1.0 INTRODUCTION

Plan 8 Infinite Energy (Pty) Ltd (Plan 8) proposes to construct a 140 megawatt (MW) wind energy facility consisting of 56 turbines of 2.5 MW each on a farm, near Copperton in the Northern Cape. Aurecon South Africa (Pty) Ltd (Aurecon) has been appointed to undertake the requisite environmental process as required in terms of the National Environmental Management Act (No. 107 of 1998), as amended, on behalf of Plan 8.

The associated infrastructure would include a power line to connect into the existing grid and roads between the turbines.

Aurecon South Africa (Pty) Ltd (Aurecon) has commissioned Karen Hansen, Landscape Architect, as an independent Visual Impact Assessment practitioner to provide this Visual Impact Assessment for this development.

Source: Excerpt from: Final Scoping Report: Environmental Impact Assessment Process: Proposed Wind Energy Facility Near Copperton, Northern Cape DEA Ref. No. 12/12/20/2099: Aurecon

1.1 Terms of Reference

The scope of the work in this specialist Study is as follows:

- Source and review baseline information and participate in the finalisation of these Terms of Reference.
- Undertake a level 3 impact assessment to include the following areas of study for the preferred layout, Alternatives, and the 'No-go' Alternative in a Visual Impact Assessment report:
    - Identify issues raised relating to visual, aesthetic and scenic resources through any existing reports, baseline studies and framework plans, any public scoping phase, and site visits. The study must take into account the expected community response as well as the applicable South African standards.
    - Describe of the receiving environment and the proposed project in terms of landscape types, landscape character and land use patterns.
    - Describe the sense of place and contributing factors, (spatial and non-spatial).
    - Establish the view catchment area, view corridors, viewpoints and receptors
    - Determine the relative visibility or visual intrusion of the proposed project
    - Determine the relative compatibility or conflict of the project with the surrounding land uses in terms of visibility.
    - Determine significant/sensitive receptors.
    - Views under varying operating scenarios.
    - Indicate potential visual impacts using established criteria and including:
        - Potential lighting impacts at night
        - Consideration of impacts at the construction phase

        - Consideration implications of any phased development
    - Describe alternatives, mitigation measures and monitoring programs
    - Describe the opportunities and constraints of the alternatives
- Use mapping and photo-montage techniques as appropriate.
- Undertake an assessment of the visual impacts at the site in terms of the scale of impact (local, regional, national), magnitude of impact (low, medium or high) and the duration of the impact (construction, up to 10 years after construction, more than 10 years after construction). The assessment is to indicate the potential cumulative impacts;
- To rank and assess the visual impact of any alternative layouts of the development from key areas within the viewshed
- In terms of evaluation criteria, use the criteria specific for Visual Impact Assessments listed in the Department of Environmental Affairs and Development Planning guideline document "Guideline for involving visual and aesthetic specialists in EIA processes"[14].

1.2 Methodology

1.2.1 The following sequence of work was employed in this Visual Impact Study

A desktop survey was made using 1:50,000 trigonometrical survey maps to assess the site setting. These were used to identify landform and landscape and habitation patterns as well as to assess the viewshed. Aerial photography, Google Earth, was used to assist in this part of the study. Terrain analysis software, Global Mapper, was used to start the visual envelope definition process. Adobe photoshop and CAD software were used to manipulate some images to test the visual effect of turbines.

1.2.2 Written and Drawn Material was made available by Aurecon:

Word document: ToR VIA
Word document,' Description for Specialists'; outlining significant information, including a schedule of Alternatives to be examined, and including the following drawings:

- Location of the proposed wind energy facility near Copperton, Western Cape
- Location of turbines for all 3 phases of the proposed wind energy facility
- Aerial map showing the 2 alternative distribution connection points

Email received 31.08.2011 including the Final Scoping Report, and Copperton.kmz, (Google Earth) Further emails containing clarification of issues. All used as source reference material.

1.2.3 The receiving site was assessed, and also areas of the locality from where the site appeared to be likely to be visible.

This study was conducted during the months of August and September 2011.

- A photographic survey of the site and parts of the surrounding areas was carried out; this determined the extent of the visibility of the site.
- The visual impacts were evaluated using standard criteria such as geographic viewsheds and viewing distances as well as qualitative criteria such as compatibility with the existing landscape character and settlement pattern; referring to The Guidelines, Provincial Government of the Western Cape, Department of Environmental Affairs and Development Planning, June 2005.

- Relevant mitigation measures were proposed.

The assessment evaluates direct, indirect and cumulative effects and was undertaken in accordance with defined impact assessment criteria. It includes recommendations for management actions and monitoring programs, measures for avoiding negative impacts, measures for mitigating risk, and compensating for negative impacts.

1.2.4 Determination of the Theoretical Viewshed

The theoretical viewshed has been determined in two ways for this study. First the locality has been thoroughly explored in publicly accessible areas and photographed from places where the view appeared to be significant.

Secondly, Global Mapper software was used to generate a viewshed by inputting the exact position and heights of a representative sample of turbines. Global Mapper is terrain analysis software and as such contains detailed information on the terrain, transportation routes and centres of habitation, but not on lesser elements in the landscape that can delineate a view, such as trees and the height of buildings. The resulting images were useful, but the information they contained was interpreted with information gathered on site.

1.2.5 Summary of opinions of the maximum viewing distance from the Turbine(s) appropriate for the VIA

For this study, the specialist has determined that the maximum distance from each turbine that will be assessed will be 25km. This is based on personal experience as well as that of other specialistsin visual impact, and on excerpted studies indicated below.

Polish study:

> *'Rules of human visual perception say that a person can see an object with similar visual parameters with perfect sight in optimal weather conditions from a maximum distance of 17.5km. Beyond this distance the visual effect of such a remote object is insignificant because of atmosphere opacity and the low contrast between an object and its background'.*
> Digital Analyses of Visual Aspects of Wind Farms in South East Poland; Pawel Ozimek, Agnieszka, Piotr Labedz. 2008.

Mark Turnbull Study:

> *'Blade movement perceptibility in average weather conditions is evident at distances from 15 to 20 km. Can in some circumstances be up to 30 km, in specific weather conditions; no layout intention can be seen, whether planned or not, as most receptors move relative to the static turbines.*
> *Access tracks and ancillary components can generally only be seen within 2km'.*
> Visual Impact Assessments of Wind Farms, Mark Turnbull, 2009, UK

University of Newcastle study:

> *'Large blades only require to rotate slowly to generate power; the effects of sunlight streaming past rotating blades and creating a stroboscopic effect would only be of short duration.*
> *Main effects on amenity are concentrated within 5 km, tourists would notice within 10 km'.*
> Visual Assessment of Wind Farms, Best Practice, University of Newcastle, 2002, UK

1.2.6 For this study the specialist has reviewed opinions on turbine colour treatment in the landscape

Caroline Stanton Study:

> *'Grey is more recessive than white, a matt surface is best, reduces glint. Graduated colour schemes work well in all situations, helping to root the turbines in their setting, tying them to their surroundings'*

The Landscape Impact and Visual Design of Wind Farms, Caroline Stanton, 1996, Heriot Watt University, Scotland.

1.3 Key Issues

Some of the issues relating to visual concerns arising from the assessment of the site and the proposed development will be:

- The potential visibility of the development from the surrounding terrain, residential areas, and transport corridors
- The ability of the landscape to absorb the development
- The technical specifications of all the infrastructure elements
- The potential negative visual impact during the construction phase
- The potential visual impacts at night, in a rural area in terms of glare, light trespass and sky glow, where relevant)
- Views under the worst (least visible) and best (most visible) weather conditions;
- The potential visual impacts during the life of the project
- The consideration of the alternative layouts and the no development alternative
- Possible Mitigation measures to reduce the impacts

1.4 Assumptions and Limitations

The information and deductions in this report are based on information received from Aurecon Group (South Africa) (Pty) Ltd; (Cape Town).

There are **three** Location alternatives to consider; **two** Activity Alternatives to consider, (including the no-go alternative), **two** Site Layout Alternatives, and **two** Technology Alternatives to consider.

Fig 1.1: The location of the site in the Northern Cape, S Africa. Source: Google Maps/Viridian

2.0 PROJECT CONTEXT

Fig 2.1: Location of Copperton, south of Prieska, Northern Cape. Source: Google maps/Viridian

2.1 Overview of Wind Energy Facility, WEF: Technical Context

A wind turbine is a rotary device that extracts mechanical energy from wind energy, a renewable energy, which is then converted to electricity. It comprises a tall mast, a nacelle housing the mechanical and electrical components, and a 3-bladed rotor.

South Africa generates much of its required electricity from non-renewable sources, but is now being placed under some pressure to change from this dependence on fossil fuels to more environmentally acceptable sources of energy; and green energy sources are becoming more competitive. The National Energy Regulator of South Africa published in April 2009 a favourable feed-in tariff structure for renewable energy and this has been one of the catalysts for the establishment of wind farms. However, a tender process with the feed-in tariffs as the maximum price was initiated on 3 August 2011.

The selection of a wind power generation site is based on many criteria, *inter alia*:

- Power Yield: the most important factor is the power that wind turbines are able to generate at a specific site; this is the capacity factor and is tested by the installation and monitoring of wind measuring masts.
- Access to Eskom transmission and distribution power lines.

- Good road transport avoiding steep inclines, and tunnels, for transport of the components from the port of entry.

2.2 The Study Area

The proposed project to generate 140MW by wind energy, would take place on Struisbult Farm (Farm No. 103 Portions 4 and 7 and Farm No. 104 (Portion 5). Struisbult Farm is located approximately 5 km east of Copperton and the two portions cover approximately 3 000 ha. The project will consist of a single phase

The associated infrastructure includes 56 turbines, a power line to connect into the existing grid, sub-station and roads between the turbines.

The town of Prieska, which is the major local centre, is 50km away. The site lies within SiyaThemba Local Municipality and Pixley ka Seme District Municipality.

The site is currently accessed by a gravel road out of Copperton, which is linked to a tar road off a national road, the R357.The site and its setting appear almost flat, with scrub and grassland, and is used for grazing and transmission lines.

Fig 2.2: Location of the Site adjacent to Copperton, and off the R357. Source: Google maps/Viridian

2.3 Information on the Construction Phase

The mast comprises sections, the first is bolted to the concrete foundation and subsequent sections are lifted on site by a crane, manoeuvred into position and bolted together. There is a ladder-way inside the mast that operatives use for access to the top, as the sections, and then

the nacelle, are lifted into position and bolted on. Finally the blades are lifted and bolted to the nacelle and the unit is tested prior to being commissioned.

Although it is essential that the site of a WEF should be windy, construction must be completed during days when there is little wind as all the components are very difficult to control while suspended from a crane. This can result in standing time. Generally there are teams of people on the ground holding tag lines through winches to assist in the manoeuvring of the components in the air.

All the components are large and heavy and transporting them to the construction site is complex, requiring specialised transport, good clearance, avoidance of routes through tunnels or above certain inclines.

