PROPOSED ILANGA LETHEMBA PHOTOVOLTAIC SOLAR ENERGY FACILITY

ON A SITE NORTH EAST OF DE AAR, NORTHERN CAPE

VISUAL IMPACT ASSESSMENT

Produced for:

Solar Capital (Pty) Ltd

Produced by:

MetroGIS (Pty) Ltd.
PO Box 384, La Montagne, 0184
Tel: (012) 349 2884/5 Fax: (012) 349 2880
E-mail: lourens@metrogis.co.za Web: www.metrogis.co.za

On behalf of:

Savannah Environmental (Pty) Ltd.
PO Box 148, Sunninghill, 2157
Tel: (011) 234 6621 Fax: 086 684 0547
E-mail: info@savannahSA.co.za Web: www.savannahSA.com

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1. STUDY APPROACH

1.1. Qualification and Experience of the Practitioner

MetroGIS (Pty) Ltd, specialising in visual assessment and Geographic Information Systems, undertook this visual assessment in collaboration with V&L Landscape Architects CC.

Lourens du Plessis, the lead practitioner undertaking the assessment, has been involved in the application of Geographical Information Systems (GIS) in Environmental Planning and Management since 1990.

The team undertaking the visual assessment has extensive practical knowledge in spatial analysis, environmental modelling and digital mapping, and applies this knowledge in various scientific fields and disciplines. The expertise of these practitioners is often utilised in Environmental Impact Assessments, State of the Environment Reports and Environmental Management Plans.

The visual assessment team 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.

Savannah Environmental (Pty) Ltd appointed MetroGIS (Pty) Ltd as an independent specialist consultant to undertake the visual impact assessment for the Proposed Ilanga Lethemba Solar Energy Facility north east of De Aar in the Northern Cape Province. Neither the author, MetroGIS or V&L Landscape Architects will 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:
  - 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:

[1] Adapted from Oberholzer (2005).

- 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:

	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 of the study area and experience of this type of project by the practitioner is rated as **3**.

1.4. Methodology

The study was undertaken using Geographic 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 20m interval contours supplied by the Surveyor General.

The approach utilised to identify issues related to the visual impact included the following activities:

- The creation of a detailed digital terrain model (DTM) of the potentially affected environment;
- The sourcing of relevant spatial data. This included cadastral features, vegetation types, land use activities, topographical features, site placement, etc;
- The identification of sensitive environments upon which the proposed facility could have a potential impact;
- The creation of viewshed analyses from the proposed development area in order to determine the visual exposure and the topography's potential to absorb the potential visual impact. The viewshed analysis takes into account the dimensions of the proposed structures.

This report (visual impact assessment) sets out to identify and quantify the possible visual impacts related to the proposed Solar Energy Facility, including associated infrastructure, as well as offer potential mitigation measures, where required.

The following methodology has been followed for the assessment of visual impact:

- **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 the proposed Solar Energy Facility and associated infrastructure were not visible, no impact would occur.

  Viewshed analyses of the proposed Solar Energy Facility and related infrastructure on the site indicate the potential visibility.

- **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 discernable detail in visual characteristics of both environment and structure decreases.

  The digital terrain model utilised in the calculation of the visual exposure of the facility does not incorporate the potential visual absorption capacity (VAC) of the natural vegetation of the region. It is therefore necessary to determine the VAC by means of the interpretation of the vegetation cover, supplemented with field observations.

- **Determine Visual Distance and Observer Proximity to the facility**

  In order to refine the visual exposure of the proposed 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 the Solar Energy Facility.

  Proximity radii for the proposed development site 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 negative visual perception of the proposed facility.

- **Determine Viewer Incidence and Viewer Perception**

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

It is therefore 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, and purpose of sighting which would create a myriad of options.

- **Determine the Visual impact index**

  The results of the above analyses are merged in order to determine where the areas of likely visual impact would occur. These areas are further analysed in terms of the previously mentioned issues (related to the visual impact) and in order to judge the magnitude of each impact.

- **Determine Impact significance**

  The potential visual impacts identified and described are quantified in their respective geographical locations in order to determine the significance of the anticipated impact. Significance is determined as a function of extent, duration, magnitude and probability.

2. BACKGROUND

Solar Capital (Pty) Ltd (Solar Capital) is proposing the establishment of a Photovoltaic (PV) Solar Energy Facility on a site about 7km north east of De Aar within the Emthanjeni Local Municipality in the Northern Cape Province.

Solar Capital intends to utilise photovoltaic (PV) technology, to construct an alternative energy generation facility with a total generating capacity of up to 300MW. It is anticipated that 75MW will be developed in a first phase, and the facility capacity increased to up to 300MW in subsequent phases as per future electricity requirements.

Photovoltaic technology is used to generate electricity by converting solar radiation into direct current electricity using semiconductors (i.e. silicon) through the photovoltaic effect. PV technology refers to the use of multiple PV cells which are linked together to form PV panels.

Photovoltaic energy generation is generally considered to be an environmentally friendly electricity generation option.

The purpose of the proposed facility is to add new capacity for generation of renewable energy to the national electricity mix.

The proposed Solar Energy Facility will consist of the following infrastructure:

- An array of Photovoltaic solar panels with a generating capacity of up to 300MW, to be developed in 4 phases (as indicated on Map 1);
- Foundations to support the PV panels;
- An on-site substation with a direct link to the existing Hydra MTS-Behrshoek 132kV power line that traverses the site to connect directly into the Eskom electricity network. This substation is located roughly in the middle of the site (as indicated on Map 1);
- Internal overhead power lines between the PV panel blocks and the substation (as indicated on Map 1);

- Cabling between the project components;
- Internal roads, of which the main site access is directly off the R48 just south of Paardevlei (as indicated on Map 1);
- A workshop and storage area.

The construction phase of the Solar Energy Facility is expected to take up to one year whilst the lifespan of the facility is approximated at 20 to 30 years.

3. SCOPE OF WORK

The study area for the visual assessment encompasses a geographical area of about 1200km² (the extent of the maps displayed below) and includes a minimum 16km buffer zone from the proposed development area.

The proposed site for the development of the facility is located on Portion 3 of the Farm Paarde Valley 145. The total area under consideration measures about 27 780ha, although the project space required will be smaller (refer to **Map 1**).

The scope of work for this assessment includes the determination of the potential visual impacts in terms of nature, extent, duration, magnitude, probability and significance of the construction and operation of the proposed infrastructure.

Issues related to the proposed Solar Energy Facility include:

- The visibility of the facility to, and potential visual impact on, observers travelling along national and arterial roads (i.e. the N10, the R48 and the R388) as well as secondary roads in close proximity[2] to the proposed Solar Energy Facility and within the region[3].
- The visibility of the facility to, and potential visual impact on, commuters and tourists travelling by rail in close proximity to the proposed Solar Energy Facility and within the region.
- The visibility of the facility to, and potential visual impact on residents of small-holdings, farms and homesteads in close proximity to the proposed Solar Energy Facility and within the region.
- The visibility of the facility to, and potential visual impact on residents of urban areas (i.e. De Aar) within the region.
- The potential visual impact of the facility on the visual character of the landscape and sense of place of the region.
- The potential visual impact of the facility on tourist access routes (i.e. N10) within the region.
- The potential visual impact of ancillary infrastructure (i.e. substation, overhead power line, internal access roads and workshop) on observers in close proximity to the proposed Solar Energy Facility.
- The potential visual impact of operational, safety and security lighting of the facility at night on observers in close proximity to the proposed Solar Energy Facility.
- Potential visual impacts associated with the construction phase on observers in close proximity to the proposed Solar Energy Facility.
- Potential cumulative visual impacts of the proposed Solar Energy Facility, specifically in context of the existing industrial infrastructure within the study area.
- Potential residual visual impacts after the decommissioning of the facility.
- The potential to mitigate visual impacts and inform the design process.

[2] For the purpose of this study, close proximity is considered to be within 2,5km of the proposed Solar Energy Facility.

[3] For the purpose of this study, the region is considered to be beyond the 2,5km radius of the proposed Solar Energy Facility.

4. THE AFFECTED ENVIRONMENT

The site is located north east of De Aar. Regionally, the study area is located about 94km south of Hopetown, 33km west of Philipstown, 54km north west of Hanover and about 42km east of Britstown within the Northern Cape Province.

