

SOUTH AFRICAN RENEWABLE GREEN ENERGY (PTY) LTD

**NOBELSFONTEIN WIND ENERGY FACILITY, WITHIN THE UBUNTU AND  
BEAUFORT WEST LOCAL MUNICIPALITIES, NORTHERN CAPE PROVINCE  
PROPOSED AMENDMENT TO THE AUTHORISED TURBINE NUMBER AND  
TURBINE DIMENSIONS**

**VISUAL IMPACT ASSESSMENT ADDENDUM**

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**Prepared by:**

Environmental Planning and Design  
P.O. Box 50910,  
Musgrave Road, 4062

Tel: 083 703 2995

Email: jon@enviroconsult.co.za

**Prepared for:**

Terramanzi Group  
5 Devon Air Close,  
Noordhoek  
7975

Tel: 021 701 5228

Fax: 086 558 1213

Email: chane@terramanzi.co.za



ENVIRONMENTAL PLANNING AND DESIGN

PO BOX 2122, WESTVILLE, 3630, SOUTH AFRICA

## Contents

1	INTRODUCTION .....	3
1.1	PROJECT LOCATION.....	3
1.2	TERMS OF REFERENCE .....	3
1.2	DOCUMENTATION .....	4
1.3	BACKGROUND OF SPECIALIST .....	4
1.4	PROCESS FOLLOWED.....	4
2	PROJECT AMENDMENT DESCRIPTION .....	6
2.1	CONTEXT .....	6
2.2	PROPOSED LOCATION OF ADDITIONAL TURNINES .....	6
2.3	POSSIBLE Landscape and Visual IMPLICATIONS OF THE PROPOSED AMENDMENT .....	6
3	VISIBILITY .....	8
3.1	APPROXIMATE LIMIT OF VISIBILITY AND VISUAL PROMINENCE .....	8
3.2	ZONES OF THEORETICAL VISIBILITY.....	9
3.3	THE INFLUENCE OF APPARENT INCREASE IN HEIGHT OF WINDTURBINES ON VIEWS .....	10
4	SHADOW FLICKER .....	16
5	REVIEW OF ORIGINAL ASSESSMENT .....	17
5.1	PRIMARY IMPACTS.....	17
5.1.1	Potential visual impact on users of national, arterial and secondary roads in close proximity (within 5km) to the facility. ....	17
5.1.2	Potential visual impact on residents of settlements and homesteads on and in close proximity (within 5km) to the facility. ....	18
5.1.3	Potential visual impact on visual receptors (users of roads and residents of settlements and homesteads) within the region. ....	19
5.1.4	Potential visual impact of substations on observers in close proximity to the facility. ....	19
5.1.5	Potential visual impact of the power lines on observers in close proximity to the facility.....	20
5.1.6	Potential visual impact of lighting at night on observers in close proximity to the facility.....	20
5.1.7	Potential visual impact of internal access roads on observers in close proximity to the facility. ...	20
5.1.8	Shadow Flicker.....	20
5.1.9	Construction.....	20
5.2	SECONDARY IMPACTS.....	21
5.2.1	Potential visual impact of the proposed facility on visual character and sense of place within the region. ....	21
5.2.2	Potential visual impact of the proposed facility on tourist routes and tourism potential within the region. ....	21
6	SUMMARY AND CONCLUSION.....	22
	REFERENCES.....	23

## APPENDICES

I ASSESSOR'S BRIEF CV

II FORMULA FOR DERIVING THE APPROXIMATE VISUAL HORIZON

## FIGURES

- 1 APPARENT REDUCTION IN SCALE OF STRUCTURES WITH DISTANCE
- 2 VP1 – VIEW FROM THE N12 (13.2KM TO THE WEST)
- 3 VP2 – VIEW OF 5.6MW TURBINES FROM BIESSIESPOORT HOMESTEAD (1.13KM TO THE NORTH)
- 4 VP2 – VIEW OF 3MW TURBINES FROM BIESSIESPOORT HOMESTEAD (1.13KM TO THE NORTH)
- 5 VP3 – VIEW FROM RISE ABOVE THE DESERT DEW HOMESTEAD (5.6KM TO THE EAST)

## MAPS

- 1 SITE LOCATION AND CONTEXT
- 2 ZTV ANALYSIS (EXISTING & PROPOSED)
- 3 ZTV ANALYSIS 180M / 220M TURBINES

## TABLES

- 1 APPROXIMATE LIMIT OF VISIBILITY
- 2 GENERAL PERCEPTION OF A WIND FARM IN AN OPEN LANDSCAPE

# **1 INTRODUCTION**

## **1.1 PROJECT LOCATION**

The Noblesfontein Wind Energy Facility (WEF) is located in the Northern and Western Cape provinces of South Africa within the Ubuntu and Beaufort West local municipalities, approximately 25km from Victoria West, 25 km South of Hutchinson and 7.5 km North of Three Sisters. The wind energy facility is on the Noblesfontein farm, which consists of 11,000 hectares of Karoo veld and comprises the following farm portions:

- Remainder of Farm Noblesfontein 227;
- Portion 3 of the Farm Noblesfontein 227;
- Portion 2 of the Farm Ezelsfontein 235;
- Portion 3 of the Farm Ezelsfontein 235;
- Portion 4 of the Farm Ezelsfontein 235;
- Remaining extent of the Farm Annex Noblesfontein 234;
- Portion 1 of the Farm Annex Noblesfontein 234; and
- Portion 1 of the Farm Rietkloofplaaten 239.

Refer to Map 1 Site Location and Context.

## **1.2 TERMS OF REFERENCE**

The Environmental Authorisation (EA) for the Nobelsfontein Wind Energy Facility project, reference 12/12/20/1993/1 was granted on the 22<sup>nd</sup> February 2012.

The Applicant is seeking authorisation for an amended project layout and wind turbine specification.

The original EA approved the construction of a WEF with up to 44 wind turbines each with a generating capacity up to 3MW, a turbine tower height of between 80m and 125m and a rotor diameter of between 90m and 110m.

To date 41 turbines have been installed on the site with this specification.

The applicant now wishes to replace the outstanding three wind turbines with two turbines with a technical specification upgraded to between 4MW and 5.6MW.

This addendum reviews the visual impact associated with the authorised turbine specification / layout and the proposed amended specification / layout. It has been prepared in a format that can be read with the findings of the original Visual Impact Assessment (VIA)<sup>1</sup> (Original VIA).

In terms of the amended National Environmental Management Act (NEMA) Act No. 107 of 1998, the proposed amendment requires environmental authorisation. A key impact to be assessed comprises the visual impact that the facility will have on surrounding areas.

Work has been undertaken in accordance with;

- a) The Government of the Western Cape Guideline for Involving Visual and Aesthetic Specialists in EIA Processes, which is the only relevant local guideline, setting various levels of assessment subject to the nature of the proposed development and surrounding landscape and

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<sup>1</sup> Metro GIS, Karoo Renewable Energy Facility, March 2011.

- b) The Landscape Institute and Institute of Environmental Management and Assessment (UK) Guidelines for Landscape and Visual Impact Assessment which provides detail of international best practice (technical methodology).

The Original VIA report is a Level 4 Assessment in accordance with the Western Cape Guidelines. The Addendum Report has been undertaken at the same level.

## **1.2 DOCUMENTATION**

This document must be read in conjunction with:

- The original Visual Impact Assessment for reference to the project location, background, analysis of the existing landscape, sensitive receptors, methodology and the original assessment of visual impacts associated with the original WEF proposal.
- The original Environmental Authorisation for reference to the authorised turbine number and specification.

## **1.3 BACKGROUND OF SPECIALIST**

Jon Marshall qualified as a Landscape Architect (Dip LA) at Cheltenham (UK) in 1979. He has been a chartered member of the Landscape Institute UK since 1986. He is also a Registered Landscape Architect and has had extensive experience as an Environmental Assessment Practitioner within South Africa.

During the early part of his career (1981 - 1990) he worked with Clouston (now RPS) in Hong Kong and Australia. During this period he was called on to prepare visual impact assessment (VIA) input to numerous environmental assessment processes for major infrastructure projects. This work was generally based on photography with line drawing superimposed to illustrate the extent of development visible.

