint (if present) is not unnecessarily removed during the construction phase, where possible.
➢ Plan the placement of laydown areas and temporary construction equipment camps in order to minimise vegetation clearing (i.e. in already disturbed areas) wherever possible.
➢ Restrict the activities and movement of construction workers and vehicles to the immediate construction site and existing access roads.</td></tr>
</table>

➢ Ensure that rubble, litter, and disused construction materials are appropriately stored (if not removed daily) and then disposed regularly at licensed waste facilities. ➢ Reduce and control construction dust using approved dust suppression techniques as and when required (i.e. whenever dust becomes apparent). ➢ Restrict construction activities to daylight hours whenever possible in order to reduce lighting impacts. ➢ Rehabilitate all disturbed areas (if present/if required) immediately after the completion of construction works.
Residual impacts: None, provided rehabilitation works are carried out as specified.

6.8.2. Operational impacts

6.8.2.1. Potential visual impact on sensitive visual receptors located within a 1km radius of the PV facility

The PV facility is expected to have a **low** visual impact pre-mitigation and and post-mitigation due to the fact that there are no homesteads and no roads within a 1km radius of the facility.

Mitigation of this impact is possible and both specific measures as well as general "best practice" measures are recommended in order to reduce/mitigate the potential visual impact. The table below illustrates this impact assessment.

Table 3: Visual impact on observers in close proximity to the proposed PV facility structures.

Nature of Impact: Visual impact on observers travelling along the secondary road and homesteads within a 1km radius of the PV facility structures		
	Without mitigation	***With mitigation***
Extent	Very Short **(4)**	Very Short **(4)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Very high **(10)**	High **(8)**
Probability	Very improbable **(1)**	Very improbable **(1)**
Significance	Low **(18)**	Low **(16)**
Status (positive, neutral or negative)	Negative	Negative
Reversibility	Reversible **(1)**	Reversible **(1)**
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation / Management:
Planning: ➢ Retain/re-establish and maintain natural vegetation (if present) immediately adjacent to the development footprint, where possible. ➢ Consult adjacent landowners (if present) in order to inform them of the development and to identify any (valid) visual impact concerns. ➢ Investigate the potential to screen affected receptor sites (if applicable and located within 1km of the facility) with planted vegetation cover. 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.

6.8.2.2. Potential visual impact on sensitive visual receptors within a 1 – 3km radius

The operational PV facility could have a **moderate** visual impact (significance rating = 45) on observers travelling along the secondary road and the residents of the homesteads Witstinkhoutboom 4, Hollaagte 4, as well as an unnamed homestead towards the north of the PV4 Facility within the 1-3km zone. This impact may be mitigated to **low** (significance rating = 26).

Mitigation of this impact is possible and both specific measures as well as general "best practice" measures are recommended in order to reduce/mitigate the potential visual impact. The table below illustrates this impact assessment.

Table 4: Visual impact of the proposed PV facility structures within a 1 – 3km radius.

Nature of Impact: Visual impact on observers travelling along the secondary road and residents of homesteads within a 1 – 3km radius of the PV facility structures		
	Without mitigation	***With mitigation***
Extent	Short distance **(3)**	Short distance **(3)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	High **(8)**	Moderate **(6)**
Probability	Probable **(3)**	Improbable **(2)**
Significance	Moderate **(45)**	Low **(26)**
Status (positive, neutral or negative)	Negative	Negative
Reversibility	Reversible **(1)**	Reversible **(1)**
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No, however best practice measures are recommended.	

Mitigation / Management: Planning: ➢ Retain/re-establish and maintain natural vegetation (if present) immediately adjacent to the development footprint. 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.

6.8.2.3. Lighting impacts

Potential visual impact of operational, safety and security lighting of the facility at night on observers in close proximity to the proposed PV facility.

Lighting impacts relate to the effects of glare and sky glow. The source of glare light is unshielded luminaries which emit light in all directions and which are visible over long distances.

Sky glow is the condition where the night sky is illuminated when light reflects off particles in the atmosphere such as moisture, dust or smog. The sky glow intensifies with the increase in the number of light sources. Each new light source, especially upwardly directed lighting, contribute to the increase in sky glow. It is possible that the PV facility may contribute to the effect of sky glow within the environment which is currently undeveloped.

Mitigation of direct lighting impacts and sky glow entails the pro-active design, planning and specification of lighting for the facility. The correct specification and placement of lighting and light fixtures for the PV facility and the ancillary infrastructure (e.g. workshop and storage facilities) will go far to contain rather than spread the light.

The following table summarises the assessment of this anticipated impact, which is likely to be of **moderate** significance, and may be mitigated to **low**.