The study area occurs on land that ranges in elevation from about 1200m a.s.l. (along the drainage lines) to 1650m a.s.l. (at the top of the nearby koppies).

The terrain surrounding the proposed site is generally flat, sloping gently towards the Brak River which traverses the centre of the study area, and forms the southern boundary of the proposed site. A few dams are present, both on and off-stream.

The terrain type of the region is relatively homogenous and is described as predominantly *lowlands with hills*. Some prominent hills and koppies occur in the north and north east of the study area. Refer to **Map 1** and **Figure 1**.

Figure 1: Topography of the study area showing hills in the background and flat landscape in the middle and foreground.

De Aar is a primary commercial distribution centre for a large area of the central Great Karoo. Major economic activities of the area include wool production and livestock farming. The area is also popular for hunting.

The study area is sparsely populated outside of the urban areas (i.e. less than 1 person per km^2). De Aar is the third largest town in the Northern Cape with a population density of 30-100 people per km^2.

The N10 national road traverses the study area, which also includes arterial roads (i.e. the R48 and R388) and secondary roads.

Figure 2: Junction of the N10 and R48 with the southern outskirts of De Aar in the background.

Rail infrastructure is prominent in the area, with De Aar representing the second most important railway junction in South Africa. Lines run from the north, the west the south and the south east, converging in the town. These lines include both freight and passenger lines.

Other industrial infrastructure includes the aerodrome just south of the N10, the existing Hydra substation to the south of the proposed site (**Figure 3**), and a significant network of power lines extending in all directions except to the north west (**Figure 4**).

Figure 3: The hydra substation in the south of the study area.

Figure 4: Power line infrastructure along the N10 south of De Aar.

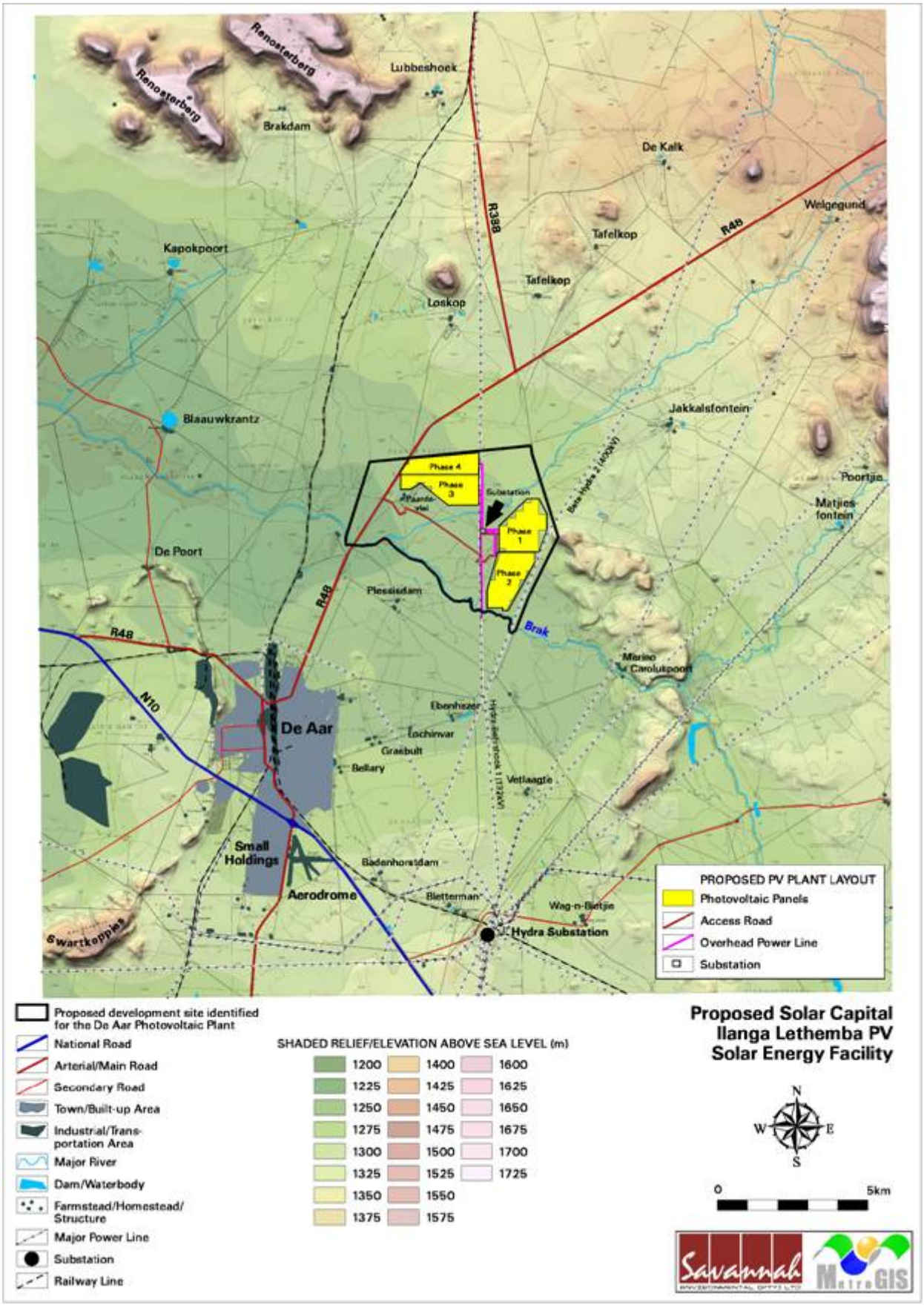
The climate is semi arid, with the study area receiving between 320mm and 433mm of rainfall per annum. Land cover is primarily *shrubland* with patches of *grassland and thicket and bushland.* Some *wetland* and *degraded land* is evident along the water courses, and more specifically, in the southern parts of the site.

Vegetation types include *Central upper karoo* in the north west of the study area (and on the site itself), and *False upper karoo* in the south east. Refer to **Map 2.**

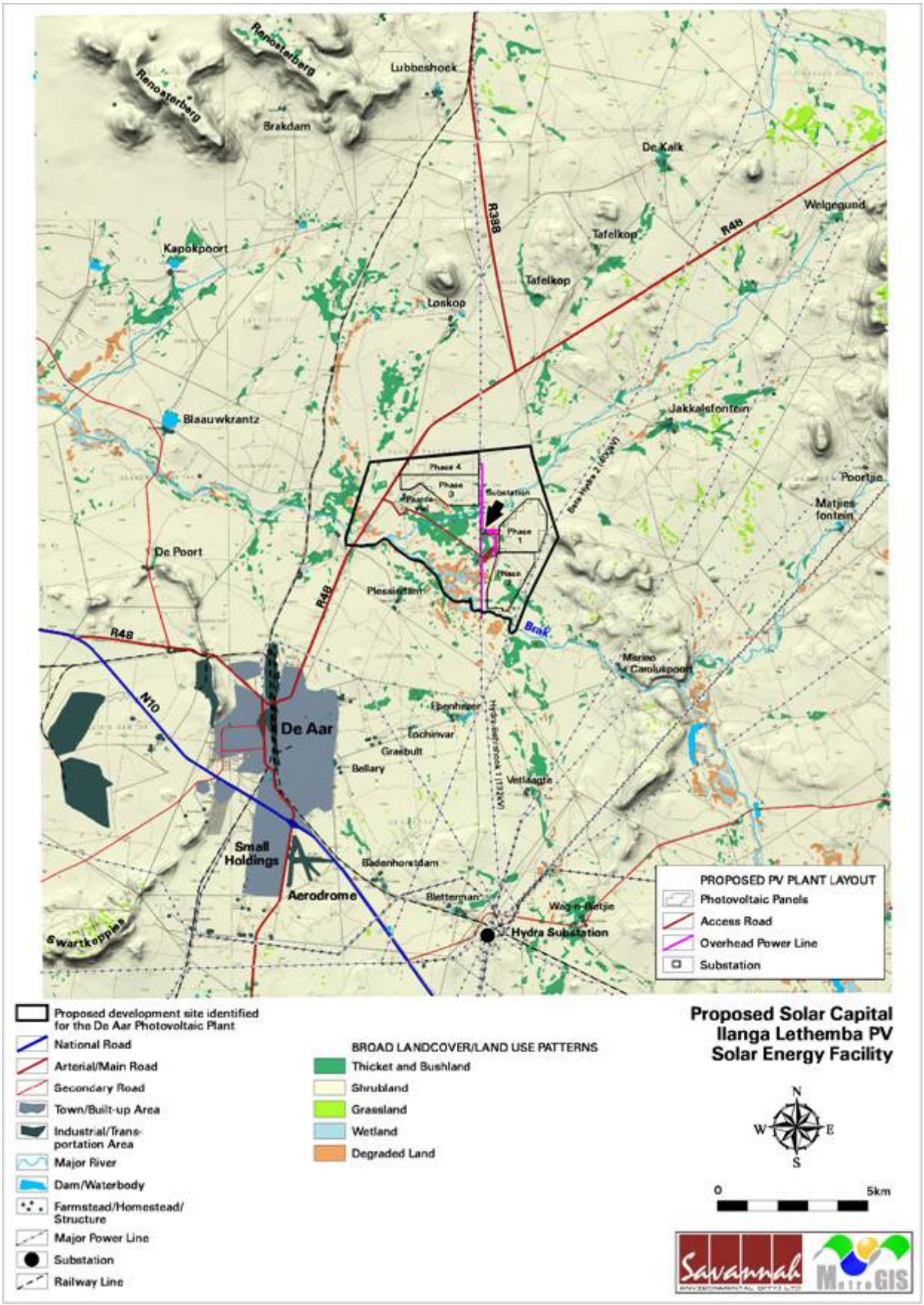
Despite the significant industrial type infrastructure in and around the town of De Aar, the greater landscape of the study area is characterised by wide-open spaces and little development.

