GREAT KAROO WIND FARM (PTY) LTD

GREAT KAROO WIND ENERGY FACILITY, NEAR SUTHERLAND IN THE NORTHERN CAPE PROVINCE

PROPOSED AMENDMENT TO AUTHORISED LAYOUT AND ROTOR DIAMETER

ADDENDUM TO THE VISUAL IMPACT ASSESSMENT

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ENVIRONMENTAL PLANNING AND DESIGN

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1 INTRODUCTION

1.1 TERMS OF REFERENCE

The Applicant would like to amend the environmental authorisation to increase the rotor diameter from 120m to 140m.

The applicant would also like to amend the turbine layout. A 52 WTG layout which represents the applicant's optimized and preferred option is considered against the originally authorised 56 WTG layout.

The addendum will be prepared in a format that reviews the visual impact associated with the two alternatives. It will be undertaken in a format that can be integrated with the findings of the current assessment document.

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

Work will be 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
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 current VIA report is a Level 4 Assessment in accordance with the Western Cape Guidelines. The Addendum Report will be undertaken to the same level.

1.2 DOCUMENTATION

This addendum report must be read with The Visual Impact Assessment that was prepared for the proposed Hidden Valley Wind Energy Facility by MetroGIS (Pty) Ltd, dated March 2012.This document is referred to as the "original assessment".

The Hidden Valley Wind Energy Facility includes the following three phases;

1. Phase 1 - Proposed Karusa Wind Farm (to be located on Farm De Hoop 202, Farm Standvastigheid 210, and Portion 1, 2, 3 and the remainder of Farm Rheebokke Fontein 209).
2. Phase 2 – Proposed Soetwater Wind Farm (to be located on the remainder of, and Portion 1 of Farm Orange Fontein 203, Annex Orange Fontein 185, Farm Leeuwe Hoek 183 and Farm Zwanepoelshoek 184).
3. Phase 3 – Proposed Great Karoo Wind Farm (to be located on Farm Kentucky 206 and Portion 1 of Farm Wolvenkop 207).

This addendum is relevant to Phase 3 of the project only.

1.3 BACKGROUND OF SPECIALIST

Jon Marshall qualified as a Landscape Architect in 1978. He is also a registered Environmental Impact Assessment Practitioner of South Africa. He has been involved in

Visual Impact Assessment over a period of approximately 30 years. He has developed the necessary computer skills to prepare viewshed analysis and three dimensional modelling to illustrate impact assessments. He has undertaken visual impact assessments for major buildings, industrial development, mining and infrastructure projects and has been involved in the preparation of visual guidelines for large scale developments.

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

1.4 PROJECT DESCRIPTION

ACED Renewables Hidden Valley (Pty) Ltd obtained environmental authorisation from the National Department of Environmental Affairs for the construction of the Great Karoo Wind Energy Facility and associated infrastructure in 2012.

The site is located approximately 40 km south east of the town of Sutherland and forms part of the Karoo Hoogland Local Municipality, which in turn falls within the Namakwa District Municipality) in the Northern Cape Province (Map 1: Locality Map).

The following project description was included in the original VIA;

ACED intends to construct 207 wind turbines over an area of approximately 332km² in extent defined by cadastral boundaries. The final surface area to be utilised for the facility will be smaller than this, as turbines are placed on exposedhighpoints and ridges.

Each turbine would generate between 2 and 3,5MW, implying that the facility will have a combined energy producing capacity of between 416 and 725 MW (depending on the choice of turbine).

Phase 3, Great Karoo Wind Energy Facility comprises 77 turbine sites located on elevated points and ridgelines. Note that post a mitigation strategy and response layout being developed 56 turbines were subsequently applied for and authorised.

The WEF will connect to the national grid at Eskom's existing Komsberg Substation, which is located on the site. The proposed layout of the WEF infrastructure (including substation/power line alternatives) is shown on Map 1.

Additional infrastructure will include the following:

- ***Cabling between the turbines, to be laid underground where practical;***
- ***Internal access roads to each turbine;***
- ***Workshop area / office for control, maintenance and storage;***
- ***Up to three 132kV on-site substations and one 400kV substation to***
- ***facilitate the connection between the wind energy facility and the grid;***
- ***New 132kVA overhead power line/s likely to be connected to Eskom's***
- ***Existing Komsberg substation which is located on the site.***

The infrastructure above will be located within the confines of the farms identified for the wind energy facility.

It is now intended to increase the rotor diameter of turbines from 120m to 140m and reduce the number of turbines from 56 to 52. Each turbine will have a generating capacity of up to 3.6MW.

The Hub height of the turbine will remain the same: up to 120m.

Map 1 indicates the original layout that was assessed in the original assessment. This included 77 proposed turbine locations.

Subsequent to the original assessment, an amended layout incorporating 56 turbine locations was authorized. In addition to increasing the rotor diameter, the applicant is proposing to amend these turbine locations and reduce the number of turbines to 52.

Map 2 indicates the authorized turbine locations overlaid with the currently proposed turbine locations. From this map it is obvious that the proposed locations affect the same ridgelines as the authorized scheme and that the proposed locations are really a refinement of the authorized layout.

1.5 REASONS FOR THE PROPOSED AMENDMENT

The originally proposed turbines were selected as they were the best available technology at the time. They were rated as having a maximum output of 3.5MW. The proposed turbines have an output of 3.6MW.

The new proposal sees an increase in the rotor diameter from 120m to 140m. Whilst the individual turbines will have a maximum output of 3.6MW which is similar to the original proposal, the larger blade will mean that output is likely to be consistently higher than envisaged with the original proposal.

The small increase in output enables the applicant to develop the facility using slightly fewer turbines.

Section 2 of the original VIA noted that;

Variations of these dimensions may occur, depending on the preferred supplier or commercial availability of wind turbines at the time of construction.

It was therefore indicated that dimensions of the turbines could vary from those anticipated at the time of reporting.

The purpose of this report is to investigate whether the proposed increase in rotor diameter will result in any impacts that were not anticipated in the original VIA or whether anticipated impacts will be exacerbated.

1.6 RELEVANT GUIDELINES

Work is to be undertaken in accordance with the following guideline documents;

a. The Government of the Western Cape Guideline for Involving Visual and Aesthetic Specialists in EIA Processes (Western Cape Guideline) (Oberholzer, 2005). This is the only local relevant guideline available in South Africa, setting various levels of assessment subject to the nature of the proposed development and surrounding landscape, and

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 (UK Guidelines) (Landscape Institute and Institute of Environmental Assessment and Management, 2013).

