PROPOSED SRPM SOLAR PHOTOVOLTAIC (PV) FACILITY AND ASSOCIATED GRID CONNECTION INFRASTRUCTURE, NORTH WEST PROVINCE

VISUAL ASSESSMENT – INPUT FOR SCOPING REPORT

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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 modeling 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.

1. INTRODUCTION

The development of renewable energy facilities is proposed by various Special Purpose Vehicles (SPVs). The project entails the development of three (3) separate solar Photovoltaic (PV) facilities with a combined contracted capacity of up to 205MW and will be known as SRPM Solar PV, Karee Solar PV, and Marikana Solar PV respectively, each including a grid connection and other associated infrastructure. The Solar PV facilities are based near current Sibanye Stillwater mining operations ~6km east of the town of Rustenburg, 3km east of the town of Photshaneng and 8km east from the town of Marikana within the Rustenburg and Madibeng Local Municipalities respectively, and within the greater Bonjanala Platinum District Municipality, North West Province (NWP). The projects will all tie-in to the electricity grid behind the Eskom meter at the respective Sibanye customer substations.

As of 2019, the Industrial Sector was the leading electricity consumer in South Africa, with up to 56 percent of the total consumption (Ratshomo 2019). *Mining* and quarrying accounted for 10% of the industrial *consumption* while non-ferrous metals and non-metallic both accounted for 8% and 5%, respectively (*Chamber of Mines of South Africa, 2017*,). The NWP is rated as the fourth largest electricity consuming province in South Africa and consumes approximately 12% of the available electricity (*Department of Economic Development, Environment, Conservation and Tourism (DEDECT) 2012*). This is mainly due to the high demand of the electrical energy-intensive mining and related industrial sector. Approximately 63% of the electricity supplied to the NWP is consumed in its mining sector (*DEDECT 2012*)

The North West DEDECT's renewable energy strategy aims to improve the North West Province's environment, reduce the NWP's contribution to climate change, and alleviate energy poverty, whilst promoting economic development and job creation in the province whilst developing its green economy. Sibanye Stillwater aims to comply with the Mining industry's Mission to decarbonise.

The successful development of the renewable energy projects will enable Sibanye Stillwater to make a valuable and meaningful contribution towards growing the green economy within the province and South Africa. This will assist the NWP in creating green jobs and reducing Green House Gas emissions, whilst reducing the energy demand on the National Grid.

Overview of the proposed projects

A development footprint of approximately up to 230 ha for SRPM Solar PV, up to 210 ha for Karee Solar PV and up to 100 ha for Marikana Solar PV has been identified within the broader combined project sites (approximately 780 ha in extent) for the development of the Rustenburg Solar facilities. The onsite infrastructure associated with each solar PV facility will include the following:

- Solar PV array comprising bifacial PV modules and mounting structures, using single axis tracking technology. Once installed, the entire structure will stand up to 5m above ground level.
- Inverters and transformers.
- Cabling between the project components.
- Balance of Plant.
- On-site facility substation to facilitate the connection between the solar PV facility and Eskom electricity grid. The size and capacity of each of the on-site stations will be 80MVA, 95MVA and 30MVA respectively.
- An onsite Medium Voltage (MV) switching station forming part of the collector substation.

- 100MWh Battery Energy Storage System (BESS) per site.
- Temporary Laydown areas.
- Access roads, internal roads and fencing around the development area.
- Up to 132kV Overhead Power Lines (OHPL) – maximum of 30m height with a 15m servitude width.
- Underground LV cabling will be used on the PV sites.

The details on the PV Facilities and grid connection infrastructure are listed below:

Table 1: Project details for the PV facilities.

Applicant	Project Name	Generating capacity	Farm Name and No.	Portion No.
SRPM Solar (Pty) Ltd	SRPM Solar PV	80MW	Farm Waterval No. 303	5, 6, 8, 16, and 48
K4 Solar (Pty) Ltd	Karee Solar PV	95MW	Farm Brakspruit No. 299	23
Marikana Solar (Pty) Ltd	Marikana Solar PV	30MW	Farm Middelkraal No. 466	9

Table 2: Project details for the grid connection infrastructure.

