PROPOSED SUN GARDEN PV FACILITY, EASTERN CAPE PROVINCE

VISUAL IMPACT ASSESSMENT

Produced for:

Sun Garden (Pty) Ltd

On behalf of:

Savannah Environmental (Pty) Ltd
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- October 2021 -

EXECUTIVE SUMMARY

This report is the undertaking of a Visual Impact Assessment (VIA) of the proposed Sun Garden Photovoltaic (PV) Facility. The determination of the potential visual impacts is undertaken in terms of the nature, extent, duration, magnitude, probability and significance of the construction and operation of the proposed infrastructure.

Sun Garden (Pty) Ltd is proposing the development of a commercial solar PV facility and associated infrastructure on a site located approximately 36km south-east of Somerset East and 28km south-west of Cookhouse within the Blue Crane Route Local Municipality and the Sarah Baartman District Municipality in the Eastern Cape Province. The entire extent of the site falls within the Cookhouse Renewable Energy Development Zone (REDZ) and within the Eastern Corridor of the Strategic Transmission Corridors.

A preferred project site with an extent of ~4,037ha has been identified by Sun Garden (Pty) Ltd as a technically suitable area for the development of the Sun Garden PV Facility.

The development envelope for the proposed Sun Garden PV Facility is located 16km (by road) from the N10 national road, near the Eskom Rippon Substation. The entire development envelope is located within an area earmarked for the proposed Redding Wind Farm. A separate Basic Assessment (BA) process is underway for the wind farm. An additional PV facility, the Solaris Fields Solar PV Facility (immediately east of the Sun Garden PV Facility), is also being investigated in a separate BA process. This PV facility will also fall within the larger development envelope.

The relatively constrained dimensions of the PV 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, with the predominant exposure to the north. This is due to the parallel ridges to the south of the proposed PV facility, shielding the facility from observers to the south. The areas of exposure are generally located on higher ground and it is noticeable that lower-lying areas (e.g. along the water courses within the study area) would not be exposed to the project infrastructure.

The study area may ultimately include wind turbines and associated infrastructure, predominantly related to the proposed Redding WEF, but also potentially from the Aeoulus WEF to the south-east of the site and the Rippon WEF to the north of the site. It is expected that, in the event that the WEFs are authorised and constructed, the wind turbine structures would dominate the landscape and would largely detract attention from the PV facility.

The following potential impacts were identified:

Nature of Impact	***Without mitigation***	***With mitigation***
Primary Impacts		
Visual impact of construction activities on sensitive visual receptors in close proximity to the proposed PV facility	Moderate	Low
Visual impact on observers travelling along the roads and residents at homesteads within a 1km radius of the PV facility structures	Moderate	Moderate
Visual impact on observers travelling along the roads and residents at homesteads within the region (1–3km radius of the PV facility structures)	Low	Low

Visual impact of lighting at night on sensitive visual receptors in close proximity to the proposed PV facility	Moderate	Low
The visual impact of solar glint and glare as a visual distraction and possible air/road travel hazard	Low	Low
Visual impact of the ancillary infrastructure during the operation phase on observers in close proximity to the structures	Low	Low
Secondary Impacts		
The potential impact on the sense of place of the region	Low	Low
The potential cumulative visual impact of the PV facility on the visual quality of the landscape	Moderate	Moderate

Concluding remarks

The construction and operation of the proposed 400MW Sun Garden PV Facility and its associated infrastructure, may have a visual impact on the study area, especially within (but potentially not restricted to) a 1 - 3km radius of the proposed facility. The visual impact will differ amongst places, depending on the distance from the facility. The post mitigation significance of these visual impacts is expected to range from **moderate** to **low.**

The anticipated visual impacts on sensitive visual receptors (if and where present) in close proximity to the proposed infrastructure are not considered to be fatal flaws for the proposed PV 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 would be considered to be acceptable from a visual impact perspective and can therefore be authorised.

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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.

Savannah Environmental appointed Lourens du Plessis as an independent specialist consultant to undertake the visual impact assessment for the proposed Sun Garden Photovoltaic (PV) Facility. He will not benefit from the outcome of the project decision-making.

1.2. Assumptions and limitations

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

1.3. 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:

[1] Adapted from Oberholzer (2005).

- 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**.

1.4. 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 infrastructure.

- **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 infrastructure.

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.

- **Site visit**

A site visit was undertaken in July 2020 in order to verify the results of the spatial analyses and to identify any additional site specific issues that may need to be addressed in the VIA report.

2. BACKGROUND

Sun Garden (Pty) Ltd is proposing the development of a commercial solar PV facility and associated infrastructure on a site located approximately 36km south-east of Somerset East and 28km south-west of Cookhouse within the Blue Crane Route Local Municipality and the Sarah Baartman District Municipality in the Eastern Cape Province. The entire extent of the site falls within the Cookhouse Renewable Energy Development Zone (REDZ) and within the Eastern Corridor of the Strategic Transmission Corridors. The facility is known as the Sun Garden PV Facility.

Figure 1: Regional locality of the study area.

A preferred project site with an extent of ~4,037ha has been identified by Sun Garden (Pty) Ltd as a technically suitable area for the development of the Sun Garden PV Facility. The project site consists of four affected properties:

- Portion 9 of the farm Britzkraal No 253, Division of Somerset East
- Portion 8 (a Portion of Portion 7) of the farm Britzkraal No 253, Division of Somerset East
- Portion 7 of the farm Britzkraal No 253, Division of Somerset East
- Portion 1 of farm Bothas Hoop 358

A development envelope for the placement of the solar facility infrastructure (i.e. development footprint) has been identified within the project site and assessed as part of the BA process. The development envelope is ~500ha in extent and the much smaller development footprint of ~350ha will be placed and sited within the development envelope. The development footprint will contain the following infrastructure to enable the solar facility to generate up to 400MW:

- Solar PV array comprising PV modules and mounting structures.
- Inverters and transformers.
- Cabling between the project components, lain underground where practical.
- A 132/33kV on-site collector substation to be connected to a proposed 400kV Main Transmission Substation (MTS) located to the south east of the site via a new 132kV overhead power line (twin turn dual circuit line). The development of the proposed 400kV Main Transmission Substation will

be assessed as part of the separate BA process in order to obtain Environmental Authorisation.

- Site offices and maintenance buildings, including workshop areas for maintenance and storage.
- Temporary laydown areas.
- Access roads to the site and between project components with a width of approximately 4,5m. The main access points will be 8m wide.
- Water supply pipelines from onsite boreholes.
- A temporary concrete batching plant.
- Staff accommodation (temporary).
- Operation and Maintenance buildings including a gate house, security building, control centre, offices, warehouses, a workshop and visitor's centre.

The new 132kV overhead power line to connect the PV facility to the proposed 400kV Main Transmission Substation will follow a route north-east of the project site to complete the connection. The power line will be parallel to the proposed power lines for the Solaris Fields PV facility and the Redding Wind Energy Facility, and will therefore cross properties located to the north-east of the project site. The majority of these properties form part of the project sites of the adjacent proposed wind farms which forms part of the cluster of renewable energy facilities proposed. The power line is being assessed within a 300m grid connection corridor which will provide for the avoidance of sensitive environment areas and features and allow for the micro-siting of the power line within the corridor.

The PV facility will take approximately four months to construct and the operational lifespan of the facility is estimated at up to 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 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*).

3. SCOPE OF WORK

This report is the undertaking of a Visual Impact Assessment (VIA) of the proposed PV facility as described above.

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 study area for the visual impact assessment encompasses a geographical area of 213km² (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 development footprint of the facility.

The broader study area includes a section of the R335 arterial road, the Beenleegte secondary road and a number of homesteads or farm residences.

Anticipated issues related to the potential visual impact of the proposed PV facility include the following:

- The visibility of the facility to, and potential visual impact on, observers travelling along the Beenleegte secondary road (and potentially the R335 arterial road).

- 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, 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 the Cookhouse Renewable Energy Development Zone (REDZ).

- 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 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 constitute a visual impact at a local and/or regional scale.

4. 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.