Table 5: Impact table summarising the significance of visual impact of lighting at night on visual receptors in close proximity to the proposed PV facility.

Nature of Impact: Visual impact of lighting at night on sensitive visual receptors in close proximity to the proposed PV facility.		
	Without mitigation	***With mitigation***
Extent	Very short distance **(4)**	Very short distance **(4)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Very High **(10)**	Moderate **(6)**
Probability	Probable **(3)**	Improbable **(2)**
Significance	Moderate **(54)**	Low **(28)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible **(1)**	Reversible **(1)**
Irreplaceable loss of resources?	No	No

Can impacts be mitigated?	Yes

Mitigation: Planning & operation: ➢ Shield the sources of light by physical barriers (walls, vegetation, or the structure itself). ➢ Limit mounting heights of lighting fixtures, or alternatively use foot-lights or bollard level lights. ➢ Make use of minimum lumen or wattage in fixtures. ➢ Make use of down-lighters, or shielded fixtures. ➢ Make use of Low Pressure Sodium lighting or other types of low impact lighting. ➢ Make use of motion detectors on security lighting. This will allow the site to remain in relative darkness, until lighting is required for security or maintenance purposes.
Residual impacts: The visual impact will be removed after decommissioning, provided the PV facility and ancillary infrastructure is removed. Failing this, the visual impact will remain.

6.8.2.4. Solar glint and glare impacts

Potential visual impact of solar glint and glare as a visual distraction and possible air/road travel hazard

Glint and glare occur when the sun reflects off surfaces with specular (mirror-like) properties. Examples of these include glass windows, water bodies and potentially some solar energy generation technologies (e.g. parabolic troughs and CSP heliostats). Glint is generally of shorter duration and is described as "a momentary flash of bright light", whilst glare is the reflection of bright light for a longer duration.

The visual impact of glint and glare relates to the potential it has to negatively affect sensitive visual receptors in relatively close proximity to the source (e.g. users of the secondary road), or aviation safety risk for pilots (especially where the source interferes with the approach angle to the runway). The Federal Aviation Administration (FAA) of the United States of America have researched glare as a hazard for aviation pilots on final approach and may prescribe specific glint and glare studies for solar energy facilities in close proximity to aerodromes (airports, airfields, military airbases, etc.). It is generally possible to mitigate the potential glint and glare impacts through the design and careful placement of the infrastructure.

PV panels are designed to generate electricity by absorbing the rays of the sun and are therefore constructed of dark-coloured materials, and are covered by anti-reflective coatings. Indications are that as little as 2% of the incoming sunlight is reflected from the surface of modern PV panels (i.e. such as those proposed for the Kiara PV Cluster) especially where the incidence angle (angle of incoming light) is smaller i.e. the panel is facing the sun directly. This is particularly true for tracker arrays that are designed to track the sun and keep the incidence angle as low as possible.[4]

There are no major roads within a 1km radius of the proposed Kiara PV 4 Facility. This approximate distance (1km) is recommended as a threshold within which the visual impact of glint and glare (if there is visual line of sight from the road) may influence road users.

[4] Sources: Blue Oak Energy, FAA and Meister Consultants Group.

The potential visual impact related to solar glint and glare as a road travel hazard is therefore expected to be of **low** significance. No mitigation of this impact is required since the solar reflection is predicted towards a local/secondary road.

Table 6: Impact table summarising the significance of the visual impact of solar glint and glare as a visual distraction to users of the secondary road

Nature of Impact: The visual impact of solar glint and glare as a visual distraction and possible road travel hazard		
	Without mitigation	***With mitigation***
Extent	High **(4)**	N.A.
Duration	Long term **(4)**	N.A.
Magnitude	High **(8)**	N.A.
Probability	Very improbable **(1)**	N.A.
Significance	Low **(16)**	N.A.
Status (positive or negative)	Negative	N.A.
Reversibility	Reversible **(1)**	N.A.
Irreplaceable loss of resources?	No	N.A.
Can impacts be mitigated?	N.A.	
Mitigation: N.A.		
Residual impacts: N.A.		

Potential visual impact of solar glint and glare on static ground-based receptors (residents of homesteads) in close proximity to the PV facility

There are no affected residences within a 1km radius of the proposed PV4 Facility. The potential visual impact related to solar glint and glare on static ground-based receptors (residents of homesteads) is therefore expected to be of **low** significance, both before and after mitigation.

Mitigation of this impact is possible and both specific measures as well as general "best practice" measures are recommended in order to reduce/mitigate the potential visual impact. The table below illustrates this impact assessment.

Table 7: Impact table summarising the significance of the visual impact of solar glint and glare on static ground receptors.