He worked in the United Kingdom (1990 - 1995) for major supermarket chains including Sainsbury's and prepared CAD based visual impact assessments for public enquiries for new store development. He also prepared the VIA input to the environmental statement for the Cardiff Bay Barrage for consideration by the UK Parliament in the passing of the Barrage Act (1993).

His more recent VIA work (1995 to present) includes a combination of CAD and GIS based work for a new international airport to the north of Durban, new heavy industrial operations, overhead electrical transmission lines, mining operations in West Africa and numerous commercial and residential developments.

VIA work undertaken during the last twelve months includes VIA input for numerous solar plant projects (CSP and PV), a new coal fired power station as well as electrical infrastructure.

A brief Curriculum Vitae outlining relevant projects is included as **Appendix I**.

## **1.4 PROCESS FOLLOWED**

The following process was followed;

- The Original VIA document was reviewed;
- A desktop analysis utilising aerial photography and the Global Mapper GIS system was conducted in order to familiarise the assessor with the site, visual receptors and sensitive landscapes;

- A new GIS analysis was undertaken in order to compare the visibility of the proposed wind turbines with the originally proposed wind turbines;
- 3D CAD modelling and preparation of simulations for the proposed wind turbines was undertaken in order to compare their visual impact with the originally proposed wind turbines; and
- This addendum report was then prepared.

## **2 PROJECT AMENDMENT DESCRIPTION**

### **2.1 CONTEXT**

Forty one (41) of the authorised forty four 44 authorised wind turbines have been installed at Nobelsfontein.

In addition to the Nobelsfontein WEF, the Original VIA includes another proposed WEF (Modderfontein) on a site immediately to the east of Nobelsfontein. Environmental Authorisation has also been granted for Modderfontein.

### **2.2 PROPOSED LOCATION OF ADDITIONAL TURBINES**

It is proposed to install 2 additional turbines within the authorised Nobelsfontein site boundary as indicated on **Map 1. Site Location and Context**.

As indicated in Section 1, it is proposed that in place of the three authorised 3MW turbines two larger turbines between 4MW and 5.6MW are installed.

The 5.6MW turbine has a rotor diameter of 165m and a maximum hub height of 137.5m. The maximum height therefore will be 220m.

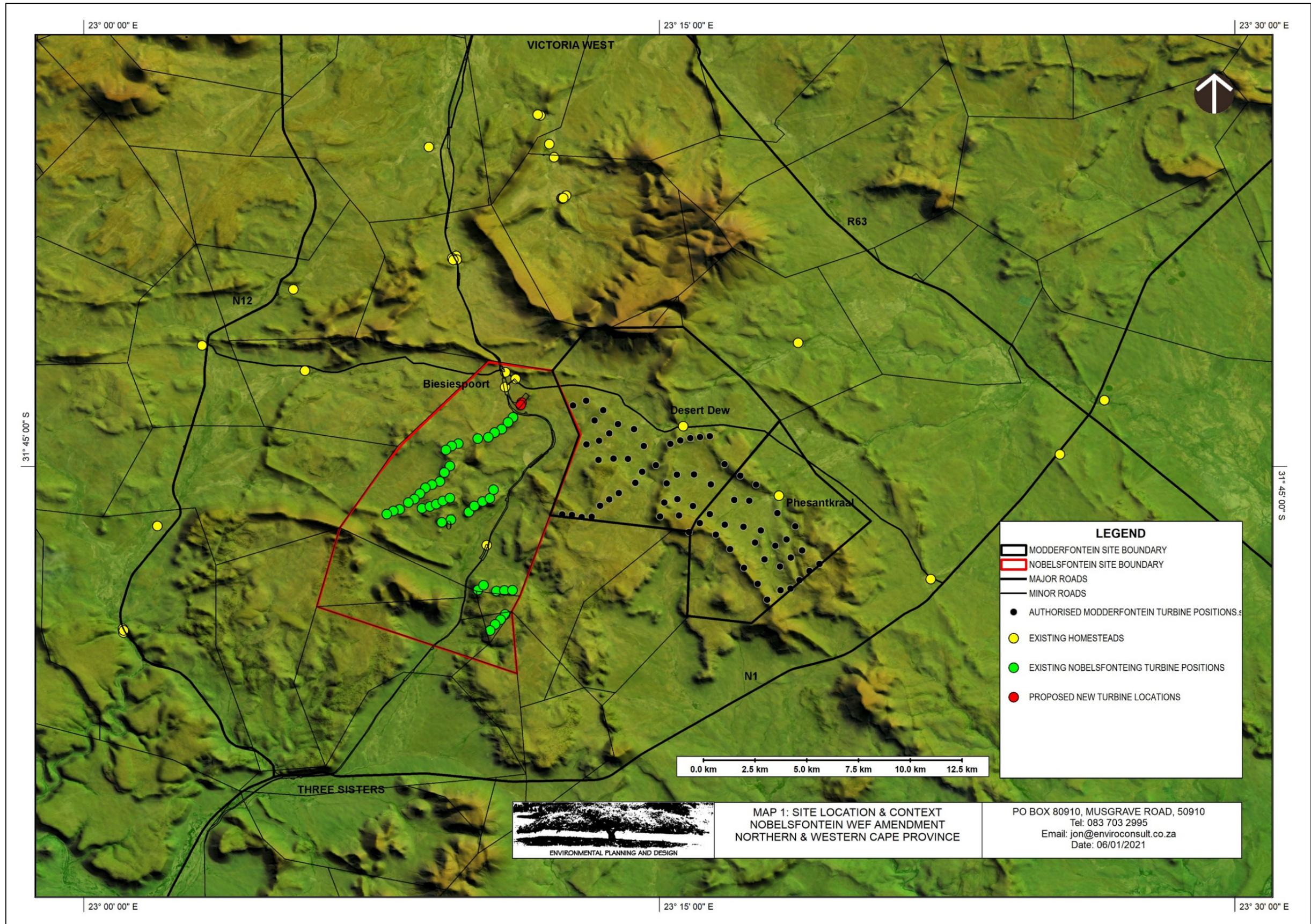
Therefore, the proposed additional turbines are approximately 40m higher than the currently authorised turbines.

### **2.3 POSSIBLE LANDSCAPE AND VISUAL IMPLICATIONS OF THE PROPOSED AMENDMENT**

Possible landscape and visual implications include:

- a) Due to the larger size of turbines, it is possible that they may be visible over a wider area than the smaller authorised structures;
- b) Due to the larger size of turbines, it is possible that they may more obvious than the smaller authorised structures;
- c) Due to the larger size of turbines, it is possible that they may affect a greater number of stakeholders with shadow flicker than the smaller authorised structures;

The general construction methodology, associated infrastructure and phasing will all be as described in the Original VIA.



### 3 VISABILITY

#### 3.1 APPROXIMATE LIMIT OF VISIBILITY AND VISUAL PROMINENCE

The affected landscape is comprised of the area over which the development will be visible. In order to provide an initial focus for the updated assessment an approximate limit of visibility has been defined based on the height of turbines in order to determine their visual horizon that is limited by the curvature of the earth.

This has been calculated using a universally accepted navigational calculation (refer to **Appendix II**). Using this formula the distance within which the structures might be visible or the Approximate Limit of Visibility (**ALV**) within a flat landscape is indicated in the table below:

**Table 1 – Approximate Limit of Visibility**

<b>STRUCTURE</b>	<b>ALV</b>
Proposed Turbine Height 220m	53.0km
Authorised Turbine Height 180m	47.9km

It is acknowledged that the landscape within which the development is proposed is not flat. However, the nature of the structures being a relatively slim and light coloured is such that they are likely to be indiscernible from its background well within these distances.

It is difficult to be precise about the exact area of visual influence as in reality visibility could be affected by:

- Weather conditions that limit visibility including hazy conditions during fine weather as well as mist and rain; and
- Scale and colour of individual elements making it difficult to differentiate structures from background.
- The fact that as a viewer approaches the limit of visibility only a small portion of the development will be visible to the extent that it is likely to be indiscernible to the human eye.