5. THE AFFECTED ENVIRONMENT

The development envelope for the proposed Sun Garden PV Facility is located 16km (by road) from the N10 national road, near the Eskom Rippon Substation. The entire development envelope is located within an area earmarked for the proposed Redding Wind Farm. A separate Basic Assessment (BA) process is underway for the wind farm. An additional PV facility, the Solaris Fields Solar PV Facility (immediately east of the Sun Garden PV Facility), is also being investigated in a separate BA process. This PV facility will also fall within the larger development envelope.

The collective surface area of the farms identified for the Sun Garden PV project is approximately 4,037ha, but the final development site for the PV facility would be closer to 382ha, roughly 9.5% of the farms.

The development envelope and proposed PV facility are indicated on **Figure 4**. The site is located in a rural area, currently zoned as agricultural.

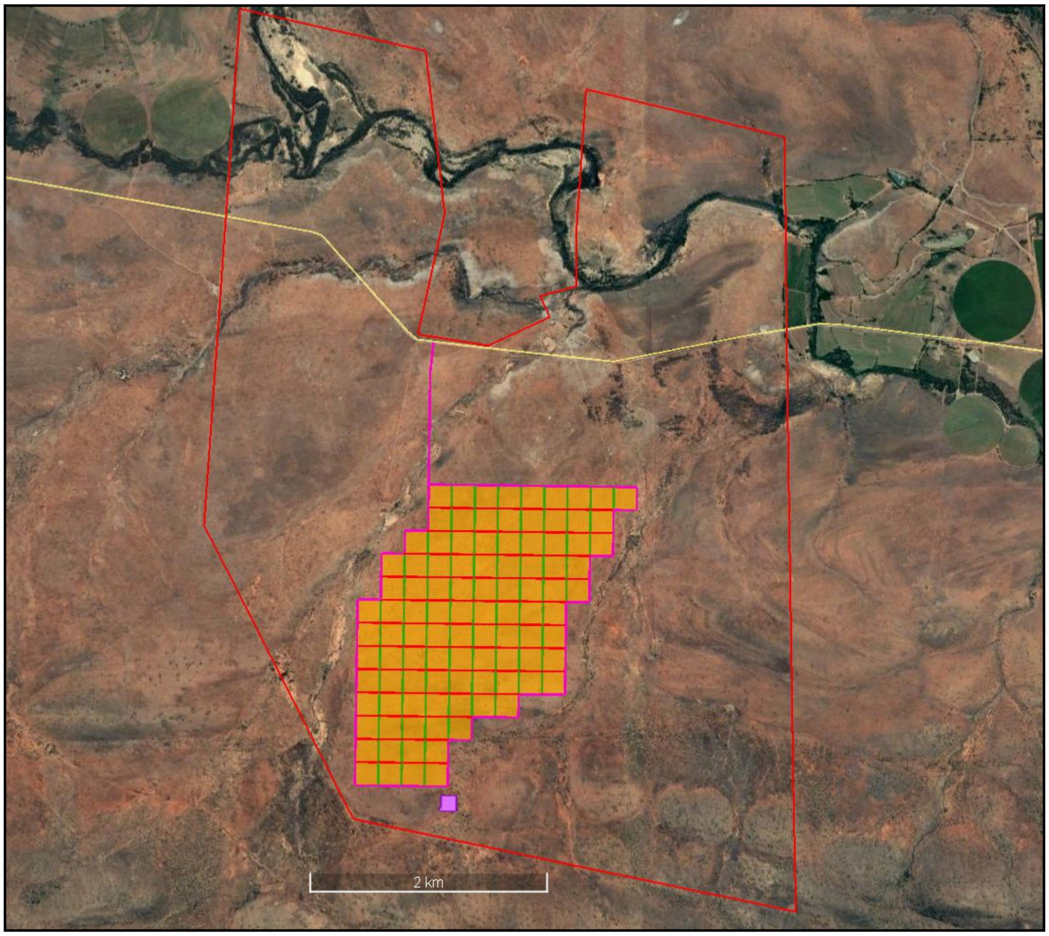

Figure 4: Aerial view of the development envelope (red), PV arrays (orange) and substation (purple).

Topography, hydrology and vegetation

The study area occurs on land that ranges in elevation from approximately 465m (in the south-east) to 730m (at the top of the hills to the south of the proposed PV facility). The terrain surrounding the farm is predominantly flat with an even slope towards the north. The proposed development envelope itself is located at an average elevation of 541m above sea level.

The terrain morphology is described as *lowlands (plains) with parallel hills*, and even though the study area is predominantly flat, there are a number of prominent ridges to the south. The Little Fish River (to the north-east) is the only perennial river in the study area. Besides the Little Fish River there are a number of non-perennial drainage lines and farm dams. The Brak River is the most prominent non-perennial river. It feeds into the Little Fish River near the *Draai van Visrivier* homestead. The region is relatively arid and is referred to as the Nama-Karoo Biome (Lower Karoo Bioregion). The average rainfall is indicated at between 300 – 500mm per annum.

The vegetation cover in the region is primarily *grassland* and *low shrubland*, with some *forest* and *woodland* occurring along the banks of the Brak and Little Fish Rivers. The floodplains of these rivers are indicated as *Southern Karoo Riviere*, whilst the grassland and low shrubland is referred to as *Albany Broken Veld.* In the higher lying ridges to the south, the vegetation type is *Kowie Thicket*.

Refer to **Maps 1** and **2** for the topography and land cover maps of the study area.

Land use and settlement patterns

The majority of the study area is sparsely populated (less than 10 people per km^2) and consists of a landscape of wide-open spaces and very little development. The relatively low rainfall has as a consequence that the region has not been transformed by dryland agriculture, with irrigated agriculture (crop circles) and dryland crop production primarily limited to areas along the Brak and Little Fish Rivers.

Besides the limited cultivation of crops, the study area is largely in a natural state, with mainly sheep and game farming as additional economic activities.

Farm residences, or homesteads, dot the landscape at an irregular interval. These homesteads are generally located at great distances from each other (i.e. more than 3km apart). Some of these within the study area include:

- Britskraal 1 and 2
- Sarahdale
- Stillerus
- Rooiplaas
- Jordaanskraal
- Karee Krans
- Glentana
- Alwingate
- Request
- Draai van Visrivier
- Glen Roy
- Stonefountain
- Russel Park

Note:

It is uncertain whether all of these farmsteads are inhabited or not. It stands to reason that farmsteads that are not currently inhabited will not be visually impacted upon at present. These farmsteads do, however retain the potential to be affected visually should they ever become inhabited again in the future. For this reason, the author of this document operates under the assumption that they are all inhabited.

Most of these homesteads are located on farms earmarked for the proposed Redding Wind Farm.

There is an airfield (Henry's Flats Aerodrome) to the far north of the study area, approximately 5.5km north of the proposed PV facility (at the closest). The author is uncertain whether this airfield is operational. The airfield and the Jordaanskraal homestead are located on farms earmarked for the proposed Rippon Wind Farm. There is also another airfield (indicated on the SA 1:50 000 topographical maps) at the Glentana homestead (dairy farm) as well, but it appears to be under irrigation and not functioning as an airfield any more.[2]

The N10 national road provides motorised access to the region from the city of Port Elizabeth, the largest urban centre closest to the site (approximately 130km by road). Another 16km gravel road (the Beenleegte secondary road) provides

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[2] Information received from neighbouring land owners and the project proponent indicates that neither of the airfields is operational.

the quickest access to the proposed development site from the N10. This road splits off from the N10 near the Rippon Substation.

There are no designated protected areas within the region and there are no other identified tourist attractions or destinations within the study area.[3]

The entire proposed development envelope is located within the Cookhouse Renewable Energy Development Zone (REDZ) and Strategic Transmission Corridor. Refer to **Figure 5** for the regional locality of the study area in relation to the Cookhouse REDZ. REDZ are described as:

"areas where large scale wind and solar PV energy facilities can be developed in terms of SIP 8 and in a manner that limits significant negative impacts on the environment, while yielding the highest possible socio-economic benefits to the country."

