PROPOSED DALMANUTHA WIND ENERGY FACILITY, DALMANUTHA WEST WIND FACILITY, AND ASSOCIATED GRID INFRASTRUCTURE, EMAKHAZENI LOCAL MUNICIPALITY, MPUMALANGA PROVINCE

VISUAL ASSESSMENT – INPUT FOR SCOPING REPORT

Produced for:

ENERTRAG South Africa

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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 modelling and digital mapping and applies this knowledge in various scientific fields and disciplines. His GIS expertise is 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 a 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 applicant **ENERTRAG South Africa** proposes to establish a Wind Energy Facility (WEF), the Dalmanutha Wind Energy Facility and associated infrastructure (referred to as "Dalmanutha Wind"), as well as Dalmanutha West Wind Energy on a site located approximately 7 km southeast of the Belfast town within Emakhazeni Local Municipality, Mpumalanga Province.

The project is composed of the following:

- Dalmanutha Wind Energy Facility (up to 300MW);
- Dalmanutha Wind Energy Facility Grid infrastructure (up to 132kV);
- Dalmanutha West Wind Facility (up to 20MW);
- Dalmanutha West Grid infrastructure (up to 132kV); and
- Common Collection Substation and Powerline (up to 132kV)

The Dalmanutha Wind Energy Facility:

➢ The Dalmanutha Wind Energy Facility ("*Dalmanutha Wind*") is located approximately 7km southeast of the Belfast town within Emakhazeni Local Municipality, Mpumalanga Province. Site access is via the N4, which is approximately 220 meters from Dalmanutha Wind.

➢ Dalmanutha Wind will be located over eighteen farm portions covering approximately 4370 ha (Refer to **Table 1**). The proposed facility will consist of up to 70 wind turbines, with a generating capacity of approximately 300MW.

➢ To connect the Dalmanutha Wind to the Eskom grid, the applicant proposes collecting the various turbines' underground cables to an up to 132kV onsite IPP substation which will form part of a separate Basic Assessment Report (BAR). The IPP substation is proposed to occupy an area of up to 4ha This IPP substation will be located adjacent to the Common Grid Infrastructure.

➢ Site access is via the N4 (approximately 220 meters from Dalmanutha Wind). This will allow for ease of access for the transportation of the turbine components during the construction phase.

➢ The project site is proposed to accommodate both the wind turbines as well as the associated infrastructure which is required for such a facility including:

- Up to80 wind turbines with up to 200m hub height and a rotor diameter of up to 200m;
- Internal road width of between 8m and 10m that may be increased to 12m on bends. Approximately 60km in length;
- Concrete turbine foundations and turbine hardstands;
- Temporary laydown or staging areas which will accommodate storage and assembly areas (Typical area 220m x 100m = 22000m². Laydown area could increase to 30000m² for concrete towers, should they be required);
- Cabling between the turbines, to be laid underground where practical;
- A temporary concrete batching plant;
- An independent Power Producer (IPP) site substation and battery energy storage system (BESS); with a total footprint of up to 4ha in extent. The substation will consist of a high voltage substation yard to allow for multiple (up to) 132kV feeder bays and transformers, control building, telecommunication infrastructure, access roads, etc. The associated BESS

storage capacity will be up to 100MW/400MWh with up to four hours of storage. It is proposed that Lithium Battery Technologies, or Vanadium Redox flow technologies will be considered as the preferred battery technology. The main components of the BESS include the batteries, power conversion system, and transformer which will all be stored in various rows of containers. And finally;

- Operation and Maintenance (O & M) buildings including typical areas such as an operations building, a workshop, stores and septic tanks with portable toilets.

The Dalmanutha West Wind Energy Facility:

➢ The Dalmanutha West Wind Energy Facility ("*Dalmanutha West*") is to be located approximately 12km south-southeast of Belfast town, adjacent to Dalmanutha Wind. Site access is via the R33, which is approximately 2.14km from the proposed development area.

➢ Dalmanutha West will be located over three farm portions which cover approximately 475ha. These are highlighted in **Table 2**. The proposed facility will consist of up to 4 wind turbines, with a generating capacity of approximately 20MW.

➢ Dalmanutha West will have an onsite IPP substation and a 10km up to 132kV powerline that will connect Dalmanutha West to the Common Grid Infrastructure.

➢ Site access is via the R33 Site access is via the R33, which is approximately 2.14km from the proposed development area. This will allow for ease of access for the transportation of the turbine components during the construction phase.