Nature of Impact: The visual impact of solar glint and glare on residents of homesteads in closer proximity to the PV facility		
	Without mitigation	***With mitigation***
Extent	Very short distance **(4)**	Very short distance **(4)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Very high **(10)**	Very high **(10)**
Probability	Very improbable **(1)**	Very improbable **(1)**
Significance	Low **(18)**	Low **(18)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible **(1)**	Reversible **(1)**
Irreplaceable loss of resources?	No	No

Can impacts be mitigated?	Yes
Mitigation: Planning & operation: ➢ Use anti-reflective panels and dull polishing on structures, where possible and industry standard. ➢ Adjust tilt angles of the panels if glint and glare issues become evident, where possible. ➢ If specific sensitive visual receptors are identified during operation, investigate screening at the receptor site, where possible.	
Residual impacts: The visual impact will be removed after decommissioning, provided the PV facility infrastructure is removed. Failing this, the visual impact will remain.	

6.8.2.5. Ancillary infrastructure

On-site ancillary infrastructure associated with the PV facility includes a BESS, inverters, low voltage cabling between the PV arrays, internal access roads, workshop, office buildings, etc.

No dedicated viewshed analyses have been generated for the ancillary infrastructure, as the range of visual exposure will fall within that of the PV arrays. The anticipated visual impact resulting from this infrastructure is likely to be of **low** significance both before and after mitigation.

Table 8: Visual impact of the ancillary infrastructure.

Nature of Impact: Visual impact of the ancillary infrastructure during the operation phase on observers in close proximity to the structures.		
	Without mitigation	***With mitigation***
Extent	Very short distance **(4)**	Very short distance **(4)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Low **(4)**	Low **(4)**
Probability	Improbable **(2)**	Improbable **(2)**
Significance	Low **(24)**	Low **(24)**
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/power line servitude where possible. Operations: ➢ Maintain the general appearance of the infrastructure. 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 ancillary infrastructure is removed. Failing this, the visual impact will remain.

6.8.2.6. Potential visual impact on visitors to Protected Areas in the region

Situated north west of the study area, with its southern half falling within the 6km radius; the Rall Broers Private Nature Reserve is the only known protected area that falls within the study area. It is expected that areas of higher elevation (i.e. hills / koppies) located within this Nature Reserve may be visually impacted upon.

The anticipated visual impact resulting from the Kiara PV 4 infrastructure on visitors to the Rall Broers Private Nature Reserve is likely to be **moderate** before mitigation and **low** after mitigation.

Mitigation of this impact is possible and both specific measures as well as general "best practice" measures are recommended in order to reduce/mitigate the potential visual impact. The table below illustrates this impact assessment.

Table 9: Visual impact on sensitive receptors within the Protected Areas in the Region

Nature of Impact: Visual impact of Kiara PV 4 on visitors to the Rall Broers Private Nature Reserve.		
	Without mitigation	***With mitigation***
Extent	Medium to long distance **(2)**	Medium to long distance **(2)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Moderate **(6)**	Low **(4)**
Probability	Probable **(3)**	Improbable **(2)**
Significance	Moderate **(36)**	Low **(20)**
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: <u>Planning:</u> ➢ Retain/re-establish and maintain natural vegetation (if present) immediately adjacent to the development footprint/power line servitude where possible. <u>Operations:</u> ➢ Maintain the general appearance of the infrastructure. <u>Decommissioning:</u> ➢ 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.		

6.8.2.7. Secondary impacts

The potential visual impact of the proposed PV facility on the sense of place of the region.

Sense of place refers to a unique experience of an environment by a user, based on his or her cognitive experience of the place. Visual criteria, specifically the visual character of an area (informed by a combination of aspects such as topography, level of development, vegetation, noteworthy features, cultural / historical features, etc.), plays a significant role.

An impact on the sense of place is one that alters the visual landscape to such an extent that the user experiences the environment differently, and more specifically, in a less appealing or less positive light.

The greater environment has a predominantly rural, undeveloped character and a natural appearance. These generally undeveloped landscapes are considered to have a high visual quality, except where urban development and power generation/distribution infrastructure represents existing visual disturbances.

The anticipated visual impact of the proposed PV facility on the regional visual quality (i.e. beyond 6km of the proposed infrastructure), and by implication, on the sense of place, is difficult to quantify, but is generally expected to be of **low** significance.

Table 10: The potential impact on the sense of place of the region.

