

**PROPOSED GREAT KAROO WIND ENERGY FACILITY,
NORTHERN CAPE PROVINCE**

**AMENDMENT:
COMPARATIVE VIEWSHED ANALYSIS AND VISUAL ASSESSMENT**

Produced for:

African Clean Energy Developments (Pty) Ltd

On behalf of:



Savannah Environmental (Pty) Ltd
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Lourens du Plessis (t/a LOGIS), a specialist in visual assessments and Geographical Information Systems (GIS), undertook the comparative viewshed analysis and visual assessment for the proposed amendment to the turbine specifications for the Great Karoo Wind Energy Facility (WEF). Lourens, then director of MetroGIS (Pty) Ltd, did the Visual Impact Assessment for the original Great Karoo WEF (submission date 2012).

Lourens has been involved in the application of 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 expertise is often utilised in Environmental Impact Assessments, State of the Environment Reports and Environmental Management Plans.

Lourens is familiar with the "Guidelines for Involving Visual and Aesthetic Specialists in EIA Processes" (Provincial Government of the Western Cape: Department of Environmental Affairs and Development Planning) and utilises the principles and recommendations stated therein to successfully undertake visual impact assessments.

Savannah Environmental (Pty) Ltd appointed Lourens du Plessis as an independent specialist consultant to undertake the visual assessment for the proposed amendment to the Great Karoo WEF. He will not benefit from the outcome of the project decision-making.

1. INTRODUCTION

African Clean Energy Developments (Pty) Ltd (ACED) wishes to amend the dimensions and generation capacity of their wind turbine generators (WTG) for the proposed Great Karoo WEF located between Sutherland (Northern Cape) and Laingsburg (Western Cape).

The intended amendment includes:

- The increase of the hub height from 120m (authorised in 2016) to up to 150m (an increase of 30m).
- Increase of the maximum turbine rotor diameter from 140m (authorised in 2016) to a maximum of 180m diameter (an increase of 40m).
- Increase in the capacity output per wind turbine from 2MW - 3.5MW, to up to 6.5MW.
- Update the layout as required.
- Extend the validity period by an additional five years.

The number of turbines of the facility will be reduced from 52 to 42, ten turbines less.

The primary relevance of this proposed increase in dimensions, from a visual impact perspective, is that the total maximum vertical dimension (height) of the wind turbine increases from approximately **190m** (120m hub-height + 70m blade length) to **240m** (150m hub-height + 90m blade length) above ground level. This translates to a total **50m** maximum increase in blade tip height per WTG.

2. SCOPE OF WORK

The scope of work includes a comparative viewshed analysis and identification of potential sensitive visual receptors that may be influenced by the increase in dimensions of the WTGs. This is done in order to determine:

- If there are any additional visual receptors that may be negatively influenced by the amendment;
- Whether the increase in dimensions would significantly aggravate the potential visual impact on identified receptors (identified during the EIA phase);
- If additional impact mitigation measures are relevant; and
- To suggest amendments or additions to the Environmental Management Programme (EMPr) (if applicable).

3. METHODOLOGY

The visual assessment includes a comparative viewshed analysis in order to determine the visual exposure (visibility) of the original (authorised) turbine dimensions compared to the potential (additional) exposure of the increased (proposed) turbine dimensions. The viewshed analysis focuses on a radius of 5km from the proposed turbine layout (development footprint) and potential visual receptors located within this zone. The original VIA report determined that receptors, where visible, within this zone may experience a **high** visual impact of the proposed infrastructure. Should this review of the change in dimensions of the wind turbine structures indicate that there may be a significant increase in the visual impact within this zone, as determined during the VIA, the study area may need to be increased to accommodate areas that were rated as **moderate** as well (i.e. beyond a 5km radius and up to a 20km radius from the structures).

Potential sensitive visual receptors include observers residing at homesteads (farm residences and dwellings) within the study area, and observers travelling along the secondary roads traversing near or over the proposed development site.