➢ The project site is proposed to accommodate both the wind turbines as well as the associated infrastructure which is required for such a facility including:

- Up to 4 wind turbines with up to 200m hub height and a rotor diameter of up to 200m;
- Internal road width of between 8m and 10m that may be increased to 12m on bends. Approximately 15-20 km in length;
- Concrete turbine foundations and turbine hardstands;
- Temporary laydown or staging areas which will accommodate storage and assembly areas (Typical area is approximately 20 000m². Laydown area could increase to 30 000m² for concrete towers, should they be required);
- Cabling between the turbines, to be laid underground where practical;
- A temporary concrete batching plant;
- An Independent Power Producer (IPP) site substation and battery energy storage system (BESS); with a total footprint of up to 2ha in extent. The substation will consist of a high voltage substation yard to allow for multiple (up to) 132kV feeder bays and transformers, control building, telecommunication infrastructure, access roads, etc. The associated BESS storage capacity will be up to 100MW/400MWh with up to four hours of storage. It is proposed that Lithium Battery Technologies or Vanadium Redox flow technologies will be considered as the preferred battery technology. The main components of the BESS include the batteries, power conversion system, and transformer which will all be stored in various rows of containers. And finally;

- Operation and Maintenance (O & M) buildings including typical areas such as an operations building, a workshop, stores and septic tanks with portable toilets.

These projects are being developed in the context of the Department of Mineral Resources and Energy (DMRE) Integrated Resource Plan and the Countries plan for a Just Transition.

A WF generates electricity by means of wind turbines that harness the wind of the area as a renewable source of energy. Wind energy generation, or wind farming as it is commonly referred to, is generally considered to be an environmentally friendly electricity generation option.

It is the Developer's intention to bid the Dalmanutha Wind Energy Facility ("Dalmanutha Wind") under the Department of Mineral Resources and Energy's Independent Power Producers Procurement Programme, while simultaneously diversifying South Africa's electricity mix, and positively contributing toward socio-economic and environmentally sustainable growth.

The WEF will take approximately 12 months to construct and the operational lifespan of the facility is estimated at 20 years.

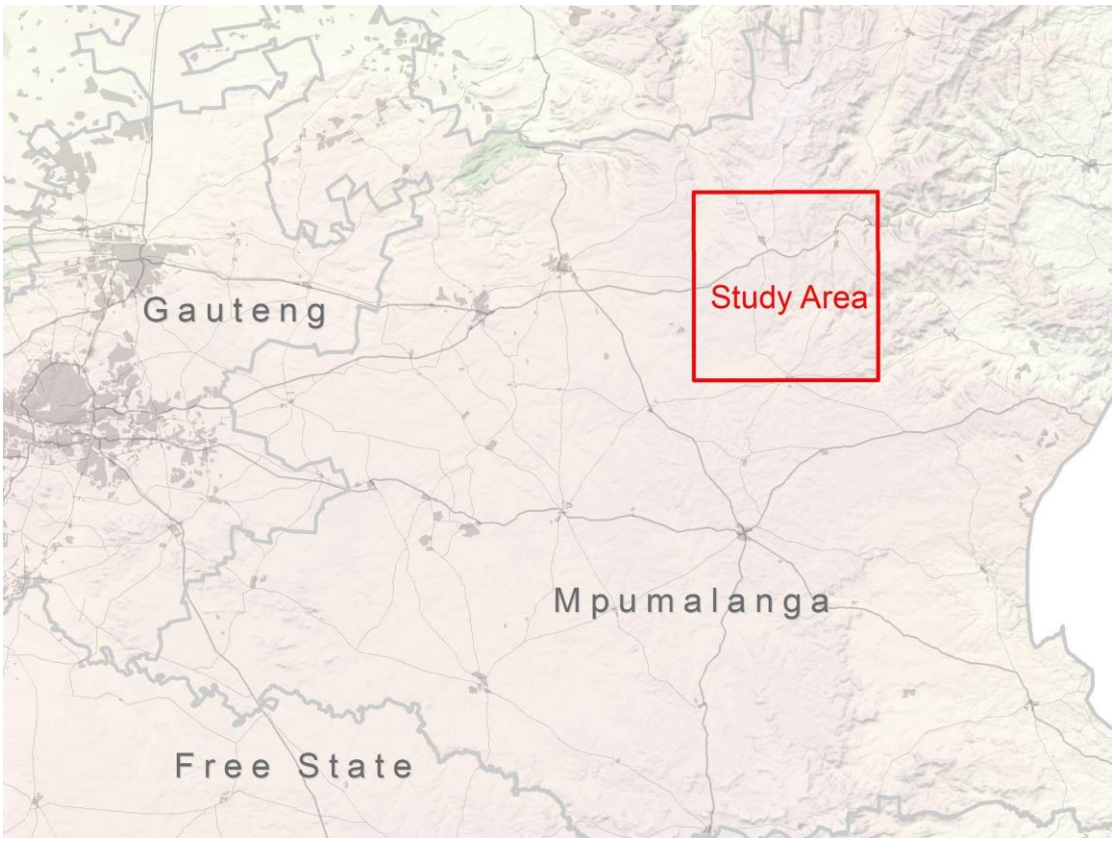


Figure 1: Regional locality of the proposed project area.

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 3,118km^2 (the extent of the full-page maps displayed in this report) and includes a minimum 20km buffer zone (area of potential visual influence) from the boundaries of the proposed farms identified for the wind farm development.