Source: https://redzs.csir.co.za

Figure 5 further indicates the status of Renewable Energy Environmental Applications (REEA) within the Cookhouse REDZ (dated 2021 1st quarter).

Applications that have been approved/constructed in the Cookhouse REDZ include:

- Amakhala Emoyeni Wind Farm
- Cookhouse Wind Farm
- Golden Valley Wind Farm
- Msenge Emoyeni Wind Farm
- Nxuba Wind Farm
- Waainek Wind Farm
- Golden Valley II Wind Farm

[3] Sources: DEAT (ENPAT Eastern Cape), NBI (Vegetation Map of South Africa, Lesotho and Swaziland), NLC2013-14 (ARC/CSIR), REEA_OR_2021_Q1 and SAPAD2019-20 (DFFE).

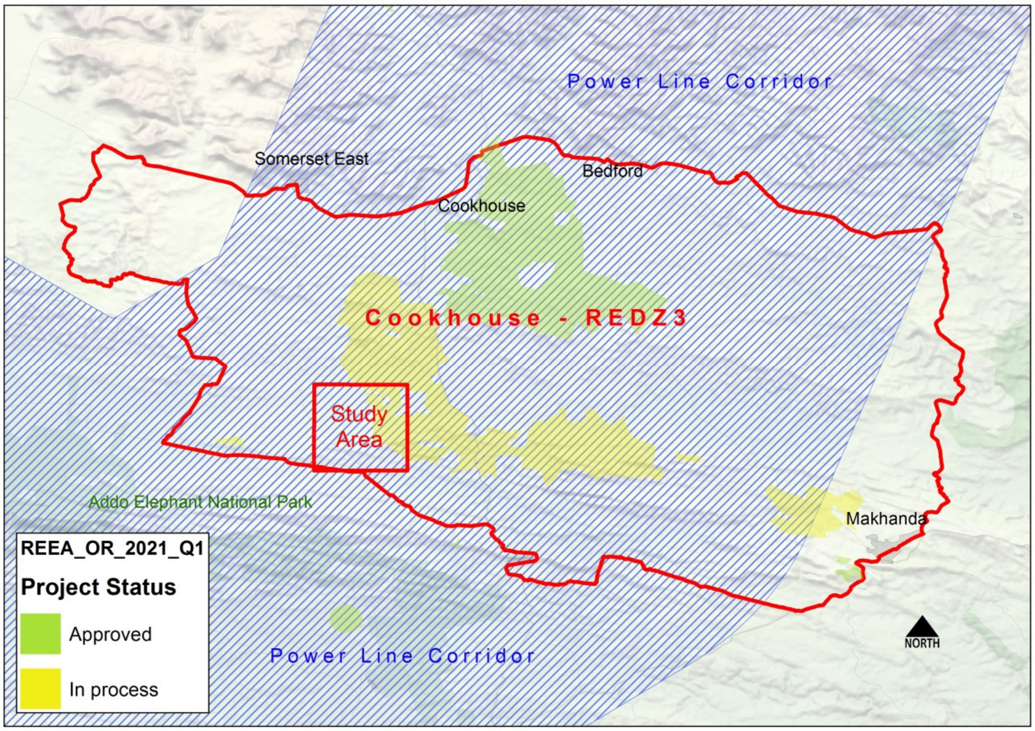


Figure 5: Regional locality of the study area in relation to the Cookhouse Renewable Energy Development Zone (REDZ).

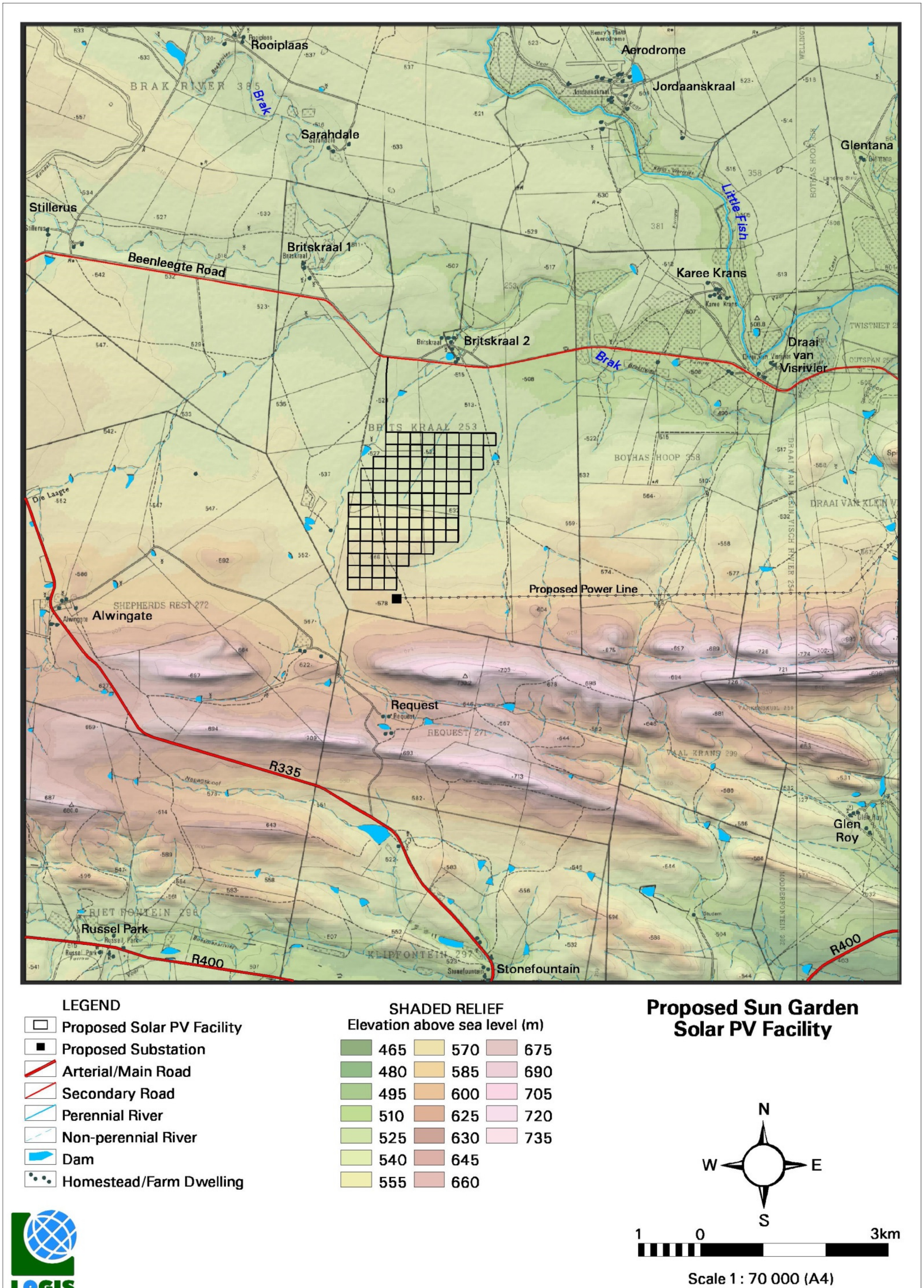
Note*: The data above (**Figure 5**) is provided by the Department: Forestry, Fisheries and the Environment (DFFE). The author accepts no responsibility for the accuracy thereof.*

The photographs below aid in describing the general environment within the study area and surrounding the proposed development site.