<table>
<tr><td colspan="3">Nature of Impact:
The potential impact on the sense of place of the region.</td></tr>
<tr><td></td><td>Without mitigation</td><td>With mitigation</td></tr>
<tr><td>Extent</td><td>Long distance (1)</td><td>Long distance (1)</td></tr>
<tr><td>Duration</td><td>Long term (4)</td><td>Long term (4)</td></tr>
<tr><td>Magnitude</td><td>Low (4)</td><td>Low (4)</td></tr>
<tr><td>Probability</td><td>Improbable (2)</td><td>Improbable (2)</td></tr>
<tr><td>Significance</td><td>Low (18)</td><td>Low (18)</td></tr>
<tr><td>Status (positive, neutral or negative)</td><td>Negative</td><td>Negative</td></tr>
<tr><td>Reversibility</td><td>Reversible (1)</td><td>Reversible (1)</td></tr>
<tr><td>Irreplaceable loss of resources?</td><td>No</td><td>No</td></tr>
<tr><td>Can impacts be mitigated?</td><td colspan="2">No, only best practise measures can be implemented</td></tr>
<tr><td colspan="3">Generic best practise mitigation/management measures:
<u>Planning:</u>
➢ Retain/re-establish and maintain natural vegetation (if present) immediately adjacent to the development footprint/servitude, where possible.
<u>Operations:</u>
➢ Maintain the general appearance of the facility as a whole.
<u>Decommissioning:</u>
➢ Remove infrastructure not required for the post-decommissioning use.
➢ Rehabilitate all affected areas. Consult an ecologist regarding rehabilitation specifications.</td></tr>
<tr><td colspan="3">Residual impacts:
The visual impact will be removed after decommissioning, provided the PV facility infrastructure is removed. Failing this, the visual impact will remain.</td></tr>
</table>

The potential cumulative visual impact of the PV facility on the visual quality of the landscape.

The construction of the **Kiara PV 4** Facility may increase the cumulative visual impact of industrial type infrastructure within the region, especially in relation to the other six (6) solar energy facilities that form part of the Kiara PV Cluster and its associated infrastructure, as well as other approved renewable energy projects (namely Lichtenburg 1 Solar PV and an Unknown (incorrectly specified) project falling within the homestead areas of Vlakpan 1,2,3 and 4).

The cumulative visual impact is expected to be of **moderate** significance due to their remote locations and limited potential sensitive visual receptors.

Table 11: The potential cumulative visual impact of the renewable energy facilities on the visual quality of the landscape.

<table>
<tr><td colspan="3">Nature of Impact:
The potential cumulative visual impact of the PV facility on the visual quality of the landscape.</td></tr>
<tr><td></td><td>Overall impact of the proposed project considered in isolation (with mitigation)</td><td>Cumulative impact of the project and other projects within the area (with mitigation)</td></tr>
<tr><td>Extent</td><td>Very short distance (4)</td><td>Short distance (3)</td></tr>
<tr><td>Duration</td><td>Long term (4)</td><td>Long term (4)</td></tr>
<tr><td>Magnitude</td><td>Moderate (6)</td><td>Moderate (6)</td></tr>
<tr><td>Probability</td><td>Probable (3)</td><td>Probable (3)</td></tr>
<tr><td>Significance</td><td>Moderate (42)</td><td>Moderate (39)</td></tr>
<tr><td>Status (positive, neutral or negative)</td><td>Negative</td><td>Negative</td></tr>
<tr><td>Reversibility</td><td>Reversible (1)</td><td>Reversible (1)</td></tr>
<tr><td>Irreplaceable loss of resources?</td><td>No</td><td>No</td></tr>
<tr><td>Can impacts be mitigated?</td><td colspan="2">No, only best practise measures can be implemented</td></tr>
<tr><td colspan="3">Generic best practise mitigation/management measures:
<u>Planning:</u>
➢ Retain/re-establish and maintain natural vegetation (if present) immediately adjacent to the development footprint where possible.
<u>Operations:</u>
➢ Maintain the general appearance of the facility as a whole.
<u>Decommissioning:</u>
➢ Remove infrastructure not required for the post-decommissioning use.
➢ Rehabilitate all affected areas. Consult an ecologist regarding rehabilitation specifications.</td></tr>
<tr><td colspan="3">Residual impacts:
The visual impact will be removed after decommissioning, provided the PV facility infrastructure is removed. Failing this, the visual impact will remain.</td></tr>
</table>

6.9. The potential to mitigate visual impacts

The primary visual impact, namely the layout and appearance of the PV panels is not possible to mitigate. The functional design of the PV panels cannot be changed in order to reduce visual impacts.

The following mitigation is however possible:

- It is recommended that vegetation cover (i.e. either natural or cultivated) immediately adjacent to the development footprint be maintained, both during construction and operation of the proposed facility. This will minimise visual impact as a result of cleared areas and areas denuded of vegetation.

- Existing roads should be utilised wherever possible. New roads should be planned taking due cognisance of the topography to limit cut and fill requirements. The construction/upgrade of roads should be undertaken properly, with adequate drainage structures in place to forego potential erosion problems.