The study area includes towns and built-up areas, a large number of settlements, farms and homesteads, the Nooitgedacht Dam and a number of protected/conservation areas (i.e., the Greater Lakenvlei Protected Environment, Langkloof Private Nature Reserve, Cecilia Private Nature Reserve, and Paulina van Niekerk Private Nature Reserve), as well as a number of exotic plantations.

The N4 is in close proximity to the site towards the north. In addition, several arterial roads traverse the area, namely R540 to the north, the R541 to the east, while the R36 lies along the east towards the south of the site, and the R33 lies along the northwest of the site towards the south, converging into the R38. A number of secondary roads form links between these arterials.

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 NASA in the form of a 30m SRTM (Shuttle Radar Topography Mission) 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 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 consider the dimensions of the proposed structures and activities.

This report (scoping report) sets out to identify the possible visual impacts related to the proposed Dalmanutha Wind Energy Facility from a desktop level.

4. THE AFFECTED ENVIRONMENT

Dalmanutha Wind will be located over eighteen farm portions covering approximately 4370 ha. These portions are highlighted in **Table 1** below:

Table 1: Farm Portions for the Dalmanutha Wind Project.

Farm Number	Portion Number	Farm Name
378	1	Berg-en-Dal
385	24	Waaikraal
378	9	Tropical Paradise Trading 271
384	7	Blyvoor Boerdery
385	6	P C Van Wyk Trust
385	7	P C Van Wyk Trust
385	8	Ben Vilikazi
385	10	Francois van Rooyen
385	12	Ben Vilikazi
385	13	Ben Vilikazi
385	24	Weltervreden Holdings
403	3	Wessel Hendrik Pieters
403	4	Wessel Hendrik Pieters
404	1	Lihle Group
404	2	Lihle Group
405	3	Zena Pieters
412	1	Simunye CPA
467	0	Wessel Hendrik Pieters

Dalmanutha West Wind Energy Facility will be located over three farm portions covering approximately 475 ha. These portions are highlighted in Table 2 below:

Table 2: Farm Portions for the Dalmanutha West Wind Energy Facility.

Farm Number	Portion Number	Farm Name
384	4	GTGH Trust
384	15	GTGH Trust
384	17	GTGH Trust

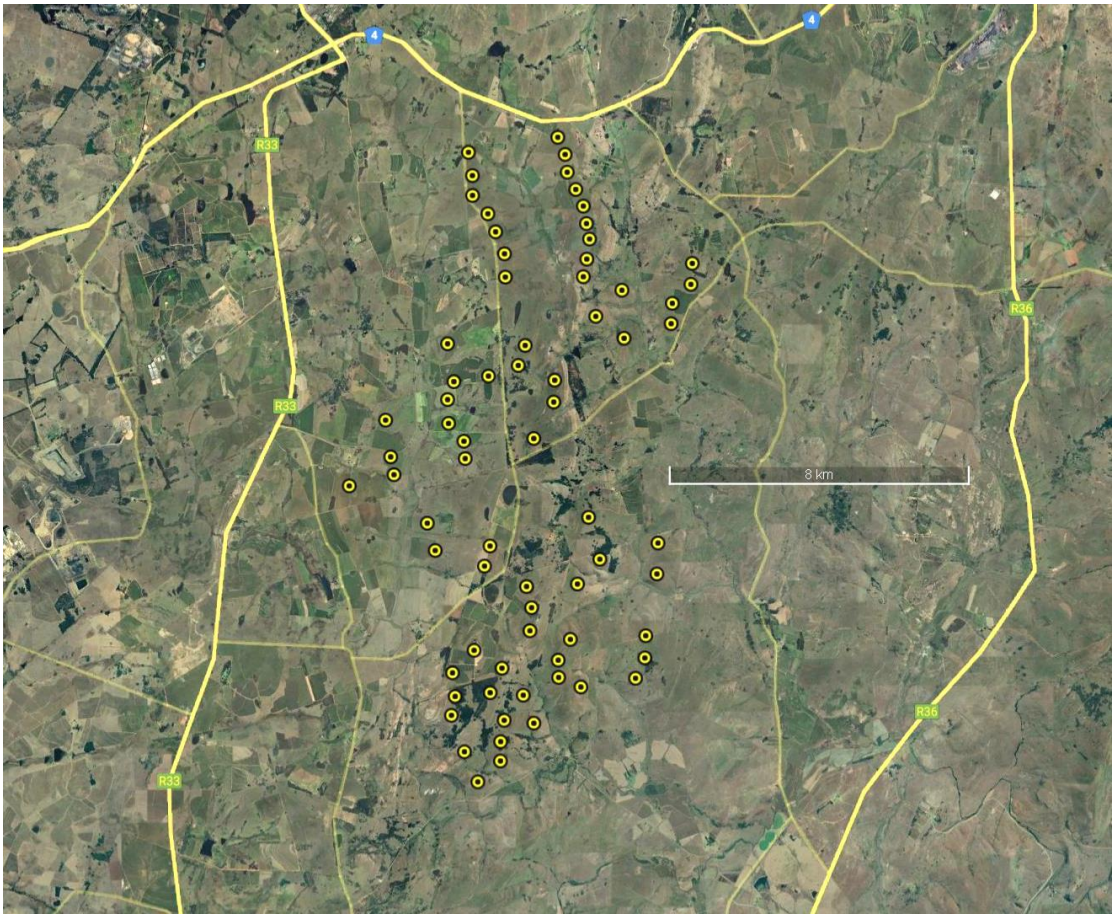


Figure 2: Aerial view of the proposed wind turbine layout.