Applicant	Project Name	Capacity	Farm Name/s and no/s.	Alternatives	Infrastructure components
SRPM Solar (Pty) Ltd	SRPM Solar PV	11kV	Farm Waterval No. 303	• Alternative 1: Farm Waterval 303, RE/16, 14, 9, RE10 RE303,19 • Alternative 2: RE16, 14, 9, RE10, RE303, 19 • Alternative 3: RE16, 14, 9, RE10, RE303, 19 • Alternative to option 2, of both MV rooms with an OHL RE16, 14	Power line to the Paardekraal and UG2 sub-station
K4 Solar (Pty) Ltd	Karee Solar PV	33kV	Farm Brakspruit No. 299 Portion 23	• Alternative 1: Farm Rooikoppies 297, RE/276, 277 • Alternative 2: is an option to avoid some infrastructure and is an extension of Alternative 1 with the addition of crossing portion 42/297 157, 159 • Alternative 3: RE/276, 223, 135, RE/116, 123, 171, 170, 169, 168, 164, 158, 156,155 • Alternative 3b: RE/276, 223, 135, RE/116,297, 123, 171, 170, 169, 168, 164, 158, 156,155, 157, 42	Power line to the Karee sub-station
Marikana Solar	Marikana Solar PV	88Kv	Farm Middelkraal	• Alternative 1: farm Middelkraal 466,	Power line to the Marikana

Applicant	Project Name	Capacity	Farm Name/s and no/s.	Alternatives	Infrastructure components
(Pty) Ltd			No. 466 Portions 9, 12, 7, 36, 5, 3	Portions 9, 12, 7, 15, 14, 3 • Alternative 2: farm Middelkraal 466, RE/9, 12, 7, 15, 14, RE/3. • Alternative 3: farm Middelkraal 466: RE/9, 12, 7, 36, RE/5, River crossing, 18, RE/3. • Alternative addition to Alternative 1 to reach tie in point: RE/3.	sub-station
N/A	Marikana alternatives from Karee			• Alternative 1: Farm Brakspruit No. 299 Portion 23, Farm Rooikoppies 297: 280, RE/329,RE/281,RE/282, 283, 1, 221, 248, 250, 249, 247, RE/415, 244, 122, RE/333; Farm Elandsdrift 467: RE/2, 100, RE/21, 56, 38; Farm Middelkraal No. 466: RE/22, 48, RE/23, 49, RE/1, 29, 30, 47, 16, 14, Unmarked, RE/3; • Alternative 2: Farm Brakspruit No. 299 Portion 23, Farm Rooikoppies 297: 280, RE/314, RE/5; Farm Elandsdrift 467; Farm Middelkraal No. 466: 14, Unmarked, RE/3;	

Figure 1: Regional locality of the study area.

Each 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 and Battery Energy Storage System (BESS) facilities are provided below.

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

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

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

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

2. SCOPE OF WORK

The scope of the work includes a scoping level visual assessment of the issues related to the visual impact. The scoping phase is the process of determining the spatial and temporal boundaries (i.e. extent) and key issues to be addressed in an impact assessment. The main purpose is to focus the impact assessment on a manageable number of important questions on which decision-making is expected to focus and to ensure that only key issues and reasonable alternatives are examined.

The study area for the visual assessment encompasses a geographical area of approximately 578km² (the extent of the full page maps displayed in this report) and includes a minimum 6km buffer zone (area of potential visual influence) from the proposed project site.

The study area includes predominantly mining land, farm land and a long section of the N4 national road.

3. 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.

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

- The creation of a detailed digital terrain model 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 or receptors upon which the proposed facility could have a potential impact.

- The creation of viewshed analyses from the proposed project site in order to determine the visual exposure and the topography's potential to absorb the potential visual impact. The viewshed analyses take into account the dimensions of the proposed structures and activities.