Images of examples of the two Technology Alternatives assessed in this report.
Source:Aurecon,www.nordex-online.com

Fig. 2.3 example of the N100 wind turbine **Turbine 1**, (100m mast, 50m rotors)

Fig. 2.4 example of the N117wind turbine, **Turbine 2**, (91m mast, 58.5m rotors)

Fig 2.5. Existing 132kV lines on the site; Eskom's gravel maintenance track under the line can be seen. Source: Viridian

3.0 PROJECT DESCRIPTION

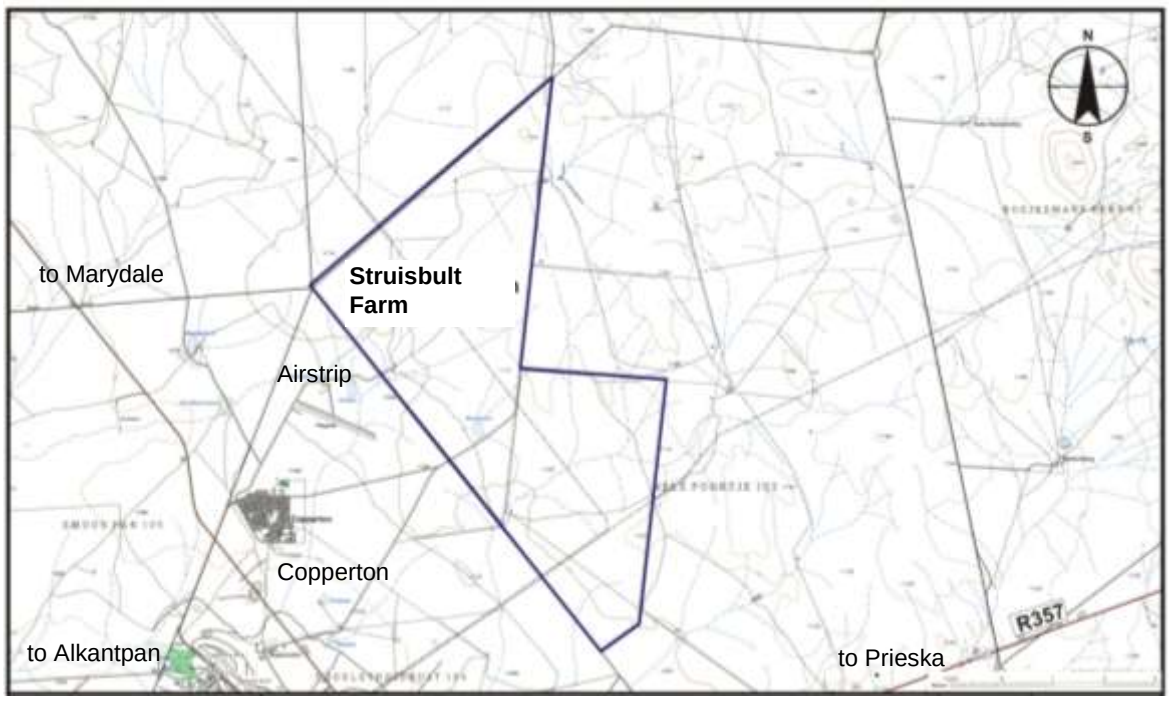


Fig 3.1: Site Boundary Location in relation to Copperton and the R357. Source: Plan 8 2011/Aurecon

3.1 Project Description, received from Aurecon:

The proposed project would consist of a single phase of development of 56 turbines distributed evenly through the site including close to the site boundaries. This layout is however likely to change, once wind monitoring data is received from the meteorological mast present on site.

The final foundation design of turbines is dependent on geotechnical investigation; however it is likely that for the proposed project foundations would be made of reinforced concrete. The foundations would be approximately 20 m x 20 m and an average of 3 m deep. The foundation would be cast *in situ* and could be covered with top soil to allow vegetation growth around the 6m diameter steel tower.

A hard-standing for a crane made of an impermeable material such as concrete or tar and approximately 20 m x 6 m, would be constructed adjacent to each turbine. Access roads of 6 m we would also be required between each turbine. Source: Description for Specialists, Aurecon.

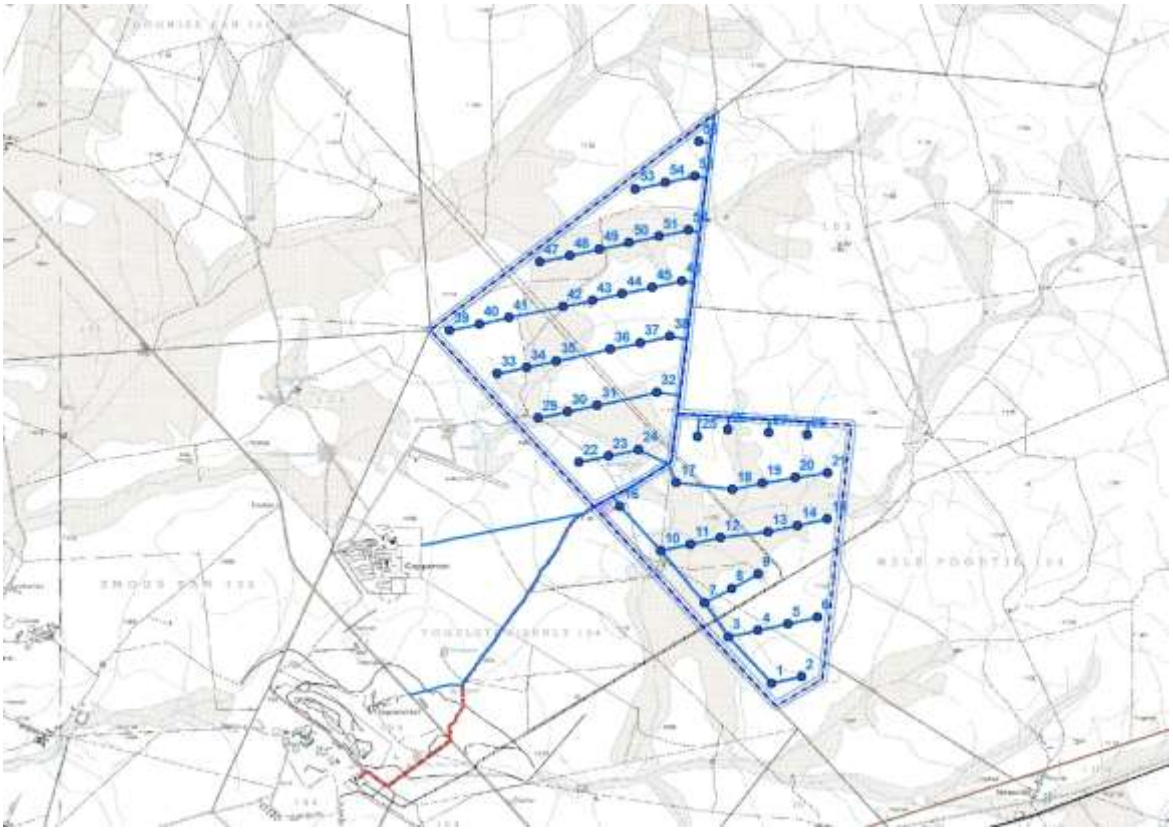


Fig 3.2 Preliminary location of turbines for the proposed wind energy facility. The proposed new substation/transformer unit is located at the site access on the west boundary. Source: Plan 8/Aurecon

3.2 Infrastructure: Turbines

3.2.1 Layout

56 wind turbines are proposed and their preliminary locations are illustrated in the Layout Plan provided by Plan 8 Infinite Energy. (see Fig 3.2).

It is intended that the whole of the developed area will receive turbines at distances apart varying between 3 and 5 times the rotor diameter and in lines aligned approximately west-east.

The will be seen in conjunction with the existing Eskom transmission lines, (both metal and timber pylons). Each turbine will result in about 400sq m of disturbed ground adjacent, for foundations and hard-standings. At each mast base there will be a small transformer unit, placed either directly adjacent or within the mast.

The blades veer to align with the wind direction by the hub turning into the wind. In this area the prevailing wind direction is north; (source: FSR:Aurecon). However there is some seasonal variation. This could result in the clearest view of the swept area of the rotating turbines being seen from the south and north.

3.2.2 Operation

Turbine 1 masts will be 100m high, turbine 2 masts will be 91m high, (see paragraph 3.4 for Alternatives). The masts will be about 6.0m diameter at the base, narrower at the top, with a 3-bladed rotor diameter which, for turbine 1 would be 100metres, and for turbine 2, 117metres.

In average operating conditions the rotors will turn at variable revolutions per minute (rpm); turbine 1 at 9.6 to 14.8 rpm with a tip speed of 77m/s, and turbine 2 at 7.5 to 13.2 rpm, with a tip speed of 72m/s. Rates will vary with wind speeds but turbines are fitted with a device to control the maximum rpm.

Turbine 1 has a higher mast, shorter rotors and higher average tip speed.
Turbine 2 has a shorter mast, longer rotors and a lower average tip speed

The flicker effect of sunlight on turning blades is only noticeable close up, (within 300-500m), and is not regarded as a concern in this project; (see section 5).

It is understood that, at this time, all the turbines, (mast, nacelle, rotor), will be of the same design and they will be visually the same. In addition, the site has an existing wind measuring mast, initially to determine the amount and type of wind. The mast may remain for the monitoring of wind conditions. This is lightweight structure in appearance, and is 80m high.

The WEF site would not be fenced, there are existing fences locally.

The turbines will be fitted with red flashing night visibility lights in accordance with the requirements of the South African Civil Aviation Authority, (CAA); mounted on the nacelles.

There would be no sky-glow or light trespass from this development as it would not be lit at night.

3.3 Infrastructure: Transmission lines

There is electricity distribution infrastructure adjacent to the farm which is designed for 132 kilovolt (kV) distribution. This line could be used by the proposed project to evacuate the power generated and hence a new line, other than the existing 2 km long connection, would not be required. However, Eskom may require that the electricity is evacuated via the Cuprum substation, which is located on the site of the disused Copper mine rock crushing facility approximately 6.5 km away. The final connection will be dependent on the technical requirements and cost set out by Eskom.

Source: Description for Specialists, Aurecon.

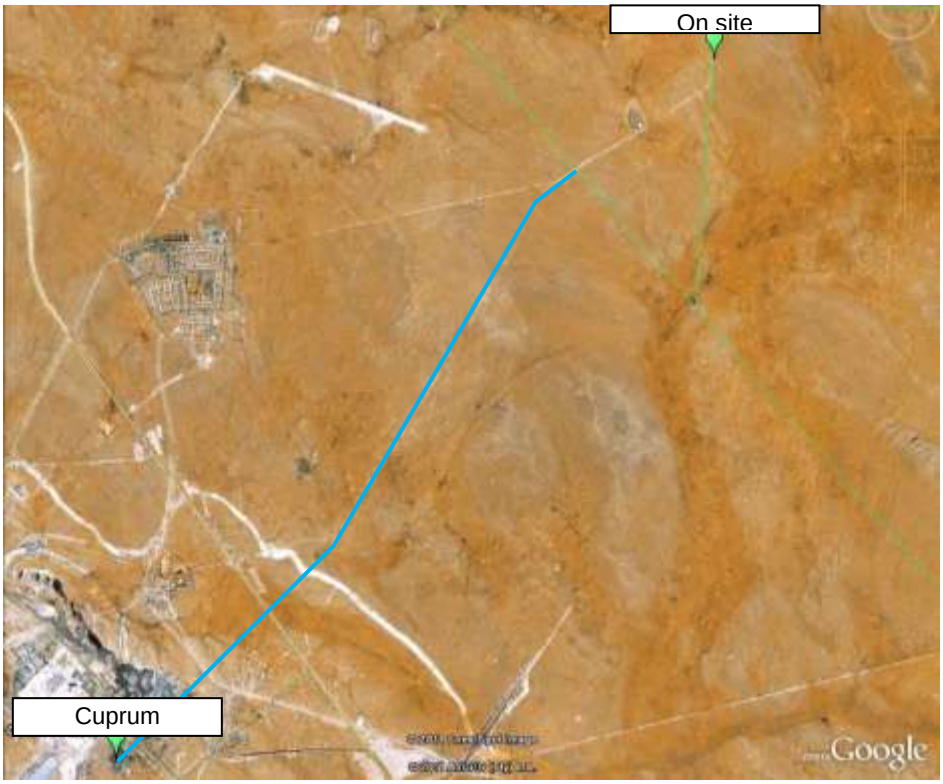


Fig 3.3 Showing the two alternative distribution connection points for the development. Eskom will determine whether that connection is made on site or whether a new line will be built in the location shown in blue. Source: Google Earth/Aurecon

3.4 Alternative Layouts

The development of a WEF is constrained by many technical issues relating to optimum wind profiling and also to the minimum distance from an existing sub-station to which the generated power can be transmitted. Optimally, the WEF must be located in an area where the capacity factor is high – that is, the amount of power that can be generated is high; the terrain must be suitable with good access, and the site must be close to Eskom transmission, and distribution network.

It is the opinion of Plan 8, as advised by their technical consultants that this is one of the preferred sites with the optimum layout and specification, hence this, and their other preferred sites, are being pursued. However the following Alternatives are presented in the Project Description for analysis in this assessment:

Location alternatives:
One location for the proposed wind energy facility

Alternatives for the transmission network:

Electricity distribution via an onsite linkage to the existing grid.
Electricity distribution via a 6.5km 132 kV connection to Cuprum substation.

Activity alternatives:
Wind energy generation via wind turbines

"No-go" Alternative to wind energy production. If the development does not proceed, the no-development alternative will be implemented. The WEF, its roads and pylons, etc., will not be built and the ground will remain unchanged, to continue as at present, (supporting dryland agriculture, sheep grazing and scrub vegetation); the visual status quo will remain. The land may be considered for development in the future.

Site layout alternatives:
Two layout alternatives*(The layout may change depending on research into the wind regime)*

Technology alternatives:
Two wind turbine alternatives:
Turbine 1: 100m mast and 50m rotors, a total height of 150m from ground level to rotor tip
Turbine 2: 91m mast and 58.5m rotors, a total height of 149.5mm from ground level to rotor tip.