Figure 5: Landscape character of the study area showing undeveloped wide open spaces interspersed with power lines.

There are no formally protected or conservation areas within the study area.



Map 1: Locality, Topography and Shaded Relief of the broader study area.



Map 2: Land Cover and Broad Land Use Patterns within the broader study area.

5. RESULTS

5.1. Potential visual exposure

The result of the visibility analysis for the proposed Solar Energy Facility is shown on **Map 3**. The analysis was undertaken from a number of vantage points within the proposed PV blocks at an offset of 4m above average ground level (i.e. the approximate maximum height of the PV structures).

This was done in order to determine the visual exposure of the proposed PV plant within the study area, by simulating the proposed structures associated with the Solar Energy Facility.

It must be noted that the viewshed analyses do not include the potential shielding effect of vegetation cover or existing structures on the exposure of the proposed facility, and it does not take into consideration the limitations of the human eye, therefore signifying a worst-case scenario.

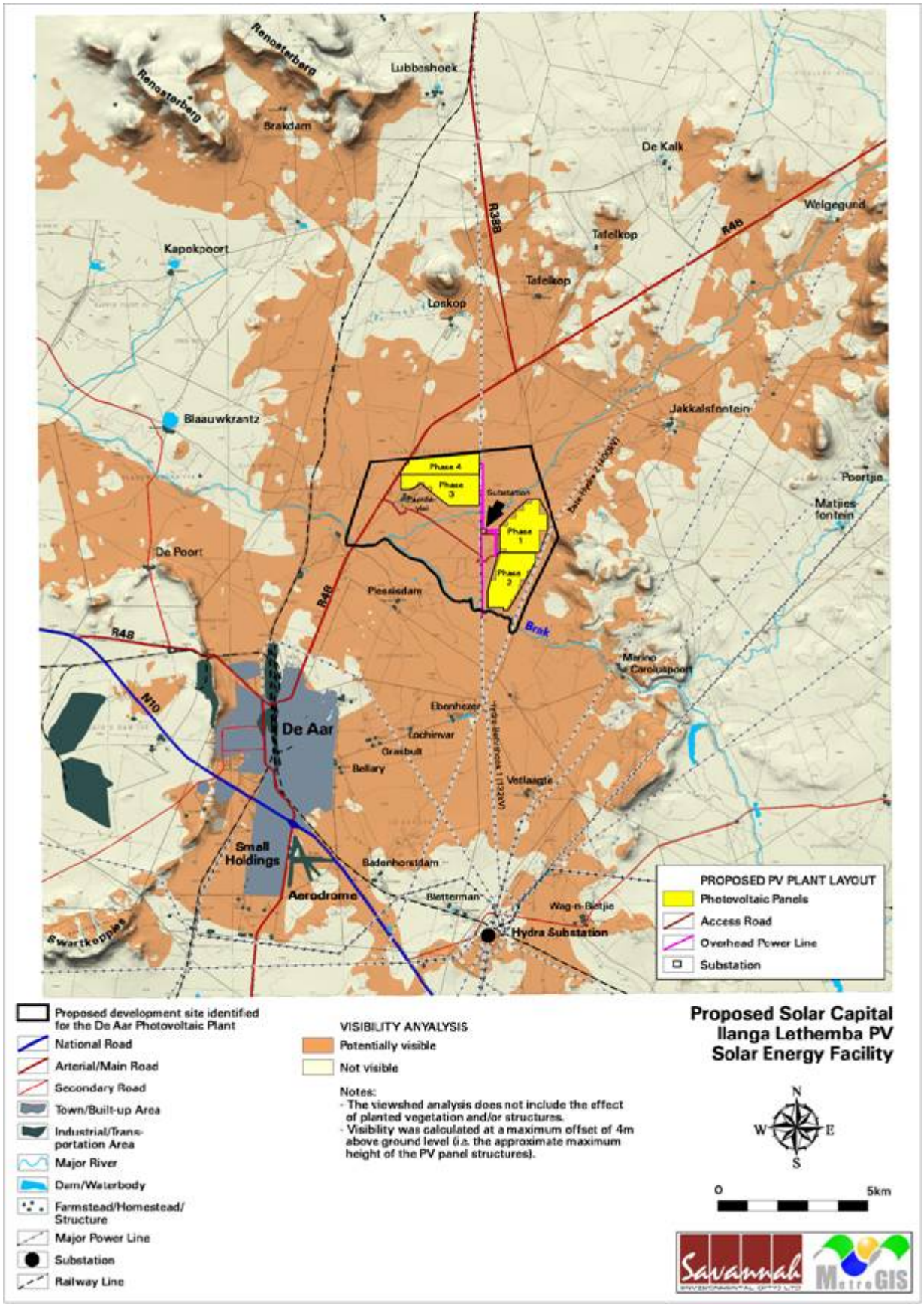
The analysis indicates that the proposed Solar Energy Facility is likely to be visually exposed within the site itself, the area within about 4km to the south, west and north of the site. In the east, the low hills immediately adjacent to the site screen much of the study area in the east.

The visually exposed zone extends largely uninterrupted to the south up to a distance of about 8km from the site. Most of the town of De Aar to the south west lies within this zone.

Further afield in the west, the zone of visual exposure is limited in extent to an area south of the Brak River. To the far north and north east, the hilly topography strongly influences the potential visual exposure of the proposed facility, effectively shielding areas beyond them (i.e. within their view shadows).

The southern slopes of the Renosterberg Mountains in the north will, however be visually exposed, as will the south and west facing slopes of the undulating hills in the north and north east.

Large, visually protected areas lie in to the far north west, north, east, south east and south west (beyond De Aar).



Map 3: Potential Visual Exposure of the Proposed Solar Energy Facility.

5.2. Visual absorption capacity

The climate is semi arid, with the study area receiving between 320mm and 433mm of rainfall per annum. Land cover is primarily *shrubland* with patches of *grassland and Thicket and Bushland.* Some *wetland* and *degraded land* is evident along the water courses.

Overall, the Visual Absorption Capacity (VAC) of the receiving environment is low due to the nature and height of the vegetation, and the largely undeveloped state of the receiving environment. VAC will thus not be taken into account in the undeveloped environment.

The VAC within the town of De Aar will be higher and will be taken into account. For this reason, neither **Map 4** nor **Map 5** indicate the urban areas as sensitive visual receptors, as the VAC of the buildings and infrastructure will render visual impact to be largely negligible from within these areas.

5.3. Visual distance / observer proximity to the facility

MetroGIS determined proximity radii based on the anticipated visual experience of the observer over varying distances. The distances are adjusted upwards for larger facilities and downwards for smaller facilities (i.e. depending on the size and nature of the proposed infrastructure). MetroGIS developed this methodology in the absence of any known and/or acceptable standards for South African Solar Energy Facilities.