This report (scoping report) sets out to identify the possible visual impacts related to the proposed SRPM PV facility from a desktop level.

4. THE AFFECTED ENVIRONMENT

The study area is situated within the Bojanala Platinum District, so called due to the predominantly platinum and chrome mining activities within the region. The region historically had a stronger agricultural economy (in the 1960s) with tobacco, maize, soya, and sunflower amongst some of the major crops produced. In the 1970s mining was introduced and grew to become the main economic driver of the area. The mining activities have since then greatly influenced the settlement patterns and socio-economic structure of the region.

Figure 6: Aerial view of the proposed SRPM PV facility.

The study area is located north of the N4 national road and north of the Magaliesberg mountain range. The topography of the region is predominantly described as plains and strongly undulating plains, with hills (Norite Koppies) to the north. The terrain elevation ranges from approximately 1,095m above sea level to the north and 1,395m to the south-west, south of Rustenburg. This town is the main commercial distribution centre within the region and the most populous city in the North West Province (population approximately 550,000). Refer to **Map 1** for the shaded relief (topography) map of the study area.

The Hex River traverses east of Rustenburg and west of the SRPM PV facility site. The Sterkstroom and Maretlwane Rivers traverse in between the Marikana and Karee PV facility sites. These rivers flow north-wards, respectively towards the Vaalkop and Beestekraal Dams. Other than these perennial rivers there are a number of non-perennial tributaries and dams (primarily mine dams) within the study area.

The remaining natural land cover and vegetation of the study area is described as *Marikana Thornveld*. This veld type consists of a combination of trees and bushes (open, closed and sparse) and grassland, with various levels of degradation. The level of vegetation transformation is clearly illustrated on the land cover map (**Map 2**) where the agricultural, mining and settlement patterns are shown. Some of the old agricultural fields are regenerating and slowly returning to their natural status. The hills mentioned above are *Norite Koppies Bushveld* veld types and the far south of the study area (primarily south of the N4 national road) is *Moot Plains Bushveld*.

The most prominent (and visible) land use within the region is the mining activities, mining infrastructure and mine dumps. Interspersed with these mining activities are agricultural land uses, ranging from irrigated agriculture to the south-west, dryland agriculture to the north and citrus farming (orchards) to the south-east. Agricultural activities include the production of maize, wheat and sun flower crops, as well as cattle farming. The farmers working these fields predominantly reside at homesteads or farm residences scattered throughout the study area. Homesteads located in closer proximity to the proposed SRPM PV facility site include Waterval, Waterkloof and Arnoldistad. Homesteads located in closer proximity to the proposed Karee PV facility site include Brakspruit and Rooikoppies. Homesteads located in closer proximity to the proposed Marikana PV facility site include Middelkraal and Elandskraal.[1]

Towns or residential areas primarily associated with the mines in the region include:

- Modderspruit
- Makolokwe
- Marikana
- Mooinooi
- Segwaelane
- Makolokwe
- Thekwane
- Mfidike
- Waterval
- Photsaneng
- Nkaneng

The N4 national road provides access to the region and is the main connecting route in between the Gauteng Province (Pretoria) and Rustenburg. The proposed PV facility sites are all accessible from the N4 via secondary roads from near Kroondal (SRPM and Karee sites) and from near Mooinooi (Marikana site).

[1] The names listed here 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.

Besides the large number of mines and mining infrastructure within the study area, there are numerous power lines and substations, predominantly associated with the mines. The largest substation is the Bighorn 275/88kV Main Transmission System (MTS) substation near Marikana. The other substations earmarked for the grid connection points of the PV facilities are the Paardekraal 88/11kV (SRPM connection), Karee 88/33kV (Karee connection) and Wonderkop 88/6.6kV (Marikana connection) substations.

The proposed SRPM PV facility is located approximately 3.8km south-east of the Rustenburg Airfield. This distance is measured from the south-eastern tip of the runway to the north-western corner of the proposed PV facility.

Figure 7: View of the SRPM site from 1st Street.

Figure 8: View along the Karee Road (the Karee PV site is to the left of the road).