- In terms of onsite ancillary buildings and structures, it is recommended that it be planned so that clearing of vegetation is minimised where possible. This implies consolidating this infrastructure as much as possible and making use of already disturbed areas rather than undisturbed sites wherever possible.

- Mitigation of lighting impacts includes the pro-active design, planning and specification of lighting for the facility. The correct specification and placement of lighting and light fixtures for the proposed PV facility and ancillary infrastructure will go far to contain rather than spread the light. Mitigation measures include the following:

    - Shielding the sources of light by physical barriers (walls, vegetation, or the structure itself);
    - Limiting mounting heights of lighting fixtures, or alternatively using foot-lights or bollard level lights;
    - Making use of minimum lumen or wattage in fixtures;
    - Making use of down-lighters, or shielded fixtures;
    - Making use of Low-Pressure Sodium lighting or other types of low impact lighting.
    - Making use of motion detectors on security lighting. This will allow the site to remain in relative darkness, until lighting is required for security or maintenance purposes.

- Mitigation of visual impacts associated with the construction phase, albeit temporary, would entail proper planning, management and rehabilitation of the construction site. Recommended mitigation measures include the following:

    - Ensure that vegetation adjacent to the development footprint (if present) is not unnecessarily cleared or removed during the construction period.
    - Reduce the construction period through careful logistical planning and productive implementation of resources wherever possible.
    - Plan the placement of laydown areas and any potential temporary construction camps in order to minimise vegetation clearing (i.e. in already disturbed areas) wherever possible.
    - Restrict the activities and movement of construction workers and vehicles to the immediate construction site and existing access roads.
    - Ensure that rubble, litter, and disused construction materials are appropriately stored (if not removed daily) and then disposed regularly at licensed waste facilities.

    - Reduce and control construction dust through the use of approved dust suppression techniques as and when required (i.e. whenever dust becomes apparent).
    - Restrict construction activities to daylight hours in order to negate or reduce the visual impacts associated with lighting wherever possible.
    - Rehabilitate all disturbed areas (if present/if required) immediately after the completion of construction works.

- Glint and glare impact mitigation measures include the following:

    - Use anti-reflective panels and dull polishing on structures, where possible and industry standard.
    - Adjust tilt angles of the panels if glint and glare issues become evident, where possible.
    - If specific sensitive visual receptors are identified during operation, investigate screening at the receptor site, where possible.

- During operation, the maintenance of the PV arrays and ancillary structures and infrastructure will ensure that the facility does not degrade, therefore avoiding aggravating the visual impact.

- Roads must be maintained to forego erosion and to suppress dust, and rehabilitated areas must be monitored for rehabilitation failure. Remedial actions must be implemented as and when required.

- Once the facility has exhausted its life span, the main facility and all associated infrastructure not required for the post rehabilitation use of the site should be removed and all disturbed areas appropriately rehabilitated, unless a new authorisation is granted for the plant to continue a new cycle. An ecologist should be consulted to give input into rehabilitation specifications.

- All rehabilitated areas should be monitored for at least a year following decommissioning, and remedial actions implemented as and when required.

- Secondary impacts anticipated as a result of the proposed PV facility (i.e. visual character and sense of place) are not possible to mitigate.

- Where sensitive visual receptors (if present), are likely to be affected it is recommended that the developer enter into negotiations with the property owners regarding the potential screening of visual impacts at the receptor site. This may entail the planting of vegetation, trees or the construction of screens. Ultimately, visual screening is most effective when placed at the receptor itself.

Good practice requires that the mitigation of both primary and secondary visual impacts, as listed above, be implemented and maintained on an ongoing basis.

7. CONCLUSION AND RECOMMENDATIONS

The construction and operation of the proposed **Kiara PV 4 Facility** and its associated infrastructure may have a visual impact on the study area, especially within a 1km radius (and potentially up to a radius of 3km) of the proposed facility. The visual impact will differ amongst places, depending on the distance from the facility.

The combined visual impact or cumulative visual impact of Six additional PV facilities (namely Kiara PV 1, Kiara PV 2, Kiara PV 3, Kiara PV 5, Kiara PV 6, and Kiara PV 7; which are collectively be known as the Kiara PV Cluster) is expected to increase the area of potential visual impact within the region. The intensity of visual impact (number of PV arrays visible) to exposed receptors, especially those located within a 3km radius, is expected to be greater than it would be for a single solar energy facility. The cumulative visual impact is however still expected to be within acceptable limits, due to the limited potential sensitive visual receptors.