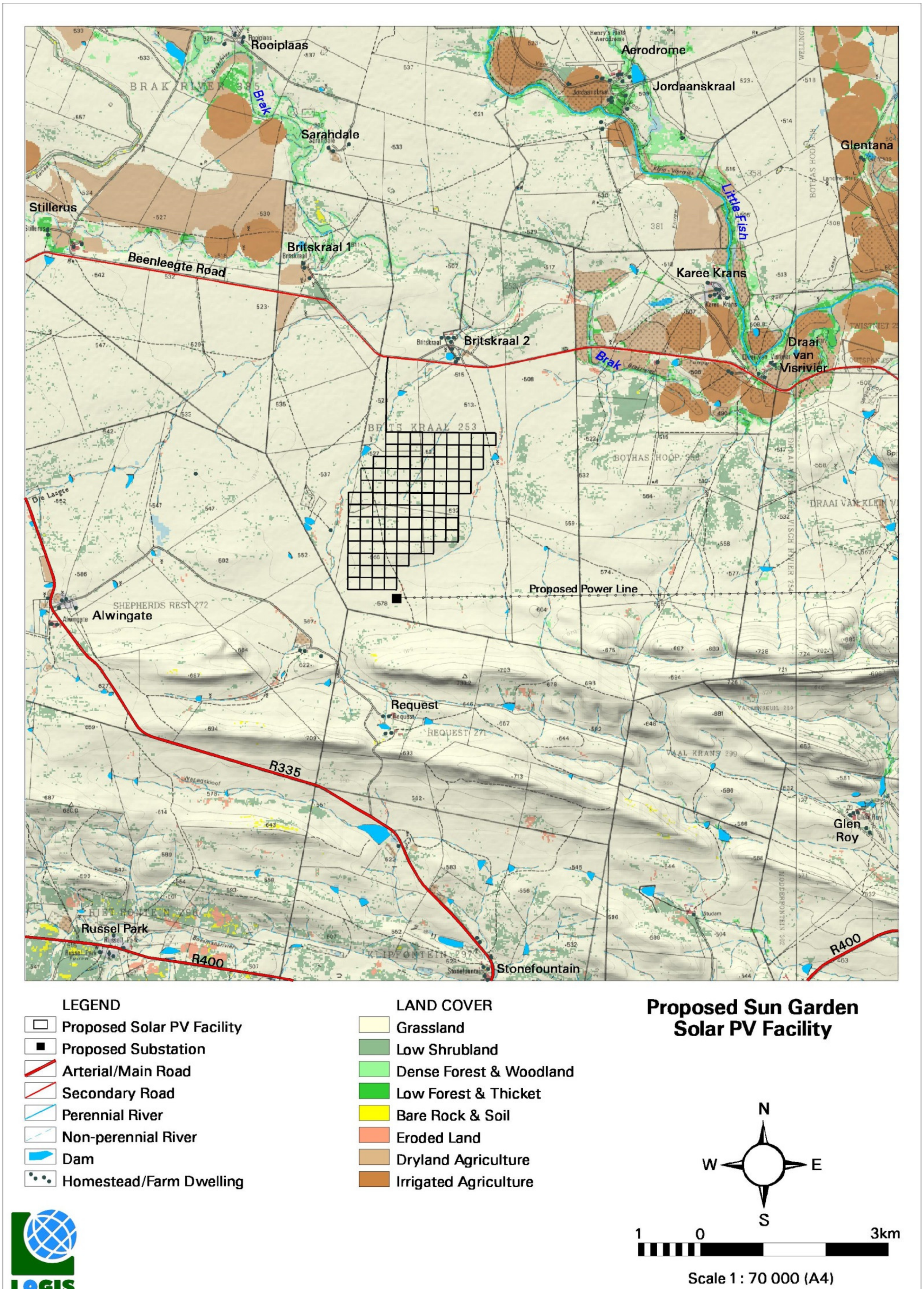
Figure 6: The general environment within the study area.

Figure 7: The Rippon Substation as seen from the N10 national road.

Figure 8: Access road to the proposed development site.



Map 1: Shaded relief map of the study area.



Map 2: Land cover and broad land use patterns.

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, etc.) associated with the facility.

The viewshed analyses include 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 PV 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, with the predominant exposure to the north. This is due to the parallel ridges to the south of the proposed PV facility, shielding the facility from observers to the south.

The areas of exposure are generally located on higher ground and it is noticeable from Map 3, that lower-lying land (e.g. along the water courses within the study area) would not be exposed to the project infrastructure.

The following is evident from the viewshed analysis:

0 – 1km

The facility may be highly visible within a 1km radius of the development. There are no homesteads or public roads within this zone.

1 – 3km

This zone contains the Britskraal (2) homestead[4] and sections of the Beenleegte secondary road. Other than these potential receptor sites, the rest of the visually exposed areas fall within vacant farmland.

3 - 6km

Visual exposure within this zone will predominantly be towards the north and west. Homesteads within this zone that may be exposed to the PV facility include:

- Sarahdale
- Karee Krans
- Draai van Visrivier
- Alwingate

It should be noted that all of the receptor sites (except Sarahdale) are located on farms earmarked for the Redding Wind Farm.

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[4] The names listed below are of the homestead or farm dwelling as indicated on the SA 1: 50 000 topographical maps and do not refer to the registered farm name.

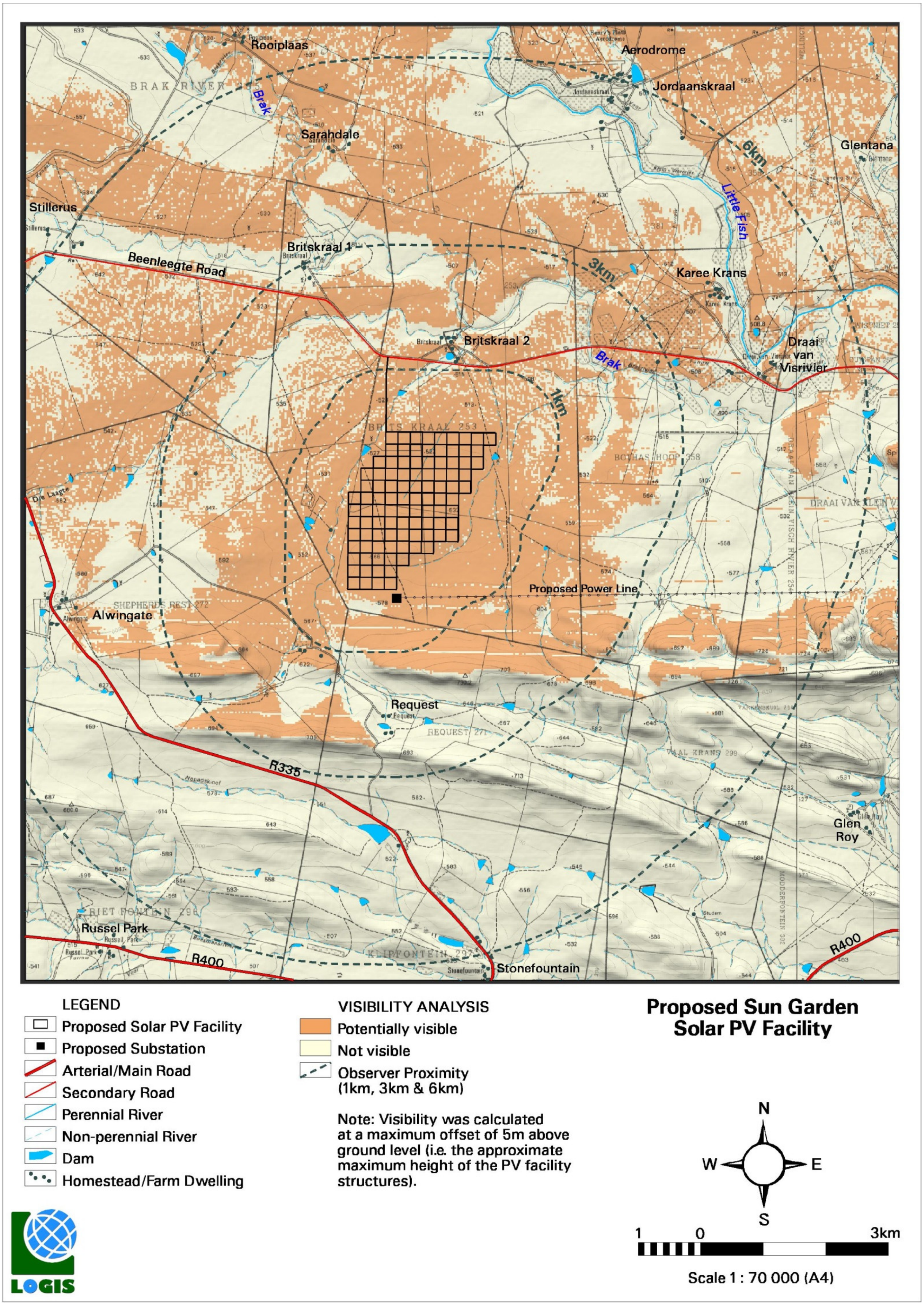
> 6km

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. The only exposed homestead within this zone is Rooiplaas, located approximately 6.6km north-west of the site. A very short section of the R335 arterial road also falls within this zone, but in transit observations of the PV facility from this road are highly unlikely at this distance.