Figure 9: General environment near the Marikana PV site.

There is one operational solar PV facility within the study area, namely the RustMo1 7MW Solar Farm on a portion of the farm Spruitfontein, located approximately 4km south of the proposed Karee PV facility (at the closest).

There are no formally protected or conservation areas within the study area and no additional tourist attractions, destinations or facilities were identified in closer proximity to the proposed PV facility sites.[2]

Figure 10: Mine dumps, power lines and mining infrastructure within the study area.

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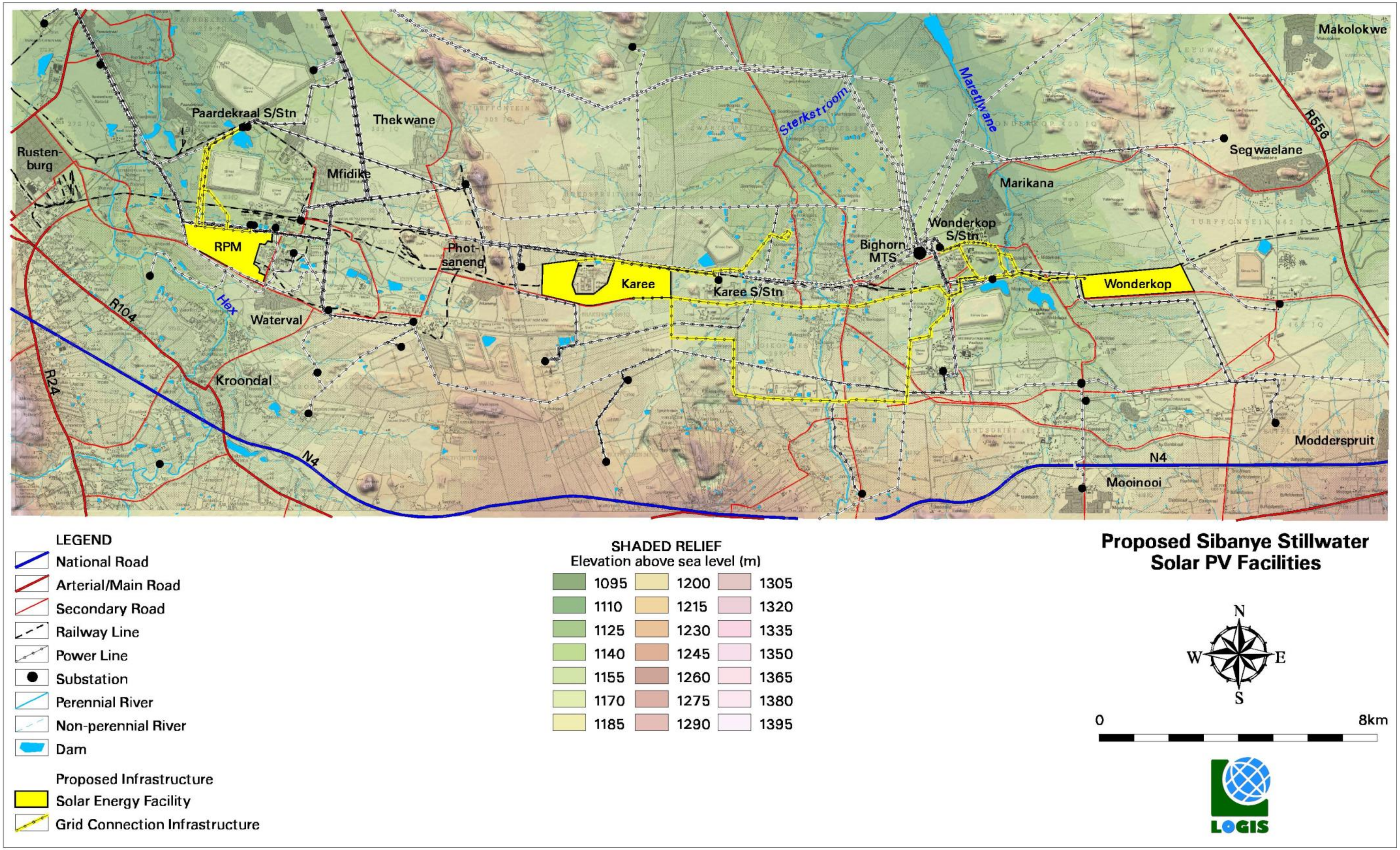
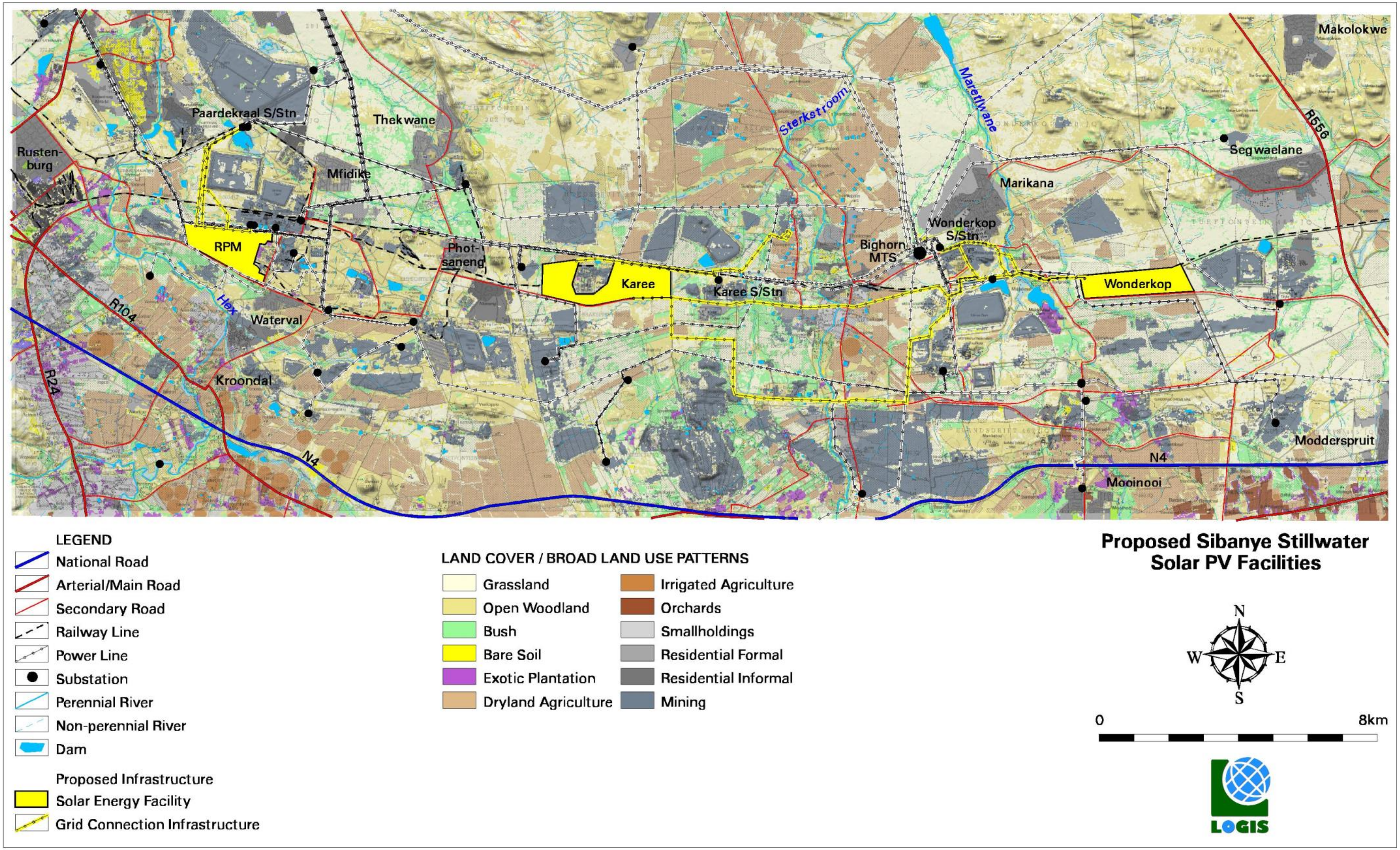
[2] Sources: DEAT (ENPAT North West), NBI (Vegetation Map of South Africa, Lesotho and Swaziland), NLC2018 (ARC/CSIR), REEA_OR_2021_Q1 and SAPAD2021 (DFFE), Wikipedia.