Together these documents provide a basis for the level and approach of a VIA as well as the necessary tools for assessment and making an assessment legible to stakeholders.

1.7 LEVEL OF ASSSSMENT

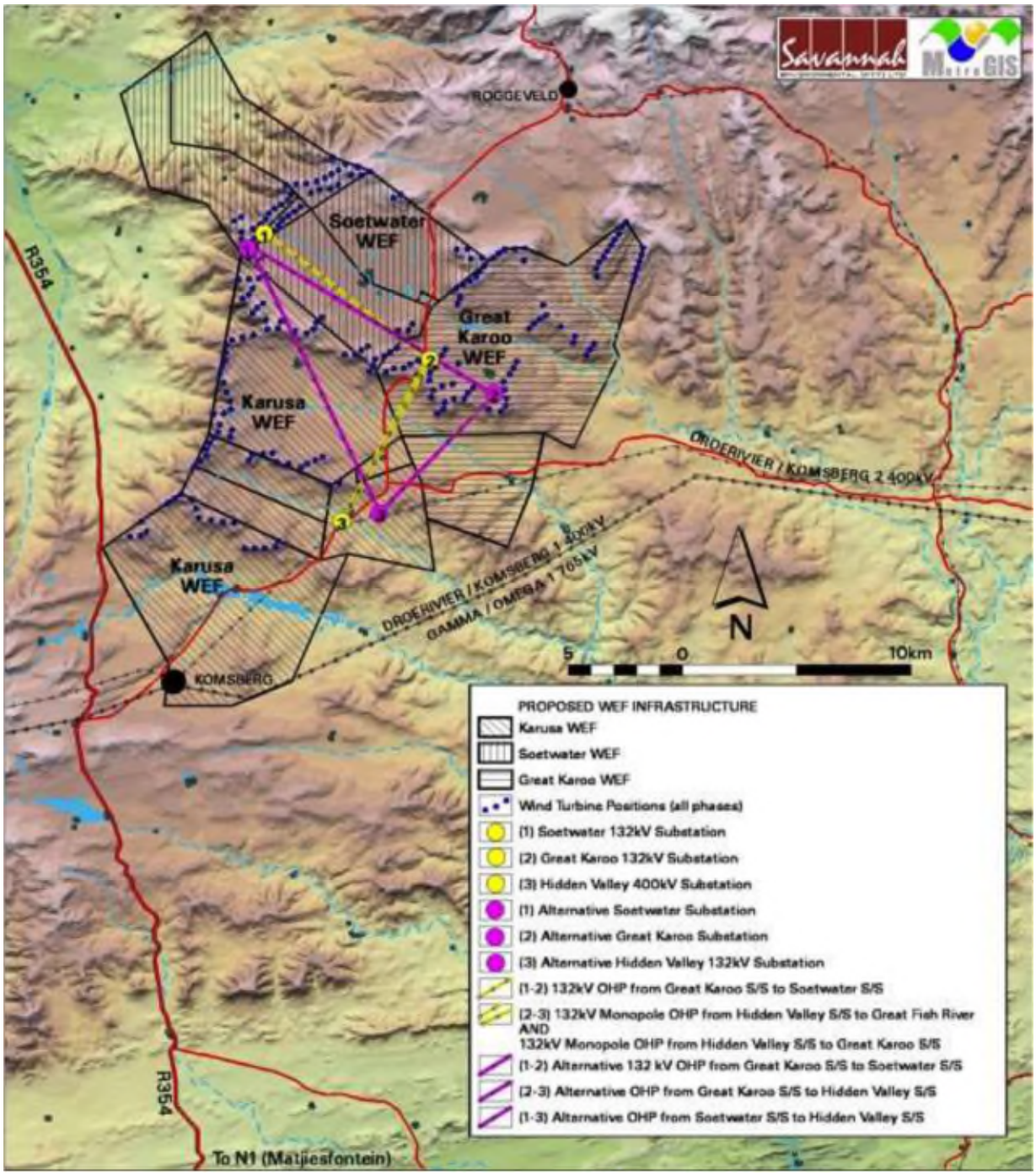
The original VIA was a level 4 assessment in accordance with the Western Cape Guidelines which included simulations. This addendum has therefore been undertaken to the same level.

1.8 PROCESS FOLLOWED

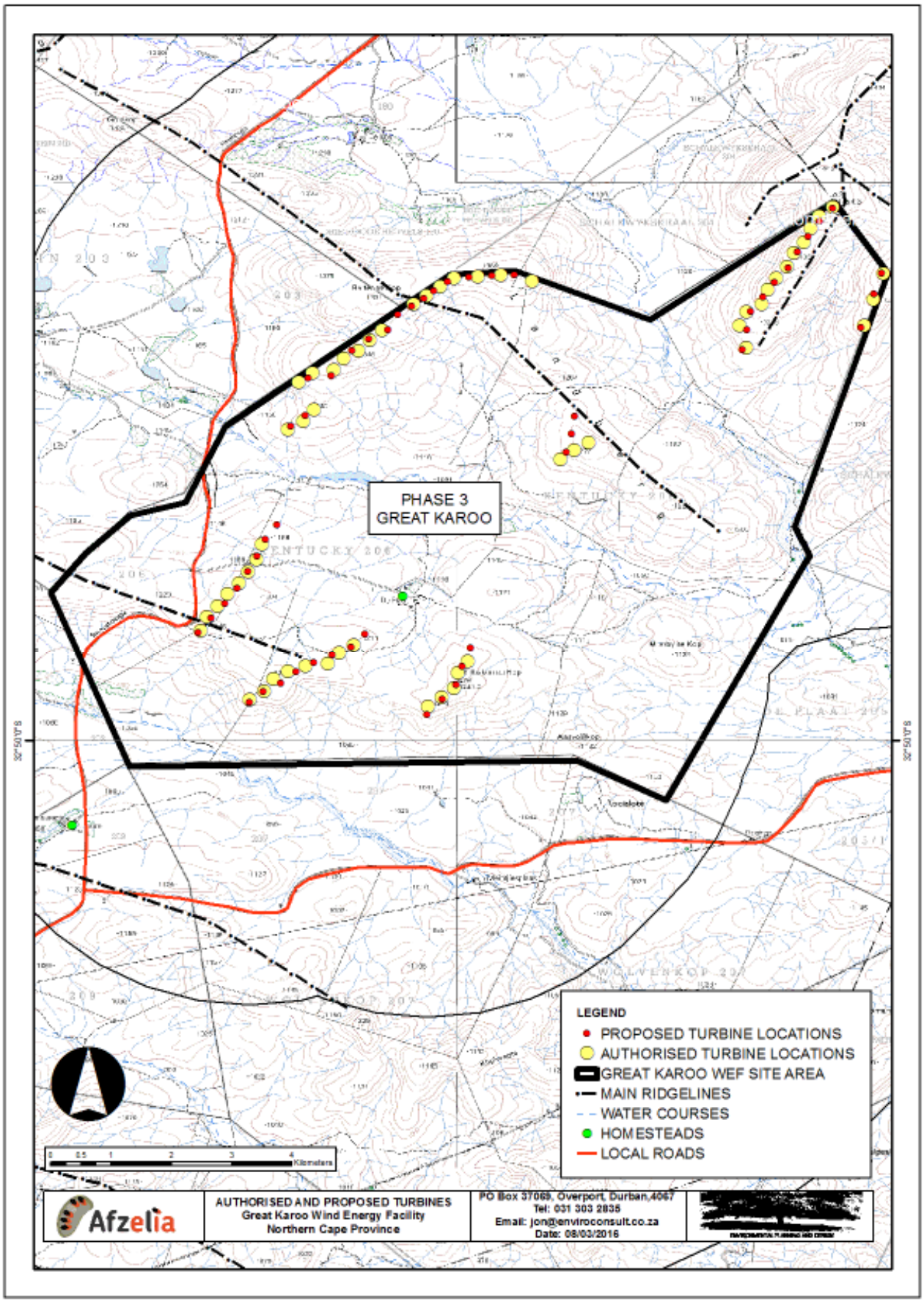
A desktop analysis utilising aerial photography and Arc GIS mapping was conducted in order to familiarise the assessor with the site and to locate visual receptors and sensitive landscapes within the proposed site.