4. RESULTS OF THE COMPARATIVE VIEWSHED ANALYSIS

A visibility analysis was undertaken from each of the wind turbine positions (52 in total) at an offset of 190m (maximum blade tip height) above ground level. The result of this analysis represents the potential total visual exposure of the original turbine dimensions (indicated in green). The viewshed analysis was repeated at an offset of 240m to indicate the visual exposure (shown in red) of the increased turbine dimensions, updated positions and reduced number of turbines (42 in total). The results of the visibility analyses are displayed on **Map 1** below.

It is clear that the approximately 21% increase in turbine dimensions, would have a relatively small influence on the overall visual exposure, due to the already tall turbine structures previously approved and the elevated positions of the turbines on ridges. The surface area (within the study area) of the original turbine exposure is 345km², compared to the 354km² of the increased dimensions of the wind turbine exposure. This is an increase of 9km², or alternatively, an increase of less than 3% in potential visual exposure.

There are no additional sensitive visual receptors located within the area of increased visual exposure.

Potential sensitive visual receptors within an approximately 5km radius (identified during the EIA phase) include:

- De Plaat*
- Oranjefontein*
- De Hoop*

- De Kom*
- Welgemoed*
- Damslaagte*
- Meintjiesplaas*
- Weltevrede*
- Kareedoornekraal and Spitskop (located at distances exceeding 6.7km)
- Observers travelling along the secondary roads traversing near or over the proposed development site

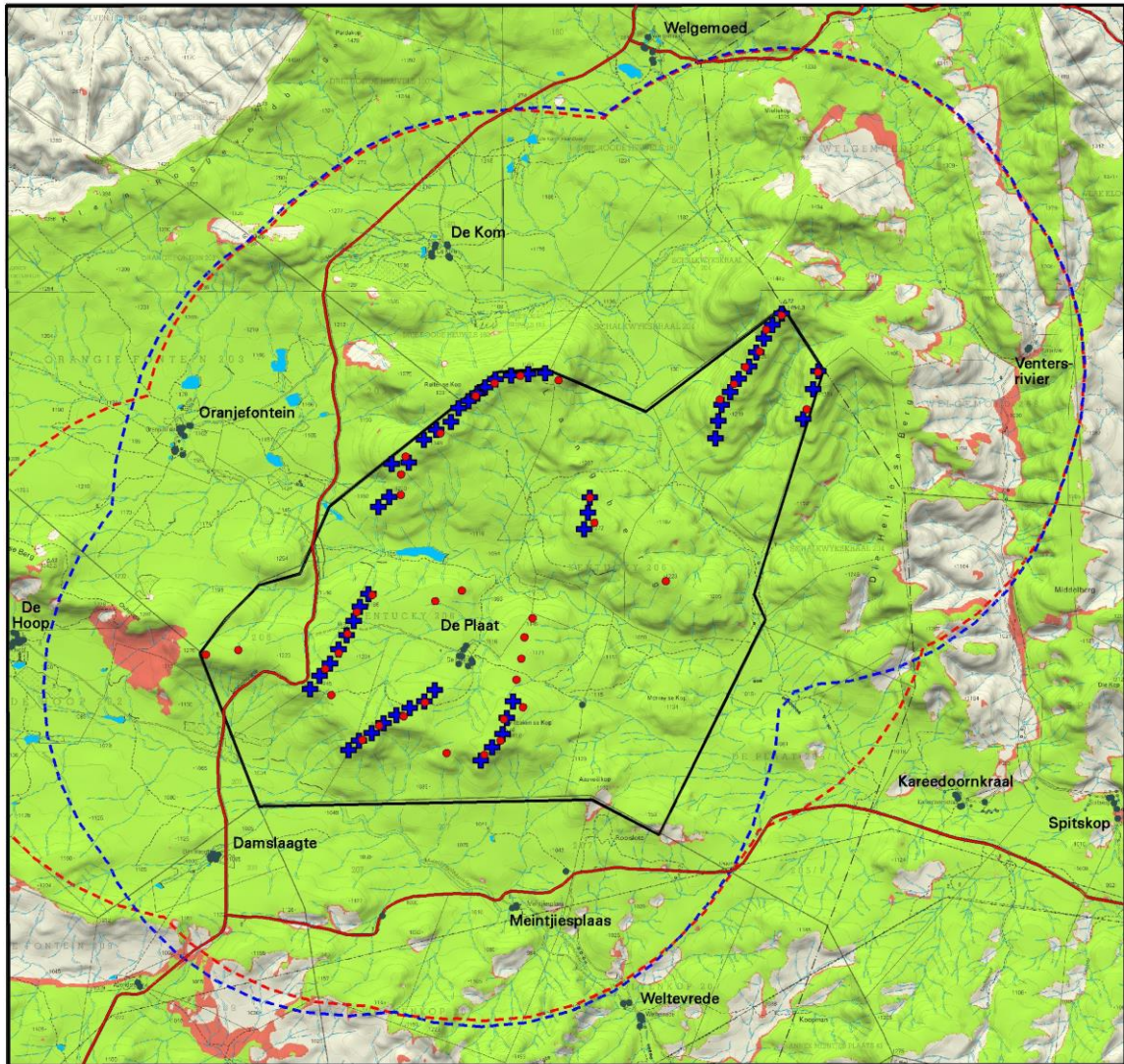
Note:

