PROPOSED ZEN WIND ENERGY FACILITY, WESTERN CAPE PROVINCE

AMENDMENT: COMPARATIVE VIEWSHED ANALYSIS AND VISUAL ASSESSMENT

Produced for:

FE Bonne Esperance (Pty) Ltd

On behalf of:

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Lourens du Plessis, a specialist in visual assessment and Geographic Information Systems, undertook the comparative viewshed analysis and visual assessment for the proposed amendment. Lourens, then director of MetroGIS (Pty) Ltd, also did the Visual Impact Assessment for the original Zen Wind Energy Facility (WEF) (submission date June 2015).

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 expertise are often utilised in Environmental Impact Assessments, State of the Environment Reports and Environmental Management Plans.

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

Savannah Environmental appointed Lourens du Plessis as an independent specialist consultant to undertake the visual assessment for the proposed amendment to the Zen Wind Energy Facility. He will not benefit from the outcome of the project decision-making.

1. INTRODUCTION

FE Bonne Esperance (Pty) Ltd is requesting the Department of Environmental Affairs (DEA) to amend the turbine specifications, in the Environmental Authorisation (EA) dated 03 November 2016 (as amended), as follows:

- Reduction in the number of turbines from **46** to **27;**
- Increase rated power of turbines from **3MW** to up to **6MW** per wind turbine generator (WTG);
- Increase rotor diameter from **122m** to up to **165m**;
- Increase hub height from **110m** to up to **140m**;
- Increase in the overall capacity of the wind energy facility from **140MW** to up to **147MW**;
- Potential increase to dimensions of the crane pad and laydown area (storage area per turbine);
- Increase in the concrete foundation from **20m x 20m x 4m** to **25m x 25m x 6m**;
- Update of the **layout**; and
- Change the **holder of the EA**.

The proposed amendment will reduce the number of wind turbines by 19, a positive when considering the overall frequency of visual exposure of the WEF.

However, the primary concern, from a visual impact perspective is the proposed increase in the dimensions of the 27 remaining wind turbines. The total maximum vertical dimension (height) of each wind turbine is expected to increase from approximately **171m** (110m hub-height + 61m blade length) to **222.5m** (140m hub-height + 82.5m blade length) above ground level. This translates to a total **51.5m** 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 there are any positive visual impacts associated with the removal of 19 wind turbines;
- 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 and revised layout. 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 settlements (e.g. Saron), homesteads (farm residences and dwellings) within the study area, and observers travelling along the arterial (R44) and secondary roads traversing near or over the proposed development site.

4. RESULTS OF THE COMPARATIVE VIEWSHED ANALYSIS

Potential visual exposure

A visibility analysis was undertaken from each of the wind turbine positions (46 in total) at an offset of 171m (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 222.5m to indicate the visual exposure (shown in red) of the increased turbine dimensions and reduced number of turbines (27 in total). The results of the visibility analyses are displayed on **Map 1** below.

It is clear that the approximately **30.1%** 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 predominantly flat topography of the surrounding landscape. The surface area (within the study area) of the original turbine exposure is **292km^2**, compared to the **296km^2** of the increased dimensions of the wind turbine exposure. This is an increase of

4km², or alternatively, an increase of less than **1.5%** in potential visual exposure.

Sensitive visual receptors

There are no additional sensitive visual receptors located within the area of increased visual exposure. Potential sensitive visual receptors (identified during the IEA phase) include:

- Goedertrou
- Dagbreek
- Ebenaeser
- Nuwerus
- Leeuvlei
- Nuwedrif
- Wolwekloof
- Plato
- Moredou
- Frisgewaagd (1)
- Frisgewaagd (2)
- Nuwewater
- Gouda
- Ons Rust
- Bellevue
- La Bonne Esperance
- Skutplaas
- Hartebeeskraal
- Goedverwag
- Groenvlei
- Sandgat
- La Gratitude
- Kleinbergrivier
- Ruigtevlei
- Klipdrift
- Skoenmakersfontein
- Molenaarsdrift
- Rhenostervlei
- Kruispad
- Langkloof
- Klein Bakoven
- The Junction
- Morester
- Arbeidgenot
- Die Eiland
- Kleindrift
- Vier-en-twintigriviere (1)
- Vier-en-twintigriviere (2)
- De Molen
- Ertjieskloof
- De Hoop
- De Mond (added for this amendment – informed by the Comparative Heritage Assessment)
- Saron
- Observers travelling along the R44 arterial road and secondary roads within the region

Notes:

The location of La Gratitude, Kleinbergrivier, De Mond and La Bonne Esperance on properties earmarked for existing or potential WEF developments, assumes these land owners' approval of WEF developments, and reduces the probability of this impact occurring.