3.5Significant Changes to Levels

It is not anticipated that ground levels will vary from those existing; the foundations for the turbines will be placed onto the land and it is intended that they will be covered with enough local material to enable some remediation to take place

3.6Access

Access to the development could be gained off the existing gravel road, (3.5km) from Copperton onto the site. This road links from the roundabout at the entrance to the community straight through to a gated gravel road leading to the site. There are also other existing gravel roads accessing the site and several gravel roads through the site, mainly servicing the Eskom power lines. Copperton is accessed off a tar road, (13.4km) from the R357 from Prieska. The site roads will either be widened to the 6m required or new gravel roads will be constructed from the chosen access point to serve the construction camp for the storage of materials; then to provide access to each turbine location.

These gravel roads within the site will be permanent for the lifetime of the proposed project as they provide access for maintenance during the operational period. Also, it will be determined where any surplus excavated materials are placed or whether they are taken off site.

Prior to construction, the turbines will be likely delivered to a port, and driven by lorry, as abnormal loads, on a route avoiding mountain passes and tunnels, to the site.

3.7 Proposed Built Form

There will be a main transformer constructed at the connection to the grid

3.8 Proposed Landscape Treatment

At this stage there is no information to hand about any proposed landscape treatment. Landscape treatment, per se, is not generally associated with a development of this nature, whether on-site or off-site. The only exceptions to this could be the sculpting of landform, but this is rarely seen. It is anticipated that the existing land cover will only be altered by the specific needs of the construction of the development. It is stated that a layer of local material will be placed over the foundations and vegetated.

3.9 Services

Water will be required during the construction period, and this is being addressed by the proponent. It may come from the supply at Prieska. 22kv electricity cabling will be laid underground; the tie in point will be very close to the 132kv grid, resulting in minimal overhead lines. The main electricity connection to the grid will be overhead 132kv lines similar to those already on the site.

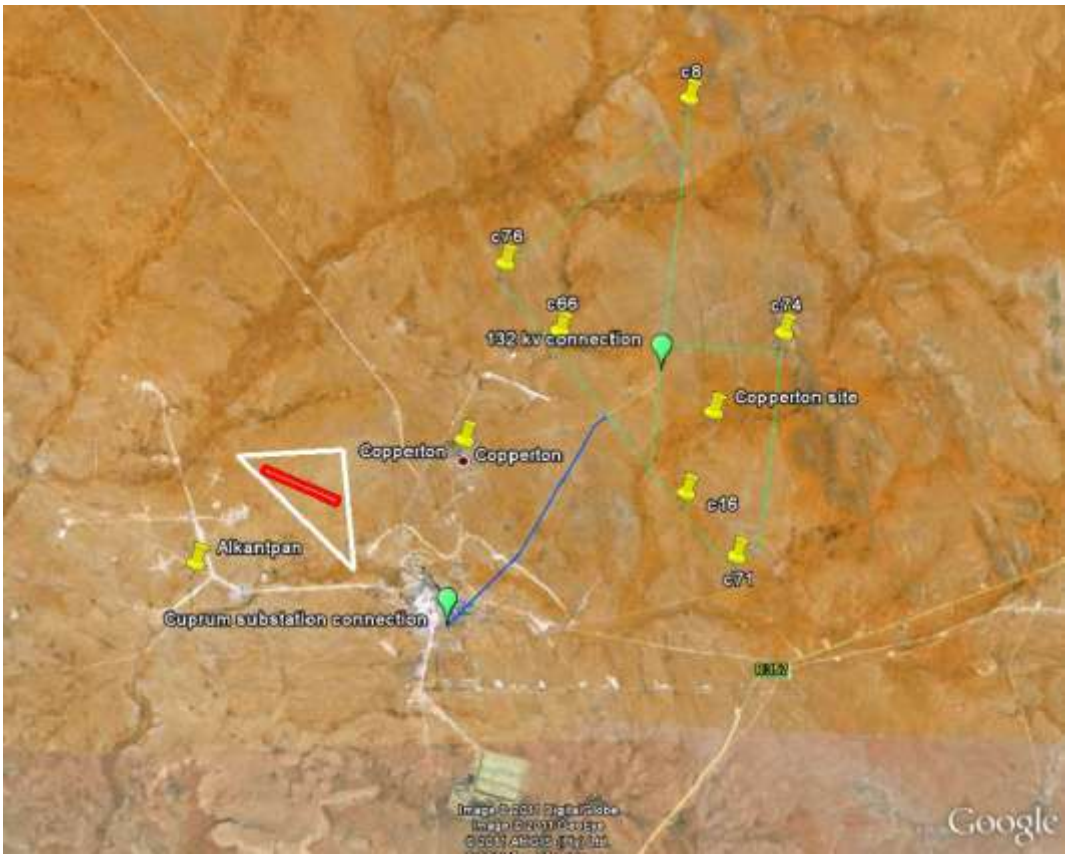


Fig 3.4 Google earth image illustrating:

- The development site area for both alternatives;
- The proposed transmission line from the development to Cuprum at the Mine,
- The proposed new location of the Airstrip, in red

All in relation to Copperton and Alkantpan. source Aurecon/Viridian

4.0 NATURE OF THE RECEIVING ENVIRONMENT

4.1 General

Landscape Character is the distinct and recognisable pattern of elements that occurs consistently in a particular type of landscape, and how this pattern is perceived. It reflects particular combinations of geology, landform, soils, vegetation, river systems, land use and human settlement. It creates the definite sense of place of different areas of the landscape.

4.2 Location and Routes

The community at Copperton was established for the copper mine. Copperton is 13.4km by tarred road from the R357, and from there to Prieska, is about 50km. Prieska is located on the N10. The local roads are either tarred or gravel, and in good condition. The R357 continues south, after Copperton, to Vanwyksvlei, a small community 72kms away. There was a railway line to serve the Copperton Mine, but it was lifted and abandoned about 10 years ago.

There is a local airfield, about 2.5kms to the north of the town, and used about twice a month by people working at Alkantpan, (source: Pers comm. Mrs H Meyer) and occasionally by recreational users, (source: FSR, Aurecon). It would be within 2km of the development site. There is a small civilian airport at Prieska. It is proposed to move this airstrip to the east as part of the proposed project (see Figure 3.4).

At Alkantpan, 5 or 6 km to the west of Copperton, ammunition is tested by many parties, both local and international. This facility is on Government land, is long established, and is likely to continue for the foreseeable future.

Copperton and its surrounds are therefore quite remote. The mine is now closed and, without the rail line to transport mined ore to Okiep for smelting, may not reopen.

4.3 Copperton

Originally a small settlement, (1.5 sq km in extent), compact, and laid out in a grid pattern, to serve the mine; there were single storey houses built for married quarters and a barracks constructed for single quarters. The majority of the houses were demolished along with their services infrastructure when the mine closed. This study has not been able to arrive at finite numbers of households, and residents. Depending on source, household numbers vary from 9 to 42; none of the houses are owner occupied, all are rented. The people are mainly retired, but a few work at Alkantpan, a few work at IetsNeitz and a few own and work on local farms but live in Copperton. Sources: Pers. Comm. Mrs H Meyer; Mr M Meyer; FSR; Viridian.

All the buildings are single storey; the vertical elements are provided by garden trees, telegraph poles and the un-used, tall, lighting structures. There used to be community facilities here, rugby fields and a drive-in cinema for example, but these are derelict. There is one small shop, but no clinics, etc. Some roads are tarred, some are surfaced in material from the slag heap, which is black.

There is tree planting in the gardens, (6 to 9m in height, pines, gums, acacias and ornamentals); there is a wide, but low and open, strip of trees and shrubs around the community, many relating to derelict erven, which provides an indication of the built-up edge.

The area has a low-key tourism profile, and is mainly visited by the residents, the users of Alkantpan and local farmsteads.

4.4 The Mine

The mine, about 6.5km from the site, is disused and occupies an area of about 4.5 sq km. The remaining built structures are the mineshaft, a tall, handsome structure; a large, tall, concrete shed stands beside it and a series of large concrete storage tanks adjacent. There are tall, unused, lighting pylons. There were two residential areas, but all the houses, except for one small apartment block, have been demolished. There are some workers still living there. There is a large 4-5m high slag heap, and other piled and ridged materials on the site. The railway halt at the end of the line and the railhead still stand, although much of the line has gone.

Cuprum sub-station, built to serve the mine, still operates, the transmission lines feeding in and out of it link to the major switching-station at Kronos several km to the south, and to the national grid.

The ground in and around the mine is of no use to agriculture, covered in concrete and other debris; scrubby trees are encroaching. The mine is closed to the public, and is not believed to be a source of attraction for industrial or mining archaeology, and therefore, tourism.

4.5 Alkantpan

Located 6km on a gravel road to the south west of Copperton, and extends out to 9km away; (would lie about 15kms and more from the development). A high security area with low concrete bunkers and low observation buildings. No residential component to the installation; people visit only to work.

4.6 Farmsteads

There are scattered farmsteads locally, all widely spaced and not all are still regularly inhabited. Within a 25km radius of the development site there are about 22 groups of farm buildings varying from 5 to 10kms apart. It was possible to gain an understanding of the farming and habitation trends locally, but not to establish, farmstead by farmstead, which were inhabited one day a week, or one day a month, or visited only, and so on. In many cases, the farms are visited by the farmer or an employee on a regular basis whose timings are determined by seasonal needs.

There are no farmsteads on the development site; the nearest groups of farm buildings are 4km away.

4.7 Topography Rivers and Climate

The main geographic features defining the development site locality are the wide, almost flat to slightly undulating, open spaces, big skies and sparse settlements. The site lies between 1100m and 1120m asl; Copperton at approximately 1085m asl, the mine at 1075m asl., Alkantpan at 1060m asl. The land slopes down gradually from the N10 in the north-east, (1200m asl), towards the south west.

Gradients across the site, north-east down to south-west, range from 1:30 to 1:150; slope analysis of the terrain shows that there are gently downward valleys carrying irregular streams and separated by equally gentle upward ridges. Between them there is a perceptible cone of visibility from the north east corner of Copperton towards the development site.

The local area lies at an interface between the Namaqua metamorphic provinces and the Kalahari group, and where there is a fault line. (source Simplified Geology, Co for Geoscience, Aug 2003).

This is a low rainfall area, (205mm per year on average, source: FSR, Aurecon), and fires can occur in the dry season, (source: Pers. Comm. Mr M Meyer); the wind comes from all compass points, but are predominately northerly. Due to the flatness of the land the wind is not prone to gusting.

There are no perennial rivers locally, but during the rains, there are seasonal watercourses evident and a seasonal pan on the site. Water is available from boreholes on farmsteads; most of the Copperton community uses municipal water piped in from Prieska.

4.8 Vegetation

There are grasslands and scrub on the site; there are few trees locally, apart from those planted around Copperton and those at farmhouses. There are sporadic bushes to 1m in height (mostly invasive *Prosopis* species) but most of the scrub is lower; the road verges are grassed. There are yellow-green grasslands with grey scrub interspersed with the pale brown roads. In winter the grasslands are dry and many of the trees are bare.

4.9 Agriculture and Other Land Uses

The dominant land use locally is agriculture,(apart from the area given over to munitions testing). There is pasture mainly for sheep and goats, and for a few cattle, there are some fodder crops. All the stock requires supplementary feeding all year. The large fields are mainly defined by fencing. There are infrequent small dams fed by seasonal rainfall, and wind pumps. There is some evidence of small scale surface sand and gravel borrow pits.

There are a number of renewable energy projects within the Copperton area in various stages of approval, including Mainstream's approved 190 turbine WEF south-east of the mine and located on two sites 8km to the south-south-west of Plan 8.

A 20MW Solar Farm, (PVF) has been approved; it is to be located directly north of the road to the mine off the R357, some 6km from the proposed Plan 8 WEF. In addition three proposed PVF sites are currently being assessed. They are a 100MW facility at Struisbult Farm, just to the north of the one already approved, and two 100MW facilities north and south of the R357, which will lie between 4 and 15km south of the Plan 8 site

4.10 Landscape character

The character of the landscape is defined as open, flat, remote, sparsely populated lands, typical of the rural open plains of the Karoo. Vertical elements in the landscape are the lines of transmission pylons leading to and from existing sub stations, telegraph poles, the mine shaft and other tall, bulky, remnant mine buildings. These bring some industrial character into this rural area. Views are very long and open to all compass points.

There are no formally protected areas in the vicinity of which this specialist is aware. Some farm buildings may be more than 60 years old, (the area has been farmed for a long time), and have some heritage interest but this is outside the scope of this report. No old farmsteads are located on the site.