- *The homesteads marked * are located on the farms earmarked for WEF developments (i.e. Karusa, Soetwater (phases of the Hidden Valley WEF), Rietrug, Maralla and Komsberg West WEFs), assuming their approval of WEF developments.*
- *Where homesteads are derelict or deserted, the visual impact will be non-existent, until such time as it is inhabited again.*

The increased area of visual exposure does not include a significant portion of additional exposure to the secondary roads within the study area.

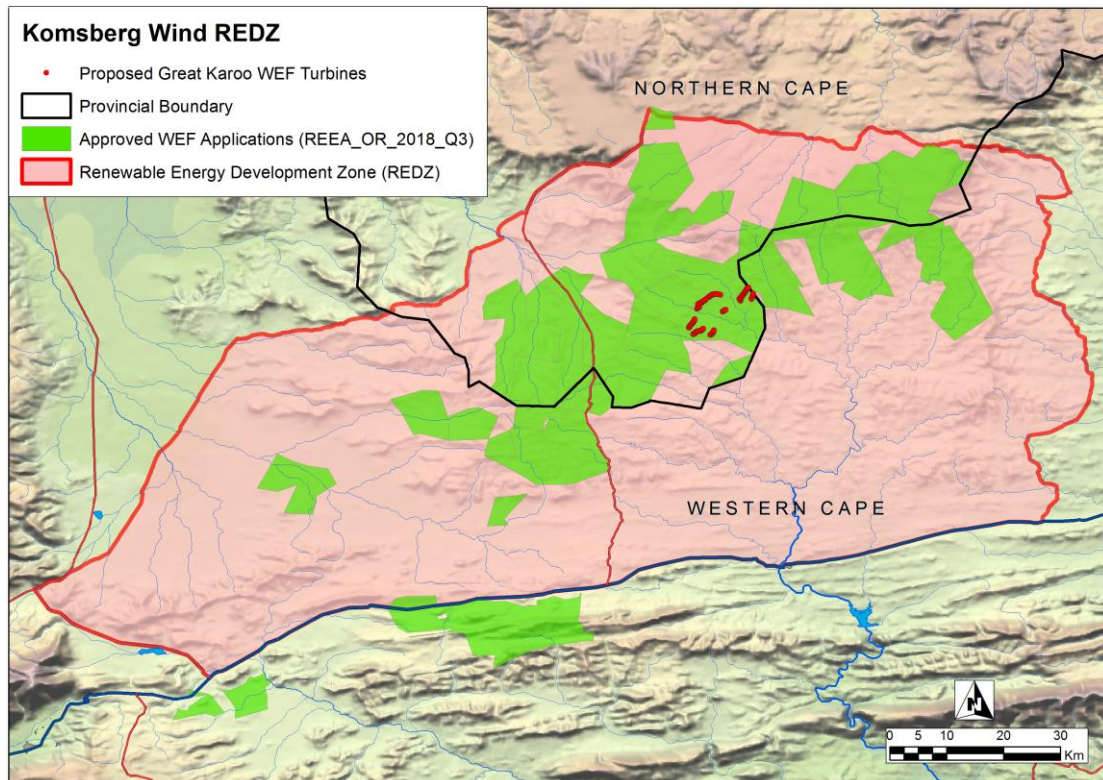
It is expected that the wind turbine structures, both the original dimensions and the proposed increased dimensions would be equally visible and noticeable from both the roads and homesteads identified above, therefore signifying a negligible change to the potential visual impact.