A site visit was conducted during November 2015 from which the site characteristics were confirmed and the location of the proposed WEF inspected.

This addendum report was then prepared.



MAP 1: PROPOSED LAYOUT OF THE HIDDEN VALLEY WEF INDICATING THE PROPOSED WIND ENERGY FACILITY INFRASTRUCTURE, PHASE 3 - GREAT KAROO WEF.
(Map extracted from the original VIA)



MAP 2: COMPARISON OF AUTHORISED AND PROPOSED TURBINE LOCATIONS

2 DESCRIPTION OF THE AFFECTED ENVIRONMENT

2.1 LANDSCAPE CHARACTER

The following character description was included in the original VIA. This has been ground trothed by the assessor during the site visit;

The proposed WEF is located within the band of mountainous terrain, below the escarpment. The proposed site incorporates a number of east flowing drainage lines and wetlands.

The terrain adjacent to the proposed WEF is mountainous to the north east and south west, with the hilly terrain abating somewhat in the north west and south east.

The terrain type of the region is described as low mountains for the most part, with escarpment giving rise to mountains and lowlands in the north east.

The semi arid karoo climate of the area yields between 185mm and 433mm of rainfall per year and gives rise to land cover that is entirely shrubland. Vegetation types are predominantly mountain renoster-bush veld with western mountain karoo in the north western corner.

The study area does not include any towns or urban areas, but a number of structures occur scattered throughout the study area. Some of these are occupied residences or farming homesteads, whilst others are pump houses, ruins or stone walls (kraals).

Only one arterial road (i.e. the R354) runs in a north south direction and a number of lower order secondary roads traverse the study area in different directions.

Three Eskom 400kV transmission lines (i.e. the Komsberg-Muldersvlei, the Bacchus-Komsberg and the Gamma-Omega) traverse the southern section of the proposed development site. Another power line runs in a north south direction to the east of the site

The Southern African Large Telescope (SALT) observatory is located approximately 42km to the north east of the site. The telescope, funded by a consortium of international partners (USA, Germany, the UK, Poland, India, etc.),was specifically located within this region due to the absence of light sources brought about by urban developments.

The population density of the region is less than 1 person per km2. The environment has therefore remained in a natural state with little or no large-scale development. Sheep farming is the predominant land use activity. The study area has harsh, rugged character with vast expanses of natural and undeveloped landscape. Views are wide open and expansive, and unimpeded by development.

The key points regarding landscape character are;

a) The Great Karoo WEF is located on three minor ridgelines below the level of the Komsberg which rises to an elevation of approximately 1150m amsl approximately 8.5km to the north of the northern most turbine location. The minor ridgelines vary in elevation from approximately 1100m amsl to 1400m amsl. In essence the

ridgelines on which the project is located are foot hills below the main Komsberg ridgeline;
b) The landform is steeply undulating;
c) The main land use is low intensity stock rearing and particularly sheep farming;
d) The affected area is sparsely populated; and
e) The vegetation is generally low and provides no screening ability.

2.2 POSSIBLE VISUAL RECEIVERS

Visual Receptors are defined as "individuals and / or defined groups of people who have the potential to be affected by the proposal".

It is also possible that an area might be sensitive due to an existing use. The nature of an outlook is generally more critical to areas that are associated with recreation, tourism and in areas where outlook is critical to land values.

The Original VIA identifies a number of possible receivers including;

a) Observers residing on or in close proximity to the proposed WEF. These are largely comprised of isolated agricultural homesteads.
b) The R354 which is the main tourist route in the area. This road is located approximately 14.3km to the west of the closest turbine position.
c) The South African Large Telescope which is located above the main Komsberg ridgeline approximately 41km to the north of the closest turbine position.

3 ZONES OF THEORETICAL VIAIBILITY

3.1 GENERAL

Zones of Theoretical Visibility (ZTV) are defined in the UK Guidelines as "a map usually digitally produced showing areas of land within which a development is theoretically visible".

ZVTs of the proposed development have been assessed in the Original VIA and this addendum report using Arc Spatial Analyst GIS.

3.2 ZTV IDENTIFIED IN THE ORIGINAL VIA

The ZTV analysis for the Great Karoo WEF prepared for the original VIA is indicated in **Map 3.**

The Potential visual exposure as a result of the proposed Great Karoo WEF is focussed primarily to the north and west of the study area. Visual exposure is moderate to high to the north and west, but is limited to a radius of about 8km by ridgelines and mountains.

Visual exposure to the west is limited to the farm portions (and turbine sites) reserved for Phase 1 and Phase 2 of the Hidden Valley WEF. Only three settlement nodes are identified in this area, namely De Hoop, Oranjefontein and Bobbejaansfontein.