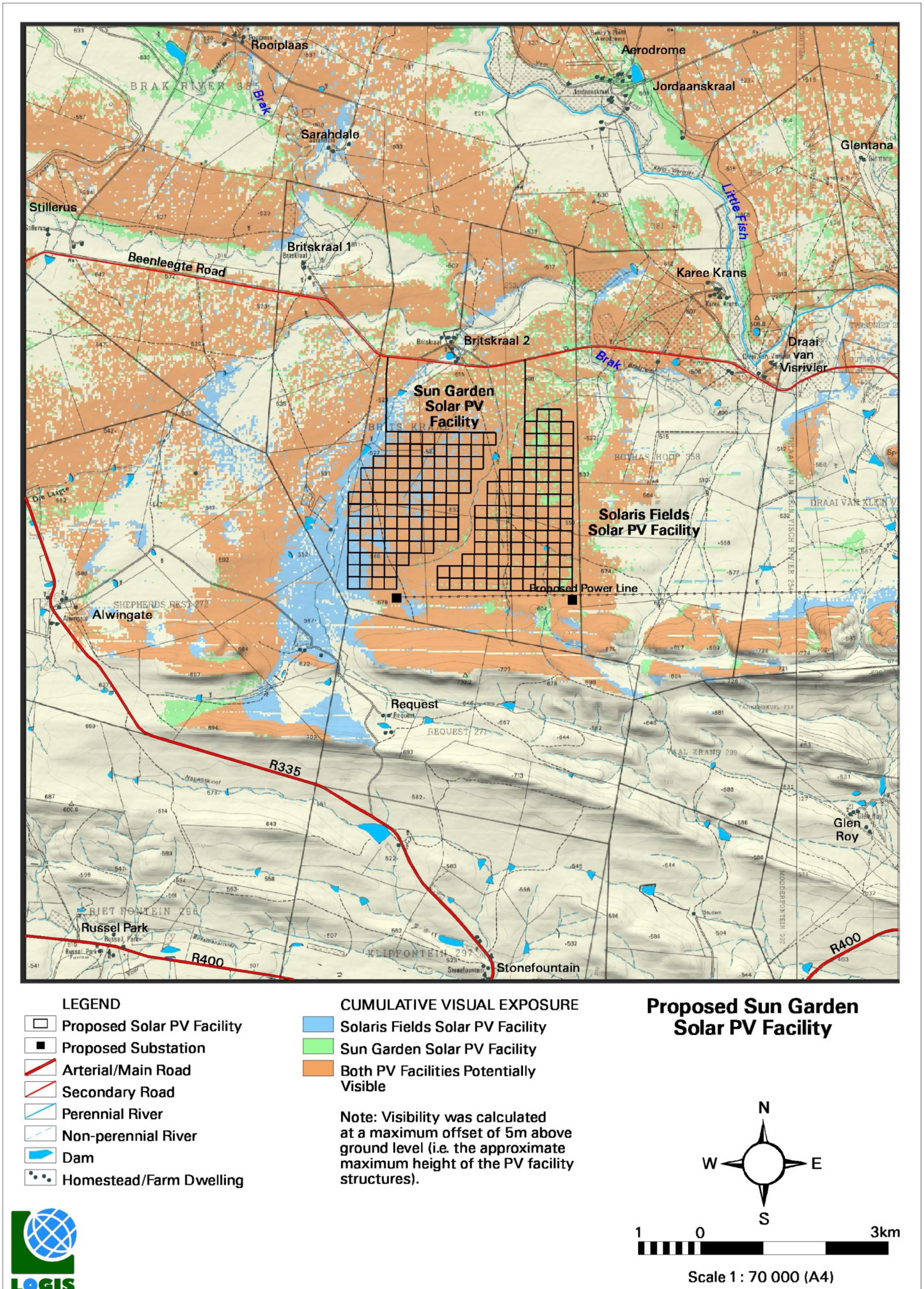
Conclusion

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 mentioned above, as well as observers travelling along the Beenleegte secondary road in closer proximity to the facility.

The incidence rate of sensitive visual receptors is however expected to be quite low, due to the generally remote location of the proposed development, the low number of potential observers and the assumed support of (most of) the land owners to the overarching renewable energy facility developments (including the PV facilities and various wind energy facilities).



Map 3: Viewshed analysis of the proposed Sun Garden PV Facility.



Map 4: Cumulative visual exposure.

6.2. Potential cumulative visual exposure

The study area may ultimately include wind turbines and associated infrastructure, predominantly related to the proposed Redding WEF, but also potentially from the Aeoulus WEF to the south-east of the site and the Rippon WEF to the north of the site. It is expected that, in the event that the WEFs are authorised and constructed, the wind turbine structures would dominate the landscape and would largely detract attention from the PV facility.

In terms of the construction of two PV facilities (namely Solaris Fields and Sun Garden PV Facilities) within the study area, please refer to **Map 4** above. The map indicates the potential cumulative visual exposure of the two PV facilities. It is clear that the visual exposure of both facilities is very similar. This is due to the close proximity of the two sites adjacent to each other, and the relatively homogenous landscape to the north of the parallel hills. The close proximity of these facilities is in all likelihood expected to create the impression that they form part of one larger PV facility. This expectation and the fact that no additional sensitive visual receptors are affected, leads the author to the conclusion that it is preferable to locate the facilities as close as possible to each other, rather than to spread the visual impact further afield. To this end, the potential cumulative visual impact is expected to be within acceptable limits from a visual impact perspective.

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 facilities/technologies (e.g. more extensive infrastructure associated with power plants exceeding 300MW) and downwards for smaller plants (e.g. smaller infrastructure associated with power plants with less generating capacity such as the proposed Sun Garden PV Facility). 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 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 solar energy facility and its related 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.