These proximity radii (calculated from the boundary lines of the farms) are shown on **Map 4** and are as follows:

- 0 – 4km - Short distance view where the facility would dominate the frame of vision and constitute a very high visual prominence.
- 4 - 8km - Medium distance views where the facility would be easily and comfortably visible and constitute a high visual prominence.
- 8 - 16km - 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 medium visual prominence.
- Greater than 16 km - Long distance view where the facility would still be visible though not as easily recognisable. This zone constitutes a low visual prominence for the facility.

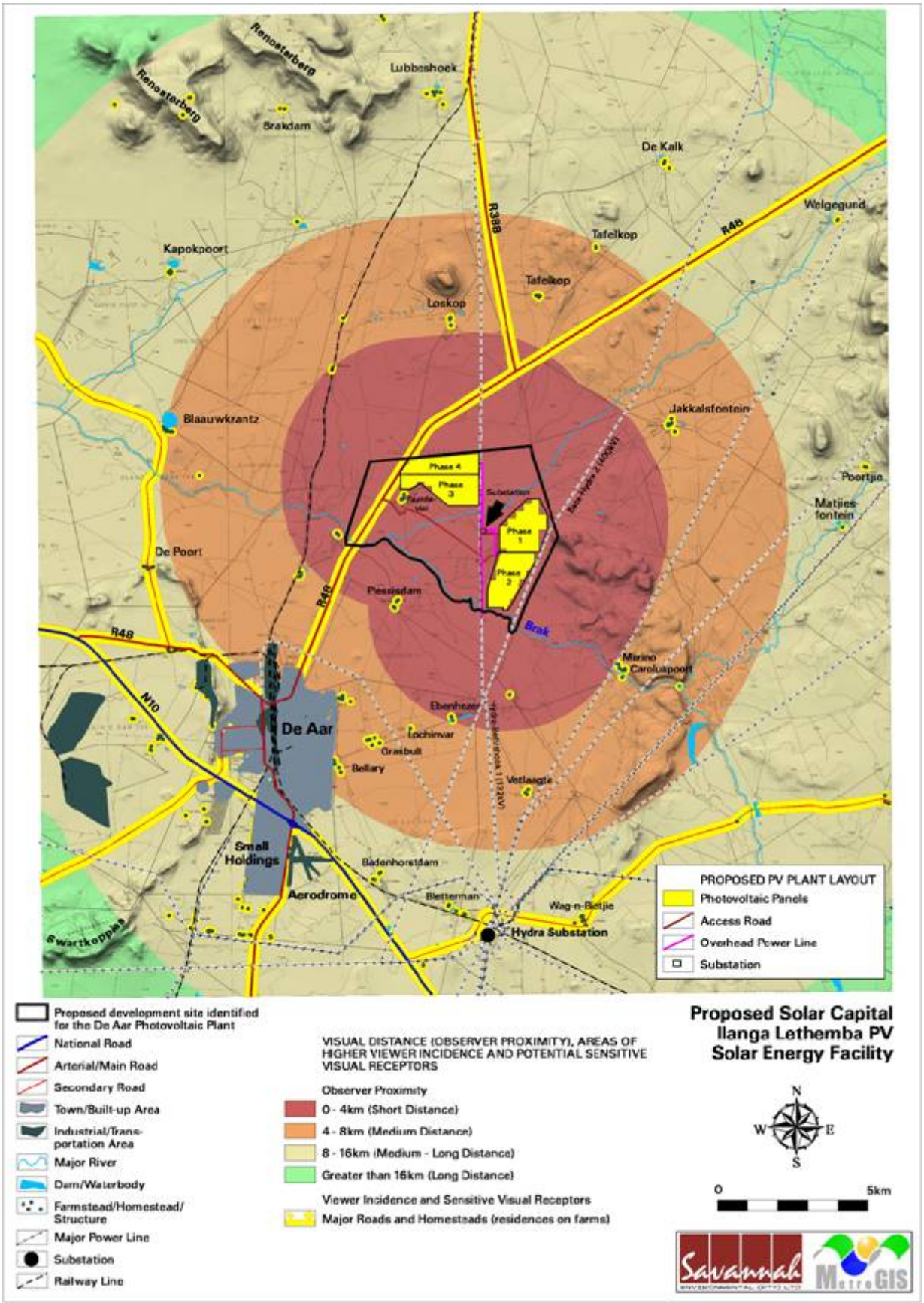
5.4. Viewer incidence / viewer perception

Refer to **Map 4**. Viewer incidence is calculated to be the highest along the national road (i.e. the N10) and arterial roads (i.e. the R48 and the RR388) as well as along the secondary roads within the study area. Commuters using these roads could be negatively impacted upon by visual exposure to the facility.

Other than along the above roads, viewer incidence will be concentrated in the town of De Aar and within the agricultural homesteads and settlements within the study area.

Commuters on the railway lines (especially passenger trains) also represent visual receptors, but are not considered to be sensitive to visual intrusion, especially in such close proximity to De Aar.

The severity of the visual impact on visual receptors decreases with increased distance from the proposed facility.



Map 4: Observer Proximity, Areas of High Viewer Incidence and Potential Sensitive Visual Receptors.

5.5. Visual impact index

The combined results of the visual exposure, viewer incidence / perception and visual distance of the proposed Solar Energy Facility are displayed on **Map 5**.

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 in order to calculate the visual impact index.

An area with short distance, a potential visual exposure to the proposed facility, a high viewer incidence and a predominantly negative perception would therefore have a higher value (greater impact) on the index. This helps in focussing the attention to the critical areas of potential impact when evaluating the issues related to the visual impact.

The following is of relevance:

- Areas of potentially **moderate** visual impact are indicated within a 4km radius of the proposed facility. The eastern part of this zone includes undulating hills, which effectively screen large areas beyond them. It the therefore primarily the areas to the north, south and west that are likely to experience visual impact.

  The Brak River will be exposed to potential visual impact for its entire length within this radius.

  Within the 4km radius, sensitive visual receptors may experience potentially **high** visual impact. These receptors are users of the R48, a short stretch of the R388 in the north and a number of homesteads / settlements, including Paardevlei (on the site), Plessisdam and Ebenezer.

- The extent of potential visual impact decreases somewhat between the 4km and 8km radius. Visually exposed areas lie primarily to the south and south west, and to a lesser extent to the north, north west and north east. These areas are likely to be exposed to potentially **low** visual impact.

  Short stretches of the R48 in the south west and north east, as well as stretches of the R388 in the north are likely to be exposed to potentially **moderate** visual impact. In addition, a number of homesteads / settlements may be exposed to moderate visual impact. These include the following:

  - Loskop;
  - Tafelkop;
  - Jakkalsfontein;
  - Merino;
  - Carouluspoort;
  - Vetlaagte;
  - Lochinvar;
  - Grasbult; and
  - Bellary.

  The north eastern parts of De Aar lie within this zone, but potential visual impact is expected to be low, where this occurs at all. This is due to the high VAC within the urban area.