The dominant terrain morphological units or terrain types that describe the study area are predominantly composed of *moderately undulating plains.* The site itself is situated on relatively flat land, with a slight rise in elevation towards the southern proposed wind turbine positions. Hilly terrain lies along the northeastern and southeastern portions of the study area, as well as towards the northwest of the site: The Elandsrivier is defined by the Dwaalheuwel, Baldhill and Mareskop *koppie* surrounds towards the northeast. The Komati River lies within a valley of up to 400m deep within the Krokodilkop surrounding the south-east, while the Nooitgedacht Dam (fed by the Witkloofspruit, releasing into the Vaalwaterspruit) lies within a gentle depression south of the study area alongside the Nakop. The Steelpoort River is delineated in a slight depression towards the northwest of the study area. Tributaries of the Komati River traverse through / surround certain portions of the proposed WEF. Refer to **Map 1** for a topographical map of the study area.

Lamb and mutton farming dominate the land-use character in the western part of the study area, as well as dairy and maize. Timber is a leading industry in the district, therefore exotic plantations are located throughout the study area, but are more concentrated in areas towards the north, north-east and south-east of the site.

Mining/quarrying areas (coal and black granite are other leading industries in the study area), have been delineated towards the west, north-west, north-east and south of the proposed Dalmanutha WEF.

The region has a rural character, with scattered isolated homesteads occurring within the study area. In terms of the natural vegetation, the study area falls within the grassland biome, and more specifically the Mesic Highveld Grassland Bioregion. Steenkampsberg Montane Grassland has been delineated north of the study area, while Eastern Highveld Grassland (towards the southeast) and KaNgwane Montane Grassland (towards the southwest) have been further identified.

The towns of Belfast (north of the site, with a population of 200.7 people per km^2), Emgwenya or Waterval Boven and Machadodorp (north-east of the site, with Waterval Boven having 153.0 people per km^2 and Machadadorp having 152.1 people per km^2), and Carolina (south of the site, having 1,150 people per km²) lie within the study area.[1] The town of Carolina, therefore, accounts for the highest population concentration within the region.

The study area receives approximately 773mm of rainfall per annum[2]. Most of the farming (in terms of surface area) is dryland agriculture, with sporadic patches of irrigated agriculture towards the northwest, west and south of the proposed facility.

The region has a rural character, with scattered isolated homesteads occurring within the study area. Refer to **Map 2** for the land cover and broad land use patterns within the study area.

The following conservation areas have been identified:

- The Greater Lakenvlei Protected Environment and the Langkloof Private Nature Reserve (towards the north);
- the Pauline van Niekerk Private Nature Reserve towards the southeast;
- the Cecilia Private Nature Reserve lies towards the west of the proposed WEF; and
- the Nooitgedacht Dam Nature Reserve is located some 15 km to the south of the site.