Overall, the significance of the visual impacts is expected to range from **moderate** to **low** as a result of the generally undeveloped character of the landscape and the remote location of the project infrastructure. There are a very limited number of potential sensitive visual receptors within a 3km radius of the proposed PV4 structures (ie. five (5) homesteads have been described), although the possibility does exist for visitors to the region to venture into closer proximity to the PV facility structures. These observers may consider visual exposure to this type of infrastructure to be intrusive.

A number of mitigation measures have been proposed (**Section 6.9.**). Regardless of whether or not mitigation measures will reduce the significance of the anticipated visual impacts, they are considered to be good practice and should all be implemented and maintained throughout the construction, operation and decommissioning phases of the proposed facility.

If mitigation is undertaken as recommended, it is concluded that the significance of most of the anticipated visual impacts will remain at or be managed to acceptable levels. As such, the PV facility and associated infrastructure would be considered to be acceptable from a visual impact perspective and can therefore be authorised.

8. IMPACT STATEMENT

The findings of the Visual Impact Assessment undertaken for the proposed **100MW** PV4 facility is that the visual environment surrounding the site, especially within a 1km radius (and potentially up to a radius of 3km) of the proposed facility, may be visually impacted during the anticipated operational lifespan of the facility (i.e. a minimum of 20 years).

This impact is applicable to the individual **Kiara PV 4 Facility** and to the potential cumulative visual impact of the facility in relation to the proposed six additional PV facilities (Kiara PV 1, Kiara PV 2, Kiara PV 3, Kiara PV 5, Kiara PV 6, Kiara PV 7) where the combined frequency of visual impact is expected be greater. The potential area of cumulative visual exposure is however still deemed to be within acceptable limits, considering the PV facilities' relatively close proximity to each other, the generally remote location of the infrastructure, and the limited number of observers within the region.

The following is a summary of impacts remaining, assuming mitigation as recommended, is exercised:

- During construction, there may be a noticeable increase in heavy vehicles utilising the roads to the development site that may cause, at the very least, a visual nuisance to other road users and landowners in the area. Because no known sensitive receptors occur in this area; construction activities may result in a **Low** significance temporary visual impact, both before and after mitigation.

- The PV4 facility is expected to have a **low** visual impact pre-mitigation and and post-mitigation due to the fact that there are no homesteads and no roads within a 1km radius of the facility.

- The operational PV4 facility could have a **moderate** visual impact on observers travelling along the secondary road within a 1 – 3km radius of the PV structures, including the residents of homesteads Witstinkhoutsboom 4, Hollaagte 4, as well as an unnamed homestead towards the north of the PV4 Facilty within the 1-3km zone. This impact may be mitigated to **low**.

- The anticipated impact of lighting at the PV facility is likely to be of **moderate** significance, and may be mitigated to **low**.

- The potential visual impact related to solar glint and glare as a road travel hazard is expected to be of **low** significance.

- There are no affected residences within a 1km radius of the proposed PV4 Facility. The potential visual impact related to solar glint and glare on static ground-based receptors (residents of homesteads) is therefore expected to be of **low** significance, both before and after mitigation.

- The anticipated visual impact resulting from the construction of on-site ancillary infrastructure is likely to be of **low** significance both before and after mitigation.

- The potential visual impact on visitors to Protected Areas in the region is determined to be **moderate** before mitigation to **low** after mitigation. It must, however be noted that the Reserve does not appear to be that of a commercial tourist enterprise.

- The anticipated visual impact of the proposed PV facility on the regional visual quality (i.e. beyond 6km of the proposed infrastructure), and by implication, on the sense of place, is difficult to quantify, but is generally expected to be of **low** significance.

- The cumulative visual impact is expected to be of **moderate** significance due to their remote locations and the general absence of potential sensitive visual receptors.

The anticipated visual impacts listed above (i.e. post mitigation impacts) range from **moderate** to **low** significance. Anticipated visual impacts on sensitive visual receptors (if and where present) in close proximity to the proposed facility are not considered to be fatal flaws for the proposed PV facility.

Considering all factors, it is recommended that the development of the facility as proposed be supported; subject to the implementation of the recommended mitigation measures (**Section 6.9.**) and management programme (**Section 9.**).

9. MANAGEMENT PROGRAMME

The following management plan tables aim to summarise the key findings of the visual impact report and suggest possible management actions in order to mitigate the potential visual impacts. Refer to the tables below.

Table 12: Management programme – Planning.

OBJECTIVE: The mitigation and possible negation of visual impacts associated with the planning of the proposed Kiara PV 4 facility.