There is very limited potential visual exposure along the crests of south and east facing ridges beyond a 10 km radius. None of these areas are settled or traversed by roads.

There is a high frequency of potential visual exposure on the site itself due to the elevated location of the proposed turbines. The settlement of De Plaat is located in the centre of this area.

The frequency of visual exposure is moderate to high to the immediate south and east of the site (5km radius), with visual exposure beyond this radius being limited to exposed south and west facing ridgelines. Potentially affected settlements with a high potential exposure are Damslaagte and Meintjiesplaas to the south and Kareedoornkraal to the east.

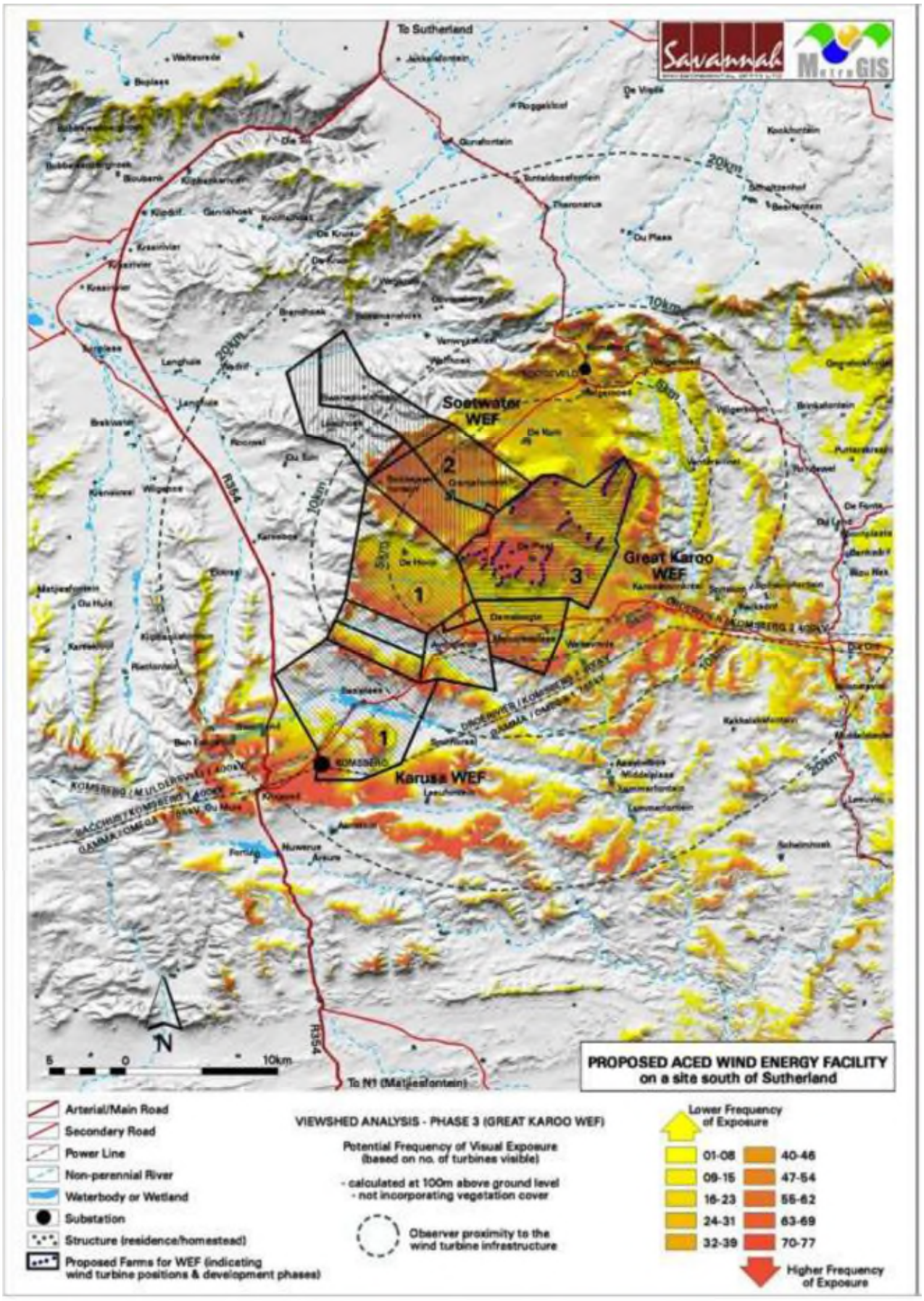
3.3 ZTV OF THE PROPOSED GREAT KAROO WEF TAKING INTO ACCOUNT THE PROPOSED INCREASE IN ROTOR DIAMETER.

The ZTV analysis for the Great Karoo WEF taking into account proposed amendment to the layout and the proposed additional overall height of the structure due to the increased diameter of the rotor is indicated in **Map 4.**