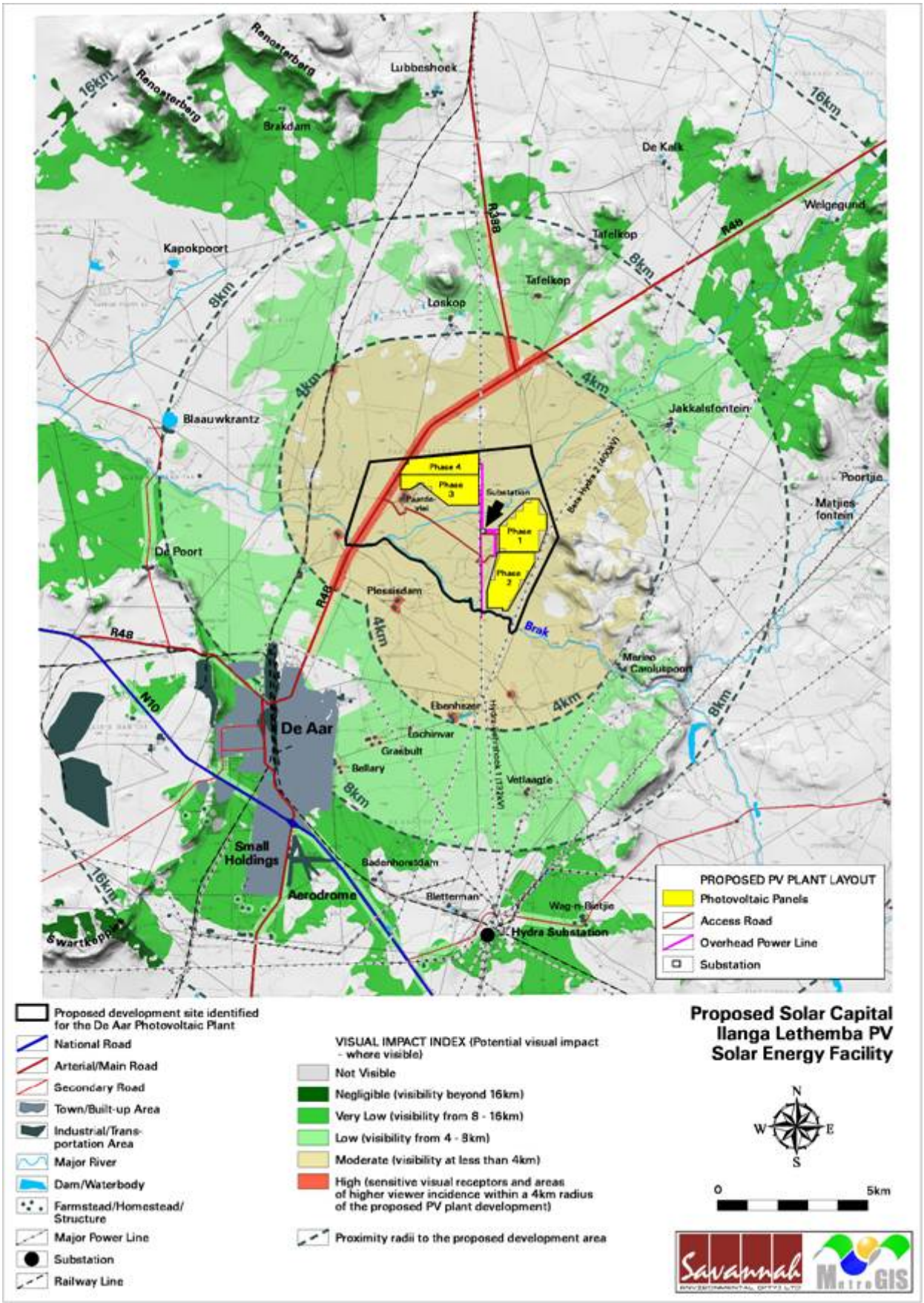
- Between 8km and 16km, the magnitude of visual impact is mostly reduced to **very low**. Visually exposed areas are patchy and interrupted, and lie mainly to the north, north east, west and south of the study area.

  SA stretch of the N10, short stretches of the R48 (west and south), a secondary road in the west and a limited number of homesteads and settlements (including the smallholdings south of De Aar) may experience potentially **low** visual impact.

  The western and southern parts of De Aar fall within this zone, but potential visual impact is expected to be very low due to the high VAC.

  The south facing slopes of the *Renosterberg* to the north may also be exposed to potentially very low visual impact, as may the west facing slopes of the hills in the north east.

  It is unlikely, however, that the facility will be visible from this distance.



Map 5: Visual Impact Index of the Proposed Solar Energy Facility.

5.6. Visual impact assessment: methodology

The previous section of the report identified specific areas where likely visual impacts would occur. This section will attempt to quantify these potential visual impacts in their respective geographical locations and in terms of the identified issues (see Chapter 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 Solar Energy Facility) and includes a table quantifying the potential visual impact according to the following criteria:

- **Extent** - site only (very high = 5), local (high = 4), regional (medium = 3), national (low = 2) or international (very low = 1).
- **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). This value is informed by the Visual Impact Index.
- **Probability** – very improbable (= 1), improbable (= 2), probable (= 3), highly probable (= 4) and definite (= 5). This value is read from the visual impact index.
- **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).

*Please note that due to the declining visual impact over distance, the **extent** (or spatial scale) rating is reversed (i.e. a localised visual impact has a higher value rating than a national or regional value rating). This implies that the visual impact is highly unlikely to have a national or international extent, but that the local or site-specific impact could be of high significance.*

5.7 Visual impact assessment: primary impacts

5.7.1 The Solar Energy Facility

Potential visual impact on users of main roads in close proximity to the proposed Solar Energy Facility.

Visual impacts on users of the R48 and the R388 within a radius of 4km of the proposed facility are expected to be of **high** significance, both before and after mitigation.

Table 1: Impact table summarising the significance of visual impacts on users of main roads in close proximity to the proposed Solar Energy Facility.

Nature of Impact: Potential visual impact on users of main roads in close proximity to the proposed Solar Energy Facility.		
	No mitigation	***Mitigation considered***
Extent	Local **(4)**	Local **(4)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	High **(8)**	High **(8)**
Probability	High **(4)**	High **(4)**
Significance	High **(64)**	High **(64)**
Status (positive, neutral or negative)	Negative	Negative
Reversibility	Recoverable **(3)**	Recoverable **(3)**
Irreplaceable loss of resources?	No	No
Can impacts be mitigated	Yes	
Mitigation: Planning: ➢ Retain a buffer (approximately 100m wide) of intact natural vegetation along the perimeter of the development area (i.e. the 4 PV panel blocks) and along the site boundary. This includes the eastern side of the R48 where this road traverses the site. This measure will give some distance between the facility footprint and the visual receptors. ➢ Retain and maintain natural vegetation in all areas outside of the development footprint.		
Cumulative impacts: The construction of the Solar Energy Facility and ancillary infrastructure will increase the cumulative visual impact of industrial type infrastructure within the region. This is relevant in light of the significant electricity related infrastructure within the region (i.e. the power lines and the hydra substation).		
Residual impacts: The visual impact will be removed after decommissioning, provided the facility and ancillary infrastructure is removed. Failing this, the visual impact will remain.		

Potential visual impact on commuters and tourists travelling by rail in close proximity to the proposed Solar Energy Facility.

Commuters and tourists travelling by rail, and especially those travelling by luxury coach, may be impacted upon within a radius of 4km of the proposed facility. Visual impacts are expected to be of **low** significance, before and after mitigation.

The visual context of the site in close proximity to De Aar is of relevance, and as such will reduce the probability of this impact occurring.

Table 2: Impact table summarising the significance of visual impacts on commuters travelling by rail in close proximity to the proposed Solar Energy Facility.

Nature of Impact: Potential visual impact on commuters travelling by rail in close proximity to the proposed Solar Energy Facility.		
	No mitigation	***Mitigation considered***
Extent	Local **(4)**	Local **(4)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Moderate **(6)**	Moderate **(6)**
Probability	Improbable **(2)**	Improbable **(2)**
Significance	Low **(28)**	Low **(28)**
Status (positive, neutral or negative)	Negative	Negative
Reversibility	Recoverable **(3)**	Recoverable **(3)**
Irreplaceable loss of resources?	No	No
Can impacts be mitigated	Yes	
Mitigation: Planning: ➢ Retain a buffer (approximately 100m wide) of intact natural vegetation along the perimeter of the development area (i.e. the 4 PV panel blocks) and along the site boundary. ➢ Retain and maintain natural vegetation in all areas outside of the development footprint.		
Cumulative impacts: The construction of the Solar Energy Facility and ancillary infrastructure will increase the cumulative visual impact of industrial type infrastructure within the region. This is relevant in light of the significant electricity related infrastructure within the region (i.e. the power lines and the hydra substation).		
Residual impacts: The visual impact will be removed after decommissioning, provided the facility and ancillary infrastructure is removed. Failing this, the visual impact will remain.		

Potential visual impact on residents of smallholdings, homesteads and settlements in close proximity to the proposed Solar Energy Facility.

The visual impact on residents of smallholdings, homesteads and settlements within a radius of 4km of the proposed facility are expected to be of **moderate** significance, both before and after mitigation.

The very limited number of visual receptors (i.e. the very few homesteads and settlements present within this radius) will reduce the probability of this impact occurring.

Table 3: Impact table summarising the significance of visual impacts on residents of smallholdings, homesteads and settlements in close proximity to the proposed Solar Energy Facility.