4.11 Landscape Value

A landscape may be valued for many reasons, which may include landscape quality, scenic quality, tranquillity, wilderness value, or consensus about its importance either nationally or locally, and other conservation interests and cultural associations.

This site landscape appears to have some value for its remoteness; the site does not have a strong or identifiable sense of place.

4.12 Visual significance of the area

There is little in the local landscape to provide visual definition and a visual signpost to signal the exact location of the development site. The site cannot be defined locally by proximity to any noted feature; the flatness and sameness of the local landscape results in the sites' definition fading away at its edges and blending with other flat open areas.

This is a completely uncluttered landscape; even the clutter of the mine and of the community is set in a landscape of such a scale that they barely form a visual focus. The overall visual impression of the locality is one of an open, flat, rural, landscape with some industry, offering long expansive views.

Fig 4.1. Landscape character of the development site illustrating its open nature and expansive views. This image shows the existing Wind Measuring Mast (WMM), a lightweight structure, 80m high. Source Viridian

5.0 VISUAL IMPACT ASSESSMENT

5.1. The Viewshed Envelope definition

This refers to the theoretical outer-most extent of the area from which an object, (in this case the whole development site), may be seen. Visibility can be obscured in part or in whole by objects within the viewshed such as existing buildings, trees, or landform.

Objects can also appear to be obscured by distance, where an object can seem to blend into its background by virtue of the distance between it and the viewer. In this part of the study the viewshed for the whole of the development site is defined.

In addition to the foregoing it is noted that the Viewshed is influenced by the total height of the wind turbines, *Technology Alternative1*: 150m high to the tips of the rotors, (blades) and *Technology Alternative 2* : 149.5m high to the tips of the rotors, (blades). A distance of 25 km has been taken as the maximum distance of visual significance, with reasons for this 25 km provided in Section 1.2.5.

5.2 View Catchment Areas

The 25 km viewshed for the Development Site includes and is defined by:

- Copperton
- Alkantpan Munitions Testing Range
- Farmsteads
- Mine
- Transportation corridors
- The wider landscape and its terrain

The viewshed envelope is therefore defined partly by views from existing places of habitation and employment, from transport corridors and by topography; views of the proposed development will be obtained from extensive but under-populated areas, farmsteads, transport corridors, and the wider landscape.

5.3 Viewsheds

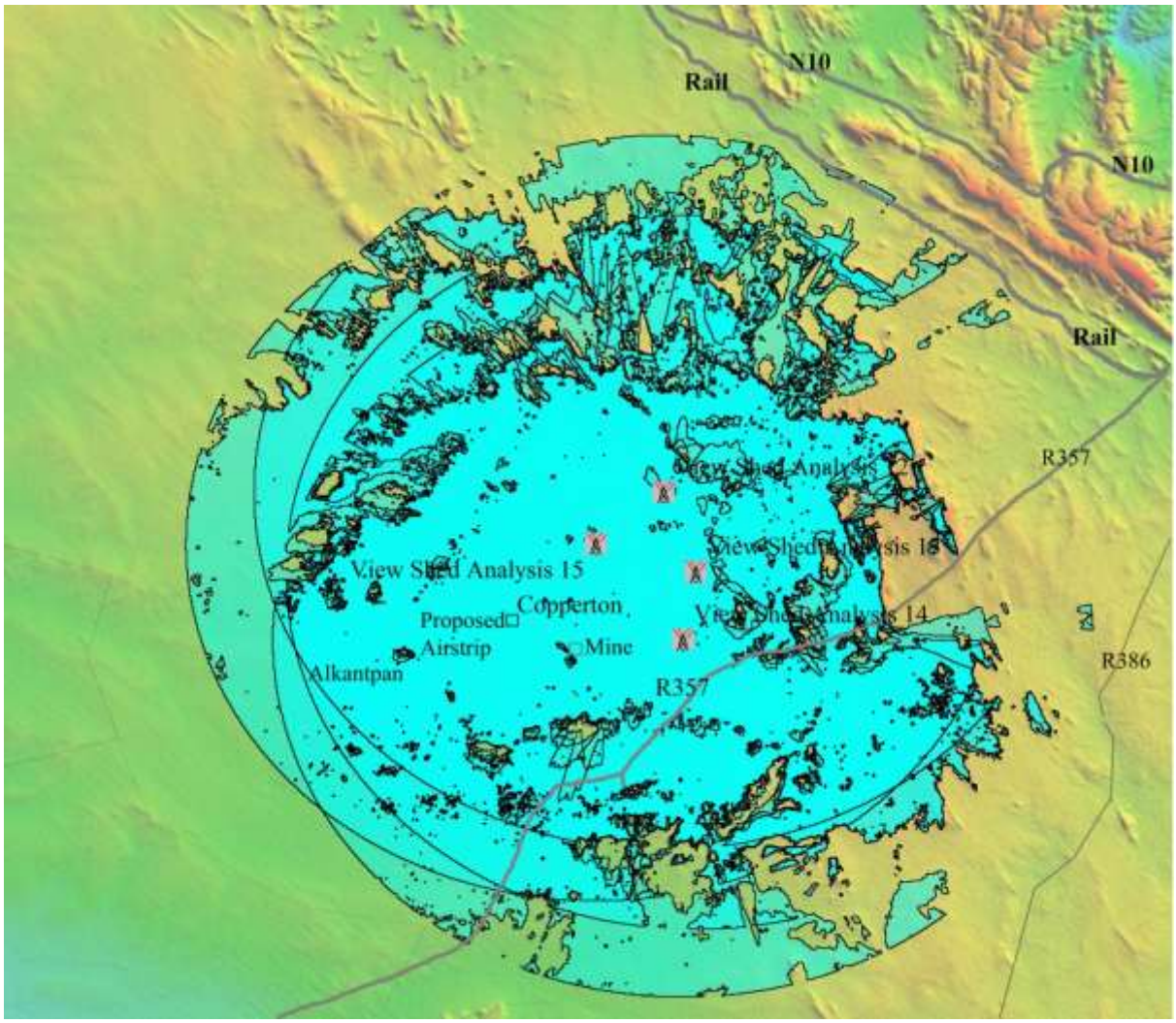


Fig 5.1 Visual envelopes calculated at a radius of 25km from the installations, showing the locations of Copperton, proposed airstrip, Alkantpan, transportation corridors, and on the basis of:

- *Alternative technology1*: 100m mast and 50m rotor
- *Alternative technology 2*: 91m mast and 58.5m rotor
- A representative number of turbine stations at the extremes of the layout:
  Turbine nr 56, (most northerly).
  Turbine nr 39, (most westerly).
  Turbine nr 1, (most southerly).
  Turbine nr 28, (most easterly).

Areas affected (i.e. areas coloured blue):

- Areas with an open and consistent view:
  - Copperton
  - a length of the R357
  - Alkantpan
  - Proposed new airstrip site

- Areas with a view that is extensive but more intermittent, due to terrain:

- portions of the mine,
- areas south of the R357,
- an arc in the wider landscape between 12 and 14km north of the development site
- Ridges to the north, north east and east will intercept the view

The affected area extends to the full 25km in most compass points apart from ENE and E, where there will be some shielding by terrain. The rail line parallel with the N10, and the N10, both lie in valleys and will not be visually impacted upon. Part of the R357 will be impacted upon.

Impact of the differing Technology Alternatives: The similarity of their heights from ground level to rotor tip ensures that their impact is similar.

5.3.1 General Conclusion

The visual envelope indicates that none of the portions of the installation is more or less visible to a significant degree. Each individual turbine location has a similar visual impact but they impact upon slightly different localities.

5.4 Cross Sections

To assist in the understanding of the viewshed a series of cross sections has been drawn from significant locations. This section has been generated at a horizontal-vertical scale of 1:1, which renders detail difficult to discern. But it does show the relationship of turbine height in the landscape. The wind turbine symbol is expressed at the same vertical scale.

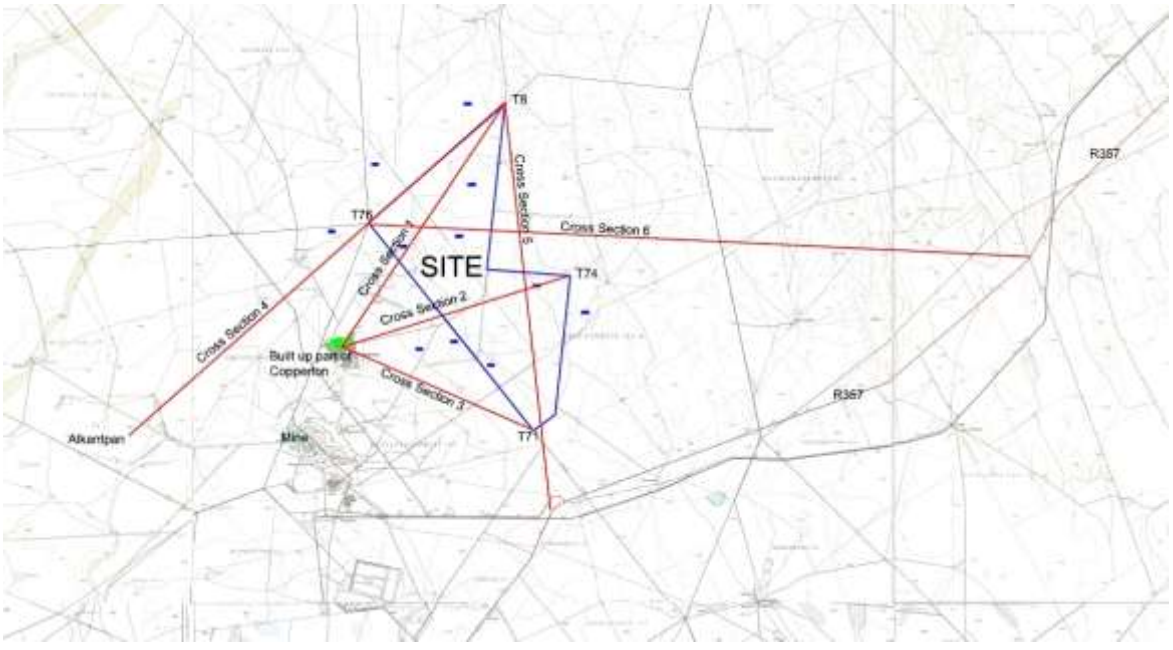
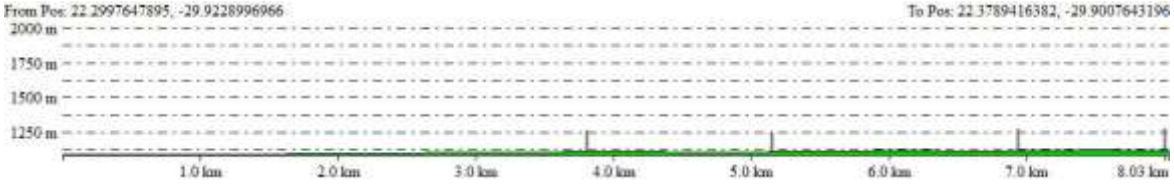
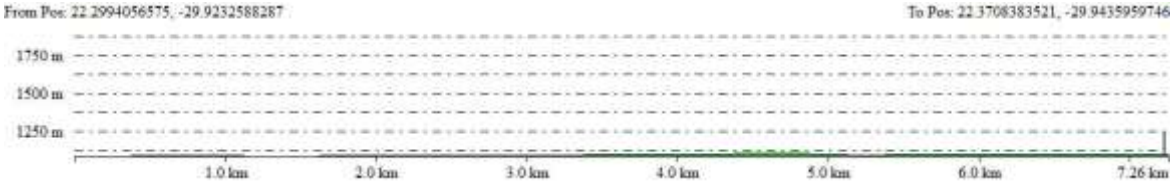


Fig 5.2: Locations of the Cross Sections. Plan generated on 1:50 000 topographical mapping Source: Viridian

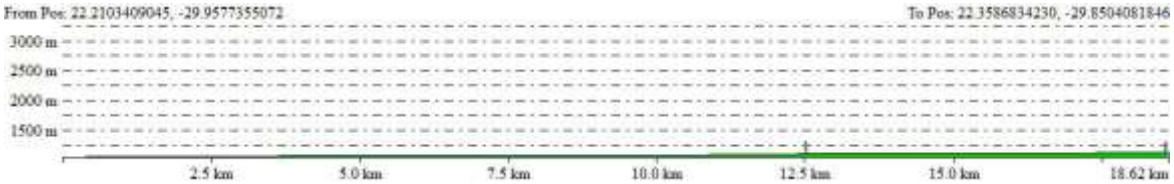
1 Fig 5.3 from Copperton to the north-east to Turbine 56, a view which is clear and which would include other turbines. The small vertical lines show the full height of *Technology Alternatives 1 and 2*, at turbine 33, (3.5km from viewpoint) and at turbine 56, (10km from viewpoint). Source Viridian



2 Fig 5.4 from Copperton towards the east to Turbine 28, a clear view, other turbines would also be seen.

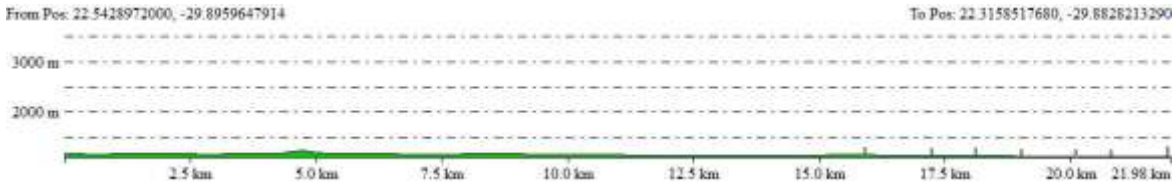


3 Fig 5.5 from Copperton towards the south-east to Turbine 1, almost clear view, other turbines would also be seen.



4 Fig 5.6 from Alkantpan to Turbine 39, and Turbine 56, (clear view, other turbines would also be seen.

5 Fig 5.7 from the R357 at the junction with the Copperton Road to Turbine 1, and Turbine 56, almost clear view, other turbines would also be seen.