Internationally research has been undertaken by planning authorities to help guide the development of Wind Energy Facilities (WEFs). In Scotland, which is a country that has extensive natural upland areas that have been subject to large scale WEF development, the Scottish Executive, Development Department have published numerous Planning Advisory Notes (PANs) to help guide this type of development. Their PAN 45, describes public perceptions towards WEFs based on distance. These perceptions are indicated in the table below:

**Table 2 - General Perception of a Wind Farm in an Open Landscape**

<b>Distance</b>	<b>Visual Perception of Turbines</b>
Up to 4 km (Short Distance)	Likely to be a prominent feature
4-10 km (Mid Distance)	Relatively prominent
10-20 km (Long Distance)	Only prominent in clear visibility – seen as part of the wider landscape

Distance	Visual Perception of Turbines
20-30+ km	Only seen in very clear visibility – a minor element in the landscape

(Extract from Scottish Executive PAN 45)

PAN 45 clearly indicates that whilst a WEF may be visible over an extensive area, it is only mid to short distance views (up to 10km) over which they are generally prominent.

### 3.2 ZONES OF THEORETICAL VISIBILITY

Zones of Theoretical Visibility (ZTV) are defined as “a map usually digitally produced showing areas of land within which a development is theoretically visible”<sup>2</sup>.

ZTVs of the authorised and proposed developments have been assessed using Global Mapper GIS.

The detailed location of the existing and proposed Nobelsfontein turbines have been provided by the developer.

In order to generate the ZTV for the authorised and proposed projects, points were set at the each turbine location with an offset equal to the overall height of the authorised and proposed structures.

A 2.0m offset has been used in the analysis in order to approximate the eye level of receptors.

Whilst the ZTV has been calculated from terrain data only, existing vegetation may have a modifying effect on the areas indicated. It should be noted however that the landscape within which the project is set is relatively barren and it is likely that the landform will be the main constraint in terms of visibility.

**Map 2** indicates the relative ZTV of two 3MW turbines (authorised specification) relative to the proposed larger 5.6MW turbines located as proposed by the Applicant.

**Map 3** indicates the ZTV of the existing forty one 3MW Nobelsfontein turbines relative to the proposed larger two 5.6MW turbines located as proposed by the Applicant.

**The ZTV of the proposed turbines compared with the ZTV of the authorised turbines highlights the fact that due to their additional height, the proposed turbines are likely to be visible over a slightly greater distance.**

**The ZTV of the proposed 5.6MW turbines compared with the ZTV of the existing 3MW Nobelsfontein Turbines indicates that the proposed turbines will be visible to areas of the landscape and receptors to which the existing turbines are currently visible. Therefore they will not extend the area ZTV of the current WEF development.**

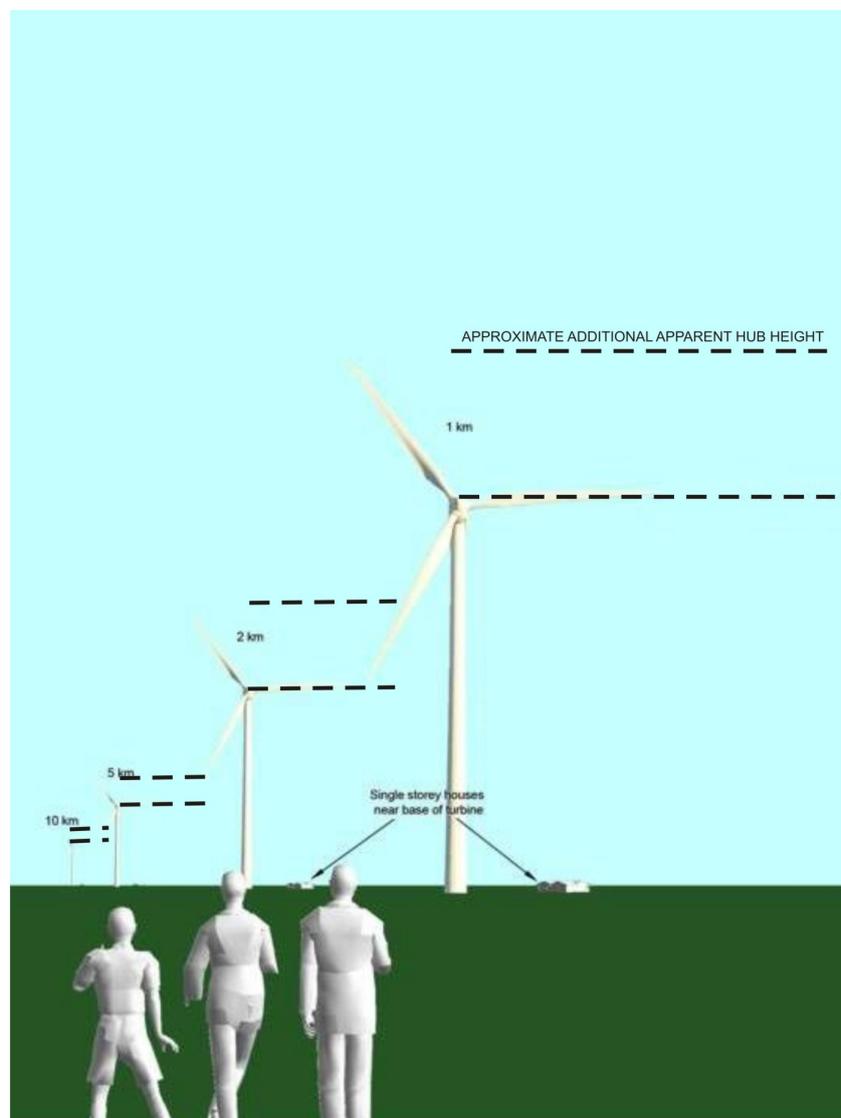
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<sup>2</sup> UK Guidelines

### 3.3 THE INFLUENCE OF APPARENT INCREASE IN HEIGHT OF WINDTURBINES ON VIEWS

**Figure 1 (Apparent Reduction in Scale of Structures with Distance)**, indicates the way that the relative scale of proposed structures will reduce with distance. From reference to this diagram, it is suggested that the proposed structures are likely to be more imposing in the landscape within 10km. At greater distances the apparent difference is likely to be negligible. The original Visual Impact Assessment identified a **High Impact Zone** within 5km and a **Moderate Impact Zone** within 10km of the authorised turbines. This tends to reinforce the general guideline provided by PAN 45.

A 10km and a 5km buffer are indicated on Maps 1 and 2 in order to highlight the extents of these impact zones.



**FIGURE 1, APPARENT REDUCTION IN SCALE OF STRUCTURES WITH DISTANCE**

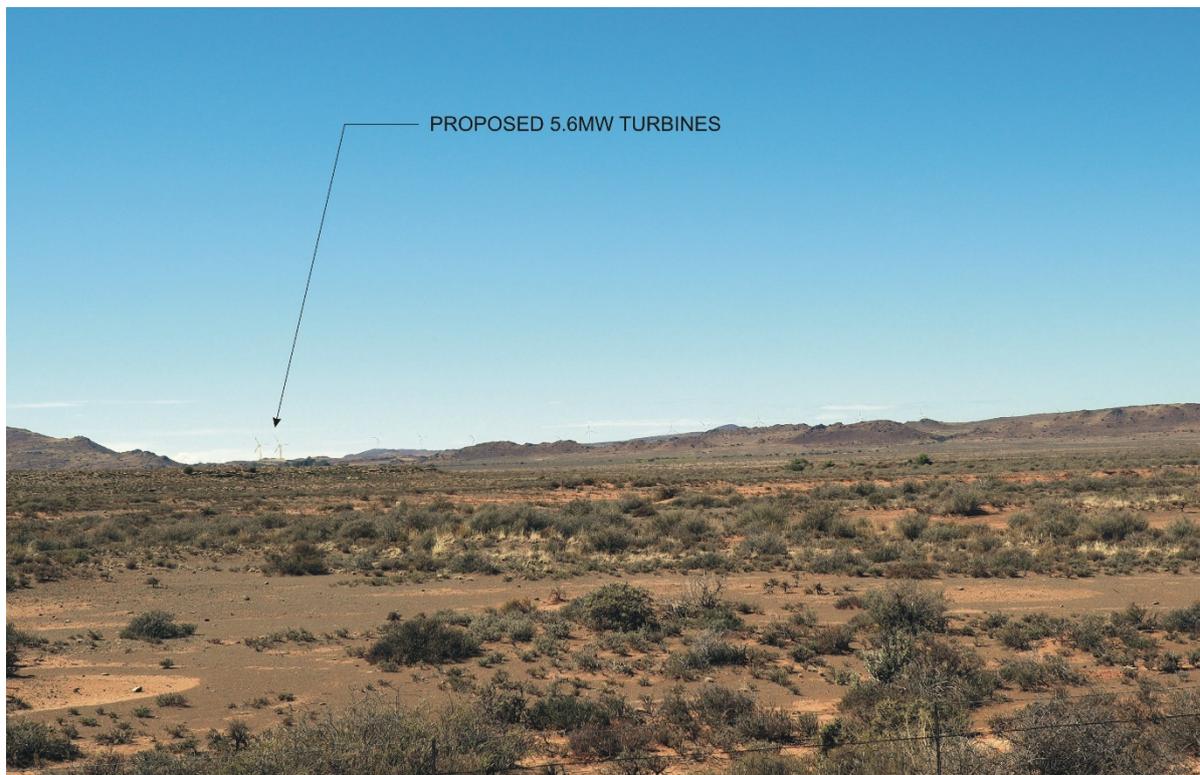
From the ZTV analysis it is obvious that the additional impact associated with the increased height of the two proposed 5.6MW turbines is unlikely to be obvious to the main roads in the area including the N1, N12 and R63.