The residents of Saron have not objected to the development of the WEF, and the residential (built-up) nature of the town is expected to contain the visual impact to acceptable levels.

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

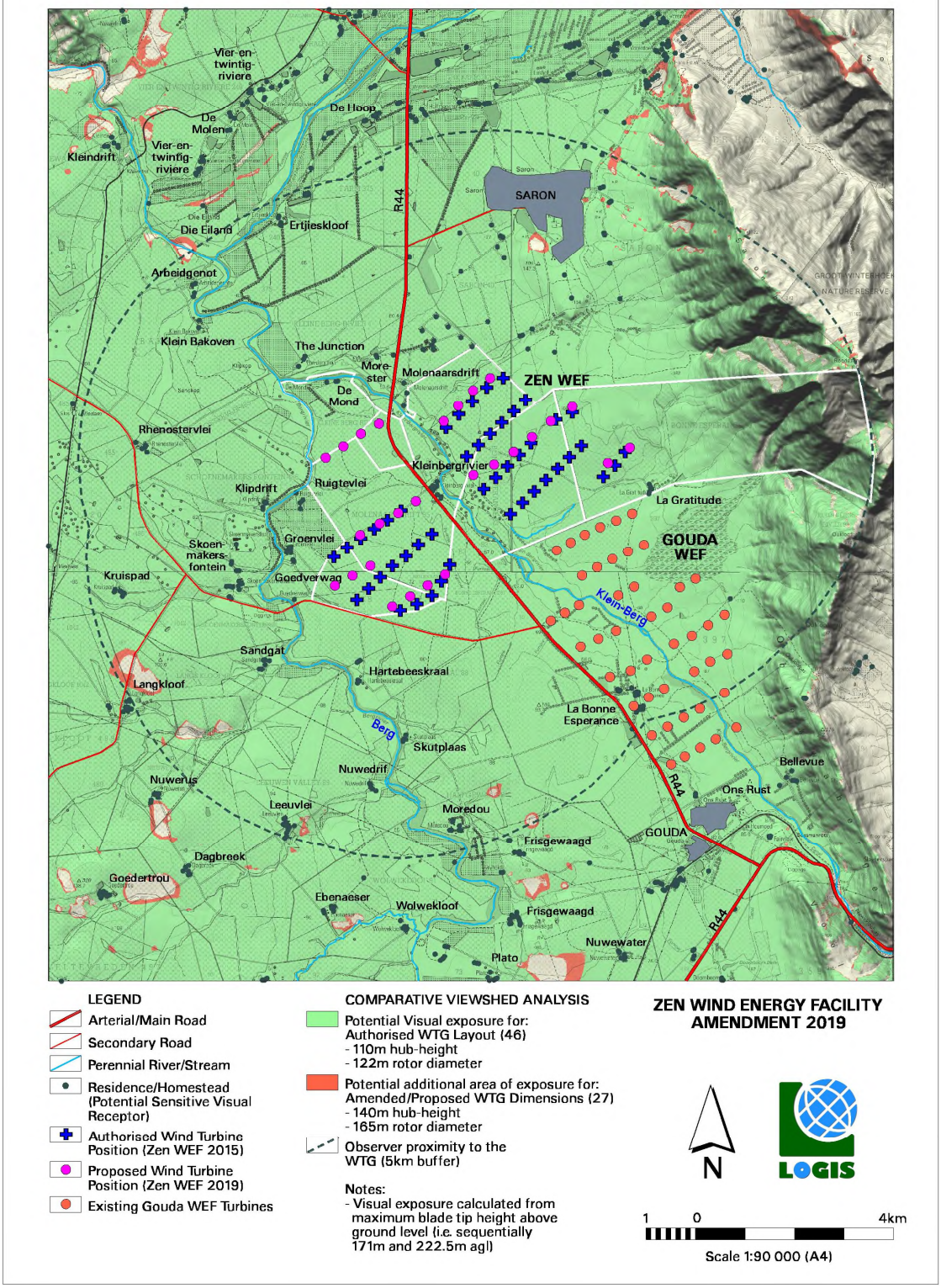
The increased area of visual exposure does not include any additional exposure to major roads within the study area.