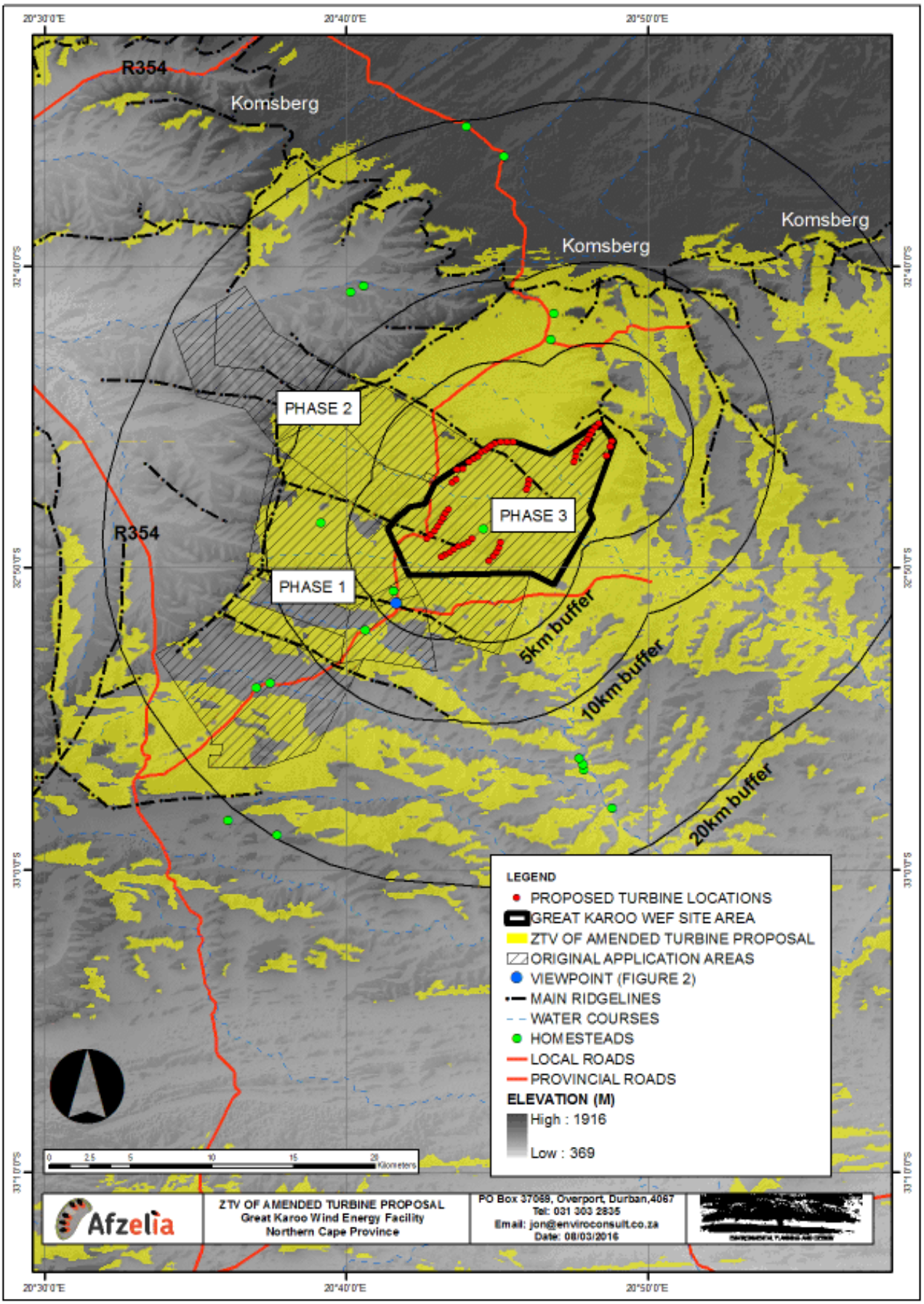
Mapping has been undertaken at the same scale as the Original Assessment and the same reference distances from the facility are indicated in order to assist comparison.

3.4 COMPARISON OF ZTV ANALYSIS

From comparison of Map 3 and Map 4, it is reasonably obvious that the proposed increase in turbine diameter and reduction in turbine numbers will not result in a noticeable change in the visibility of the proposed facility.



MAP 3: ZTV OF GREAT KAROO WEF WITH 120M ROTORS.
(Map extracted from the original VIA)



MAP 4: ZTV OF THE PROPOSED TURBINE LOCATIONS WITH 140M ROTORS.

4 VISUAL IMPACT ASSESSMENT

4.1 THE NATURE OF LIKELY CHANGES IN IMPACT DUE TO THE PROPOSED ADDITIONAL ROTOR DIAMETER

The proposed increase in the diameter of the rotor from 120m to 140m is likely to result in small differences in resulting visual impact this is because;

- Although the rotor diameter increase is 20m, this will result in a 10m overall height increase when the rotor blades are at the top of their rotation only. This will equate to a 5.5% increase in the overall height of structures.
- The rotors rotate horizontally to face the wind direction and so are rarely seen from ninety degrees from where the full width of the rotor might be appreciated.
- The section of the turbine with the greatest visual mass is the tower and nacelle which sits at the top of the tower. The height of the towers will not change from that assessed in the original VIA (120m).

Given that the nacelle or hub height of the proposed structures is the same as that originally proposed, it is likely that if the two options were visually compared, it is likely that the difference would only be obvious over a short distance. As the viewer moves away from the structures and the apparent scale reduces, it is likely to become increasingly difficult to tell the structures apart.

Figure 1 indicates the relative increase in apparent overall height of structures as seen from distances of 1km, 5km and 10km.

Figure 2 indicates the proposed Great Karoo WEF as seen from approximately 3.3km to the south with a rotor diameter of 120m and 140m. The viewpoint is located on Map 4

From this analysis, it is suggested that at 1km, subject to orientation of the rotor, the additional diameter could be discernible to the viewer. At a distance of 2km and beyond however, it is likely to be difficult to identify the turbine with the larger rotor.

4.2 ASSESSEMNT OF VISUAL IMPACTS ASSOCIATED WITH THE PROPOSED INCREASE IN ROTOR DIAMETER

In order that the assessments are directly comparable, the same methodology has been used for the proposed amended rotor diameter as was adopted in the Original VIA.

Visual impacts are also assessed in the same categories as they were considered in the Original VIA. These include;

1. Potential visual impact on observers travelling along arterial and secondary roads in close proximity to the proposed WEF;
2. Potential visual impact on residents of settlements and homesteads in close proximity to the proposed WEF;

4.2.1 Potential visual impact on observers travelling along arterial and secondary roads in close proximity to the proposed WEF.

The original VIA found that potential visual impact on users of the R354 and secondary roads in close proximity of the proposed WEF (i.e. within 10km) was expected to be of **moderate** significance. No mitigation was possible.

The proposed increase in the rotor diameter will have a small influence on this assessment as it is likely to marginally increase the intensity of impacts particularly from close

quarters. With distance however (approximately >2km) the increase in rotor diameter is unlikely to be obvious.

There are approximately 36km of unsurfaced local road within 10km of the development that are likely to be affected.

The WEF is likely to be visible from the R354 at a distance greater than 14km and over an approximate 8km of the road.

Increased impacts associated with the proposed increase in rotor diameter is therefore likely to be marginal and will not change the original assessment (indicated below).

Nature of Impact: Potential visual impact on observers travelling along arterial and secondary roads in close proximity to the proposed WEF		
	Phase 3 (GREAT KAROO WEF)	
	No Mitigation	**Mitigation Considered**
Extent	Local **(4)**	N/A
Duration	Long term **(4)**	N/A
Magnitude	Medium **(6)**	N/A
Probability	Highly Probable **(4)**	N/A
Significance	Moderate **(56)**	N/A
Status	Negative	N/A
Reversibility	Recoverable **(3)**	N/A
Irreplaceable loss	No	N/A
Can impacts be mitigated?	No	
Mitigation / Management: ➢ None		
Cumulative impacts: The construction of Phases 1, 2 and 3) will increase the cumulative visual impact of industrial and / or power related infrastructure (such as power lines and substations) within the region.		
Residual impacts: The visual impact will be removed after decommissioning, provided the facility and ancillary infrastructure is removed. Failing this, the visual impact will remain.		