6 Fig 5.8 from the R357 to Turbine 39, passing to the north of Turbine 28, partly obscured view, other turbines would also be seen.

5.5 Description and Comparison of Alternatives

The physical form that the development will take has been described in preceding paragraphs. Under these paragraphs the elements of that development relating to the Alternatives are noted.

5.5.1 Location Alternatives

One Site location Alternative: the site north and north east of Copperton as described

Two Electricity distribution Alternatives: *Alternative 1* is a new, above ground, 2km connection on site*; Alternative 2* is a new, above ground, 6.5km connection to Cuprum, (adjacent to the Mine). These will be 132kV lines, and cross braced timber in design similar to those already on the site.

5.5.2 Activity Alternatives

Two Alternatives based on proposed site usage: *Alternative 1* is a WEF. *Alternative 2* is No-Go, (no development).

5.5.3 Site Layout Alternatives

One Alternative Layout 1 (Figure 3.1 refers); another alternative may/may not emerge following specialists reports.

5.5.4 Technology Alternatives.

Alternative 1 proposes 100m high masts with three 50m long rotors. *Alternative 2* proposes 91m high masts with three 58.5m long rotors. *Alt* 2 will have a slightly lesser visual impact due to the shorter mast.

Comparisons: Probable Visibility Implications below, to be tested in the following paragraphs:

Alternative	Probable Visibility implications	Probable Rating
5.5.1 Location Alt 1	One location only submitted and assessed	neutral
5.5.1 Location Alt 2	Shorter on-site link, similar infrastructure adjacent	low
5.5.1 Location Alt 3	Longer off-site link	moderate
5.5.2 Activity Alt 1	WEF with 56 turbines and other infrastructure	high
5.5.2 Activity Alt 2	No Go development, status quo retained	neutral

5.5.3 Site Layout Alt 1	56 turbines distributed thru the site	neutral
5.5.3 Site Layout Alt 2	Consider other distribution pattern	neutral
5.5.4 Technology Alt 1	Turbine 150m high – similar impact	high
5.5.4 Technology Alt 2	Turbine 149.5m high – similar impact	high

Table 5.1 Probable Visibility Implications

The infrastructure will appear as a matrix of towers each supporting three rotating blades and they will appear spaced part by about 3 - 5 times their height. They will not greatly vary in apparent height in their locations throughout the site. The terrain varies by about 20 metres maximum, but the site is extensive and 20m level difference represents only 13% of the 150m turbine and the 149.5m turbine. As the receptor moves around to experience the site from other angles, the towers will appear to be similarly grouped. The met mast, (WMM), may also be visible within the group.

5.6 Visibility of the Proposed Development

5.6.1 General

As images taken from viewpoints evidence, the site can be seen from extensive areas up to and beyond a radius of 25km, as described and illustrated in paragraph 5.3.

The degree to which the development is visible is determined by the height of the turbines and rotors, but is moderated by:

- distances over which this group will be seen.
- weather and season conditions
- built form and terrain

Factors affecting visibility are the open quality of the site and the surrounding land uses and land cover. It is the overall visibility of the development site that is being examined and the scheme is appraised as a whole.

The key issues are:
Visual effects: does it make a difference visually if the wind farm is in an area of existing visual clutter or in an area where it creates new patterns or better clutter? *The site is in an area of little visual clutter, despite the existing mine infrastructure neighbouring the site and the existing transmission lines across the site.*

Visual order: specific arrangements of objects recognisable as a pattern. Visual disorder – where it is not possible to perceive a pattern. *The site offers no visual order or disorder, it is quite a simple landscape.*

Visual composition: which is a deliberate arrangement of objects in a view in order to achieve a particular visual relationship, (eg., grouping turbines only where they will be back grounded). *The site itself offers no visual composition opportunities.*

5.6.2 The localities from which the development will be seen are:

- Copperton
- Alkantpan Munitions Testing Range
- Farmsteads
- Mine
- Transportation corridors
- The wider landscape and its terrain

5.6.3 Construction Period

The extent of the visual envelope, (viewshed), will not be materially affected by the construction period, as the construction access will be off the R357 onto existing site gravel roads which are already being considered within the 25km radius. Construction traffic may start by upgrading the site accesses, remaking the site roads; constructing new site roads, excavating for foundations, etc.

The works will involve excavations, provision of services, construction of concrete foundations, and installation of all above ground infrastructure. There will also be the erection of a new transmission line and sub-station.

There will be increased traffic movements especially of heavy construction vehicles; and there may also be a visible lay-down area(s) within the development site. These would be at their most visible within 5km, especially as construction plant is often fitted with warning lights and sounds.

5.6.4 Comparison of Alternatives

Alternative	Probable Visibility implications	Degree of visibility
5.5.1 Location Alt 1	One location only submitted and assessed	neutral
5.5.1 Location Alt 2	Shorter on-site link, similar infrastructure adjacent	lesser
5.5.1 Location Alt 3	Longer off-site link	greater
5.5.2 Activity Alt 1	WEF with 56 turbines and other infrastructure	greater
5.5.2 Activity Alt 2	No Go development, status quo retained	lesser
5.5.3 Site Layout Alt 1	56 turbines distributed thru the site	neutral
5.5.3 Site Layout Alt 2	Consider other distribution pattern	neutral
5.5.4 Technology Alt 1	Turbine 150m high	similar
5.5.4 Technology Alt 2	Turbine 149.5 high, slight reduction, shorter mast	similar

Table 5.2 Probable Visibility implications

5.7 The Extent of the Visual Impact

Rates the impact in terms of the geographical area that will be influenced by the visual impact, as follows:

- *no impact: no visual impact*
- *limited: visual impact is small, generally confined to the site*
- *local: the site and the immediate surrounding area, (1-5km)*

- *sub-regional: a greater area is influenced, (5-10km)*
- *regional: the influence extends to an entire region*
- *national: the influence has national importance and extends beyond boundaries*

5.7.1 The extent of the impact

The extent of the impact is regional. The maximum distance that the major infrastructure, *(Technology Alternatives 1 and 2)*, is considered visible in clear weather conditions is taken to be up to 25 km. The extent of the impact will extend up to 25kms, and the area affected is therefore a region.

5.7.2 Extent varies with available light

The visual Impact is assessed in optimum weather conditions when there is good visibility, i.e. non – rain days from sunrise to sunset. The extent of the impact will be reduced in poor light, induced by time of day, (dusk and dawn) haze or dust in the air, and rain.

It is anticipated that during times of less than optimum weather conditions, the extent of the visual impact could reduce below 20km. The aircraft warning lights on the nacelles will however affect the extent for sensitive receptors, at night time.

The extent of the impact is not materially affected by consideration of any of the *Alternatives*, but excluding the *No-Go Alternative*.

5.8 Visual Exposure

Visual exposure refers to the visibility of the project site in terms of the capacity of the surrounding landscape to offer screening. This is determined by the topography, tree cover, built form, etc.

- *no exposure: the site is hidden by topography, planting, etc*
- *low: the site is largely hidden*
- *medium: the site is partially hidden*
- *high: there is little in the surrounding landscape that can shield the development from view*

There only elements on the site itself and directly adjacent to the site which affect visual exposure are topographical. They are considered as follows:

5.8.1 Elements **on** the Site which affect Visual Exposure

Topography: the site, while gently undulating, appears almost flat.

Tree Planting and Built form: there is none on the site, which would provide any shielding of the proposed development.

5.8.2 Elements **beyond** the Site which affect Visual Exposure

Topography: the rising land to the north east and east offers some shielding. Views are generally long and open.

Tree Planting and Built Form: tree planting around and within Copperton is too open to shield to any consistent degree, and to a similar degree around local farmsteads. The spoil heaps and buildings at the Mine offer some shielding locally.

5.8.3 The visual exposure is rated as 'exposed', or high and also high for the construction period.

5.8.4 Because the visual exposure assessment refers primarily to the site and its surroundings rather than to the development itself. The extent of the impact will be high to the same degree for the *Alternatives* as well as the *No-Go Alternative, (*high*)*.

5.9 Zones of Visual Influence or Theoretical Visibility

Describes the areas visually influenced by the proposed development, and assesses the amount of influence
Ratings:
non-existent: the site cannot be seen from surrounding areas
low: the development is largely shielded from view by topography, planting, etc
moderate: the development is partially shielded
high: the development strongly influences the view and acts as a visual focus

- Copperton
- Alkantpan Munitions Testing Range
- Farmsteads
- Mine
- Transportation corridors
- The wider landscape and its terrain

The zones of visual influence, viewsheds, are recorded in Figures 5.1 and 5.2and from them it can be seen that significantly large areas will be visually affected. The degree is adjudged to be high as the development will strongly influence the view and act as a visual focus.

5.9.1 Copperton

The community is small in number and would be a minimum of 3.5km from the nearest proposed turbine. The dwellings are all single storey, few trees grow taller than 9m, and there is little or no other shielding. The most northerly dwellings and 'IetsNeitz', (accommodation for visitors to Alkantpan, etc) will be most affected. Others will have a broken but evident view from houses, and an open view from roads. The prevailing wind direction is likely to result in very **infrequent** face-on views of rotating turbines. Access for construction is a concern. The scale of the proposed development in the landscape is large and therefore it will influence the view and act as a visual focus.

Receptors will be aware of aircraft warning lights on turbines at night.

The zone of visual influence is therefore assessed as high.

5.9.2 Alkantpan Munitions Testing Range.

Alkantpan is not residential. Of the people who work there, few are permanent, most are transient, and the site is generally about 10km away from the nearest turbine. The scale of the proposed development in the landscape would be large, but at a distance that reduces the degree to which the view is influenced and moderates the visual focus.

Receptors may be aware of aircraft warning lights on turbines at night.

The zone of visual influence is assessed as moderate-high due to distance.

5.9.3 Farmsteads,

While it is known that some farmsteads are permanently inhabited, many are not, and it is not known which group of buildings is a working farm, which is permanently inhabited, and which is managed by visits only.

Within a **10km** radius of the proposed development there are 7 groups of buildings which appear to be farmsteads and working farms; the nearest of which would be 4km from the nearest turbine. These farmsteads will have an open view as there is little or no shielding by terrain; (most have a few trees planted adjacent for shelter but this will not influence the view under assessment).The scale of the development in the landscape is large and therefore it will influence the view and act as a visual focus.

Receptors may be aware of aircraft warning lights on turbines at night.

The zone of visual influence is assessed as moderate due to few receptors.

Within a **25km** radius of the proposed development there are an additional 15 groups of buildings which appear to be farmsteads and working farms. The scale of the proposed development in the landscape would be large, but at a distance that reduces the degree to which the view is influenced and moderates the visual focus.

Receptors will probably **not** be aware of aircraft warning lights on turbines at night.

The zone of visual influence is assessed as moderate due to few receptors.

5.9.4 Mine

The mine, inhabited by only a few people, (five to six), who are employed as labourers by the owners of 'IetsNeitz'; (source Pers. Comm. Mr M Meyer). This is about 6.5km from the nearest proposed turbine. The scale of the development in the landscape is large and therefore it will influence the view and act as a visual focus, but to few receptors.