In spite of the reduction in the number of turbines 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. This signifies a negligible change to the overall potential visual impact, which remains ***high***.

Cumulative visual impact

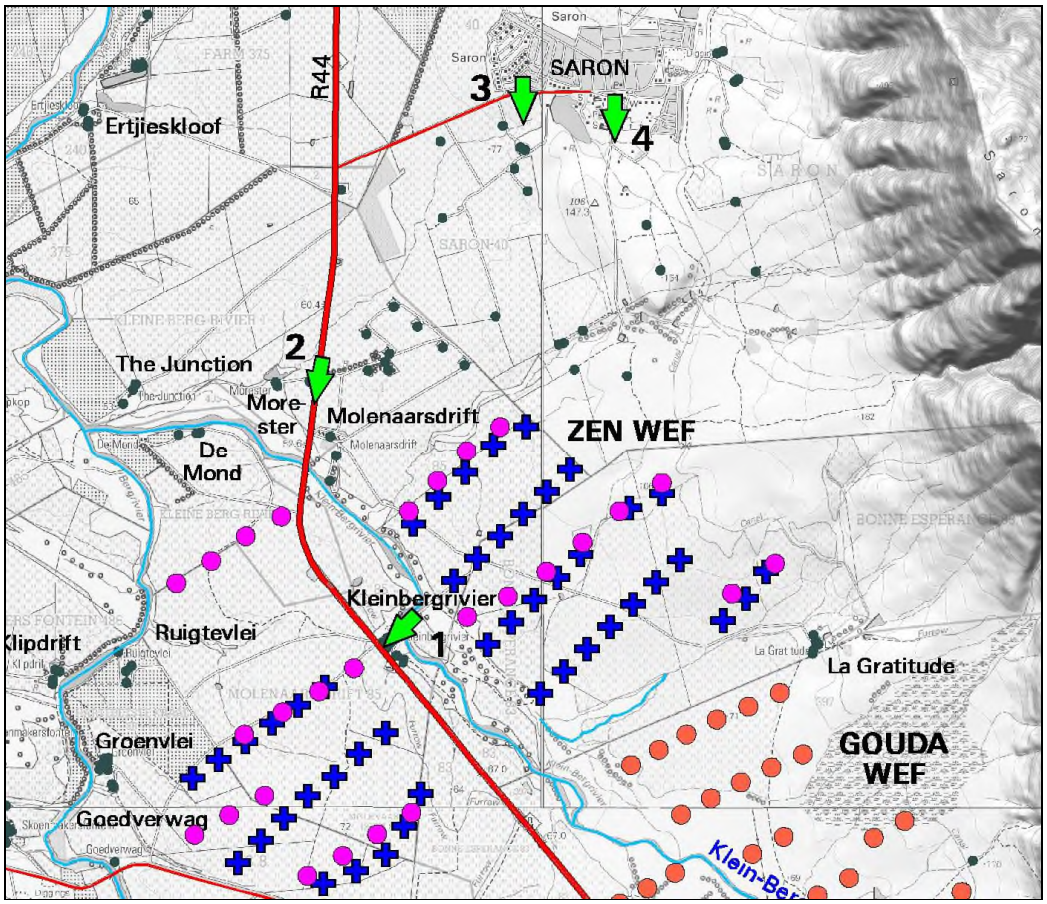
It is worth noting that the Zen WEF is located immediately north of the Gouda WEF (an existing visual disturbance) and the authorised INCA WEF (located west of the Gouda WEF). The close proximity of these three WEFs to each other is considered to consolidate and concentrate the wind energy generation infrastructure within this locality, as opposed to scattering it throughout the region (i.e. if they were placed beyond a 5km radius of each other). The placement of the Zen WEF within this zone is therefore preferred and the cumulative visual impact is deemed to be of an acceptable level.