4.2.2 Potential visual impact on residents of settlements and homesteads in close proximity to the proposed WEF.

The Original VIA found that the potential visual impact on residents of settlements and homesteads within a 10km radius of the proposed WEF was expected to be of **moderate** to **high** significance. No mitigation was possible.

The proposed increase in the rotor diameter will have a small influence on this assessment as it is likely to marginally increase the intensity of impacts particularly from close quarters. With distance however (approximately >2km) the increase in rotor diameter is unlikely to be obvious.

There are only six homesteads within 10km, two (project participants) within 5km and one (project participant) within 1km of the proposed WEF. The increased impacts associated with the proposed increase in rotor diameter is therefore likely to be marginal and will not change the original assessment (indicated below).

Nature of Impact: Potential visual impact on residents of settlements and homesteads in close proximity to the proposed WEF	
	Phase 3 (GREAT KAROO WEF)

	No Mitigation	Mitigation Considered
Extent	Local **(4)**	N/A
Duration	Long term **(4)**	N/A
Magnitude	Medium **(4)**	N/A
Probability	Highly Probable **(4)**	N/A
Significance	Moderate **(48)**	N/A
Status	Negative	N/A
Reversibility	Recoverable **(3)**	N/A
Irreplaceable loss	No	N/A
Can impacts be mitigated?	No	
Mitigation / Management: ➢ None		
Cumulative impacts: The construction Phases 1, 2 and 3 will increase the cumulative visual impact of industrial and / or power related infrastructure (such as power lines and substations) within the region.		
Residual impacts: The visual impact will be removed after decommissioning, provided the facility and ancillary infrastructure is removed. Failing this, the visual impact will remain.		

4.2.3 Potential visual impact on sensitive visual receptors within the region.

The original VIA found that visual impact on the users of roads and the residents of settlements and homesteads within the region (i.e. beyond the 10km radius) is expected to be of **moderate** significance. No mitigation is possible.

The proposed increase in the rotor diameter will have a negligible influence on this assessment as it is likely to marginally increase the intensity of impacts particularly from close quarters. With distance however (approximately 2km) the increase in rotor diameter is unlikely to influence the original assessment.

4.2.4 Potential visual impact of internal access routes on observers in close proximity to the proposed WEF.

The proposed increase in the rotor diameter will have no influence on the original assessment of this impact.

4.2.5 Potential visual impact of the overhead power lines and on-site substations on observers in close proximity to the proposed WEF.

The proposed increase in the rotor diameter will have no influence on the original assessment of this impact.

4.2.6 Potential visual impact of shadow flicker on visual receptors in close proximity to the proposed WEF.

Shadow flicker occurs when the sky is clear, and when the rotor blades of the wind turbine are between the sun and the receptor (i.e. when the sun is low). 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 400m buffer along the edge of the facility is submitted as the zone within which there is a risk of shadow flicker occurring.
In this respect, only the following receptors may possibly experience visual impact as a result of shadow flicker due to their proximity to turbine structures (<1km):
Phase 3: De Plaat and a 3km section of secondary road to the west of this homestead.

The Original VIA found that the anticipated impact was expected to be **very low** for the abovementioned settlements since they are at least 400m removed from the nearest turbines.

When compared with the original assessment, the applicant's proposal sees turbine positions removed from the east and north east of the homestead which will reduce the risk of shadow flicker particularly during spring, autumn and winter however remaining turbines to the south east could still impact during winter months. Given that the turbine diameter will increase from 120m to 140m with the new proposal and the overall height of the structure will increase by 10m when each blade reaches the top of a revolution, the potential for shadow flicker to affect the homestead will increase. The assessed impact associated with the new proposal is therefore increased from very low to **low**. With mitigation this reduces to **very low**.

The risk of shadow flicker affecting the local road remains as identified in the Original VIA

Nature of Impact: Potential visual impact of shadow flicker on visual receptors in close proximity to the proposed WEF.		
	Phase 3 (GREAT KAROO WEF)	
	No Mitigation	**Mitigation Considered**
Extent	Site **(5)**	Site **(5)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Minor **(2)**	None **(0)**
Probability	Improbable **(2)**	Very improbable **(1)**
Significance	Low **(22)**	Very Low **(9)**
Status	Negative	Negative
Reversibility	Recoverable **(3)**	Recoverable **(3)**
Irreplaceable loss	No	No
Can impacts be mitigated?	No	
Mitigation / Management: The provision of; ➢ Screening ➢ Blinds on affected windows. As this is a relatively short term impact for the majority of the day blinds may be opened but for short periods when shadow flicker is experienced they may be closed. ➢ The relocation of windows to walls unaffected by shadow flicker.		
Cumulative impacts: No cumulative impact		
Residual impacts: The visual impact will be removed after decommissioning, provided the facility and ancillary infrastructure is removed. Failing this, the visual impact will remain.		

4.2.7 Potential visual impact of operational, safety and security lighting of the facility at night on observers in close proximity to the proposed WEF.

The proposed increase in the rotor diameter will have no influence on the original assessment of this impact.

4.2.8 Potential visual impact of operational, safety and security lighting of the facility at night on observers within the region, with specific reference to the South African Large Telescope (SALT) near Sutherland.

The proposed increase in the rotor diameter will have no influence on the original assessment of this impact.

4.2.9 Potential visual impact of construction on visual receptors in close proximity to the proposed WEF.

The proposed increase in the rotor diameter will have no influence on the original assessment of this impact.

4.2.10 Potential visual impact of the facility on the visual character of the Karoo landscape and sense of place of the region.

Sense of place refers to a unique experience of an environment by a user, based on his or her cognitive experience of the place. Visual criteria and specifically the visual character of an area (informed by a combination of aspects such as topography, level of development, vegetation, noteworthy features, cultural / historical features, etc.) play a significant role.

A visual impact on the sense of place is one that alters the visual landscape to such an extent that the user experiences the environment differently, and more specifically, in a less appealing or less positive light. Specific aspects contributing to the sense of place of this region include un-impacted picturesque landscapes, dramatic mountains and isolation.

The Original VIA found that the visual impact on the visual character of the Karoo landscape and sense of place of the region is expected to be of **moderate** to **high** significance.

The proposed increase in the rotor diameter will have a very small influence on this assessment as it is likely to marginally increase the intensity of impacts from close quarters. With distance however (approximately 2km) the increase in rotor diameter is unlikely to influence the original assessment.