Nature of Impact: Potential visual impact on residents of smallholdings, homesteads and settlements in close proximity to the proposed Solar Energy Facility		
	No mitigation	***Mitigation considered***
Extent	Local **(4)**	Local **(4)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	High **(8)**	High **(8)**
Probability	Improbable **(2)**	Improbable **(2)**
Significance	Moderate **(32)**	Moderate **(32)**
Status (positive, neutral or negative)	Negative	Negative
Reversibility	Recoverable **(3)**	Recoverable **(3)**
Irreplaceable loss of resources?	No	No
Can impacts be mitigated	Yes	
Mitigation: Planning: ➢ Retain a buffer (approximately 100m wide) of intact natural vegetation along the perimeter of the development area (i.e. the 4 PV panel blocks) and along the site boundary. ➢ Retain and maintain natural vegetation in all areas outside of the development footprint.		
Cumulative impacts: The construction of the Solar Energy Facility and ancillary infrastructure will increase the cumulative visual impact of industrial type infrastructure within the region. This is relevant in light of the significant electricity related infrastructure within the region (i.e. the power lines and the hydra substation).		
Residual impacts: The visual impact will be removed after decommissioning, provided the facility and ancillary infrastructure is removed. Failing this, the visual impact will remain.		

Potential visual impact on sensitive visual receptors (users of roads and residents of smallholdings, farms and homesteads) within the region.

The visual impact users of main roads (i.e. the N10, the R48 and the R388), secondary roads and residents of homesteads and settlements within the region beyond the 4km radius, is expected to be of **moderate** significance, both before and after mitigation.

Table 4: Impact table summarising the significance of visual impacts on sensitive visual receptors within the region.

Nature of Impact: Potential visual impact on sensitive visual receptors within the region		
	No mitigation	***Mitigation considered***
Extent	Regional **(3)**	Regional **(3)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Moderate **(6)**	Moderate **(6)**
Probability	Probable **(3)**	Probable **(3)**
Significance	Moderate **(39)**	Moderate **(39)**
Status (positive or negative)	Negative	Negative
Reversibility	Recoverable **(3)**	Recoverable **(3)**
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: Planning: ➢ Retain a buffer (approximately 100m wide) of intact natural vegetation along the perimeter of the development area (i.e. the 4 PV panel blocks) and along the site boundary. ➢ Retain and maintain natural vegetation in all areas outside of the development footprint.		
Cumulative impacts: The construction of the Solar Energy Facility and ancillary infrastructure will increase the cumulative visual impact of industrial type infrastructure within the region. This is relevant in light of the significant electricity related infrastructure within the region (i.e. the power lines and the hydra substation).		
Residual impacts: The visual impact will be removed after decommissioning, provided the facility and ancillary infrastructure is removed. Failing this, the visual impact will remain.		

Potential visual impact on residents of built up and urban centres within the region.

The visual impact on residents of De Aar is expected to be of **low** significance, both before and after mitigation.

The VAC of this urban area reduces the probability of this impact occurring.

Table 5: Impact table summarising the significance of visual impacts on residents of built up and urban centres within the region.

Nature of Impact: Potential visual impact on residents of built up and urban centres within the region.		
	No mitigation	***Mitigation considered***
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 or negative)	Negative	Negative
Reversibility	Recoverable **(3)**	Recoverable **(3)**
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: Planning: ➢ Retain a buffer (approximately 100m wide) of intact natural vegetation along the perimeter of the development area (i.e. the 4 PV panel blocks) and along the site boundary. ➢ Retain and maintain natural vegetation in all areas outside of the development footprint.		
Cumulative impacts: The construction of the Solar Energy Facility and ancillary infrastructure will increase the cumulative visual impact of industrial type infrastructure within the region. This is relevant in light of the significant electricity related infrastructure within the region (i.e. the power lines and the hydra substation).		
Residual impacts: The visual impact will be removed after decommissioning, provided the facility and ancillary infrastructure is removed. Failing this, the visual impact will remain.		

5.7.2 Ancillary infrastructure

Potential visual impact of the access roads and ancillary infrastructure on observers in close proximity to the proposed Solar Energy Facility.

The construction of the on-site substation, the access roads, the workshops and the storage areas could represent a visual impact. Although no dedicated viewshed has been generated for the above infrastructure, it will all be located within the proposed Solar Energy Facility footprint, and will thus lie within that of the primary infrastructure.

The anticipated visual impact resulting from this infrastructure is likely to be of **low** significance both before and after mitigation. The presence of the PV panels (i.e. the primary impact) will result in some absorption of this impact, thus reducing the probability of the impact occurring.

Table 6: Impact table summarising the significance of visual impact of the access roads and ancillary infrastructure on observers in close proximity to the proposed Solar Energy Facility.

Nature of Impact: Potential visual impact of the access roads and ancillary infrastructure on observers in close proximity to the proposed Solar Energy Facility.		
	No mitigation	***Mitigation considered***
Extent	Local **(4)**	Local **(4)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Moderate **(6)**	Moderate **(6)**
Probability	Improbable **(2)**	Improbable **(2)**
Significance	Low **(28)**	Low **(28)**
Status (positive or negative)	Negative	Negative
Reversibility	Recoverable **(3)**	Recoverable **(3)**
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: Planning: ➢ Plan internal roads and ancillary infrastructure in such a way and in such a location that clearing of vegetation is minimised. Consolidate existing infrastructure as much as possible, and make use of already disturbed areas rather than pristine sites wherever possible. ➢ Retain a buffer (approximately 100m wide) of intact natural vegetation along the perimeter of the development area (i.e. the 4 PV panel blocks) and along the site boundary. ➢ Retain and maintain natural vegetation in all areas outside of the development footprint. Construction: ➢ Rehabilitation of all construction areas. ➢ Ensure that vegetation is not cleared unnecessarily to make way for the access road and ancillary buildings. Operation: ➢ Maintenance of roads to avoid erosion and suppress dust. Decommissioning: ➢ Removal of infrastructure and roads not required for post decommissioning use and rehabilitation of the footprint areas.		
Cumulative impacts: The construction of the ancillary infrastructure will increase the cumulative visual impact of industrial type infrastructure within the region. This is relevant in light of the significant electricity related infrastructure within the region (i.e. the power lines and the hydra substation).		
Residual impacts: The visual impact will be removed after decommissioning, provided the ancillary infrastructure is removed. Failing this, the visual impact will remain.		

Potential visual impact of the power line on observers in close proximity to the proposed Solar Energy Facility.

The construction of the overhead power line could represent a visual impact. Again, no dedicated viewshed has been generated for the power line, but it will be located within the proposed Solar Energy Facility footprint, and will thus lie within that of the primary infrastructure.

The anticipated visual impact resulting from the on-site overhead power line is likely to be of **moderate** significance both before and after mitigation.

Table 7: Impact table summarising the significance of visual impact of the power line on observers in close proximity to the proposed Solar Energy Facility.

Nature of Impact: Potential visual impact of the power line on observers in close proximity to the proposed Solar Energy Facility.		
	No mitigation	***Mitigation considered***
Extent	Local **(4)**	Local **(4)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	High **(8)**	High **(8)**
Probability	Probable **(3)**	Probable **(3)**
Significance	Moderate **(48)**	Moderate **(48)**
Status (positive or negative)	Negative	Negative
Reversibility	Recoverable **(3)**	Recoverable **(3)**
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: Planning: ➢ Retain a buffer (approximately 100m wide) of intact natural vegetation along the perimeter of the development area (i.e. the 4 PV panel blocks) and along the site boundary. ➢ Retain and maintain natural vegetation in all areas outside of the development footprint. Construction: ➢ Rehabilitation of all construction areas and servitudes. ➢ Ensure that vegetation is not cleared unnecessarily to make way for the power line and servitude. Operation: ➢ Maintenance of servitudes to avoid erosion and suppress dust. Decommissioning: ➢ Removal of infrastructure not required for post decommissioning use and rehabilitation of the footprint areas.		
Cumulative impacts: The construction of the on-site power line will increase the cumulative visual impact of industrial type infrastructure within the region. This is relevant in light of the significant electricity related infrastructure within the region (i.e. the power lines and the hydra substation).		
Residual impacts: The visual impact will be removed after decommissioning, provided the power line is removed. Failing this, the visual impact will remain.		