However, this area (i.e. the landscape located between Gouda and Saron), may fast be approaching its capacity or threshold to accommodate wind energy infrastructure. This statement considers the wind turbines from the existing Gouda WEF, as well as potential future wind turbine structures associated with the authorised INCA and Zen WEFs. The construction of any additional WEFs may exacerbate the potential cumulative visual impact and adversely transform the visual quality and landscape character of the area for the operational life spans of the WEFs.



Map 1: Comparative Viewshed Analysis – Zen Wind Energy Facility.

5. PHOTO-SIMULATIONS



Map 2: Photo Positions.

The photo-simulations were undertaken, additional to the comparative viewshed analyses, in order to visualise the approved wind turbine layout and dimensions and the proposed amended layout and dimensions during the operational phase of the WEF. The photograph positions (viewpoints) are indicated on **Map 2** above. Refer to **Appendix 1** for the larger scale photo simulations.

Figure 1: Viewpoint 1 – authorised wind turbine dimensions and layout.

Figure 2: Viewpoint 1 – proposed amended wind turbine dimensions and layout.

Viewpoint 1 is located at the *Kleinbergrivier* homestead (located on one of the farm portions earmarked for the development). The proposed amended layout will place the slightly larger wind turbines in closer proximity to the homestead, but fewer turbines may be visible due to the reduction of the overall number of turbines. Even though it is assumed that the land owner approves of the WEF development, this site is indicated as a cultural historical feature by the Comparative Heritage Assessment report, and should be referred to for additional potential visual impacts associated with its heritage status.

Figure 3: Viewpoint 2 – authorised wind turbine dimensions and layout.

Figure 4: Viewpoint 2 – proposed amended wind turbine dimensions and layout.

Viewpoint 2 is representative of views of the wind turbine structures by observers travelling along the R44 arterial road, for respectively the approved turbine layout and the proposed amended layout. As the road traverses over the WEF development site, both the layouts will provide clear views of turbines at varying distances, on either side of the road.

Figure 5: Viewpoint 3 – authorised wind turbine dimensions and layout.

Figure 6: Viewpoint 3 – proposed amended wind turbine dimensions and layout.

Viewpoint 3 provides a longer distance (approximately 3.4km at the closest) view of the wind turbine structures, from the main access road to Saron. Both the authorised and proposed amended turbine structures will be visible, notwithstanding the fact that the number of turbines and the dimensions thereof differs.

Figure 7: Viewpoint 4 – authorised wind turbine dimensions and layout.

Figure 8: Viewpoint 4 – proposed amended wind turbine dimensions and layout.

Views of the WEF from the southern outskirts of Saron (e.g. from the cemetery) may be partially obstructed by planted vegetation cover, the hill south of Saron and by built structures. The taller amended wind turbines may however be slightly more exposed above the skyline, depending on the exact position of the observer.

6. 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. The reduction in the number of wind turbines is expected to reduce the frequency of visual exposure to some extent, although the remaining (larger) turbines are expected to remain visible within a 5km radius of the WEF.

7. 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 the secondary roads within the

region) or *potential sensitive visual receptors* (residents of homesteads in close proximity to the WEF).

The proposed increase in turbine dimensions and the reduction in the number of turbines 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 to the turbine dimensions and turbine layout 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.

8. REFERENCES/DATA SOURCES

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

MetroGIS (Pty) Ltd, 2012 (Amended May 2013). Proposed Zen Wind Energy Facility. *Western Cape Province - Visual Impact Assessment Report.*

Savannah Environmental (Pty) Ltd, 2015. *Proposed Zen Wind Energy Facility & Associated Infrastructure on a site near Saron, Western Cape (Amended Final EIA Report).*

APPENDIX 1 – Enlarged Photo Simulations

Figure 1

Figure 2

Figure 3

Figure 4

Figure 5

Figure 6

Figure 7

Figure 8