4.2.11 Potential visual impact of the proposed facility on tourist routes and tourist destinations within the region.

The Original VIA considered that the area surrounding the site is itself not a major tourist attraction and that the R354 is a primary tourism route for visitors to the town of Sutherland and surrounding attractions.

Based on the above factors, the Original VIA found that the visual impact on the R354 is expected to be of **low** and that no mitigation is possible.

The proposed increase in the rotor diameter will have no influence on the original assessment of this impact.

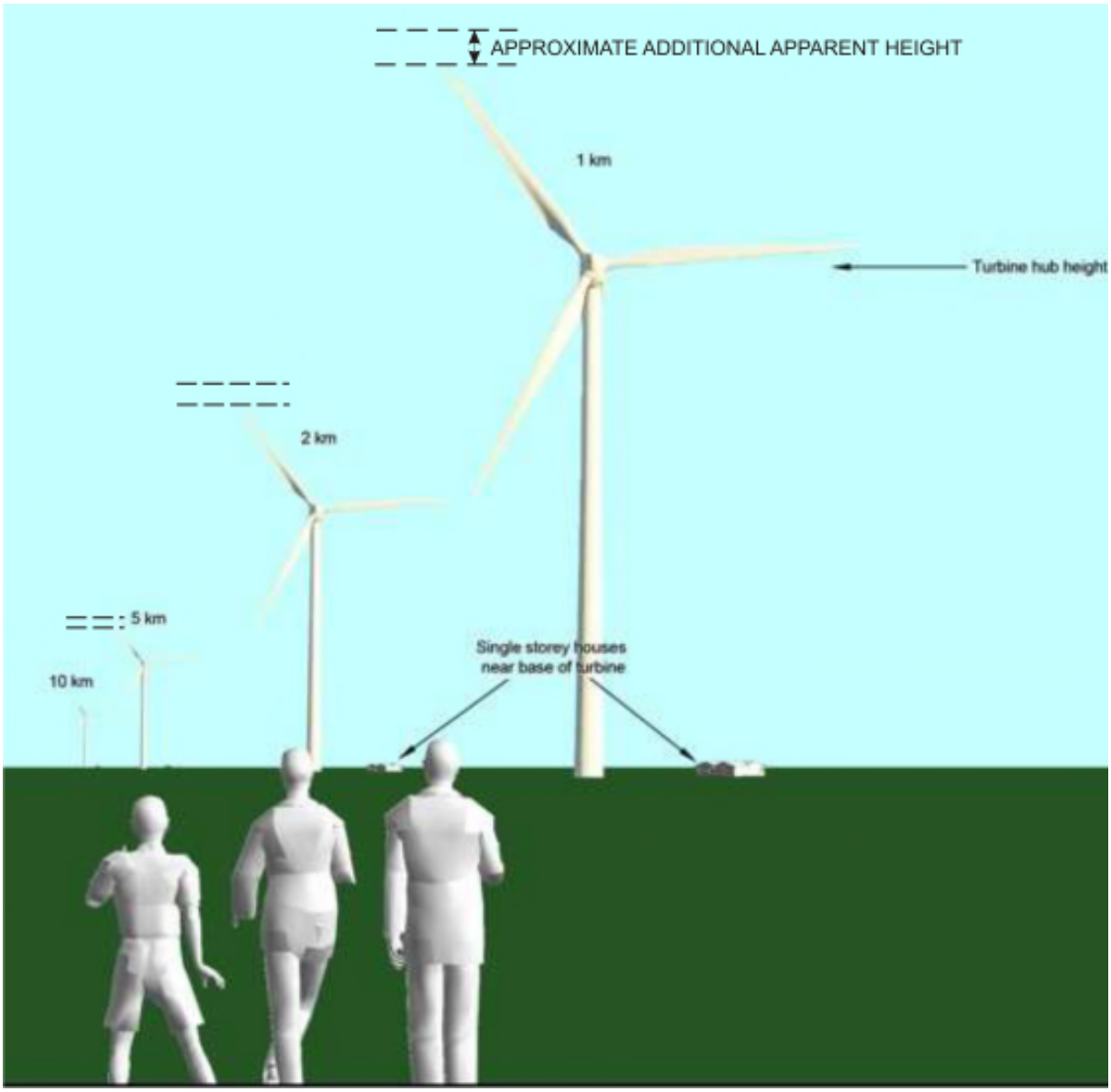


FIGURE 1, VISUAL EXPERIENCE OF A WIND TURBINE STRUCTURE AT A DISTANCE OF 1KM, 2KM, 5KM AND 10KM (EXTRACTED FROM ORIGINAL VIA).
Note, the dotted lines indicate the approximate additional overall apparent height structures due to the proposed increase in rotor diameter.

FIGURE 2, COMPARISON OF IMPACTS ASSOCIATED WITH 120M DIA ROTOR AND 140M DIA ROTOR AS SEEN FROM APPROXIMATELY 3.3KM

5 SUMMARY AND CONCLUSION

The need to change the dimensions of the turbines that were assessed was reported in the Original VIA. The motivation for this was advances in technology and availability of equipment.

The proposed increase in the diameter of the rotor from 120m to 140m is likely to result in small differences in resulting visual impact this is because;

- Although the rotor diameter increase is 20m, this will result in a 10m overall height increase when the rotor blades are at the top of their rotation only. This will equate to a 5.5% increase in the overall height of structures.
- The rotors rotate horizontally to face the wind direction and so are rarely seen from ninety degrees from where the full width of the rotor might be appreciated.
- The section of the turbine with the greatest visual mass is the tower and nacelle which sits at the top of the tower. The height of the towers will not change from that assessed in the original VIA (120m).

Given that the nacelle or hub height of the proposed structures is the same as that originally proposed, it is likely that if the two options were visually compared, the difference is only likely to be obvious over a short distance. As the viewer moves away from the structures and the apparent scale reduces, it is likely to become increasingly difficult to tell the structures apart.

The proposed increase in the rotor diameter of the wind turbines of the Great Karoo WEF will not significantly increase the visibility of the structures.

The changes in the nature of views of the facility will not be significant enough to alter the majority of the findings of the Original VIA.

The only area where the additional rotor diameter could exacerbate identified impacts is shaddow flicker that was identified as a potential threat to a homestead of a project participant that lies within 1km of propoesd turbines. Given that the turbine diameter will increase from 120m to 140m with the new proposal and the overall height of the structure will increase by 10m when each blade reaches the top of a revolution, the potential for shadow flicker to affect the homestead will increase. The assessed impact associated with the new proposal is therefore increased from very low to **low**. With mitigation this reduces to **very low**.