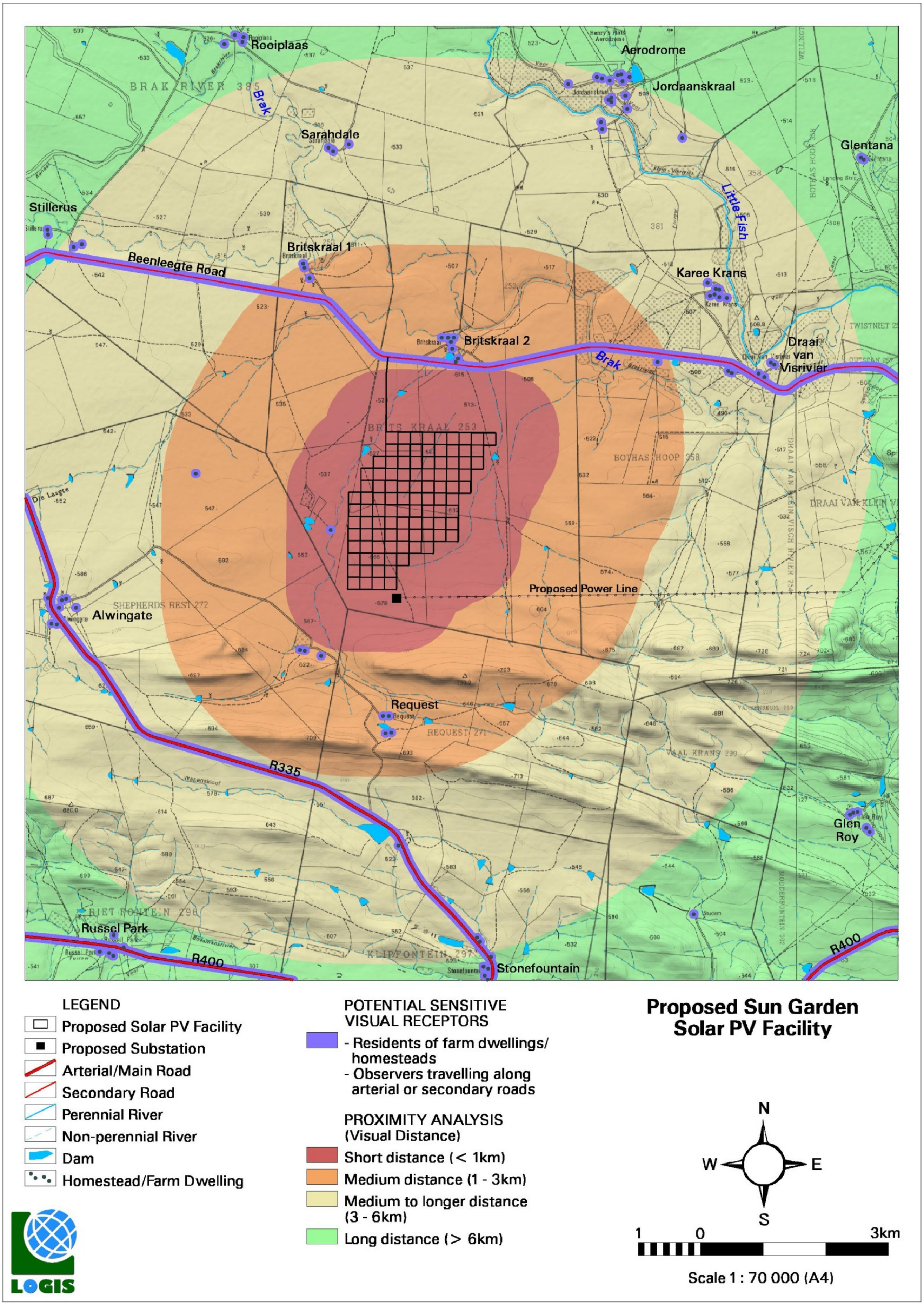
Viewer incidence is expected to be the highest along the R335 arterial road and the Beenleegte secondary road within the study area. Travellers using these roads may be negatively impacted upon by visual exposure to the PV facility.

Additional sensitive visual receptors are located at the farm residences (homesteads) within 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 (if or when visual exposure occurs).

Due to the remote location of the proposed facility, there are only a few potential sensitive visual receptors located within a 6km radius of the proposed facility. These are residents of, or visitors to:

- Britskraal 1 and 2
- Sarahdale
- Jordaanskraal
- Karee Krans
- Alwingate
- Request
- Draai van Visrivier

Refer to **Map 5** below.



Map 5: Proximity analysis and potential sensitive visual receptors.

6.5. Visual absorption capacity

The broader study area is located within the Nama-Karoo Biome characterised by large open, *low shrubland*, grassland and bare soil in places (**Figure 9**).

Overall, the Visual Absorption Capacity (VAC) of the receiving environment is deemed low by virtue of the nature of the vegetation and the low occurrence of urban development. 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.

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 facility). 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.

Figure 9: *Low shrubland*, grassland and bare soil within the study area – low VAC.

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

The PV facility is not expected to have visual impacts of **very high** magnitude, due to the fact that there are no residences/homesteads or public roads within a 1km radius of the proposed PV facility.

The facility may have a visual impact of **high** magnitude on the following observers:

Residents of/or visitors to:

- Britskraal (2)

Observers travelling along the:

- Beenleegte secondary road north of the proposed facility

The facility may have a visual impact of **moderate** magnitude on the following observers:

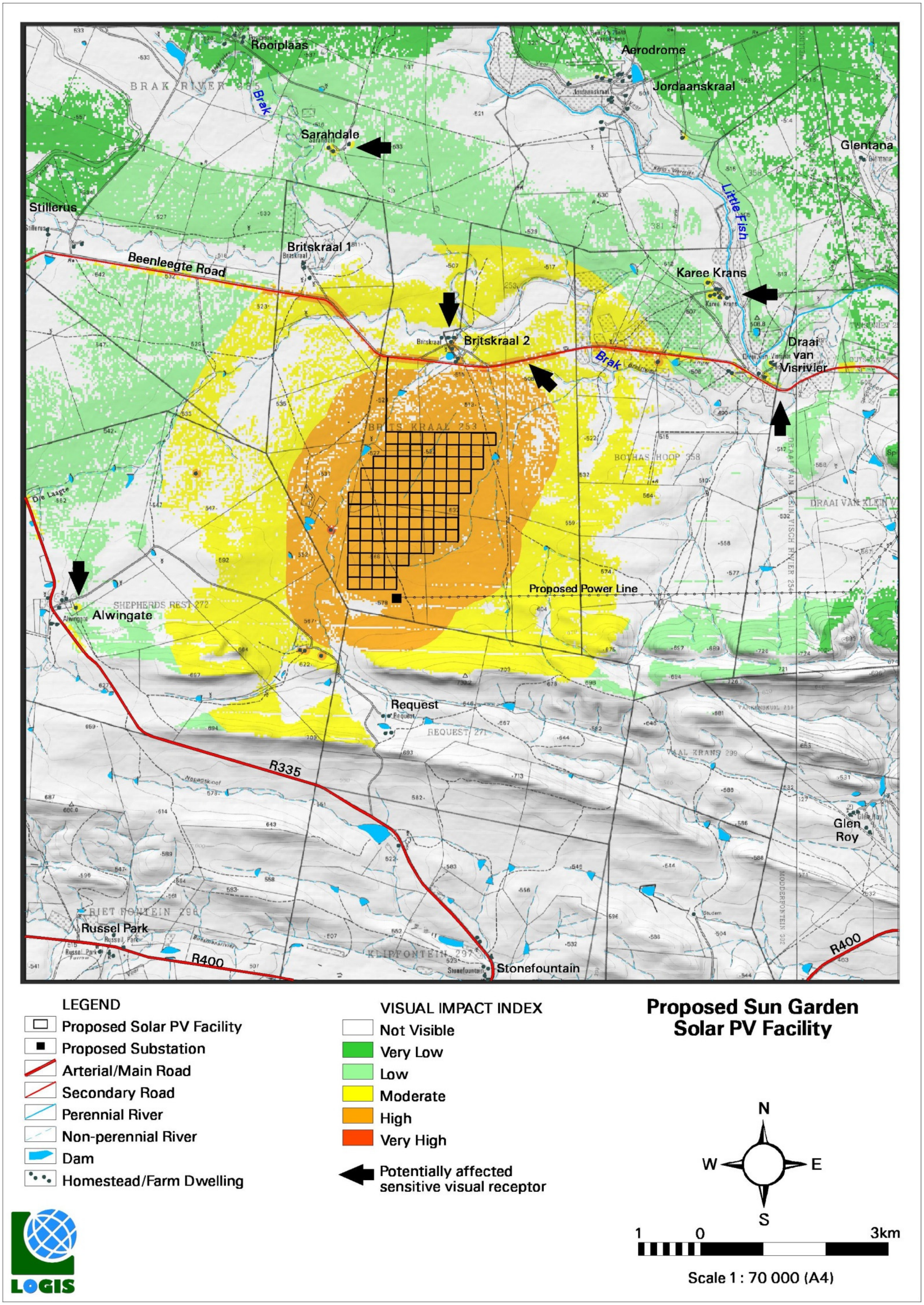
Residents of/or visitors to:

- Alwingate
- Sarahdale
- Jordaanskraal
- Kareekrans
- Draai van Visrivier

Notes:

The location of Britskraal (2), Alwingate, Jordaanskraal, Kareekrans and Draai van Visrivier on farms earmarked for the Redding or Rippon WEFs, reduces the probability of this impact occurring i.e. it is assumed that the residents/land owners are supportive of renewable energy developments and associated infrastructure on these farms and within the region.

Where homesteads are derelict or deserted, the visual impact will be non-existent, until such time as it is inhabited again.



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** - site only (very low = 1), local (low = 2), regional (medium = 3), national (high = 4) or international (very high = 5)[5].
- **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)[6].
- **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)
- 31-60 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)

[5] Local = within 1km of the development site. Regional = between 1-3km (and potentially up to 6km) from the development site.