5.7.3. Lighting Impacts

Potential visual impact of lighting at night on observers in close proximity to the proposed Solar Energy Facility.

The area immediately surrounding the proposed facility has a relatively low incidence of receptors and light sources, so light trespass and glare from the security and after-hours operational lighting for the facility will have some significance for visual receptors in close proximity.

Another potential lighting impact is that known as sky glow. 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 should be noted that the urban area of De Aar, which lies some 6km away, and is an existing source of light within the region, and as such will reduce the probability of this impact occurring somewhat.

This anticipated impact is likely to be of **moderate** significance, and may be mitigated to **low**.

Table 8: Impact table summarising the significance of visual impact of lighting at night on visual receptors in close proximity to the proposed Solar Energy Facility.

Nature of Impact: Potential visual impact on of lighting on visual receptors in close proximity of the proposed Solar Energy Facility.		
	No mitigation	***Mitigation considered***
Extent	Local **(4)**	Local **(4)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Moderate **(6)**	Moderate **(6)**
Probability	Probable **(3)**	Improbable **(2)**
Significance	Moderate **(42)**	Low **(28)**
Status (positive or negative)	Negative	Negative
Reversibility	Recoverable **(3)**	Recoverable **(3)**
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: Planning: ➢ Pro-active design, planning and specification of lighting of the facility by a lighting engineer. The correct specification and placement of lighting and light fixtures for the Solar Energy Facility and the ancillary infrastructure will go far to contain rather than spread the light.		
Cumulative impacts: The existing urban centre of De Aar generates lighting impact at night, so the impact of the Solar Energy Facility will contribute to a regional increase in lighting impact.		
Residual impacts: None. The visual impact will be removed after decommissioning.		

5.7.4. Construction Impacts

Potential visual impact of construction on observers in close proximity to the proposed Solar Energy Facility.

During the construction period, there will 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 land owners in the area. Dust from construction work could also result in potential visual impact.

This anticipated impact is likely to be of **moderate** significance, and may be mitigated to **low**.

Table 9: Impact table summarising the significance of visual impact of construction on visual receptors in close proximity to the proposed Solar Energy Facility.

Nature of Impact: Potential visual impact of construction on visual receptors in close proximity to the proposed Solar Energy Facility.		
	No mitigation	***Mitigation considered***
Extent	Local **(4)**	Local **(4)**
Duration	Very short term **(1)**	Very short term **(1)**
Magnitude	Moderate **(6)**	Moderate **(6)**
Probability	Probable **(3)**	Improbable **(2)**
Significance	Moderate **(33)**	Low **(22)**
Status (positive or negative)	Negative	Negative
Reversibility	Recoverable **(3)**	Recoverable **(3)**
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: Planning: ➢ Retain a buffer (approximately 100m wide) of intact natural vegetation along the perimeter of the development area (i.e. the 4 PV panel blocks) and along the site boundary. ➢ Retain and maintain natural vegetation in all areas outside of the development footprint. Construction: ➢ Proper planning and management of the construction site. ➢ Ensure that vegetation is not cleared unnecessarily during the construction period. ➢ Rehabilitation of construction areas		
Cumulative impacts: None.		
Residual impacts: None.		

5.8 Visual impact assessment: secondary impacts

5.8.1 The Solar Energy Facility and ancillary infrastructure

Potential visual impact of the proposed facility on the visual character of the landscape and 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, and 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) play a significant role.

A visual 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.

Despite the significant industrial type infrastructure in and around the town of De Aar, the greater landscape of the study area is characterised by wide-open spaces and little development. However, the proximity of the proposed facility to De Aar, the Hydra Substation and the numerous power lines has relevance, and as such reduces the probability of this impact occurring.

In this respect, the anticipated visual impact of the facility on the visual character of the landscape, and by implication, on the sense of place, is expected to be of **low** significance, both before and after mitigation.

Table 10: Impact table summarising the significance of visual impacts on the visual character and sense of place of the region.

Nature of Impact: Potential visual impact of the proposed facility on visual character and sense of place of the region		
	No mitigation	***Mitigation considered***
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 or negative)	Negative	Negative
Reversibility	Recoverable **(3)**	Recoverable **(3)**
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	Yes
Mitigation: Planning: ➢ Retain a buffer (approximately 100m wide) of intact natural vegetation along the perimeter of the development area (i.e. the 4 PV panel blocks) and along the site boundary. ➢ Retain and maintain natural vegetation in all areas outside of the development footprint.		
Cumulative impacts: The construction of the Solar Energy Facility and ancillary infrastructure will increase the cumulative visual impact of industrial type infrastructure within the region. This is relevant in light of the significant electricity related infrastructure within the region (i.e. the power lines and the hydra substation).		
Residual impacts: The visual impact will be removed after decommissioning, provided the facility and ancillary infrastructure is removed. Failing this, the visual impact will remain.		

Potential visual impact of the proposed facility on tourist access routes (the N10) within the region.

The anticipated visual impact of the facility on the N10, which is a recognised national tourist access route is expected to be of **low** significance, both before and after mitigation.

Table 11: Impact table summarising the significance of visual impacts on the tourist access routes within the region.

Nature of Impact: Potential visual impact of the proposed facility on tourist access routes within the region		
	No mitigation	***Mitigation considered***
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 or negative)	Negative	Negative
Reversibility	Recoverable **(3)**	Recoverable **(3)**
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	Yes
Mitigation: Planning: ➢ Retain a buffer (approximately 100m wide) of intact natural vegetation along the perimeter of the development area (i.e. the 4 PV panel blocks) and along the site boundary. ➢ Retain and maintain natural vegetation in all areas outside of the development footprint.		
Cumulative impacts: The construction of the Solar Energy Facility and ancillary infrastructure will increase the cumulative visual impact of industrial type infrastructure within the region. This is relevant in light of the significant electricity related infrastructure within the region (i.e. the power lines and the hydra substation).		
Residual impacts: The visual impact will be removed after decommissioning, provided the facility and ancillary infrastructure is removed. Failing this, the visual impact will remain.		

5.9 The potential to mitigate visual impacts

- The appearance and size of the PV panels (with an approximate height of 4m) is not possible to mitigate.

- In terms of screening, a 100m buffer of intact natural vegetation should be retained along the perimeter of the development area (i.e. the 4 PV panel blocks) and along the site boundary. This includes the eastern side of the R48 where this road traverses the site. This measure will give some distance between the facility footprint and the visual receptors.

  It is also recommended that natural vegetation be maintained in all areas outside of the development footprint.

- In terms of ancillary infrastructure, it is recommended that the access road, the power lines and ancillary infrastructure be planned in such a way and in such a location that clearing of vegetation is minimised. This implies consolidating infrastructure as much as possible and making use of already disturbed areas rather than pristine sites wherever possible.

- Mitigation of lighting impacts includes the pro-active design, planning and specification lighting for the facility by a lighting engineer. The correct specification and placement of lighting and light fixtures for the Solar Energy Facility and the ancillary infrastructure will go far to contain rather than spread the light.

- Mitigation of visual impacts associated with the construction phase, albeit temporary, entails proper planning, management and rehabilitation of the construction site and all disturbed areas. In addition, it is vital that vegetation is not unnecessarily cleared or removed during the construction period.

- During operation, the maintenance of the PV panels, the internal roads, the power line servitude and other ancillary structures and infrastructure will ensure that the facility does not degrade, thus aggravating visual impact.

- Once the Solar Energy 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.

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

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

6. CONCLUSIONS AND RECOMMENDATIONS

The construction and operation of the Proposed Ilanga Lethemba Solar Energy Facility and its associated infrastructure will have a visual impact on the visual environment especially within, but not limited to the area within 4km of the proposed facility.

The author is, however, of the opinion that the facility has an advantage over other more conventional power generating plants (e.g. coal-fired power stations).

The facility utilises a renewable source of energy (considered as an international priority) to generate power 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.

The facility further has a generally unfamiliar novel and futuristic design that invokes a curiosity factor not generally present with other conventional power generating plants. The advantage being that the facility can become an attraction or a landmark within the region, that people would actually want to come and see.

These positive aspects should not distract from the fact that the facility would be visible within an area that incorporates certain sensitive visual receptors. These include users of arterial roads and residents nearby homesteads and settlements.