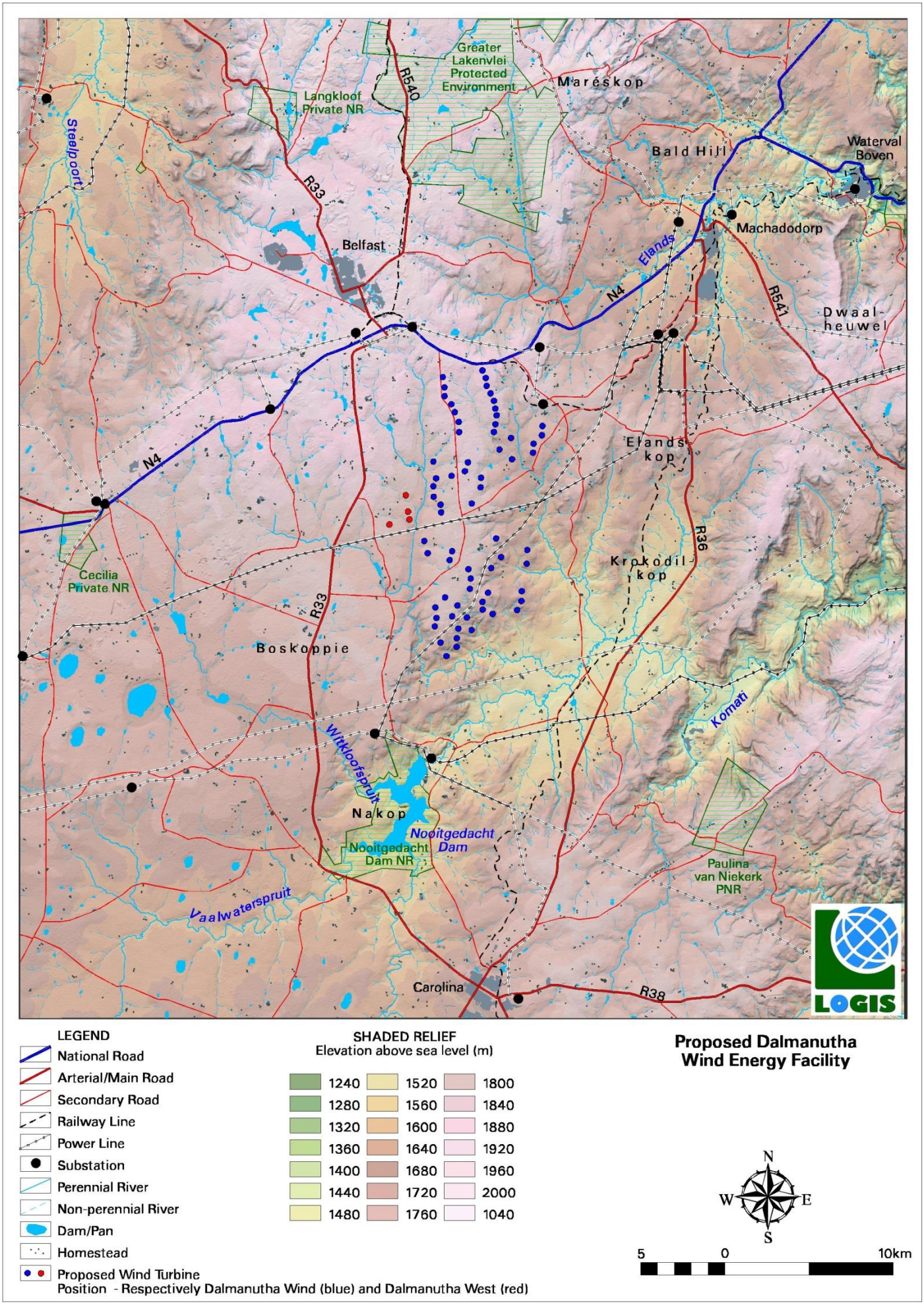
Figure 3: A view of the proposed development site from the N4 National road (Google Earth street view, June 2022).

[1] Source: Statistics South Africa, 2011.