Map 1: Shaded relief map of the study area.



Map 2: Land cover and broad land use patterns.

5. VISUAL EXPOSURE/VISIBILITY

The result of the viewshed analysis for the proposed SRPM PV 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 and BESS) associated with the facility.

The viewshed analysis will be further refined once a preliminary and/or final layout is completed and will be regenerated for the actual position of the infrastructure on the site and actual proposed infrastructure during the EIA phase of the project.

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

Results

The location of the proposed SRPM PV facility within the Hex River catchment has influenced the viewshed pattern to a large degree. Visual exposure to the east is contained by a ridgeline just east of Photsaneng, approximately 6km from the PV site. Visual exposure to the north is contained by two large slimes dams north of the PV site. Visual exposure to the south-east beyond Waterval is unlikely and the predominant visual exposure is expected to be to the west, south-west and north-west.

It should also be noted that the potential visual exposure will not occur in isolation, but rather in conjunction with the existing mining, power line and industrial infrastructure adjacent to the PV site.

The following is evident from the viewshed analyses:

0 – 1km

The PV facility may be highly visible within a 1km radius of the proposed development. This zone predominantly falls within mining land, with only one homestead (Waterval) located 1km to the west of the site (adjacent to the Hex River). The Waterval residential area is located to the south-east of the site, and visual exposure to the PV facility from the northern outlying parts of this town may be possible. The PV facility is also expected to be highly visible from the road (1st Street) traversing immediately south of the PV site.

1 – 3km

Within this zone the visual exposure will predominantly be to the north-east and the south-west. Most of the exposure to the north-east will be within mining land, but it does include the Mfidike residential area. Visual exposure is however unlikely due to the built-up nature of the town. Visual exposure to the south-west may include the Waterkloof Township and a number of smallholdings south of the Hex River. The likelihood of visual exposure to the project infrastructure is however expected to be low, due to the built-up nature of these areas, and the presence of woodland and planted vegetation cover.

The proposed PV facility may also be visible from the R104 arterial road at a distance of just under 3km. This visual exposure will be in transit and is likely to be relatively brief.

3 - 6km

Within a 3 – 6km radius, the visual exposure is more scattered and interrupted due to the undulating nature of the topography. Most of the visual exposure will be within developed (built-up) land, making the likelihood of visual exposure improbable. This zone includes the most eastern residential area of Rustenburg and the Rustenburg Airfield.