Receptors may be aware of aircraft warning lights on turbines at night.

The zone of visual influence is assessed as moderate due to few receptors.

5.9.5Transportation Corridors

5.9.5.1 The R357 between Prieska and Vanwyksvlei.

Travelling north-east towards Prieska on tar, the proposed development would come into view as the road turns to the north on its approach to the Mine. The distance is 25km from the nearest turbine at this point and the view becomes slightly broken up as the road user approaches the slime dam. The development is then temporarily obscured but would reappear and be visible up to where it is behind the user and therefore deemed to be out of view; (at about 10km from the nearest turbine).

This represents a distance of about 40km and could be experienced by a road user for about 24 minutes if travelling at 100km/hour.

Travelling south west towards Vanwyksvlei the road approaches and passes a low ridge, about 1230m high when the road is at an elevation of between 1140 and 1160m asl. The proposed development would then come into view about 13km distant. Beyond the ridge the development would be in full view and continue till it would be behind the user and therefore deemed to be out of view; (assessed as a point where the road draws level with the slime dam).

This represents a distance of about 23.5km and could be experienced by a road user for about 14 minutes if travelling at 100km/hour.

Receptors may be aware of aircraft warning lights on turbines at night.

The zone of visual influence is assessed as moderate-high

5.9.5.2 The road from the R357 to Copperton

The tar road linking Copperton with the R357 lies within 4 – 11km from the nearest proposed turbine. There is no intervening shielding but few users. Driving at 80km/hour the proposed development would be visible for a period of about 13minutes, the same for travelling in either direction.

If the longer transmission line, *Location Alternative 3* were implemented it would be seen by users of this road. There are many such transmission lines locally, and therefore this alternative would not be deemed to have an additional measureable impact. Because this road is, in part, to the south of the proposed turbines users will likely experience a face-on view of the rotating blades.

Receptors may be aware of aircraft warning lights on turbines at night.

The zone of visual influence is assessed as high due to proximity

5.9.5.3The road to Alkantpan

Traffic accessing Alkantpan, takes the Copperton turn off from the R357, makes a right and left turn, eventually driving through part of the Mine and then down a long dedicated road. The proposed development would be visible for that distance till the portion through the mine is reached when the development is deemed to be behind the receptor and out of view. The

distance is 33km and travelling at 100km/hour would be experienced by the user for about 21 minutes.

Traffic leaving Alkantpan and heading to the R357 would experience the development for a longer period, a distance of 38kms, experienced at a speed of 100km/hour for about 24 minutes.

Receptors may be aware of aircraft warning lights on turbines at night.

The zone of visual influence is assessed as moderate-high

5.9.5.4The road to Marydale

Travelling towards Copperton, and from a point 25km from the proposed development, to the junction just outside Copperton, is a distance of about 14.5km, over which the road user would have an open view of the site for about 10minutes at 80km/hour.

Leaving Copperton and driving to Marydale the development would be visible for about 7km before it was deemed to be behind the receptor. Therefore it would be experienced for a time of about 5 minutes when driving at 80km/hour.

Receptors may be aware of aircraft warning lights on turbines at night.

The zone of visual influence will be moderate-high despite being visible to few receptors, because of the clear line of sight.

5.9.6The Wider Landscape and its terrain

There are scattered farmsteads which have been discussed in para 5.9.3 and there is a network of gravel roads within the whole of the assessed area. Receptors in the wider landscape are either accessing the farmlands or undertaking maintenance inspections on the Eskom transmission lines. There will also be some recreation users. Receptors are few in number and are unlikely to travel at night.

Receptors will probably not be aware of aircraft warning lights on turbines at night.

The zone of visual influence will be moderate due to few receptors.

5.9.7 The Construction Phase

During this phase the roads selected for the transport of the construction materials and the infrastructure components will be visually impacted upon. The zone of visual influence will not vary from the foregoing, as Construction traffic will use the R357, and connecting gravel roads, and the site of any lay-down areas, may be visible.

5.9.8 Comparison with other Layouts

As the visual envelope is defined by the edge of the development site, the visibility of the *Technology Alternative* is not deemed to be different however the visibility of the *Layout Alternative* could have an added impact.

Alternative	Zone of visual Influence	Degree of impact
5.5.1 Location Alt 1	One location only submitted and assessed	neutral
5.5.1 Location Alt 2	Shorter on-site link, similar infrastructure adjacent	low
5.5.1 Location Alt 3	Longer off-site link	moderate
5.5.2 Activity Alt 1	WEF with 56 turbines and other infrastructure	high
5.5.2 Activity Alt 2	No Go development, status quo retained	low
5.5.3 Site Layout Alt 1	56 turbines distributed thru the site	neutral
5.5.3 Site Layout Alt 2	Consider other distribution pattern	neutral
5.5.4 Technology Alt 1	Turbine 150m high	high
5.5.4 Technology Alt 2	Turbine 149.5m high – similar impact	high

Table 5.3. Zone of Visual Influence

As the visual envelope is defined by the edge of the development site, the visibility of the N*o-Go Alternative* is not deemed to be different.

5.10 Visual Absorption Capacity

This refers to the ability of the surrounding area to visually absorb the development. In this assessment, high is a positive and low is a negative.

- *low: the area cannot visually absorb the development*
- *medium: the area can absorb the development to a degree but it will look somewhat out of place*
- *high: the area can easily visually absorb the development*

The ability of the terrain to visually absorb the development is low. The site at present is an open rural area appearing fairly flat, in a landscape where views are long. There are few vertical elements in the local landscape, apart from electricity pylons, and overall the land adjacent to the site has a rural character. However, it must be noted that the network of power lines and the mine buildings, all prominent n the landscape, provide an industrial aspect to the locality.

Therefore the visual absorption capacity is rated medium, (the area can absorb this development to a degree) and it will not look out of place in this landscape.

Alternative	Visual Absorption Capacity	Degree
5.5.1 Location Alt 1	One location only submitted and assessed	medium
5.5.1 Location Alt 2	Shorter on-site link, similar infrastructure adjacent	medium
5.5.1 Location Alt 3	Longer off-site link	medium
5.5.2 Activity Alt 1	WEF with 56 turbines and other infrastructure	medium
5.5.2 Activity Alt 2	No Go development, status quo retained	high
5.5.3 Site Layout Alt 1	56 turbines distributed thru the site	neutral
5.5.3 Site Layout Alt 2	Consider other distribution pattern	neutral

5.5.4 Technology Alt 1	Turbine 150m high - similar impact	medium
5.5.4 Technology Alt 2	Turbine 149.5 high – similar impact	medium

Table 5.4 Visual Absorption Capacity

For the *No-Go Alternative* the visual absorption capacity is high because the status quo would not change.

5.11 Compatibility with Surrounding Landscape

This refers to the extent to which the proposed development and land usage is in line with the surrounding development and land usage.

- *appropriate: the development will fit in well with the surrounding landscape*
- *moderately appropriate: the development can blend in, but to a lesser degree and only with care*
- *inappropriate: the development introduces new elements into the landscape that do not fit in.*

The existing landscape setting is an open rural area appearing fairly flat, vegetated by low scrub, used for grazing and power lines, and in a landscape where views are long. Its compatibility with surrounding landscape does not vary throughout its physical extent.

This development proposes to change the use of these rural lands to that of a Wind Energy Facility, which is an industrial land use. The power lines component of the proposed development will fit in. In close proximity to the development site are lands very similar to the site; further away there's a small residential community and further away again there are the visible built remnants of the mine. This, and the sub-station, has provided an industrial component to the local landscape, which, though the mine is closed, still influences the landscape character.

This development is judged to have a moderately appropriate capacity for compatibility with the surrounding landscape; the development can blend in, to a lesser degree, and only with care.

The *Alternatives* will be seen as compatible to a similar degree, (with similar infrastructure locally). The *No-Go Alternative* will be seen as a part of the surrounding landscape as the status quo will not change.

5.12 Intensity or Magnitude, of Visual Impact

This refers to the degree to which the visual nature of the landscape will be altered.

zero: natural and/or social functions and/or processes remain unaltered
very low: natural and/or social functions and/or processes are negligibly altered
low: natural and/or social functions and/or processes are slightly altered
medium: natural and/or social functions and/or processes are notably altered
high: natural and/or social functions and/or processes are severely altered

5.12.1 The area which forms the development site is about3 000ha in extent, is close to a community, scattered farmsteads, transportation corridors, power lines and a mine.

The community adjacent is quite close at 3.5km; the farmsteads and roads are not much further away. The locality has always had an industrial component, with the adjacent mine which, though closed, still influences the landscape character. This is due to the visual impact of the remaining mine buildings; and its sub-station ensured that the landscape carried many power lines.

The local landscape is characterised by long open views, and therefore the visual nature of the landscape will be altered by the introduction of objects so large in scale

The magnitude of the visual impact is adjudged to be medium. The impact will be a strong focus in the landscape but there is local context.

5.12.2 Between 1 km and 5 km
The visual receptors will be a few farmsteads and a people using transport corridors. The magnitude of the visual impact will remain medium.

5.12.3 Beyond 5 km and up to 15 km,
The visual intensity is reduced by distance, but there is little shielding; viewpoints within the zone of theoretical visibility will notice that the visual nature of the landscape has altered. Therefore the magnitude of the visual impact will remain medium-low

5.12.4 Beyond 15 km and up to 25 km,
The visual intensity is reduced by distance, and some shielding; viewpoints within the zone of theoretical visibility will notice that the visual nature of the landscape has altered, still to a noticeable degree. Therefore the magnitude of the visual impact will reduce to low: the landscapes visual nature is altered in a way that is noticeable

5.12.5 The visual intensity assessed for the construction period is rated as medium as the access points will be visible from transportation corridors and the construction traffic may go through Copperton.

5.12.6 The intensity of the visual impact of the *Technology Alternatives,* will also be rated high, they are of slightly different specifications, but similar heights; the development would intrude into the landscape to a similar degree.

5.12.7 The intensity of the visual impact of the *No-Go Alternative* will be zero because no changes to the landscape are currently anticipated.

5.13 Duration of the Visual Impact

The duration of the impact upon its surroundings, from construction period, up to 2.5 years; short term, up to 5 years after construction; medium term, 5-15 years after construction; long term, more than 15 years after construction.

The whole development, (civil engineering services, installation of turbines and power lines, roads, etc.,), is expected to take about 2 years on site to construct.

The duration of the WEF is expected to be more than 20 years. New turbines could be erected on the site and on the same foundations, or the site could be abandoned. The duration is judged to be long term.

The duration of the *No-Go alternative* cannot be known at this time but may not be permanent as another use or uses may be found for this site.

5.14 The Significance of the Visual Impact

The significance of the visual impact is assessed as a combination of:

- the extent, or spatial influence of the impact (para 5.7, regional)
- the length of time over which it may be experienced, duration, (para 5.13, long term)
- the intensity of the impact, (para 5.12, medium).

Examining all these impacts allows an assessment of the significance to be made.

Initially, the overall significance of the development can be assessed to be high as there will be permanent change in the regional landscape. This will be due to the activities associated with the construction period as well as the development but within a partly industrial landscape. The disturbance during the construction of foundations will be irreversible. With increasing maturity of the development its visual significance will not change.

The proposed *technology alternatives* receive the same assessment. The *No-Go Alternative* will have a low significance, as the status quo will not alter.

5.15 Potential Cumulative Visual Impacts.

Looks at the accretion of similar developments over time

5.15.1 Plan 8 Development

While no additional phases to this development are proposed, it is not known if the proponent, or any other body, would consider a further phase on this site. That would depend upon factors outside the scope of this study. However it is noted that the whole development site area is currently occupied by the proposed works, there is no left-over areas for further infrastructure.

If the ground is not developed, and the *No Go Alternative* remains, there may or may not be cumulative impacts; the site appears stable in its land uses at this time.

5.15.2 Other Alternative Energy Projects in the Locality

The visual impact of this proposed development must also be assessed in the context of the other renewable energy projects within the Copperton area that are in various stages of approval. If this development were to proceed it could be experienced in the context of a proposed 190 turbine development which could occupy two sites between the R357 towards Vanwyksvlei and the R386 to Carnarvon, if approved. The proponent for this development is Mainstream Renewable Energy; and their WEF would be located on two sites 8 to 15km to the south-south-west and the south of the Plan 8 WEF.