APPENDIX 1 – ASSESSOR'S BRIEF CURRICULUM VITAE

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 (South Africa)
Chartered Member of the Landscape Institute (UK)
Certified Environmental Assessment Practitioner of South Africa.
Member of the International Association of Impact Assessment, South Africa

Languages

English	-	Speaking	-	Excellent
	-	Reading	-	Excellent
	-	Writing	-	Excellent

Contact Details

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Key Experience

Jon qualified as a Landscape Architect (Dip LA) at Cheltenham (UK) in 1979. He has also been a Certified Environmental Assessment Practitioner of South Africa since 2009.

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 a major supermarket chain and prepared CAD based visual impact assessments for public enquiries for new green field 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 Bill.

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 eighteen months includes assessments for numerous solar plant projects for Eskom and private clients, Eskom power lines and substations, proposed wind farm developments, a shopping centre and a proposed tourism development within the Isimangaliso Wetland Park World Heritage Site .

Jon has also had direct experience of working with UNESCO representatives on a candidate World Heritage Site and has undertaken VIAs within and adjacent to other World Heritage Sites.

Relevant Visual Impact Assessment Projects

1. **Isundu Sub- Station Development -** Visual impact assessment for a new major sub – station in KwaZulu-Natal for Eskom.
2. **Bhangazi Lake Tourism Development** – Visual impact assessment for a proposed lodge development within the Isimangaliso Wetland Park World Heritage Site. This work is ongoing.
3. **Quarry Development for the Upgrade of Sani Pass –** Visual Impact Assessments for two proposed quarry developments on the edge of the uKhalamba-Drakensburg World Heritage Site.
4. **Mtubatuba to St Lucia Overhead Power Line** – Visual Impact Assessment for a proposed power line bordering on the Isimangaliiso Wetland Park World Heritage Site for Eskom.
5. **St Faiths 400/132 kV Sub-Station and Associated Power Lines** - Visual Impact Assessment for a proposed new major sub-station and approximately 15 km of overhead power line for Eskom.
6. **Clocolan to Ficksburg Overhead Power Line** – Visual Impact Assessment for a proposed power line for Eskom.
7. **Solar Plant Projects including Photovoltaic and Concentrating Solar Power Plants** – Numerous projects for Eskom and private clients in the Northern Cape, Limpopo, Mpumalanga and the Free State.
8. **Moorreesburg Wind Farm.** Visual impact assessment for a proposed new wind farm in the Western Cape.
9. **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.
10. **Camperdown Industrial Development** - Visual Impact Assessment for proposed new light industrial area to the north o Camperdown for a private client.
11. **Wild Coast N2 Toll Highway** – Peer review of VIA undertaken by another consultant.
12. **Gamma to Grass Ridge 765kv transmission line** – Peer review of VIA undertaken by another consultant.
13. **Gateway Shopping Centre Extension (Durban)** – Visual Impact Assessment for a proposed shopping centre extension in Umhlanga, Durban.
14. **Kouroussa Gold Mine (Guinea)** – Visual impact assessment for a proposed new mine in Guinea working with SGS as part of their EIA team.
15. **Mampon Gold Mine (Ghana)** - Visual impact assessment for a proposed new mine in Ghana working with SGS as part of their EIA team.
16. **Telkom Towers** – Visual impact assessments for numerous Telkom masts in KwaZulu Natal
17. **Dube Trade Port, Durban International Airport** – Visual Impact Assessment for a new international airport.
18. **Sibaya Precinct Plan** – Visual Impact Assessment as part of Environmental Impact Assessment for a major new development area to the north of Durban.
19. **Umdloti Housing** – Visual Impact Assessment as part of Environmental Impact Assessment for a residential development beside the Umdloti Lagoon to the north of Durban.
20. **Tata Steel Ferrochrome Smelter** - Visual impact assessment of proposed new Ferrochrome Smelter in Richards Bay as part of EIA undertaken by the CSIR.
21. **Diamond Mine at Rooipoort Nature Reserve near Kimberley** – Visual impact assessment for a proposed diamond mine within an existing nature reserve for De Beers.
22. **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.
23. **Hillside Aluminium Smelter, Richards Bay -** Visual Impact Assessment of proposed extension of the existing smelter. The project utilised 3d computer visualisation techniques.
24. **Estuaries of KwaZulu-Natal Phase 1 and Phase 2 –** 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.

25. **Signage Assessments** – Numerous impact assessments for proposed signage developments for Blast Media.
26. **Signage Strategy** – Preparation of an environmental strategy report for a national advertising campaign on National Roads for Visual Image Placements.
27. **Zeekoegatt, Durban** - Computer aided visual impact assessment. 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.
28. **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.
29. **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.
30. **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.
31. **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.
32. **Southgate Industrial Park, Durban** - Computer Aided Visual Impact Assessment and Landscape Design for AECI.
33. **Sainsbury's Bryn Rhos (UK)** - Computer Aided Visual Impact Assessment/ Planning Application for the development of a new store within the Green Wedge North of Swansea.
34. **Ynyston Farm Access (UK)** - Computer Aided Impact Assessment of visual intrusion of access road to proposed development in Cardiff for the Land Authority for Wales.
35. **Cardiff Bay Barrage (UK)** - Concept Design, Detail Design, Documentation, and Visual Input to Environmental Statement for consideration by Parliament in the debate prior to the passing of the Cardiff Bay Barrage Bill. The work was undertaken for Cardiff Bay Development Corporation.
36. **A470, Cefn Coed to Pentrebach (UK)** - Preparation of frameworks for the assessment of the impact of the proposed alignment on the landscape for The Welsh Office.
37. **Sparkford to Illchester Bye Pass (UK)** - The preparation of the landscape framework and the draft landscape plan for the Department of Transport.
38. **Green Island Reclamation Study (Hong Kong)** - Visual Impact Assessment of building massing, Urban Design Guidelines and Masterplanning for a New Town extension to Hong Kong Island.
39. **Route 3 (Hong Kong)** - Visual Impact Assessment for alternative road alignments between Hong Kong Island and the Chinese Border.
40. **China Border Link (Hong Kong)** - Visual Impact Assessment and initial Landscape Design for a new border crossing at Lok Ma Chau.
41. **Route 81, Aberdeen Tunnel to Stanley (Hong Kong)** - Visual Impact Assessment for alternative highway alignments on the South side of Hong Kong Island.