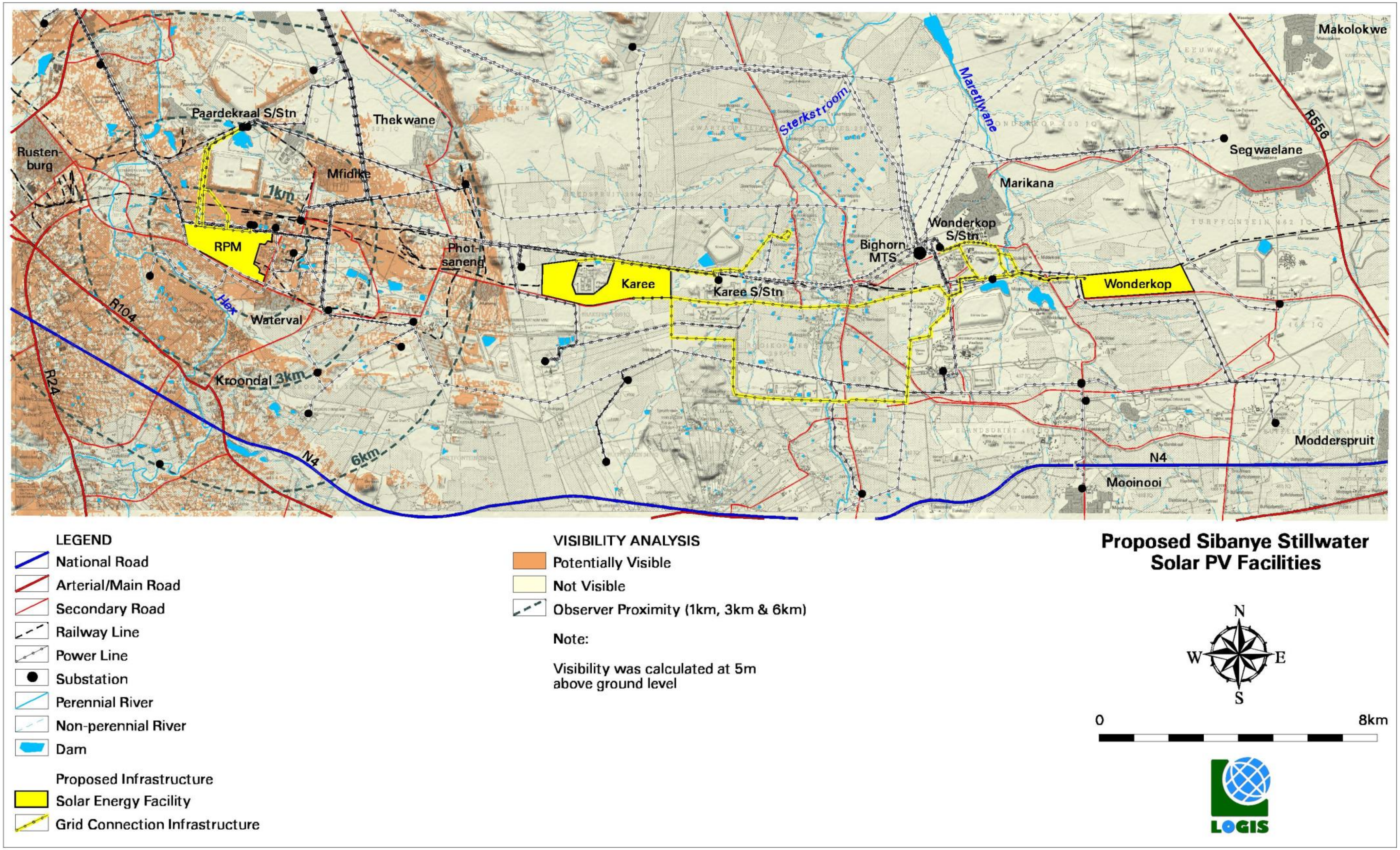
Visual exposure to the east will fall mainly within mining land, with a great deal of mining, railway line and electricity distribution infrastructure present in this area. Visual exposure from the western outlying parts of the Photsaneng residential area may theoretically be possible, but it is unlikely due to the presence of existing visual clutter and built structures at this locality.

> 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 (PV facility) and the observer, and the developed nature of the study area.

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 the residents of the farm dwelling (Waterval) mentioned above, as well as observers travelling along 1st Street south of the facility.



Map 3: Map indicating the potential (preliminary) visual exposure of the proposed SRPM PV facility.