In addition, a 20MW Solar Farm, (PVF) has been approved; it is to be located directly north of the road to the mine off the R357, some 6km south-west from the proposed Plan 8 WEF. There are also three proposed PVF sites are currently being assessed. They are a 100MW facility at Struisbult Farm, just to the north of the one already approved, and two 100MW facilities north and south of the R357, and which will be between 7 and 9km south of the Plan 8 site.

There will be new transmission lines, sub stations and new access roads associated with the new developments. The construction periods may not run concurrently with consequent increased impact on local roads.

5.15.3 The Scale of the Local Landscape

The local landscape, both north and south of the village and the mine, may therefore change in character from one which is open, and without many visual incidents, to one of wind turbines and solar arrays. The scale of the landscape is extensive enough to provide a setting for these developments, the roads serve mainly local traffic, the area is already partly industrialised.

5.15.4 The scale of this Cumulative Impact

Consideration must be given to local residents in Copperton, the people who work in Alkantpan, people who live locally on the farmsteads, and people who drive through the area. To what degree will the proliferation of these developments visually impact upon these receptors and how will it be assessed.

The construction period will have an increased impact due to longer timeframes; road access junctions will be more impacted upon and lay-down areas will be more visible.

There will be additional new transmission lines crossing the landscape from the developments and into Cuprum and Kronos.

In a more populated area, with more complex landscape patterns, the number of proposed developments could result in a high visual impact. In this context, the long views, few roads with little traffic, and the low numbers of habitations, combine to reduce this cumulative impact and rate it as *medium*. The local landscape character is changed and made more industrial, and this cumulative impact is assessed as *medium for both magnitude and significance*.

5.16 Viewpoints and Images.

The images were created on site and within the surrounding landscape from locations where the development site would be deemed to be visible. They were created both during the morning and the afternoon in the month of August 2011. The weather was clear and open, and deemed to be typical.

The camera was set at a focal length deemed to be as close to natural eye experience as possible. No filters were used. Panoramic images have been overlapped and stitched.

567/8

Fig 5.9 image taken from the R357 looking west, about 10km away, towards the development site with turbines superimposed to indicate the possible visual effect. This view would signal the locality and be seen in the context of the mine (mine tower on left). Source: Viridian

571

Fig 5.10 image taken from the R357 looking north, about 4km away towards the development site with turbines superimposed to indicate the possible visual effect. This view would signal the locality and Copperton and its derelict lighting tower can be seen on the left of the image. Source: Viridian

596

Fig 5.11. An image taken from the corner of Silver Street, from where people live, and looking east to Phase 1 turbines which would be about 3.5km away, and more. This image also shows the existing scrub at the periphery of the built-up area. Source: Viridian

653

Fig 5.12. An image taken from the road through Copperton from the roundabout at its entrance up to IetsNietz and off which most properties are accessed. The view would be to the east and looking at Phase 1 turbines which would be about 3.5 km, and more, away. This road may be being considered as an access for construction. Source: Viridian

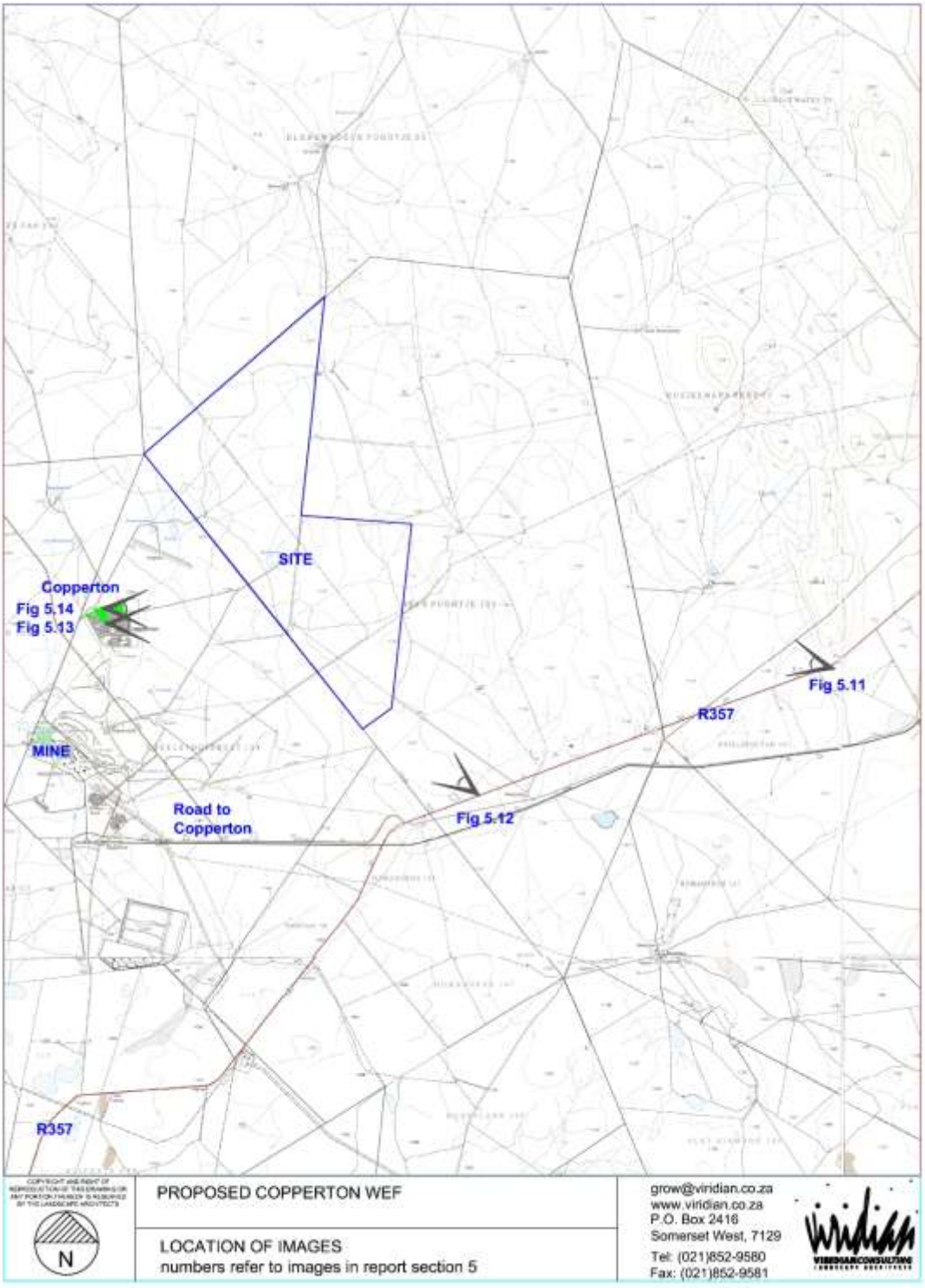


Fig 5.13Location of Images. Source: Chief Directorate, National Geo-Spatial Information. 1:50 000 Raster Images/Viridian

Results of the assessment of the Visual Significance of the Impacts associated with the Construction and Operation of the Copperton Wind Farm.

Note: ' Long term' means the whole life of the project which could be up to 20-25 years

	Nature of impact	Extent of impact	Duration of impact	Intensity	Probability of occurrence	Status of impact	Degree of confidence	Reversibility	Level of signific-ance	Mitigation Measures	Significance after mitigation
	CONSTRUCTION PHASE										
	Alternatives: Location, Site, Technology										
1	Location of the construction roads, off existing roads, (access widening, etc)	Local and site specific	Construction period	Medium	Definite	Negative	Certain	Irreversible	Medium	Comply with road traffic safety requirements	Moderate-low
2	Upgrading existing local roads to turbines	Local and site specific	Construction period	Medium	Definite	Negative	Certain	Irreversible	Medium	Careful alignment of roads for least visibility, revegetating disturbed slopes	Moderate-low
3	Impact on local roads used for low loader bringing very large, heavy components from the port etc	Regional, Local, site specific	Construction period	Medium	Definite	Negative	Certain	Reversible	Medium	Good traffic management and keeping local people informed	Moderate
4	Establishment of construction camp	Local and site specific	Construction period	Medium	Definite	Negative	Certain	Reversible	Medium	Careful placing for least visibility, revegetating disturbed areas	Moderate-low
5	Provision of new roads through the site to link infrastructure for construction and maintenance	Local and site specific	Construction period	Low	Definite	Negative	Sure	Irreversible	Low	Alignment of road for least visibility, revegetating disturbed areas; remove any surplus spoil off site	Low
6	Movement of construction vehicles around the site, with lights	Local and site specific	Construction period	High	Definite	Negative	Sure	Reversible	Medium	None	Moderate
7	Dust generation, due to movement of construction vehicles	Local and site specific	Construction period	Medium	Definite	Negative	Certain	Reversible	Medium	Choose route by-passing Copperton	Low

Table 5.5. Table of Visual Significance of Impacts

	Nature of impact	Extent of impact	Duration of impact	Intensity	Probability of occurrence	Status of impact	Degree of confidence	Reversibility	Level of significance	Mitigation Measures	Significance after mitigation
8	Construction of Alt 1 overhead 132kV lines onsite linkage to existing grid	Local and site specific	Construction period	Very low	Definite	Negative	Certain	Irreversible	Low	None	Low
9	Construction of Alt 2 overhead 132kV lines connecting turbines to Cuprum	Local and site specific	Construction period	Low	Definite	Negative	Certain	Irreversible	Medium-low	None	Moderate-Low
10	Construction of the concrete footings, for each turbine	Local and site specific	Construction period	High	Definite	Negative	Certain	Irreversible	High	Cover and re-vegetate over turbine foundations; Return adjacent ground to original state; remove surplus spoil off site	Moderate
11	The grouping of the turbines on site	Local and site specific	**Long**-term	Medium	Probable	Neutral	Certain	Irreversible	Moderate	None	Low
12	The colour finish of the turbines	Local and site specific	Long-term	Medium	Definite	Negative	Sure	Neutral	Moderate	Use a neutral colour, preferably white, non reflecting; no stripes, decals or logos	Low
	OPERATIONAL PHASE										
	Alternatives: Location, Site										
1	Maintenance visits by maintenance crew, using the existing gravel roads, the upgraded gravel roads and the gravel roads connecting the infrastructure	Local and site specific	Long term	Low	Definite	Neutral	Certain	Neutral	Low	None	Low
2	Concrete footings for each turbine	Local and site specific	Long-term	High	Definite	Negative	Certain	Irreversible	Moderate	The disturbed areas should be re-vegetated	Low

	Nature of impact	Extent of impact	Duration of impact	Intensity	Probability of occurrence	Status of impact	Degree of confidence	Reversibility	Level of signific-ance	Mitigation Measures	Significance after mitigation
3	The impact of the new transmission lines	Local and site specific	Long-term	Medium	Possible	Negative	Certain	Reversible	Moderate	None	Low-Moderate
4	The grouping of the turbines on site seen from population centres	Local and site specific	Long-term	Medium	Probable	Negative	Certain	Irreversible	Moderate	Treatment of turbines	Moderate
5	The grouping of the turbines on site seen from transport corridors	Local and site specific	Long-term	Medium	Probable	Negative	Certain	Irreversible	Moderate	None	Moderate
6	The colour finish of the turbines	Local and site specific	Long-term	Medium	Definite	Negative	Sure	Irreversible	Moderate-High	Treatment of turbines	Moderate
7	The visual impact of seeing the turbines operating/rotating	Local and site specific	Long-term	Medium	Definite	Negative	Certain	Irreversible	High	Local consultations	Moderate
	Alternative Option (Technology)										
1	Assessment of Impacts during Construction and Operational Phases	Local and site specific	Long-term	High	Definite	Negative	Certain	Irreversible	High	As for the preferred Option	Slightly less than the Preferred Option due to the shorter mast.
	Alternative Option (Activity) (No Go)										
1	Retention of status quo	Local and site specific	Long term	Medium	Probable	Status quo	Sure	Reversible	Moderate	N/a	N/a

6.0 RECOMMENDED MITIGATION MEASURES

6.1 Construction phase:

Potential Impacts*: materials haulage to and from the site; dust, site development works.*

6.1.1 Location of construction access:

Construction access will be from existing gravel road(s) off the R357 and probably through Copperton; and for the duration of the civils contract there will be the need for earthmoving equipment, transport of concrete for foundations, and transport of the entire infrastructure, viz. the turbines, masts, and transmission tower materials. Mitigation of these issues can be offered by keeping the contract time to the minimum, and by ensuring that road junctions have good sightlines, traffic control measures when needed, and signage. It is also advised that if there is a practical alternative route for construction traffic that does not go through Copperton, it should be the preferred option.