It may however be obvious to the Biessiespoort group of homesteads as well as a section of the minor road that links the N1 to the N12 via Biessiespoort.

In order to investigate the level of visual impact associated with the two proposed 5.6MW turbines, simulations have been prepared from each of the impact zones.

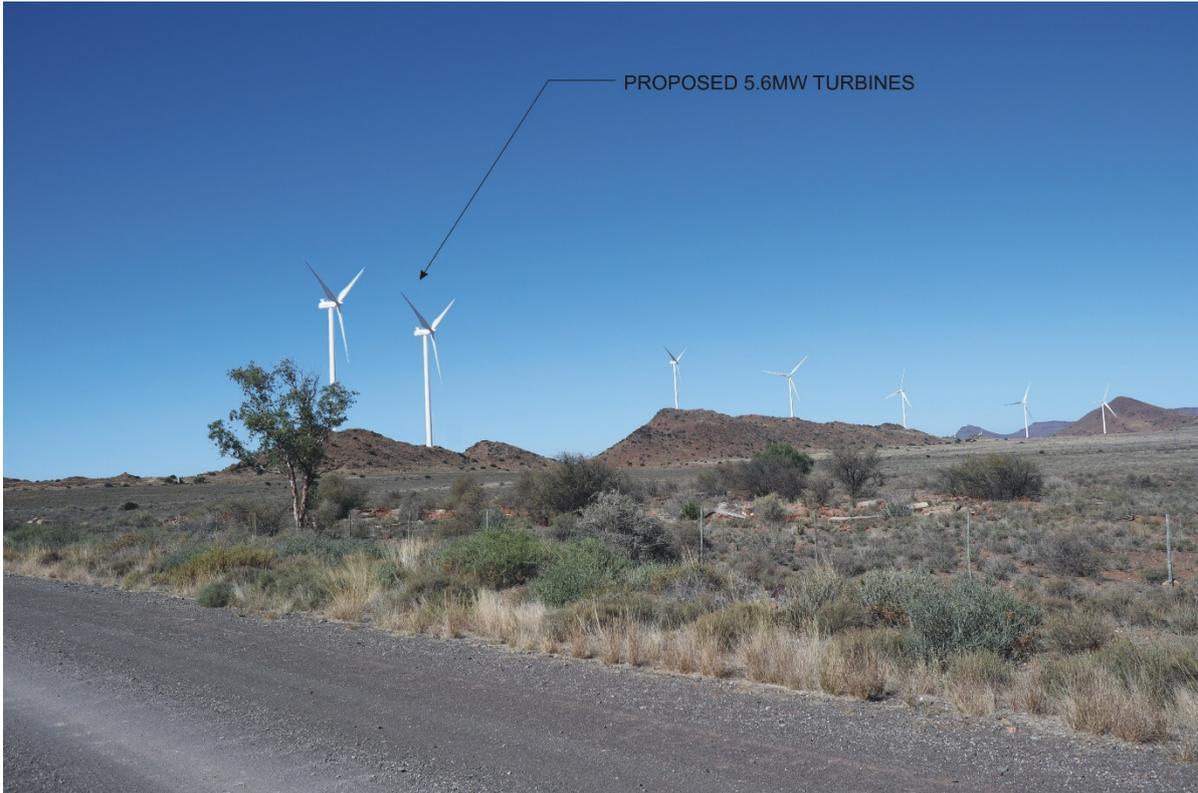
From the simulations the level of visual impact from the Moderate Impact Zone and the Low Impact Zone is not considered significant is similar in nature to the impact associated with the existing 3MW turbines.

From the High Impact Zone however, the proposed turbines are likely to be obviously more visually imposing than the existing 3MW turbines. In order to be able to compare this with the likely impact of installing authorised 3MW turbines in place of the proposed 5MW turbines, both alternatives are simulated.



**FIGURE 2, VP1 – VIEW FROM THE N12 (13.2KM TO THE WEST)**

The proposed 5.6MW turbines are likely to have a similar impact as the existing turbines.



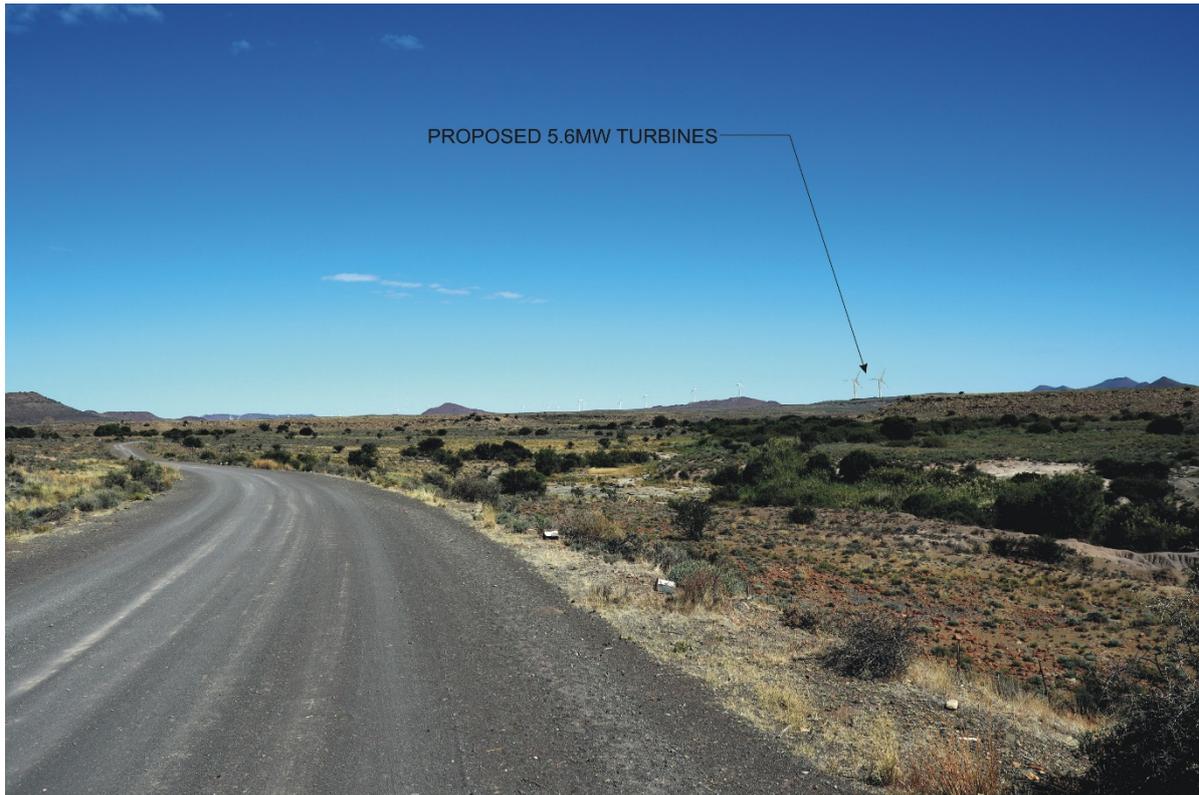
**FIGURE 3, VP2 – VIEW OF 5.6MW TURBINES FROM BIESSIESPOORT HOMESTEAD (1.13KM TO THE NORTH)**

The proposed 5.6MW turbines will be more visually imposing than the existing turbines.