6. ANTICIPATED ISSUES RELATED TO THE VISUAL IMPACT

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 secondary road (1^{st} Street) in closer proximity to the proposed infrastructure.
- The visibility of the facility to, and potential visual impact on residents of dwellings within the study area, with specific reference to the farm residence in closer proximity to the proposed development.
- The potential visual impact of the facility on the visual character or sense of place of the region.
- The potential visual impact of the facility on tourist routes or tourist destinations/facilities (if present).
- The potential visual impact of the construction of ancillary infrastructure (i.e. internal access roads, buildings, power line, etc.) on observers in close proximity to the facility.
- The visual absorption capacity of the natural vegetation (if applicable) or built structures/mining infrastructure.
- Potential cumulative visual impacts (or consolidation of visual impacts), with specific reference to the placement of the PV facility within a predominantly mining area.
- The potential visual impact of operational, safety and security lighting of the facility at night on observers residing in close proximity of the facility.
- Potential visual impact of solar glint and glare as a visual distraction and possible air/road travel hazard.
- Potential visual impact of solar glint and glare on static ground-based receptors (residents of homesteads) in close proximity to the PV facility.
- Potential visual impacts associated with the construction phase.
- The potential to mitigate visual impacts and inform the design process.

It is envisaged that the issues listed above may potentially constitute a visual impact at a local and/or regional scale. These need to be assessed in greater detail during the EIA phase of the project.

Table 3: Impact table summarising the potential primary visual impacts associated with the proposed PV facility.

Impact
Visual impact of the facility on observers in close proximity to the proposed PV facility infrastructure and activities. Potential sensitive visual receptors include: • Residents of homesteads and farm dwellings (in closer proximity to the facility)

<table>
<tr><td colspan="4">Observers travelling along the secondary roads traversing near the proposed development</td></tr>
<tr><td>Issue</td><td>Nature of Impact</td><td>Extent of Impact</td><td>No-Go Areas</td></tr>
<tr><td>The viewing of the PV facility infrastructure and activities</td><td>The potential negative experience of viewing the infrastructure and activities</td><td>Primarily observers situated within a 1km (and potentially up to 3km) radius of the facility</td><td>N.A.</td></tr>
<tr><td colspan="4">Description of expected significance of impact

Extent: Local
Duration: Long term
Magnitude: Moderate
Probability: Probable
Significance: Moderate
Status (positive, neutral or negative): Negative
Reversibility: Recoverable
Irreplaceable loss of resources: No
Can impacts be mitigated: Yes</td></tr>
<tr><td colspan="4">Gaps in knowledge & recommendations for further study

A finalised layout of the PV facility and ancillary infrastructure are required for further analysis. This includes the provision of the dimensions of the proposed structures and ancillary equipment.

Additional spatial analyses are required in order to create a visual impact index that will include the following criteria:
Visual exposure
Visual distance/observer proximity to the structures/activities
Viewer incidence/viewer perception (sensitive visual receptors)
Visual absorption capacity of the environment surrounding the infrastructure and activities
Additional activities:
Identify potential cumulative visual impacts
Undertake a site visit
Recommend mitigation measures and/or infrastructure placement alternatives
Refer to the Plan of Study for the EIA phase of the project below.</td></tr>
</table>

7. CONCLUSION AND RECOMMENDATIONS

The fact that some components of the proposed SRPM PV facility and associated infrastructure may be visible does not necessarily imply a high visual impact. Sensitive visual receptors within (but not restricted to) a 3km buffer zone from the facility need to be identified and the severity of the visual impact assessed within the EIA phase of the project.

It is recommended that additional spatial analyses be undertaken in order to create a visual impact index that will further aid in determining potential areas of visual impact. This exercise should be undertaken for the core PV facility as well as for the ancillary infrastructure, as these structures (e.g. the BESS structures and power line) are envisaged to have varying levels of visual impact at a more localised scale. The site-specific issues (as mentioned earlier in the report) and potential sensitive visual receptors should be measured against this visual impact index and be addressed individually in terms of nature, extent, duration, probability, severity and significance of visual impact.

This recommended work must be undertaken during the Environmental Impact Assessment (EIA) Phase of reporting for this proposed project. In this respect, the Plan of Study for the EIA is as follows:

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 solar energy facility layout.

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 must be 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 detailed digital terrain model of the study area.

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

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

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

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

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

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

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

- **Site visit**

Undertake a site visit in order to collect a photographic record of the affected environment, 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.

8. REFERENCES/DATA SOURCES

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

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

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

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

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

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

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

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

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

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

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