[6] 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

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 the area.

Construction activities may potentially result in a **moderate** (significance rating = 40), temporary visual impact, that may be mitigated to **low** (significance rating = 24)

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

Nature of Impact: Visual impact of construction activities on sensitive visual receptors in close proximity to the proposed PV facility.		
	Without mitigation	***With mitigation***
Extent	Local **(2)**	Local **(2)**
Duration	Short term **(2)**	Short term **(2)**
Magnitude	Moderate **(6)**	Low **(4)**
Probability	Highly Probable **(4)**	Probable **(3)**
Significance	Moderate **(40)**	Low **(24)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible **(1)**	Reversible **(1)**
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:

<u>Planning:</u>

- Retain and maintain natural vegetation immediately adjacent to the development footprint.

<u>Construction:</u>

- Ensure that vegetation is not unnecessarily removed during the construction 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.
- 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 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 immediately after the completion of construction works.
Residual impacts: None, provided rehabilitation works are carried out as specified.

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

The PV facility is expected to have a **moderate** visual impact (significance rating = 36) on observers travelling along the Beenleegte secondary road. There are no homesteads within a 1km radius of the proposed PV facility structures.

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 roads and residents at homesteads within a 1km radius of the PV facility structures		
	Without mitigation	***With mitigation***
Extent	Local **(2)**	Local **(2)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	High **(8)**	Moderate **(6)**
Probability	Probable **(3)**	Probable **(3)**
Significance	Moderate **(42)**	Moderate **(36)**
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 immediately adjacent to the development footprint. ➢ Consult adjacent landowners (if present) in order to inform them of the development and to identify any (valid) visual impact concerns. 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.		

6.8.3. Potential visual impact on sensitive visual receptors within the region (1 – 3km radius)

The operational PV facility could have a **low** visual impact (significance rating = 22) on observers located between a 1 – 3km radius of the PV facility structures, both before and after the implementation of mitigation measures. The only homestead within this zone is the Britskraal (2) residence, located on the property earmarked for the proposed development.

Table 4: Visual impact of the proposed PV facility structures within the region.

Nature of Impact: Visual impact on observers travelling along the roads and residents at homesteads within a 1 – 3km radius of the PV facility structures		
	Without mitigation	***With mitigation***
Extent	Regional **(3)**	Regional **(3)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Low **(4)**	Low **(4)**
Probability	Improbable **(2)**	Improbable **(2)**
Significance	Low **(22)**	Low **(22)**
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: <u>Planning:</u> ➢ Retain/re-establish and maintain natural vegetation immediately adjacent to the development footprint. <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.		
Residual impacts: The visual impact will be removed after decommissioning, provided the PV facility infrastructure is removed. Failing this, the visual impact will remain.		

6.8.4. 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 amount 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.

<table>
<tr><td colspan="3">Nature of Impact:
Visual impact of lighting at night on sensitive visual receptors 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>Local (2)</td><td>Local (2)</td></tr>
<tr><td>Duration</td><td>Long term (4)</td><td>Long term (4)</td></tr>
<tr><td>Magnitude</td><td>High (8)</td><td>Moderate (6)</td></tr>
<tr><td>Probability</td><td>Probable (3)</td><td>Improbable (2)</td></tr>
<tr><td>Significance</td><td>Moderate (42)</td><td>Low (24)</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 & operation</u>:
➢ 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.</td></tr>
<tr><td colspan="3">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.</td></tr>
</table>

6.8.5. 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 of 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 relative close proximity to the source (e.g. residents of neighbouring properties), 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 Sun Garden PV Facility) 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.[7]

The proposed PV facility is not located near any operational airports or airfields (as indicated by surrounding land owners and the project proponent) and is very remote in terms of exposure to other potentially sensitive visual receptors. There are no major (national or arterial) roads in close proximity to the PV facility, and the closest road, the Beenleegte secondary road, is located more than 1km away. The intensity of the light reflected from the solar panels decrease with increasing distance, and is therefore not expected to influence motorists travelling along this road. As such, the potential visual impact related to solar glint and glare is expected to be of **low** significance (significance rating = 20).

Table 6: Impact table summarising the significance of the visual impact of solar glint and glare as a visual distraction and possible air travel hazard.

Nature of Impact: The visual impact of solar glint and glare as a visual distraction and possible air/road travel hazard		
	Without mitigation	***With mitigation***
Extent	Local **(2)**	N.A.
Duration	Long term **(4)**	N.A.
Magnitude	Low **(4)**	N.A.
Probability	Improbable **(2)**	N.A.
Significance	Low **(20)**	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.		

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

Residual impacts: N.A.

6.8.6. Ancillary infrastructure

On-site ancillary infrastructure associated with the PV facility includes a 132kV power line, substation, inverters, 33kV cabling between the PV arrays, meteorological measurement station, 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 7: 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	Local **(2)**	Local **(2)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Low **(4)**	Low **(4)**
Probability	Improbable **(2)**	Improbable **(2)**
Significance	Low **(20)**	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: Planning: ➢ Retain/re-establish and maintain natural vegetation immediately adjacent to the development footprint/power line servitude. 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.		

6.9. Visual impact assessment: 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 rural, undeveloped character and a natural appearance. These generally undeveloped landscapes are considered to have a high visual quality, except where urban development represents existing visual disturbances.

The anticipated visual impact of the proposed PV facility on the regional visual quality, and by implication, on the sense of place, is difficult to quantify, but is generally expected to be of **low** significance. This is due to the relatively low viewer incidence within close proximity to the proposed development site.

Table 8: The potential impact on the sense of place of the region.

Nature of Impact: The potential impact on the sense of place of the region.		
	Without mitigation	***With mitigation***
Extent	Regional **(3)**	Regional **(3)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Low **(4)**	Low **(4)**
Probability	Improbable **(2)**	Improbable **(2)**
Significance	Low **(22)**	Low **(22)**
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 immediately adjacent to the development footprint/servitude. 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.		

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

The study area may ultimately encompass the Redding WEF, two solar energy facilities (Sun Garden and Solaris Fields PV Facilities) and the larger region the Hamlett, Rippon and Aeoulus WEFs, as well as the existing Cookhouse, Nxuba, Nojoli, Golden Valley and Amakhala Emoyeni WEFs.

The construction and operation of all of these renewable energy facilities is expected to increase the cumulative visual impact of industrial type infrastructure within the region. Details of these applications are indicated in the table below and are displayed on **Map 7**.

On the other hand the location of these renewable energy facilities within the Cookhouse REDZ will contribute to the consolidation of infrastructure to this locality and avoid a potentially scattered proliferation of renewable energy generation infrastructure throughout the region.

Table 9: Wind Relic renewable energy applications.