There are also not many options as to the mitigation of the visual impact of the proposed Solar Energy Facility. The following is, however recommended:

- A natural vegetation buffer (100m wide) must be retained and maintained along the perimeter of the development area (i.e. the 4 PV panel blocks) and along the site boundary. This includes the eastern side of the R48 where this road traverses the site.

- Natural vegetation must be retained and maintained in all areas outside of the development footprint.

- The access road, the power lines and ancillary infrastructure must be planned in such a way and in such a location that clearing of vegetation is minimised. Measures include making use of already disturbed sites rather than pristine areas wherever possible.

- A lighting engineer must be consulted to assist in the planning, placement and specification of light fixtures for the facility and all ancillary infrastructure in order to reduce visual impacts associated with glare and light trespass. 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.

- The construction phase, albeit temporary, and the construction site must be planned and managed so as to reduce / minimise visual impact during the phase. Mitigation measures include the following:
    - 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 lay-down 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, servitudes etc immediately after the completion of construction works.

- During operation, the general appearance of the facility as a whole, including the PV panels, the power line servitude and other ancillary structures and infrastructure should be maintained.

  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 a when required.

- Once the Solar Energy 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.

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

7. IMPACT STATEMENT

In light of the results and findings of the Visual Impact Assessment undertaken for the Proposed Ilanga Lethemba Solar Energy Facility, it is acknowledged that the visual environment surrounding the site will be transformed for the entire operational lifespan (approximately 20-30 years) of the facility.

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

- The potential visual impact of the facility on users of the R48 and the R388 in close proximity to the proposed facility will be of **high** significance due to the high magnitude of the impact, the high probability of occurrence and the low VAC in the vicinity of the site.

- The potential visual impact of the facility on tourists travelling by rail in close proximity to the proposed facility will be of **low** significance due to the moderate magnitude of the impact and the low probability of occurrence.

- The anticipated visual impact on residents of smallholdings, homesteads and settlements in close proximity to the proposed facility will be of **moderate** significance due to the high magnitude of the impact, the low probability of occurrence and the low VAC in the vicinity of the site.

- Within the greater region, the potential visual impact on sensitive visual receptors (i.e. users of roads and residents of homesteads and

settlements) will be of **moderate** significance. This is due to the moderate magnitude and probability of occurrence.

- The potential visual impact of the facility on residents of De Aar will be of **low** significance due to the low magnitude of the impact and the low probability of occurrence.

- In terms of ancillary infrastructure, the anticipated visual impact of on-site substation, the access roads, the workshops and the storage areas is expected to be of **low** significance. This is due to the moderate magnitude of the impact, the low probability of occurrence and the VAC of the PV panels.

- The anticipated visual impact of the power line on receptors in close proximity thereto will be of **moderate** significance due to the high magnitude of the impact, the moderate probability of occurrence and the low VAC in the region.

- Visual impacts related to lighting will be of **low** significance. This is due to the moderate magnitude and the low probability of occurrence.

- Similarly, the visual impact of construction is expected to be of **low** significance, also due to the moderate magnitude of the impact and the low probability of occurrence.

- Lastly, the anticipated impact on the visual character and sense of place of the region, and on the N10 tourist access route will be of **low** significance, due to the low magnitude and probability of occurrence.

The anticipated visual impacts listed above (i.e. post mitigation impacts) range from high to low, but are not considered to be fatal flaws from a visual perspective. The main considerations in this regard are the relatively low occurrence of potential visual receptors, the proximity to the urban centre of De Aar and the visual context of existing industrial and electrical type infrastructure within the study area.

It is therefore recommended that the development of the facility as proposed be supported, subject to the implementation of the recommended mitigation measures (Chapter 6) and management plan (Chapter 8).

8. MANAGEMENT PROGRAMME

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

Table 12: Management Programme – Planning.

OBJECTIVE: The mitigation and possible negation of visual impacts associated with the planning of the Proposed Ilanga Lethemba Solar Energy Facility.		
Project Component/s	Solar energy facility and ancillary infrastructure (i.e. power line, internal access roads, substation, offices, workshop, and storage areas).	
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 4 km of the site) as well as within the region.	
Mitigation: Target/Objective	Optimal planning of infrastructure to minimise visual impact.	
Mitigation: Action/control	**Responsibility**	**Timeframe**
Retain and maintain a natural vegetation buffer (approximately 100 m wide) along the perimeter of the development area (i.e. the 4 PV panel blocks) and along the site boundary. This includes the eastern side of the R48 where this road traverses the site. This buffer may be within or behind the security fence.	Solar Capital / design consultant	Early in the planning phase.
Retain and maintain natural vegetation in all areas outside of the development footprint.	Solar Capital / design consultant	Early in the planning phase.
Plan the access road, the power lines and ancillary infrastructure in such a way and in such a location that clearing of vegetation is minimised. Make use of already disturbed sites rather than pristine areas.	Solar Capital / 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 solar energy facility and the ancillary infrastructure. The following is recommended: o Shielding the sources of light by physical barriers (walls, vegetation, or the structure itself); o Limiting mounting heights of lighting fixtures, or alternatively using foot-lights or bollard level lights; o Making use of minimum lumen or wattage in fixtures; o Making use of down-lighters, or shielded fixtures; o Making use of Low Pressure Sodium lighting or other types of low impact lighting. o 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.	Solar Capital / design consultant	Early in the planning phase.
Performance Indicator	Minimal exposure of PV panels, ancillary infrastructure and lighting at night to observers on or near the site (i.e. within 4km) and within the region.	
Monitoring	Not applicable.	

Table 13: Management Programme – Construction.

OBJECTIVE: The mitigation and possible negation of visual impacts associated with the construction of the Proposed Ilanga Lethemba Solar Energy Facility.		
Project Component/s	Construction site	
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 (i.e. within 4 km of the site).	
Mitigation: Target/Objective	Minimal visual intrusion by construction activities and intact vegetation cover outside of immediate works areas.	
Mitigation: Action/control	**Responsibility**	**Timeframe**
Ensure that vegetation is not unnecessarily cleared or removed during the construction period.	Solar Capital / contractor	Early in the construction phase.
Reduce the construction period through careful logistical planning and productive implementation of resources.	Solar Capital / contractor	Early in the construction phase.
Plan the placement of lay-down areas and temporary construction equipment camps in order to minimise vegetation clearing (i.e. in already disturbed areas) wherever possible.	Solar Capital / contractor	Early in and throughout the construction phase.
Restrict the activities and movement of construction workers and vehicles to the immediate construction site and existing access roads.	Solar Capital / 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.	Solar Capital / 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).	Solar Capital / contractor	Throughout the construction phase.
Restrict construction activities to daylight hours in order to negate or reduce the visual impacts associated with lighting.	Solar Capital / contractor	Throughout the construction phase.
Rehabilitate all disturbed areas, construction areas, servitudes etc immediately after the completion of construction works.	Solar Capital / 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 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 Ilanga Lethemba Solar Energy Facility.		
Project Component/s	Solar energy facility and ancillary infrastructure (i.e. power line, internal access roads, substation, offices, workshop, and storage areas).	
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 (i.e. within 4 km of the site).	
Mitigation: Target/Objective	Well maintained and neat facility.	
Mitigation: Action/control	**Responsibility**	**Timeframe**
Maintain the general appearance of the facility as a whole, including the PV panels the power line servitude and other ancillary structures and infrastructure.	Solar Capital / operator	Throughout the operational phase.
Maintain roads to forego erosion and to suppress dust.	Solar Capital / operator	Throughout the operational phase.
Monitor rehabilitated areas, and implement remedial action as and when required.	Solar Capital / operator	Throughout the operational 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 Ilanga Lethemba Solar Energy Facility.		
Project Component/s	Solar energy facility and ancillary infrastructure (i.e. power line, internal access roads, substation, offices, workshop, and storage areas).	
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 (i.e. within 4 km of 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. This may include the offices, workshop, storage areas, access roads etc.	Solar Capital / operator	During the decommissioning phase.
Rehabilitate access roads not required for the post-decommissioning use of the site. If necessary, an ecologist or landscape architect should be consulted to assist or give input into specifications.	Solar Capital / operator	During the decommissioning phase.
Monitor rehabilitated areas quarterly for at least a year following decommissioning, and implement remedial action as and when required.	Solar Capital / 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.	

9. REFERENCES / DATA SOURCES

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