**FIGURE 4, VP2 – VIEW OF 3MW TURBINES FROM BIESSIESPOORT HOMESTEAD (1.13KM TO THE NORTH)**

The authorised 3MW turbines will be marginally less imposing than the proposed 5.6MW turbines.



**FIGURE 5, VP3 – VIEW FROM RISE ABOVE THE DESERT DEW HOMESTEAD (5.6KM TO THE EAST)**

The proposed 5.6MW turbines will be marginally more visually imposing than the existing turbines.

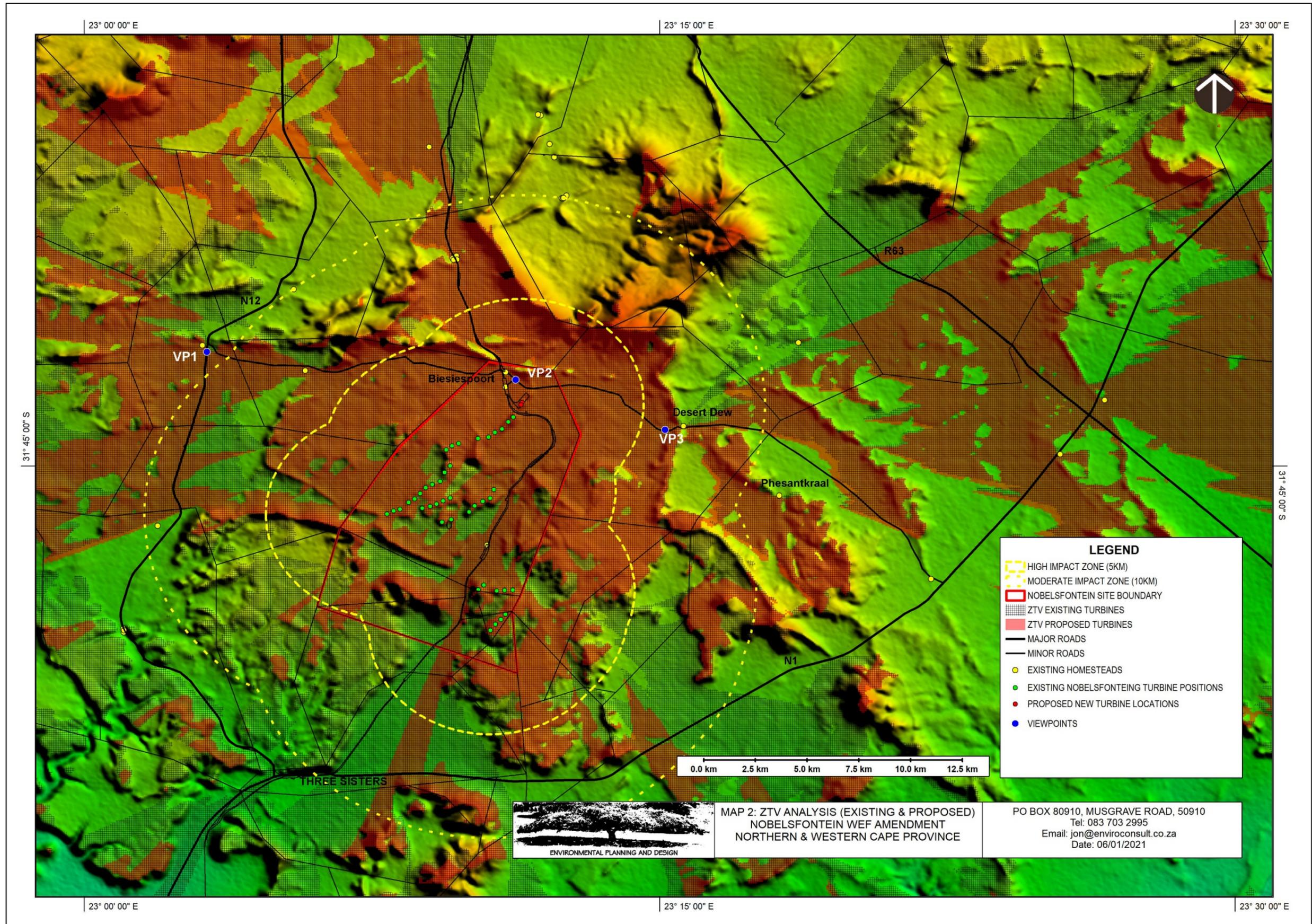
**Locations of the viewpoints simulated are indicated on Maps 2 and 3.**

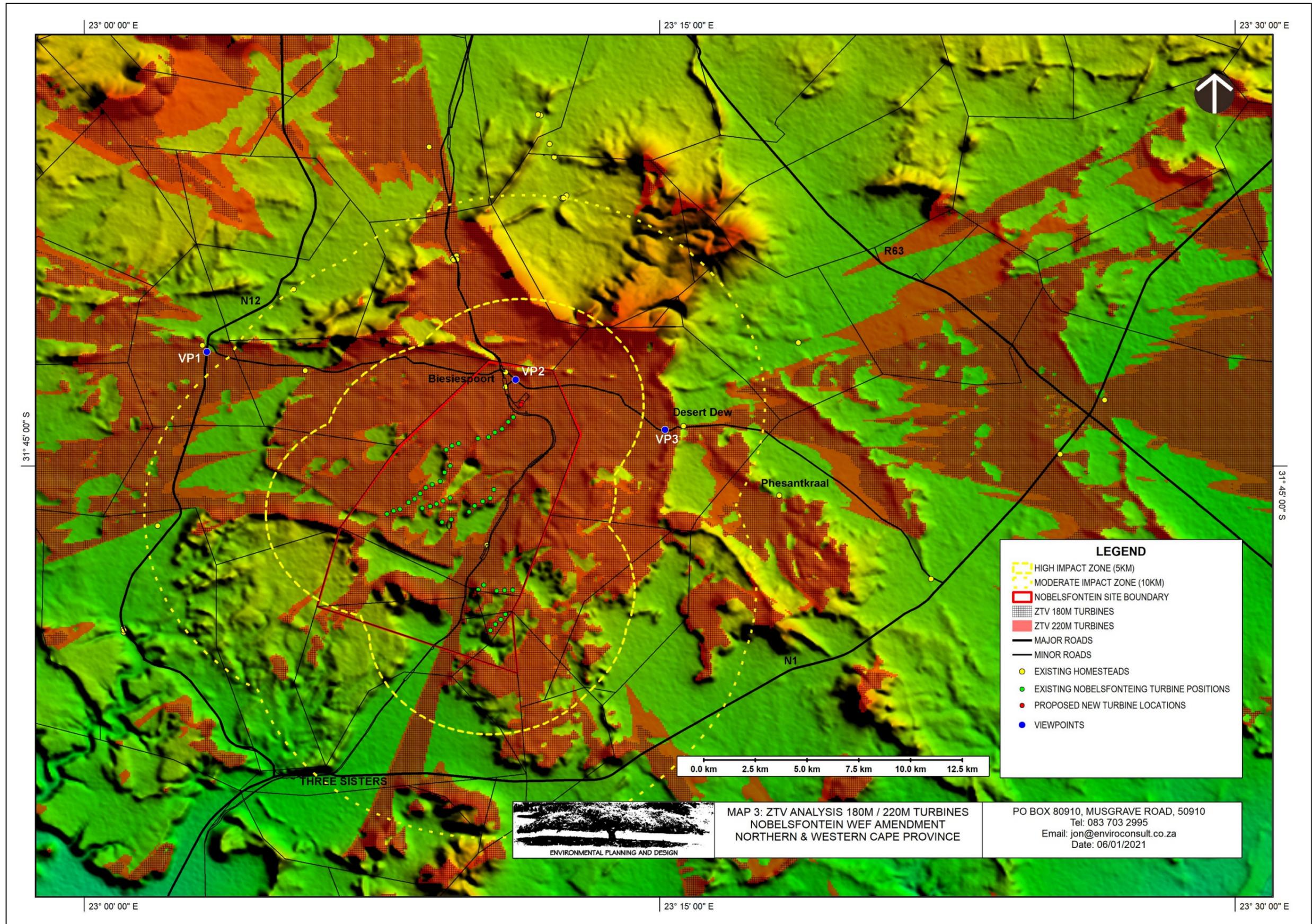
From the simulations the following conclusions can be drawn:

**From VP1** which is located outside the Moderate Impact Zone as identified by the Original VIA, The proposed 5.6MW turbines are unlikely to have any significant visual impact.