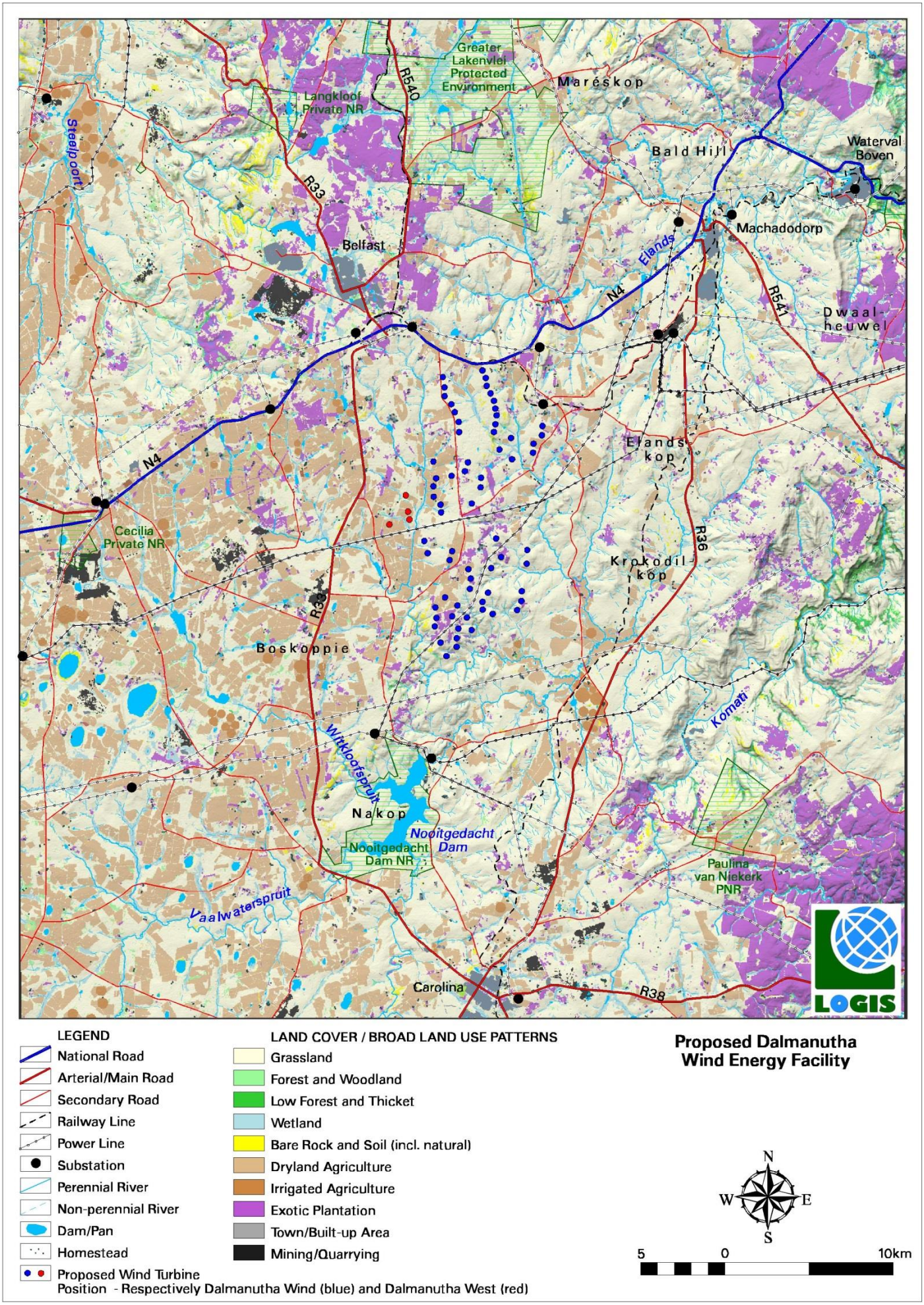
[2] Source:: https://weatherspark.com/

Figure 4: A view of the proposed development site from the R33 Arterial road (Google Earth street view, June 2022).

Figure 5: A view of the proposed development site from the R36 Arterial road (Google Earth street view, June 2022).



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 preliminary viewshed analyses for the proposed WEF is shown on the map overleaf (**Map 3**). The initial viewshed analyses were undertaken from preliminary vantage points (with a maximum of 71) within the proposed development area at offsets of 200m above average ground level (i.e., the approximate hub height of the proposed wind turbines).

This was done to determine the general visual exposure of the area under investigation, simulating the proposed structures associated with the WEF. It must be noted that the viewshed analyses do not include the effect of vegetation cover or existing structures on the exposure of the proposed wind turbines, therefore signifying a worst-case scenario.

The viewshed analyses will be refined once a final layout of the wind energy facility is completed and will be regenerated per turbine position (and actual proposed turbine height) during the EIA phase of the project.

Map 3 indicates areas from which any number of turbines (with a minimum of one turbine) could potentially be visible as well as proximity radii from the proposed development area in order to show the viewing distance (scale of observation) of the facility in relation to its surroundings.

The following is evident from the viewshed analyses:

0 – 5km

The proposed WEF would have a large core area of potential visual exposure within a 5km radius of the development site. This is due to the tall wind turbine structures and the flat topography. This core area does not include any towns, but some unnamed homesteads that dot the delineated zone.

The turbine structures are expected to be clearly visible from the N4 traversing the north of the delineated zone.

The turbine structures are expected to be clearly visible from the R33 arterial road and the secondary dust roads adjoining this as these roads traverse the proposed development area.

5 – 10km

Visual exposure will remain high in the medium distance (i.e. between 5 and 10km), due to the flat undulating nature of the topography. Of importance in this zone are the northern half of the Nooitgedacht Dam Nature Reserve, and the town of Belfast towards the northwest of the zone, as well as a number of settlements and homesteads. The town of Belfast shows approximately 80 percent potential visibility.

The turbine structures are expected to be clearly visible from the N4 traversing the north of the delineated zone.

The turbine structures are expected to be visible from the R33 west of the zone, the R540 northwest of the zone, as well as the R36, traversing the east of the delineated zone. A number of secondary dust roads within the delineated area too will be affected.

10 – 20km

In the medium to longer distance (i.e. between 10 and 20km), visual exposure will be somewhat reduced, specifically towards the northwest and east of the study area. This zone also includes a number of settlements and homesteads, the town of Machadodorp towards the northeast (with limited visibility due to the nature of the topography), and the northern regions of Belfast towards the northwest (with high potential visibility). Towards the south of the delineated area lies the northern region of the town of Carolina, with limited potential visibility due to the nature of the topography.

Of importance in this zone towards the north is the Greater Lakenvlei Protected Environment (with approximately 50 percent potential visibility), and the Langkloof Private Nature Reserve (with approximately 60 percent potential visibility). The Paulina van Niekerk Private Nature Reserve lies towards the southeast of the delineated zone, with approximately 60 percent of the reserve showing potential visibility. South of the delineated zone lies the southern half of the Nooitgedacht Dam Nature Reserve with approximately 60 percent of the reserve showing potential visibility. Finally, the Cecilia Private Nature Reserve east of the zone indicates that about 80 percent of the reserve will be potentially visible.