It is worth noting that the Great Karoo WEF is located within the Komsberg Wind Renewable Energy Development Zone (REDZ) as determined by the *Strategic Environmental Assessment for Wind and Solar Photovoltaic Energy in South Africa* (2015 – CSIR/DEA). The consolidation and concentration of the wind energy facilities within this zone is therefore preferred and the cumulative visual impact is deemed to be of an acceptable level. Refer to **Map 2**.



<p>LEGEND</p> <ul style="list-style-type: none"> Farm Identified for the Great Karoo WEF Secondary Road Non-perennial River Residence/Homestead Authorised Wind Turbine Position (2016) Proposed Wind Turbine Position (2019) 	<p>COMPARATIVE VIEWSHED ANALYSIS</p> <ul style="list-style-type: none"> Potential Visual exposure for: Authorised Wind Turbine Layout - 120m hub-height - 140m rotor diameter Potential additional area of exposure for: Amended/Proposed Wind Turbine Dimensions - 150m hub-height - 180m rotor diameter Observer's respective proximity to the WEF layouts (5km buffer) <p>Notes: - Visual exposure calculated from maximum blade tip height above ground level (i.e. sequentially 190m and 240m agl)</p>	
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Map 1: Comparative Viewshed Analysis – Great Karoo Wind Energy Facility.



Map 2: The location of the Great Karoo WEF in the Komsberg Wind REDZ.

5. COMPARATIVE VISUAL ASSESSMENT STATEMENT

In consideration of the proposed amendments, there is no (zero) change to the significance rating compared with the original EIA visual impact assessment report.

6. CONCLUSION/RECOMMENDATIONS

The proposed increase in the dimensions of the wind turbine structures is **not expected to significantly alter** the influence of the WEF on *areas of higher viewer incidence* (observers traveling along secondary roads within the region) or *potential sensitive visual receptors* (residents of homesteads in close proximity to the WEF).

The proposed increase in dimensions are consequently **not expected to significantly influence** the anticipated visual impact, as stated in the original VIA report (i.e. the visual impact is expected to occur regardless of the amendment). This statement relates specifically to the assessment of the visual impact within a 5km radius of the wind turbine structures (potentially **high** significance), but also generally apply to potentially **moderate** to **low** visual impacts at distances of up to 20km from the structures.

From a visual perspective, the proposed changes will therefore require no (zero) changes to the significance rating within the original visual impact assessment report that was used to inform the approved EIA. In addition to this, no new mitigation measures are required.

It is suggested that the proposed amendment to the turbine dimensions and layout be supported, subject to the conditions and recommendations as stipulated in the original Environmental Authorisation, and according to the Environmental

Management Programme and suggested mitigation measures, as provided in the original Visual Impact Assessment report.

7. REFERENCES

Council for Scientific and Industrial Research (CSIR), 2015. *The Strategic Environmental Assessment for wind and solar photovoltaic energy in South Africa.*

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

DEA, 2018. *South African Renewable Energy EIA Application (REEA) Database.*

MetroGIS (Pty) Ltd, 2012. *Hidden Valley Wind Energy Facility and associated infrastructure on a site south of Sutherland, Northern Cape Province - Visual Impact Assessment Report.*