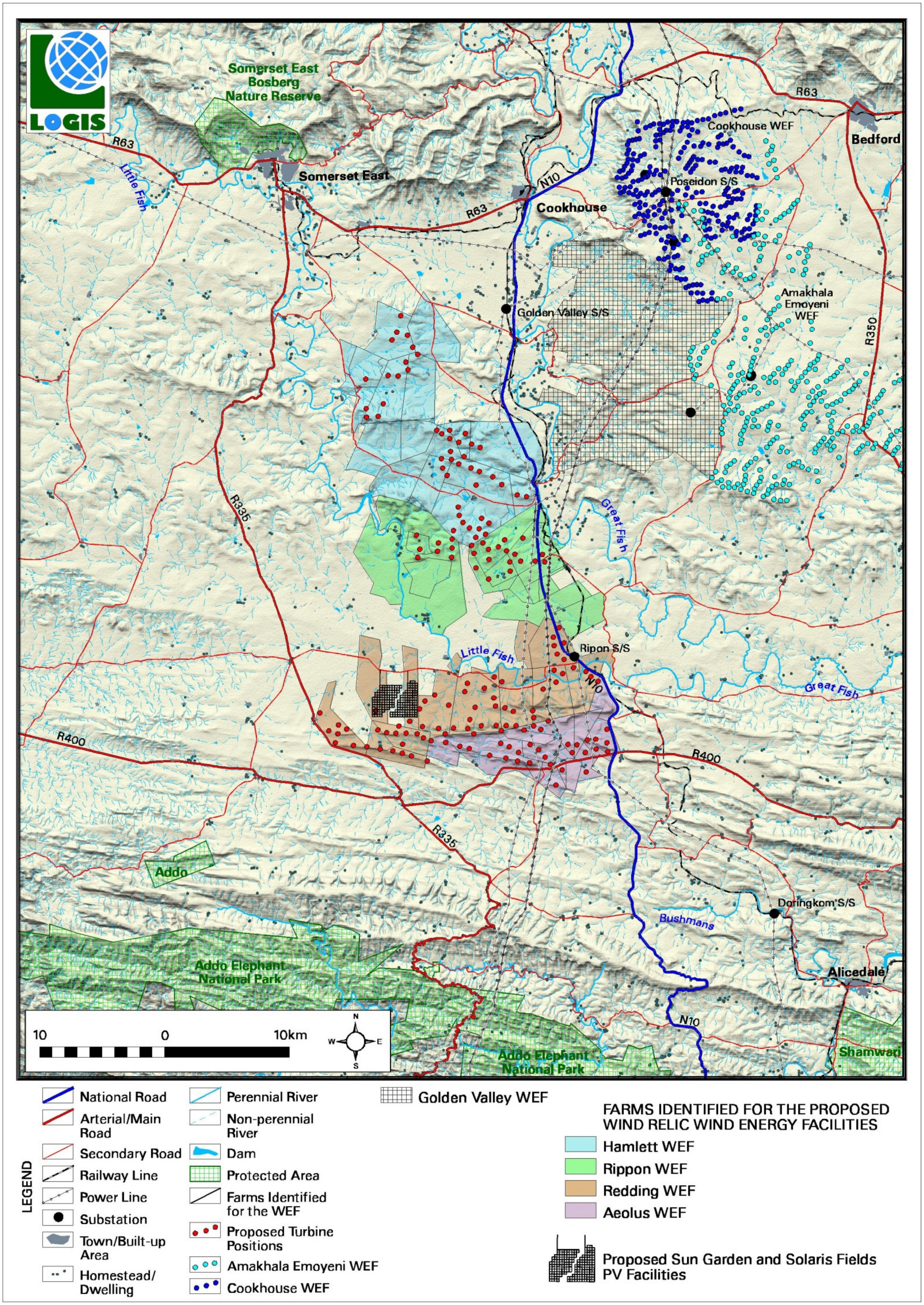
Project Name	DEA Reference Number(s)	Location	Approximate distance from the PV facility	Project Status
Hamlett WEF (333MW)		Refer Map 7	~12.5km north-east	In process
Rippon WEF (324MW)		Refer Map 7	~11km north-east	In process
Redding WEF (576MW)		Refer Map 7	On site	In process
Aeoulus WEF (297MW)		Refer Map 7	~5km south-east	In process
Solaris Fields Solar PV Facility		Refer Map 7	Adjacent East	In process

The anticipated cumulative visual impact of the proposed infrastructure is expected to be of **moderate** significance, which is considered to be acceptable from a visual perspective. This is once again due to the relatively low viewer incidence within close proximity to the proposed development sites. See **Table 9** below.

Table 10: The potential cumulative visual impact of the renewable energy facilities on the visual quality of the landscape.

Nature of Impact: The potential cumulative visual impact of the PV facility on the visual quality of the landscape.		
	Overall impact of the proposed project considered in isolation (with mitigation)	***Cumulative impact of the project and other projects within the area (with mitigation)***
Extent	Local **(2)**	Regional **(3)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Moderate **(6)**	High **(8)**
Probability	Probable **(3)**	Probable **(3)**
Significance	Moderate **(36)**	Moderate **(45)**
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 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.



Map 7: Renewable energy applications and existing WEFs within the region.

6.10. 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. 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:

    - Construct temporary screens north of the PV plant construction site to shield construction activities from observers travelling along public roads.
    - Ensure that vegetation is not unnecessarily cleared or removed during the construction period.
    - Reduce the construction period through careful logistical planning and productive implementation of resources.

    - 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.
    - Rehabilitate all disturbed areas, construction areas, roads, slopes etc. immediately after the completion of construction works. If necessary, an ecologist should be consulted to assist or give input into rehabilitation specifications.

- Glint and glare impact mitigation measures include the following:

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

- 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. 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 400MW Sun Garden PV Facility and its associated infrastructure, may have a visual impact on the study area, especially within (but not restricted to) a 1 - 3km radius 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 the two PV facilities and up to four wind energy facilities is expected to increase the area of potential visual impact within the region. The intensity of visual impact 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. It is however still more preferable that these renewable energy developments are concentrated within this area rather than being spread further apart.

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 potentially sensitive visual receptors within a 6km radius of the PV facility, although the possibility does exist for visitors to the region to venture in to closer proximity to the PV facility structures. These observers may consider visual exposure to this type of infrastructure to be intrusive.

Potential mitigation factors for the 400MW PV facility include the fact that the facility utilises a renewable source of energy (considered as an international priority) to generate electricity and is therefore generally perceived in a more favourable light. It does not emit any harmful by-products or pollutants and is therefore not negatively associated with possible health risks to observers.

A number of mitigation measures have been proposed (**Section 6.10.**). 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 PV 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 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 400MW PV facility is that the visual environment surrounding the site, especially within a 1 - 3km radius, 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 Sun Garden PV Facility and to the potential cumulative visual impact of the facility in relation to the proposed Solaris Fields PV Facility (and the proposed WEFs), 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' close proximity to each other.

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. Construction activities may potentially result in a **moderate**, temporary visual impact that may be mitigated to **low**.

- There are no homesteads within a 1km radius of the proposed PV facility. The PV facility is expected to have a **moderate** visual impact on observers traveling along the Beenleegte secondary road at a distance of just over 1km from the operational PV structures.

- The PV Facility is expected to have a **low** visual impact within the region (1 – 3km radius of the PV facility), both before and after the implementation of mitigation measures.

- 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 is expected to be of **low** significance.

- 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 anticipated visual impact of the proposed PV facility on the regional visual quality, and by implication, on the sense of place, is difficult to quantify, but is generally expected to be of **low** significance. This is due to the relatively low viewer incidence within close proximity to the proposed development.

- The anticipated cumulative visual impact of two proposed PV facilities is expected to be of **moderate** significance, which is considered to be acceptable from a visual perspective. This is mainly due to the relatively low viewer incidence within close proximity to the proposed development sites.

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 6.10.**) 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 tables below.

Table 11: Management programme – Planning.

OBJECTIVE: The mitigation and possible negation of visual impacts associated with the planning of the proposed 400MW PV 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.	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 immediately adjacent to the development footprint/servitude.	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. o Make use of Low Pressure Sodium lighting or other low impact lighting. o Make use of motion detectors on security	Project proponent / design consultant	Early in the planning phase.

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 12: Management programme – Construction.

OBJECTIVE: The mitigation and possible negation of visual impacts associated with the construction of the proposed 400MW PV 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**
Construct temporary screens north of the construction site to shield construction activities from observers travelling along local roads.	Project proponent / contractor	Early in the construction phase.
Ensure that vegetation is not unnecessarily cleared or removed during the construction phase.	Project proponent / contractor	Early in the construction phase.
Reduce the construction phase through careful logistical planning and productive implementation of resources.	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.	Project proponent / contractor	Throughout the construction phase.
Rehabilitate all disturbed areas, construction areas, servitudes, etc. immediately after the completion of construction works. If necessary, an ecologist should be consulted to assist or give input into rehabilitation specifications.	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 13: Management programme – Operation.

OBJECTIVE: The mitigation and possible negation of visual impacts associated with the operation of the proposed 400MW PV 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. 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 14: Management programme – Decommissioning.

OBJECTIVE: The mitigation and possible negation of visual impacts associated with the decommissioning of the proposed 400MW PV 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	Project proponent / operator	During the decommissioning phase.

use of the site. If necessary, an ecologist should be consulted to give input into rehabilitation specifications.		
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.

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