Project Component/s	The solar energy facility and ancillary infrastructure (i.e. PV panels, access roads, transformers, security lighting, workshop, power line, etc.).	
Potential Impact	Primary visual impact of the facility due to the presence of the PV panels and associated infrastructure as well as the visual impact of lighting at night.	
Activity/Risk Source	The viewing of the above mentioned by observers on or near the site (i.e. within 1km of the site) as well as within the region.	
Mitigation: Target/Objective	Optimal planning of infrastructure to minimise the visual impact.	
Mitigation: Action/control	**Responsibility**	**Timeframe**
Use anti-reflective panels and dull polishing on structures where possible and industry standard.	Project proponent / contractor	Early in the planning phase.
Plan the placement of laydown areas and temporary construction equipment camps in order to minimise vegetation clearing (i.e. in already disturbed areas) wherever possible.	Project proponent / contractor	Early in the planning phase.
Retain and maintain natural vegetation (if present) immediately adjacent to the development footprint.	Project proponent/ design consultant	Early in the planning phase.
Make use of existing roads wherever possible and plan the layout and construction of roads and infrastructure with due cognisance of the topography to limit cut and fill requirements.	Project proponent/ design consultant	Early in the planning phase.
Plan all roads, ancillary buildings and ancillary infrastructure in such a way that clearing of vegetation is minimised. Consolidate infrastructure and make use of already disturbed sites rather than undisturbed areas.	Project proponent/ design consultant	Early in the planning phase.
Consult a lighting engineer in the design and planning of lighting to ensure the correct specification and placement of lighting and light fixtures for the PV Facility and the ancillary infrastructure. The following is recommended: o Shield the sources of light by physical barriers (walls, vegetation, or the structure itself). o Limit mounting heights of fixtures, or use foot-lights or bollard lights. o Make use of minimum lumen or wattage in fixtures. o Making use of down-lighters or shielded fixtures.	Project proponent / design consultant	Early in the planning phase.

Project Component/s	The solar energy facility and ancillary infrastructure (i.e. PV panels, access roads, transformers, security lighting, workshop, power line, etc.).		
○ Make use of Low-Pressure Sodium lighting or other low impact lighting. ○ Make use of motion detectors on security lighting, so allowing the site to remain in darkness until lighting is required for security or maintenance purposes.			
Performance Indicator	Minimal exposure (limited or no complaints from I&APs) of ancillary infrastructure and lighting at night to observers on or near the site (i.e. within 3km) and within the region.		
Monitoring	Monitor the resolution of complaints on an ongoing basis (i.e. during all phases of the project).		

Table 13: Management programme – Construction.

OBJECTIVE: The mitigation and possible negation of visual impacts associated with the construction of the proposed Kiara PV 4 facility.		
Project Component/s	Construction site and activities	
Potential Impact	Visual impact of general construction activities, and the potential scarring of the landscape due to vegetation clearing and resulting erosion.	
Activity/Risk Source	The viewing of the above mentioned by observers on or near the site.	
Mitigation: Target/Objective	Minimal visual intrusion by construction activities and intact vegetation cover outside of immediate construction work areas.	
Mitigation: Action/control	**Responsibility**	**Timeframe**
Ensure that vegetation cover adjacent to the development footprint (if present) is not unnecessarily removed during the construction phase, where possible.	Project proponent / contractor	Early in the construction phase.
Reduce the construction phase through careful logistical planning and productive implementation of resources wherever possible.	Project proponent / contractor	Early in the construction phase.
Restrict the activities and movement of construction workers and vehicles to the immediate construction site and existing access roads.	Project proponent / contractor	Throughout the construction phase.
Ensure that rubble, litter, and disused construction materials are appropriately stored (if not removed daily) and then disposed regularly at licensed waste facilities.	Project proponent / contractor	Throughout the construction phase.
Reduce and control construction dust through the use of approved dust suppression techniques as and when required (i.e. whenever dust becomes apparent).	Project proponent / contractor	Throughout the construction phase.
Restrict construction activities to daylight hours in order to negate or reduce the visual impacts associated with lighting, where possible.	Project proponent / contractor	Throughout the construction phase.
Rehabilitate all disturbed areas (if present/if required) immediately after the completion of construction works.	Project proponent / contractor	Throughout and at the end of the construction phase.

Performance Indicator	Vegetation cover on and in the vicinity of the site is intact (i.e. full cover as per natural vegetation present within the environment) with no evidence of degradation or erosion.
Monitoring	Monitoring of vegetation clearing during construction (by contractor as part of construction contract). Monitoring of rehabilitated areas quarterly for at least a year following the end of construction (by contractor as part of construction contract).

Table 14: Management programme – Operation.