**From VP2** which is located within the High Impact Zone as identified by the Original VIA, The proposed 5.6MW turbines will be more visually imposing than the existing 3MW turbines, however they are only likely to be slightly more imposing than the authorised 3MW turbines in the same position.

**From VP3** which is located within the Moderate Impact Zone as identified by the Original VIA, The proposed 5.6MW turbines are only likely to be slightly more visually imposing than the existing 3MW turbines.





## 4 SHADOW FLICKER

The Original VIA provided the following description and analysis of areas that are likely to be affected by shadow flicker:

***Shadow flicker occurs when the sky is clear and when rotor blades of a wind turbine are between the sun and the receptor (i.e. when the sun is low). As the rotor blades move, the receptor will experience a flicker of light and shadow as the blade passes in front of the sun. The flicker of shadow and light could be experienced as disturbing and irritating.***

***De Gryse in Scenic Landscape Architecture (2006) found that "most shadow impact is associated with 3-4 times the height of the object". Based on this research, a 500m buffer along the edge of the facility is submitted as the zone within which there is a risk of shadow flicker occurring.***

Given the proposed increased height of the turbine structures this buffer should increase to 964m. All homesteads are located in excess of this distance from the proposed 5.6MW turbines.

## 5 REVIEW OF ORIGINAL ASSESSMENT

This section reviews the Original VIA assessment based on the analysis of the potential change in view of the wind turbines and shadow flicker associated with the proposed specification and layout amendment.

In order that the reports can be directly compared, the sub-headings are as indicated in the Original VIA.

Because the Original VIA considered the Modderfontein WEF, Solar PV development with the Nobelsfontein section of the project, this section provides comment as to the influence that the proposed change in the Nobelsfontein WEF will have on the overall findings. It does not re-assess the other section of the project.

### 5.1 PRIMARY IMPACTS

#### 5.1.1 Potential visual impact on users of national, arterial and secondary roads in close proximity (within 5km) to the facility.

The Original VIA indicates that:

**Potential visual impact on users of major and secondary roads in close proximity to the proposed facility is expected to be high both before and after mitigation.**

There is only one minor unsurfaced road (Biesiespoort Road) within 5km of the Nobelsfontein section of the project.

There are eleven existing turbines within 5km of the road.

The two proposed 5.6MW turbines are within 1km of the road. The proposed turbines are likely to be marginally more imposing visually than the authorised 3MW turbines. However, it needs to be considered that the **two** proposed additional 5.6MW turbines will take the place of the **three** additional authorised turbines.

The simulation from VP2 (Figure 3) indicates the likely worst case impact from the road.

When the reduced number of turbines that will be visible is also taken into account, it seems likely that the proposed amendment will result in a similar level of impact as was originally assessed.



**PLATE 1, The BIESIESPOORT ROAD LOOKING EAST FROM VP3 AT THE DESERT DEW HOMESTEAD.**

Note: The homestead is located at the base of a rise in the road, the proposed turbines will not be visible from this homestead.

### **5.1.2 Potential visual impact on residents of settlements and homesteads on and in close proximity (within 5km) to the facility.**

The Original VIA indicates that:

**The visual impact of the proposed facility on settlements and homesteads within 5km of the site is expected to be of high significance before and after mitigation.**

There are no settlements within 5km of either the existing forty one or the two proposed Nobelsfontein turbines.

There are five homesteads within 5km of the existing forty one Nobelsfontein turbines and four homesteads within 5km of the proposed turbines.

The closest homestead (Plate 2) is approximately 1.13km from the proposed 5.6MW turbines. The simulation from VP2 (Figure 4) indicates the likely nature of the impact from this homestead. This is considered the worst case impact as it is the closest homestead.

The two proposed 5.6MW turbines are within 1km of the road. The proposed turbines are likely to be marginally more imposing visually than the authorised 3MW turbines. However, it needs to be considered that the **two** proposed additional 5.6MW turbines will take the place of the **three** additional authorised turbines.

The simulation from VP2 (Figure 3) indicates the likely worst case impact from homesteads.

When the reduced number of turbines that will be visible is also taken into account, it seems likely that the proposed amendment will result in a similar level of impact as was originally assessed.



**PLATE 2, EXISTING HOMESTEAD APPROXIMATELY 1.13KM FROM PROPOSED 5.6KW TURBINES**

### **5.1.3 Potential visual impact on visual receptors (users of roads and residents of settlements and homesteads) within the region.**

The Original VIA indicates that:

**The visual impact of the proposed facility on visual receptors (users of roads and residents of settlements and homesteads) within the region (i.e. beyond 5km radius) is expected to be of moderate significance both before and after mitigation.**

The fact that the proposed 5.6MW turbines will not have a significantly greater impact than the authorised 3MW turbines outside the 5km buffer is likely to mean that the proposed additional turbines will not change the level of impact as assessed in the Original VIA.

### **5.1.4 Potential visual impact of substations on observers in close proximity to the facility.**

The Original VIA indicates that these elements are likely to have a **visual impact of low significance**.

The proposed amendment will have no effect on the location or appearance of these elements. Therefore, there will be no difference in the level of visual impact due to the proposed amendment.

#### **5.1.5 Potential visual impact of the power lines on observers in close proximity to the facility.**

The Original VIA indicates that these elements are likely to have a **visual impact of low significance**.

The proposed amendment will have no effect on the location or appearance of these elements. Therefore, there will be no difference in the level of visual impact due to the proposed amendment.

#### **5.1.6 Potential visual impact of lighting at night on observers in close proximity to the facility.**

The Original VIA indicates that these elements are likely to have a **visual impact of moderate significance without mitigation and low significance with mitigation**.

The proposed amendment will reduce the number of turbines (43 instead of 44 turbines) that will be fitted with red aircraft warning lights.

It is likely therefore that the proposed amendment will result in a marginal reduction in lighting impacts.

#### **5.1.7 Potential visual impact of internal access roads on observers in close proximity to the facility.**

The Original VIA indicates that these elements are likely to have a **visual impact of moderate significance without mitigation and low significance with mitigation**.

Due to the reduced project footprint (43 instead of 44 turbines), the proposed amendment is likely to marginally reduce the extent of internal access roads that will be required.

It is likely therefore that the proposed amendment will reduce visual impacts associated with internal access roads.

#### **5.1.8 Shadow Flicker.**

The Original VIA indicates that shadow flicker could impact on the Biesiespoort homesteads. The assessment indicates that impacts on these homesteads are improbable and are likely to have an **impact of low significance with and without mitigation**.

The closest **Biesiespoort** homestead is approximately 1.13km from the closest proposed 5.6MW turbine. This is outside the adjusted buffer area as recommended in the Original VIA.

The proposed amendment is therefore unlikely to change the level of impact as assessed in the Original VIA.

#### **5.1.9 Construction.**

The Original VIA indicates that the impacts of construction on visual receptors are likely to have a **moderate significance without mitigation and a low significance with mitigation**.

Whilst the proposed amendment will result in larger turbines, it will also result in one less turbines being constructed. In terms of construction period and disruption the difference is unlikely to be significant.

It is likely therefore that the proposed amendment will not result in a change to the level of impact as assessed in the Original VIA.

## **5.2 SECONDARY IMPACTS**

### **5.2.1 Potential visual impact of the proposed facility on visual character and sense of place within the region.**

The Original VIA indicates that the authorised project is likely to have an **impact of moderate significance** with and without mitigation.

The proposed amendment will not result in a significant increase in the assessed level of impact.

### **5.2.2 Potential visual impact of the proposed facility on tourist routes and tourism potential within the region.**

The Original VIA indicates that the authorised project is likely to have an **impact of low significance** with and without mitigation.

This is due to the fact that the authorised project will not impact on views of the local landmark known as the Three Sisters. This is a range of three hills to the south of the N1.