The turbine structures are expected to be clearly visible from the N4 traversing the north of the delineated zone. About 50 percent potential visibility is shown along the R33 and R540 north of the site, while potential visibility is shown along the R541 traversing the north east of the zone, as well as the R36 and R33 south of the zone. A number of secondary dust roads within the delineated area too will be affected, but to a lesser extent than those within a closer radius.

> 20km

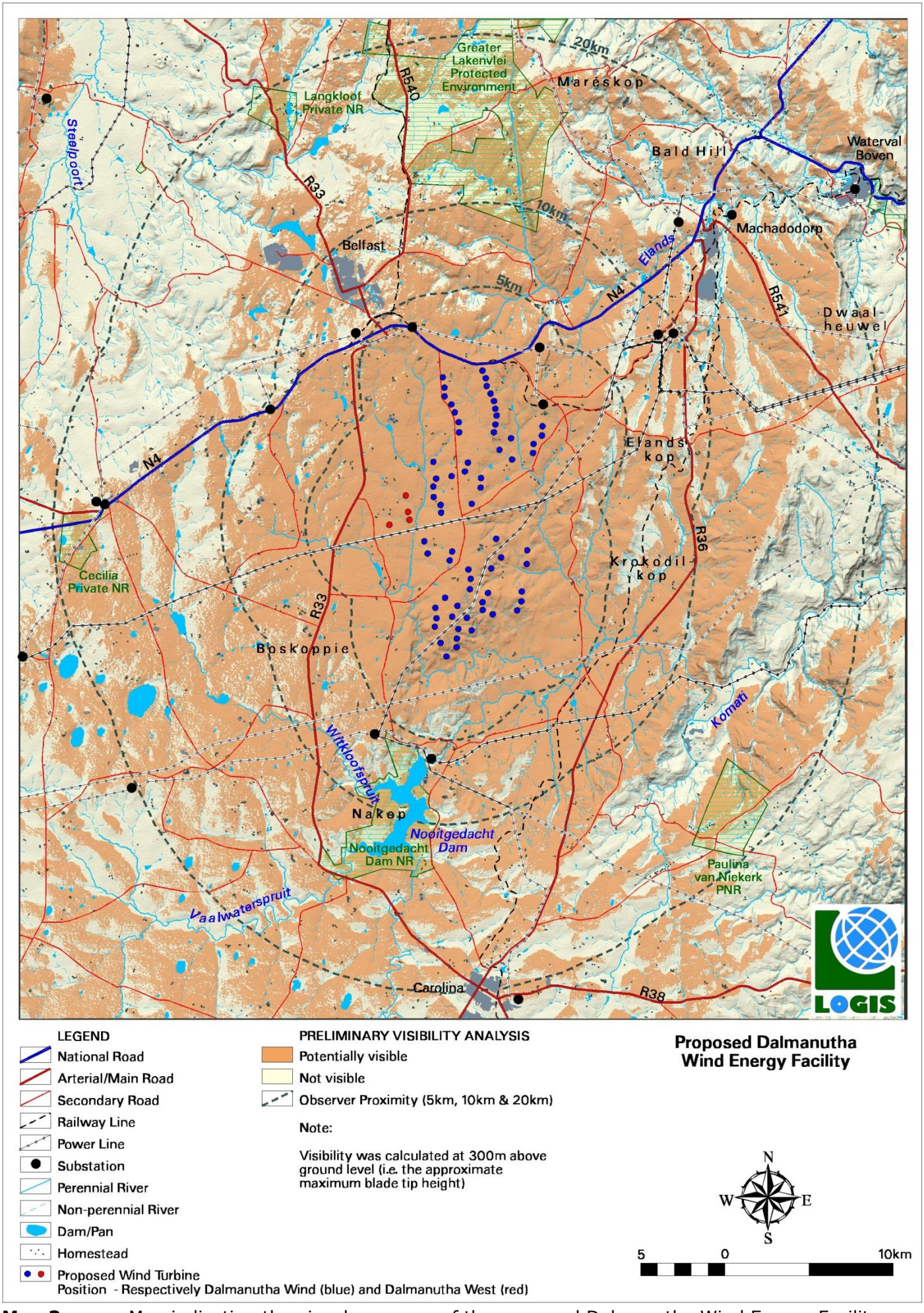
Visual exposure beyond a 20km radius is significantly reduced, especially towards the northwest and south-east.

Conclusion

It is envisaged that the WEF structures would be easily and comfortably visible to observers (i.e., people travelling along roads, residing on the outskirts of towns and at homesteads or visiting the region), especially within a 5-10km radius of the WEF and would constitute a high visual prominence, potentially resulting in a high visual impact.

The figure below helps to place the above explanations in context, illustrating the scale of a turbine structure at different viewing distances.

Figure 6: Schematic representation of a wind turbine from 1, 2, 5 and 10km under perfect viewing conditions.