OBJECTIVE: The mitigation and possible negation of visual impacts associated with the operation of the proposed Kiara PV 4 facility.		
Project Component/s	The solar energy facility and ancillary infrastructure (i.e. PV panels, access roads, workshop, etc.).	
Potential Impact	Visual impact of facility degradation and vegetation rehabilitation failure.	
Activity/Risk Source	The viewing of the above mentioned by observers on or near the site.	
Mitigation: Target/Objective	Well maintained and neat facility.	
Mitigation: Action/control	**Responsibility**	**Timeframe**
Adjust tilt angles of the panels if glint and glare issues become evident where possible. If specific sensitive visual receptors are identified during operation, investigate screening at the receptor site.	Project proponent / operator	Throughout the operation phase.
Maintain the general appearance of the facility as a whole, including the PV panels, servitudes and the ancillary structures.	Project proponent / operator	Throughout the operation phase.
Maintain roads and servitudes to forego erosion and to suppress dust.	Project proponent / operator	Throughout the operation phase.
Monitor rehabilitated areas, and implement remedial action as and when required.	Project proponent / operator	Throughout the operation phase.
Investigate and implement (should it be required) the potential to screen visual impacts at affected receptor sites.	Project proponent / operator	Throughout the operation phase.
Performance Indicator	Well maintained and neat facility with intact vegetation on and in the vicinity of the facility.	
Monitoring	Monitoring of the entire site on an ongoing basis (by operator).	

Table 15: Management programme – Decommissioning.

OBJECTIVE: The mitigation and possible negation of visual impacts associated with the decommissioning of the proposed Kiara PV 4 facility.		
Project Component/s	The solar energy facility and ancillary infrastructure (i.e. PV panels, access roads, workshop, transformers, etc.).	
Potential Impact	Visual impact of residual visual scarring and vegetation rehabilitation failure.	
Activity/Risk Source	The viewing of the above mentioned by observers on or near the site.	
Mitigation: Target/Objective	Only the infrastructure required for post decommissioning use of the site retained and rehabilitated vegetation in all disturbed areas.	
Mitigation: Action/control	**Responsibility**	**Timeframe**

Remove infrastructure not required for the post-decommissioning use of the site.	Project proponent / operator	During the decommissioning phase.
Rehabilitate access roads and servitudes not required for the post-decommissioning use of the site. If necessary, an ecologist should be consulted to give input into rehabilitation specifications.	Project proponent / operator	During the decommissioning phase.
Monitor rehabilitated areas quarterly for at least a year following decommissioning, and implement remedial action as and when required.	Project proponent / operator	Post decommissioning.

Performance Indicator	Vegetation cover on and in the vicinity of the site is intact (i.e. full cover as per natural vegetation within the environment) with no evidence of degradation or erosion.
Monitoring	Monitoring of rehabilitated areas quarterly for at least a year following decommissioning.

10. REFERENCES/DATA SOURCES

Blue Oak Energy, 2016. *https://www.blueoakenergy.com/blog/glint-and-glare-studies-for-commercial-and-industrial-solar-*

Chief Directorate National Geo-Spatial Information, varying dates. *1:50 000 Topographical Maps and Data.*

CSIR, 2017. *Delineation of the first draft focus areas for Phase 2 of the Wind and Solar PV Strategic Environmental Assessment.*

CSIR, 2015. *The Strategic Environmental Assessment for wind and solar photovoltaic energy in South Africa.*

DFFE, 2018. *National Land-cover Database 2018 (NLC2018).*

DFFE, 2021. *South African Protected Areas Database (SAPAD_OR_2021_Q1).*

DFFE, 2021. *South African Renewable Energy EIA Application Database (REEA_OR_2021_Q1).*

DEA & DP, 2011. Provincial Government of the Western Cape. *Guideline on Generic Terms of Reference for EAPS and Project Schedules.*

Department of Environmental Affairs and Tourism (DEA&T), 2001. *Environmental Potential Atlas (ENPAT) for the Northern Cape Province.*

FAA, 2015. *Evaluation of Glare as a Hazard for General Aviation Pilots on Final Approach.*

Forge Solar PV Planning and Glare Analysis, 2019. *Guidance and information on using Forge Solar analysis tools.*

JAXA, 2021. Earth Observation Research Centre. *ALOS Global Digital Surface Model (AW3D30).*

Meister Consultants Group, 2014. *http://solaroutreach.org/wp-content/uploads/2014/06/Solar-PV-and-Glare-_Final.pdf*

National Botanical Institute (NBI), 2004. *Vegetation Map of South Africa, Lesotho and Swaziland (Unpublished Beta Version 3.0)*

Oberholzer, B. (2005). *Guideline for involving visual and aesthetic specialists in EIA processes: Edition 1.*

Pager Power Urban and Renewables, 2020. *Solar Photovoltaic and Building Development – Glint and Glare Guidance.*

The Environmental Impact Assessment Amendment Regulations. In Government Gazette Nr. 33306, 18 June 2010.