The authorised project also has limited impact on the N1 and N12 that are considered to be tourism routes.

The proposed amendment to the Nobelsfontein section of the project is will not increase assessed levels of impact on these receptors.

## **6 SUMMARY AND CONCLUSION**

The Environmental Authorisation (EA) for the Nobelsfontein Wind Energy Facility project, reference 12/12/20/1993/1 was granted on the 22<sup>nd</sup> February 2012.

The Applicant is seeking authorisation for an amended project layout and wind turbine specification.

The original EA approved the construction of a WEF with up to 44 wind turbines each with a generating capacity up to 3MW, a turbine tower height of between 80m and 125m and a rotor diameter of between 90m and 110m.

To date 41 turbines have been installed on the site with this specification.

The applicant now wishes to replace the outstanding three wind turbines with two turbines with a technical specification upgraded to between 4MW and 5.6MW.

The original Visual Impact Assessment was undertaken by MetroGIS (March 2011). The

The proposed change would allow development of an additional two 5.6MW wind turbines, over and above the 41 constructed, with an overall maximum height of 220m in place of the authorised additional three 3MW wind turbines.

The review indicates that the proposed change will not significantly increase levels of visual impact compared with those assessed by the Original VIA.

Therefore, from a visual impact perspective, there is no reason why the proposed amended layout and change to the turbine specification should not be authorised.

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## **APPENDIX I – ASSESSOR’S BRIEF CURRICULUM VITAE**



#### ENVIRONMENTAL PLANNING AND DESIGN

**Name** JONATHAN MARSHALL

**Nationality** British

**Year of Birth** 1956

**Specialisation** Landscape Architecture / Landscape & Visual Impact Assessment / Environmental Planning / Environmental Impact Assessment.

**Qualifications**

Education Diploma in Landscape Architecture, Gloucestershire College of Art and Design, UK (1979)  
Environmental Law, University of KZN (1997)

Professional Registered Professional Landscape Architect (SACLAP)  
Chartered Member of the Landscape Institute (UK)  
Member of the International Association of Impact Assessment, South Africa

**Languages**

<u>English</u> -	Speaking	-	Excellent
-	Reading	-	Excellent
-	Writing	-	Excellent

**Contact Details**

Post: 13 Askew Grove  
Glenwood  
Durban  
4001  
Cell: +27 83 7032995

#### General

Jon qualified as a Landscape Architect (Dip LA) at Cheltenham (UK) in 1979. He has been a chartered member of the Landscape Institute UK since 1986. He is also a Registered Landscape Architect and has had extensive experience as an Environmental Assessment Practitioner within South Africa.

During the early part of his career (1981 - 1990) He worked with Clouston (now RPS) in Hong Kong and Australia. During this period he was called on to undertake visual impact assessment (VIA) input to numerous environmental assessment processes for major infrastructure projects. This work was generally based on photography with line drawing superimposed to illustrate the extent of development visible.

He has worked in the United Kingdom (1990 - 1995) for major supermarket chains including Sainsbury's and prepared CAD based visual impact assessments for public enquiries for new store development. He also prepared the VIA input to the environmental statement for the Cardiff Bay Barrage for consideration by the UK Parliament in the passing of the Barrage Act (1993).

His more recent VIA work (1995 to present) includes a combination of CAD and GIS based work for a new international airport to the north of Durban, new heavy industrial operations, overhead electrical transmission lines, mining operations in West Africa and numerous commercial and residential developments.

VIA work undertaken during the last twelve months includes wind energy projects, numerous solar plant projects (CSP and PV) and electrical infrastructure.

## **Select List of Visual Impact Assessment Projects**

- **Geelkop Solar PV projects** – Landscape and Visual Impact Assessment for seven proposed solar PV projects near Upington in the Northern Cape Province for Atlantic Renewable Energy Partners.
- **Makapanstad Agri- Hub** – Landscape and Visual Impact Assessment for proposed Agri-Hub development at Makapanstad in the North West Province for the Department of Rural Development and Land Reform.
- **Madikwe Sky Bubble** - Landscape and Visual Impact Assessment for proposed development of up-market accommodation at the Molori concession within the Madikwe Game Reserve.
- **Hartebeest Wind Energy Facility** – Landscape and Visual Impact Assessment Addendum Report for the proposed upgrading of turbine specifications for an authorised WEF near MoOrreesburg in the Western Cape Province for a private client.
- **Selati Railway Bridge** - Landscape and Visual Impact Assessment for proposed development of up-market accommodation on a railway bridge at Skukuza in the Kruger Park.
- **Kangala Mine Extension** - Landscape and Visual Impact Assessment for a proposed extension to the Kangala Mine in Mpumalanga for Universal Coal.
- **Khunab Solar Developments** – Landscape and Visual Impact Assessment for four proposed solar PV projects near Upington in the Northern Cape Province for a private client.
- **Sirius Solar Developments** – Landscape and Visual Impact Assessment for four proposed solar PV projects near Upington in the Northern Cape Province for Sola Future Energy.
- **Aggeneys Solar Developments** – Landscape and Visual Impact Assessment for two proposed solar PV projects near Aggeneys in the Northern Cape Province for a private client.
- **Hyperion Solar Developments** – Landscape and Visual Impact Assessment for four proposed solar PV projects near Kathu in the Northern Cape Province for Building Energy South Africa.
- **Eskom Combined Cycle Power Plant** - Landscape and Visual Impact Assessment for proposed gas power plant in Richards Bay, KwaZulu Natal Province.
- **N2 Wild Coast Toll Road, Mineral Sources and Auxiliary Roads** – VIA for the Pondoland Section of this project for the South African National Roads Agency.
- **Mpushini Park Ashburton** – VIA for a proposed amendment to an authorised development plan which included residential, office park and light industrial uses to logistics and warehousing.
- **Moedeng PV Solar Project** - VIA for a solar project near Vrybury in the North West Province for a private client.
- **Establishment of Upmarket Tourism Accommodation on the Selati Bridge, Kruger National Park** – Assessment of visual implications of providing tourism accommodation in 12 railway carriages on an existing railway bridge at the Skukuza Rest Camp in the Kruger Park.
- **Jozini TX Transmission Tower** – Assessment of visual implications of a proposed MTN transmission tower on the Lebombo ridgeline overlooking the Pongolapoort Nature reserve and dam.
- **Bhangazi Lake Development** – Visual Impact Assessment for a proposed tourism development within the iSimangaliso Wetland Park World Heritage Site.
- **Palesa Power Station** - VIA for a new 600MW power station near Kwamhlanga in Mpumalanga for a private client.
- **Heuningklip PV Solar Project** – VIA for a solar project in the Western Cape Province for a private client.
- **Kruispad PV Solar Project** – VIA for a solar project in the Western Cape Province for a private client.
- **Doornfontein PV Solar Project** – VIA for a solar project in the Western Cape Province for a private client.
- **Olifantshoek Power Line and Substation** – VIA for a new 10MVA 132/11kV substation and 31km powerline, Northern Cape Province, for Eskom.
- **Noupoort Concentrating Solar Plants** - Scoping and Visual Impact Assessments for two proposed

parabolic trough projects.