Map 3: Map indicating the visual exposure of the proposed Dalmanutha Wind Energy Facility

6. ANTICIPATED ISSUES RELATED TO THE VISUAL IMPACT

Anticipated issues related to the potential visual impact of the proposed Dalmanutha Wind Energy Facility include the following:

Construction phase

- Potential visual impacts associated with the construction phase infrastructure and activities.

Operation phase

- The visibility of the facility from, and potential visual impact on observers travelling along the National (N4), arterial (R33, R540, R541, and R36) and secondary (local) roads within the study area.
- The visibility of the facility from, and potential visual impact on built-up centres and populated places (i.e., the towns of Machadodorp, Belfast and Carolina) within the study area.
- The visibility of the facility, and potential visual impact on farmsteads and homesteads (rural residences) within the study area.
- The potential visual impact of the facility on the visual character and sense of place of the region, with specific reference to the pastoral landscape and the scenic mountains.
- The potential cumulative visual impacts (or consolidation of visual impacts) of renewable energy facilities within the larger region.
- The potential visual impact of the facility on tourist routes or tourist destinations (e.g., protected areas and other tourist attractions), namely: The Greater Lakenvlei Protected Environment, Langkloof Private Nature Reserve, Pauline van Niekerk Private Nature Reserve, Cecilia Private Nature Reserve, and Nooitgedacht Dam Nature Reserve.
- The potential visual impact of the construction of ancillary infrastructure (i.e., internal access roads, buildings, BESS, etc.) on observers in close proximity to the facility.
- The visual absorption capacity of the natural vegetation (if applicable).
- The potential visual impact of operational, safety and security lighting of the facility at night on observers residing in proximity to the facility.
- The potential visual impact of shadow flicker.
- The potential to mitigate visual impacts and inform the design process.

Decommissioning phase

- Potential residual visual impacts post decommissioning.

It is envisaged that the issues listed above may potentially constitute a significant 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 1: Impact table summarising the potential primary visual impacts associated with the Dalmanutha Wind Energy Facility, Dalmanutha West Wind Facility And Associated Grid Infrastructure.

Impact

Visual impact of the facility on observers near the proposed Wind Energy Facility infrastructure and activities. Potential sensitive visual receptors are listed in **Section 5**.

Issue	Nature of Impact	Extent of Impact	No-Go Areas
The viewing of the Wind Energy Facility infrastructure and activities	The potential negative experience of viewing the infrastructure and activities within a predominantly rural and natural setting	Primarily observers situated within a 5 - 10km (but potentially up to 20km) radius of the facility	N.A.

Description of expected significance of the impact

Construction phase
Extent: Local
Duration: Short 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

Operation phase
Extent: Local and/or regional
Duration: Long term
Magnitude: High to Very High
Probability: Probable
Significance: High
Status (positive, neutral or negative): Negative
Reversibility: Recoverable
Irreplaceable loss of resources: No
Can impacts be mitigated: Some may be mitigated

Decommissioning phase
Extent: Local
Duration: Short term
Magnitude: Moderate
Probability: Improbable
Significance: Low
Status (positive, neutral or negative): Positive
Reversibility: Recoverable
Irreplaceable loss of resources: No
Can impacts be mitigated: Yes

Gaps in knowledge & recommendations for further study

A finalised layout of the Wind Energy 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 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 (identify potentially affected sensitive visual receptors)
- Determine the 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.

7. CONCLUSION AND RECOMMENDATIONS

The construction and operation of the proposed Dalmanutha Wind Energy Facility may have a visual impact on several potentially sensitive visual receptors especially within (but not restricted to) a 5 - 10km radius of the facility.

Visual receptors include people travelling along roads and residing in towns, and tourists visiting holiday destinations in the region.

Several tourist destinations as listed in *Section 5* (conservation areas and private national parks) within the 10-20km radius of the proposed development will be affected in varying degrees depending on the topography of the landscape. In addition, the northern portion of the Nooitgedacht Dam nature reserve will also potentially be visually impacted within the 5-10km radius.

It is recommended that additional spatial analyses be undertaken 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 facility as well as for the ancillary infrastructure, as these structures (e.g., the substation and BESS) 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.

Specific spatial criteria need to be applied to the visual exposure of the proposed facility to successfully determine visual impact and ultimately the significance of the visual impact. In addition, photo simulations of critical viewpoints should be undertaken where required, to aid in the visualisation of the envisaged 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 30m SRTM 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 considered.

- **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 (VAC) 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.

- **Photo simulations**

Photographs will be used to simulate a realistic post construction view of the WEF. This will aid in visualising the perceived visual impact of the proposed WEF and place it in spatial context.

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.*

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

DEA, 2020. *South African Protected Areas Database (SAPAD_OR_2020_Q3).*

DEA, 2020. *South African Renewable Energy EIA Application Database (REEA_OR_2020_Q3).*

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

ENERTRAG, 2022. Dalmanutha Wind Energy Facility, Dalmanutha West Wind Facility And Associated Grid Infrastructure. *Project description and motivation.*

NASA, 2018. *Earth Observing System Data and Information System (EOSDIS).*

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.