- **Drakensberg Cable Car** – Preliminary Visual Impact Assessment and draft terms of reference as part of the feasibility study.
- **Paulputs Concentrating Solar Plant (tower technology)** – Visual Impact Assessment for a new CSP project near Pofadder in the Northern Cape.
- **Ilanga Concentrating Solar Plants 1, 2, 3, 4 & 5** – Scoping and Visual Impact Assessments for the proposed extension of five authorised CSP projects including parabolic trough and tower technology within the Karoshoek Solar Valley near Upington in the Northern Cape.
- **Ilanga Concentrating Solar Plants 1, 2, 3, 4 & 5 Shared Infrastructure** – Visual Impact Assessment for the necessary shared infrastructure including power lines, substation, water pipeline and roads for these projects.
- **Ilanga Concentrating Solar Plants 7, 8 & 9** - Scoping and Visual Impact Assessments for three new CSP projects including parabolic trough and tower technology within the Karoshoek Solar Valley near Upington in the Northern Cape.
- **Sol Invictus Solar Plants** - Scoping and Visual Impact Assessments for three new Solar PV projects near Pofadder in the Northern Cape.
- **Gunstfontein Wind Energy Facility** – Scoping and Visual Impact Assessment for a proposed WEF near Sutherland in the Northern Cape.
- **Moorreesburg Wind Energy Facility** – Visual Impact Assessment for a proposed WEF near Moorreesburg in the Western Cape.
- **Semonkong Wind Energy Facility** - Visual Impact Assessment for a proposed WEF near Semonkong in Southern Lesotho.
- **Great Karoo Wind Energy Facility** – Addendum report to the Visual Impact Assessment Report for amendment to this authorised WEF that is located near Sutherland in the Northern Cape. Proposed amendments included layout as well as rotor diameter.
- **Perdekraal East Power Line** – Visual Impact Assessment for a proposed power line to evacuate power from a wind energy facility near Sutherland in the Northern Cape.
- **Tshivhaso Power Station** – Scoping and Visual Impact Assessment for a proposed new power station near Lephalale in Limpopo Province.
- **Saldanha Eskom Strengthening** – Scoping and Visual Impact Assessment for the upgrading of strategic Eskom infrastructure near Saldanha in the Western Cape.
- **Eskom Lethabo PV Installation** - Scoping and Visual Impact Assessment for the development of a solar PV plant within Eskom's Lethabo Power Station in the Free State.
- **Eskom Tuthuka PV Installation** - Scoping and Visual Impact Assessment for the development of a solar PV plant within Eskom's Thutuka Power Station in Mpumalanga.
- **Eskom Majuba PV Installation** - Scoping and Visual Impact Assessment for the development of a solar PV plant within Eskom's Majuba Power Station in Mpumalanga.
- **Golden Valley Power Line** - Visual Impact Assessment for a proposed power line to evacuate power from a wind energy facility near Cookhouse in the Eastern Cape.
- **Mpophomeni Shopping Centre** – Visual impact assessment for a proposed new shopping centre close to the southern shore of Midmar Dam in KwaZulu Natal.
- **Rheebokfontein Power Line** - Addendum report to the Visual Impact Assessment Report for amendment to this authorised power line alignment located near Darling in the Western Cape.
- **Woodhouse Solar Plants** – Scoping and Visual Impact Assessment for two proposed solar PV projects near Vryburg in the North West Province.
- **AngloGold Ashanti, Dokyiwa (Ghana)** – Visual Impact Assessment for proposed new Tailings Storage Facility at a mine site working with SGS as part of their EIA team.
- **Gateway Shopping Centre Extension (Durban)** – Visual Impact Assessment for a proposed shopping centre extension in Umhlanga, Durban.

- **Kouroussa Gold Mine (Guinea)** – Visual impact assessment for a proposed new mine in Guinea working with SGS as part of their EIA team.
- **Mampon Gold Mine (Ghana)** - Visual impact assessment for a proposed new mine in Ghana working with SGS as part of their EIA team.
- **Telkom Towers** – Visual impact assessments for numerous Telkom masts in KwaZulu Natal.
- **Eskom Isundu Substation** – Visual Impact Assessment for a proposed major new Eskom substation near Pietermaritzburg in KwaZulu Natal.
- **Eskom St Faiths Power Line and Substation** – Visual Impact Assessment for a major new substation and associated power lines near Port Shepstone in KwaZulu Natal.
- **Eskom Ficksburg Power Line** – Visual Impact Assessment for a proposed new power line between Ficksburg and Cocolan in the Free State.
- **Eskom Matubatuba to St Lucia Power Line** – Visual Impact Assessment for a proposed new power line between Mtubatuba and St Lucia in KwaZulu Natal.
- **Dube Trade Port, Durban International Airport** – Visual Impact Assessment
- **Sibaya Precinct Plan** – Visual Impact Assessment as part of Environmental Impact Assessment for a major new development area to the north of Durban.
- **Umdloti Housing** – Visual Impact Assessment as part of Environmental Impact Assessment for a residential development beside the Umdloti Lagoon to the north of Durban.
- **Tata Steel Ferrochrome Smelter** - Visual impact assessment of proposed new Ferrochrome Smelter in Richards Bay as part of EIA undertaken by the CSIR.
- **Durban Solid Waste Large Landfill Sites** – Visual Impact Assessment of proposed development sites to the North and South of the Durban Metropolitan Area. The project utilised 3d computer visualisation techniques.
- **Hillside Aluminium Smelter, Richards Bay** - Visual Impact Assessment of proposed extension of the existing smelter. The project utilised 3d computer visualisation techniques.
- **Estuaries of KwaZulu Natal Phase 1** – Visual character assessment and GIS mapping as part of a review of the condition and development capacity of eight estuary landscapes for the Town and Regional Planning Commission. The project was extended to include all estuaries in KwaZulu Natal.
- **Signage Assessments** – Numerous impact assessments for proposed signage developments for Blast Media.
- **Signage Strategy** – Preparation of an environmental strategy report for a national advertising campaign on National Roads for Visual Image Placements.
- **Zeekoegatt, Durban** - Computer aided visual impact assessment. EDP acted as advisor to the Province of KwaZulu Natal in an appeal brought about by a developer to extend a light industrial development within a 60 metre building line from the National N3 Highway.
- **La Lucia Mall Extension** - Visual impact assessment using three dimensional computer modelling / photo realistic rendering and montage techniques for proposed extension to shopping mall for public consultation exercise.
- **Redhill Industrial Development** - Visual impact assessment using three dimensional computer modelling / photo realistic rendering and montage techniques for proposed new industrial area for public consultation exercise.
- **Avondale Reservoir** - Visual impact assessment using three dimensional computer modelling / photo realistic rendering and montage techniques for proposed hilltop reservoir as part of Environmental Impact Assessment for Umgeni Water.
- **Hammersdale Reservoir** - Visual impact assessment using three dimensional computer modelling / photo realistic rendering and montage techniques for proposed hilltop reservoir as part of Environmental Impact Assessment for Umgeni Water.
- **Southgate Industrial Park, Durban** - Computer Aided Visual Impact Assessment and Landscape Design for AECL.
- **Sainsbury's Bryn Rhos** - Computer Aided Visual Impact Assessment/ Planning Application for the

development of a new store within the Green Wedge North of Swansea.

- **Ynyston Farm Access** - Computer Aided Impact Assessment of visual intrusion of access road to proposed development of Cardiff for the Land Authority for Wales.
- **Cardiff Bay Barrage** – Preparation of the Visual Impact Statement for inclusion in the Impact Statement for debate by parliament (UK) prior to the passing of the Cardiff Bay Barrage Bill.
- **A470, Cefn Coed to Pentrebach** - Preparation of landscape frameworks for the assessment of the impact of the proposed alignment on the landscape for The Welsh Office.
- **Sparkford to Ilchester Bye Pass** - The preparation of the landscape framework and the draft landscape plan for the Department of Transport.
- **Green Island Reclamation Study** - Visual Impact Assessment of building massing, Urban Design Guidelines and Masterplanning for a New Town extension to Hong Kong Island.
- **Route 3** - Visual Impact Assessment for alternative road alignments between Hong Kong Island and the Chinese Border.
- **China Border Link** - Visual Impact Assessment and initial Landscape Design for a new border crossing at Lok Ma Chau.
- **Route 81, Aberdeen Tunnel to Stanley** - Visual Impact Assessment for alternative highway alignments on the South side of Hong Kong Island.

**APPENDIX II**  
**FORMULA FOR DERIVING THE APPROXIMATE VISUAL HORIZON**

## The Mathematics behind this Calculation

This calculation should be taken as a guide only as it assumes the earth is a perfect ball 6378137 metres radius. It also assumes the horizon you are looking at is at sea level. A triangle is formed with the centre of the earth (C) as one point, the horizon point (H) is a right angle and the observer (O) the third corner. Using Pythagoras's theorem we can calculate the distance from the observer to the horizon (OH) knowing CH is the earth's radius ( $r$ ) and CO is the earth's radius ( $r$ ) plus observer's height ( $v$ ) above sea level.

Sitting in a hotel room 10m above sea level a boat on the horizon will be 11.3km away. The reverse is also true, whilst rowing across the Atlantic, the very top of a mountain range 400m high could be seen on your horizon at a distance of 71.4 km assuming the air was clear enough.