6.1.2 Dust generation, movement of machinery and vehicles:

Access roads are to be kept clean, and measures taken to minimise dust from construction traffic on gravel roads. Especially if traffic uses the gravel road through Copperton, it should only to operate at 'core time', being 08.00 to 17.00 Monday to Friday to avoid disturbance out of hours. It is recommended therefore that, if practicable, consideration should be given to an alternative route that would avoid the community.

6.1.3 Measures to deal with surplus materials from excavations

It is anticipated that following the excavation of ground for foundation construction there will be surplus material for disposal. This should not be left on the site in piles and also should not be spread around the site. If it can be used locally for the construction of roads, for example, that would be acceptable on the basis that the resulting roads would match existing.

If there are no uses to which the material can be put, or if it is of a different colour than that encountered locally, then it must be removed off site. It is hoped that this will not result in heavy haulage for extended distances; it is suggested that it may be practicable to discuss storage of suitable surplus materials at the mine in places where there would not be adverse additional visual impact.

6.1.4 Visibility of Contractors compound and site offices:

Careful consideration should be given to the visual implications of the siting of the construction camp. It is advised that their likely, somewhat negative, visual impact from the small community at Copperton should be addressed.

Site offices, if required, should be limited to single storey and they should be sited carefully using temporary screen fencing to screen from the wider landscape.

6.1.5 Fires and litter:

All site operatives to receive training in awareness of these issues. In addition, no fires to be allowed, litter to be regarded as a serious offence and no contaminants to be allowed to enter the environment by any means.

6.2 Infrastructure

Potential impacts: *disturbance of the landscape due to the installation of roadways, and infrastructure.*

6.2.1 New roads into the site

The existing roads will be upgraded; and should be gravel roads if appropriate to the needs of construction traffic. Required is a 6m wide road with turning circles. The new site road(s) that will connect the turbines and permit free access for maintenance and inspection vehicles in the site should also be gravel. As the terrain is relatively flat, new gravel roads are not likely to be more visible than those on the site at present.

6.2.2 Concrete footings

The need to provide large concrete footings for each of the turbines will result in a great deal of necessary scarring of the existing land cover. Installation of each turbine will require an extensive area for the foundation, (20 by 20m) and there will also be a pad, (20 x 6m), to be laid for the 120m high crane to erect each turbine. The developer will be asked to consider a hard-standing for the crane(s), which are temporary, to be re-vegetated after installation completion.

Retention of the first 100-150mm of naturally occurring substrate (where it occurs), conserving it, and then spreading it over finished levels may be of some benefit. The developer will be required to ensure that all excess material is removed off-site, and all the ground is returned as far as possible to original levels/gradients.

6.3Visibility of Buildings and Ancillary infrastructure

It is generally advised that any new structures be placed where they are least visible to the greatest numbers of people, in places where topography can offer shielding. This development may require the installation of a transformer to serve each phase. Their locations will be determined by the location of the existing Eskom infrastructure and therefore there is deemed to be no mitigation advantage in their location.

6.4 Visibility of Transmission pylons

It is often appropriate to consider under-grounding of new power lines on a site as they introduce horizontal lines above ground which conflict with the strong vertical element of the turbine structures, potentially destroying their visual clarity. In this instance, the proposed pylons will be of a cross-braced timber design, in use on the site already. This could conflict with turbines, but is fully mitigated by the number of similar lines already through the site.

6.5 Layout

It is generally accepted that turbines are placed in the landscape more for technical reasons than for aesthetics or visual concerns.

There are many recorded instances where great care has been given to a precise layout based on mathematical principles of straight lines and angles. This has been done with the object of achieving visual clarity, because a clear pattern in a landscape is less disruptive to the eye than a random pattern. However, these installations are rarely if ever, viewed from one place only. They are very large and therefore viewed from many angles. So it is advised that there is no advantage on this site to be gained from trying to set the turbines in a straight line, for example.

By the same principle it is also advised that there is little visual advantage to be gained by carefully siting turbines at different elevations to break up some imagined view. Therefore there is no mitigation advantage on this site in proposing changes to the layout.

The receptors most visually affected by this development would be the small community at Copperton. The majority of the buildings have been demolished, and the edge of the previously built up area, is visually negative from dereliction.

6.6 The Psychological Effect of the Turbines in the Landscape

Much of this assessment report confirms that it is not practicable to attempt to screen wind farms visually. Providing a means whereby they can be absorbed into the landscape is more feasible. There are several ways in which this can be approached.

6.6.1 Technology Alternatives

While both alternatives will be very close in height from ground level, there could be perception that *Alternative* 2 has less bulk due to the shorter mast.

6.6.2 The use of certain materials and finishes.

Much has been written over the last 15 years about the affect of colour and finishes of the degree to which the turbines are accepted in the landscape. No definitive opinions have emerged but there are three trends in opinion. One is that the use of a plain galvanised finish seems to imply to most receptors that this is a technically primitive installation; powder coating with a colour looks more sophisticated. The uncoated metal also glints more in the sunlight, which is not acceptable.

Second is that it is generally preferable to use white as a finishing colour. This does make a clear and forthright statement, but in this landscape without back-grounding, off-white is also appropriate.

Thirdly, blades, (rotor), nacelle and tower should all be the same colour. Brand names on the side of the nacelle accentuate these individual components at the expense of an harmonious whole and are discouraged. Stripes of contrast colour on the blades are similarly discouraged as

they interfere with visual clarity. Turbines should be finished in matte white or off-white and be without contrast colour stripes, etc.

In some circumstances, particularly in a rural site, with some back-grounding, great success has been achieved in grounding, or associating the turbines with their setting, by giving the lower third a graduated paint finish using earthy tones to match the local landscape. There is no perceived mitigation advantage in adopting a graduated paint finish on this site because it is flat, without back-grounding.

The aircraft warning lights required by CAA should be fitted with shields so that they are only visible to aircraft, not to receptors on the ground at lower elevations.

6.6.3 Presenting the scheme to Interested and Affected Parties

There may be benefits accruing to the developer in the acceptance of this installation, by providing some information to local people. This could be in the form of making the site accessible and welcoming, so that people would not feel intimidated; by providing some interpretation information and a small car park. It is not the developers' intention to fence the site and this is regarded as a good thing.

In addition it is also worth considering that long term maintenance will also play an important role in the psychological acceptance of this installation. If turbines are faulty, the public may perceive a turbine installation to be unjustified, and a waste of resources; thus when turbines frequently don't operate, the public is less likely to tolerate their intrusion into the landscape.

Finally it must be hoped that far from becoming a source of concern to local people, the turbine installation not only becomes accepted, but also becomes a local landmark and adds to the local sense of place.

In the context of other similar developments being planned around Copperton, it is recommended that it will become even more important to provide information to local people.

6.7 Summary of Mitigation Measures

Construction Phase:	Contract time to the minimum Traffic control measures Routing of access road away from Copperton Timing and location of traffic movements Disposal of surplus materials Location of lay-down areas Environmental awareness
Operational Phase: Infrastructure:	New gravel roads Re-vegetation of disturbed areas
Operational Phase Layout:	Upgrading the built-up edge of Copperton Consideration of Alternative 2 over Alternative 1 Turbines finished in a plain colour

Fitting shields to aircraft warning lights
Discussions with local people

Addenda 1 - 3

Addendum 1 : Visual Impact Assessments : Definitions and Ratings

Visual Impact Assessments : Definitions and Ratings
Referred to are criteria specific to visual impact assessments referred to in the DEA&DP guideline document and which are as follows:

Viewshed
The viewshed refers to the theoretical outer-most extent of the area from which an object may be seen. Visibility can be obscured in part or in whole by objects within the viewshed such as existing buildings, trees, or landform.

Rating – not rated, a description given

Visibility of the Site
A description of the actual places within the view shed from which the site can be seen; significant views are discussed

Rating: not rated, a description given

The Extent of the Visual Impact
Rates the impact in terms of the geographical area that will be influenced by the visual impact

Ratings :

- no impact: no visual impact
- limited: visual impact is small, generally confined to the site
- local: the site and the immediate surrounding area, (1-5km)
- sub-regional: a greater area is influenced, (5-10km)
- regional: the influence extends to an entire region
- national: the influence has national importance and extends beyond boundaries

Visual exposure
Visual exposure refers to the visibility of the project site in terms of the capacity of the surrounding landscape to offer screening. This is determined by the topography, tree cover, buildings, etc.

Ratings:

- no exposure: the site is hidden by topography, planting, etc
- low: the site is largely hidden
- medium: the site is partially hidden
- high: there is little in the surrounding landscape that can shield the development from view

Zones of visual influence
Describes the areas visually influenced by the proposed development, and assesses the amount of influence
Ratings:
non-existant: the site cannot be seen from surrounding areas
low: the development is largely shielded from view by topography, planting, etc
moderate: the development is partially shielded

high: the development strongly influences the view and acts as a visual focus

Visual Absorption Capacity
This refers to the ability of the surrounding area to visually absorb the development. In this assessment, high is a positive and low is a negative

Ratings:

- low: the area cannot visually absorb the development
- medium: the area can absorb the development to a degree but it will look somewhat out of place
- high: the area can easily visually absorb the development

Compatibility with Surrounding Landscape
This refers to the extent to which the proposed development and land usage is in line with the surrounding development and land usage.

Ratings:

- appropriate: the development will fit in well with the surrounding landscape
- moderately appropriate: the development can blend in, but to a lesser degree and only with care
- inappropriate: the development introduces new elements into the landscape that do not fit in.

Intensity or Magnitude, of Visual Impact
This refers to the degree to which the visual nature of the landscape will be altered.

Ratings:

- low: the impact is noticeable but does not act as a strong focus in the landscape
- moderate: the landscapes visual nature is altered in a way that is noticeable
- high: the visual impact of the development intrudes into the landscape in a noticeable way

Duration of visual Impact
The duration of the impact upon its surroundings

Ratings:

- temporary: one year or less
- short term: one to five years
- medium term: five to fifteen years
- long term: more than fifteen years

Significance of the Visual Impact
This rating assesses at the overall impact

Ratings:

High	• High magnitude with a regional extent and long term duration • High magnitude with either a regional extent and medium term duration or a local extent and long term duration • Medium magnitude with a regional extent and long term duration
Medium	• High magnitude with a local extent and medium term duration • High magnitude with a regional extent and construction period or a site specific extent and long term duration • High magnitude with either a local extent and construction period duration or a site specific extent and medium term duration • Medium magnitude with any combination of extent and duration except site specific and construction period or regional and long term • Low magnitude with a regional extent and long term duration
Low	• High magnitude with a site specific extent and construction period duration • Medium magnitude with a site specific extent and construction period duration • Low magnitude with any combination of extent and duration except site specific and construction period or regional and long term • Very low magnitude with a regional extent and long term duration
Very low	• Low magnitude with a site specific extent and construction period duration • Very low magnitude with any combination of extent and duration except regional and long term
Neutral	• Zero magnitude with any combination of extent and duration

Potential Cumulative Visual Impacts
Looks at the accretion of similar developments over time

Ratings: not rated, a description given

Addendum 2 : Declaration of Interest

environmental affairs
Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF SPECIALIST AND DECLARATION OF INTEREST

	(For official use only)
File Reference Number:	12/12/20/
NEAS Reference Number:	DEAT/EIA/
Date Received:	

Application for authorisation in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Environmental Impact Assessment Regulations, 2010

PROJECT TITLE

Proposed Wind Energy Facility near Copperton, Western Cape

Specialist:	Viridian Consulting (Pty) Ltd		
Contact person:	Karen Hansen		
Postal address:	P O Box 2416 Somerset West, W Cape		
Postal code:	7129	Cell:	072 840 8900
Telephone:	021 8529580	Fax:	021 8529581
E-mail:	hansentk@cybersmart.co,za		
Professional affiliation(s) (if any)	Chartered Landscape Architect		

Project Consultant:	Aurecon South Africa (Pty) Ltd		
Contact person:	Louise Corbett/ Amy Towers		
Postal address:	P.O. Box 494, Cape Town		
Postal code:	8000	Cell:	084 014 4893 / 083 457 0057
Telephone:	021 481 2508	Fax:	021 424 5588
E-mail:	Louise.corbett@aurecongroup.com/ Amy.towers@aurecongroup.com		

4.2 The specialist appointed in terms of the Regulations_

I, **Viridian Consulting** , declare that --

General declaration:

- I act as the independent specialist in this application
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of Regulation 71 and is punishable in terms of section 24F of the Act.

Signature of the specialist:

Name of company (if applicable):
Viridian Consulting (Pty) Ltd

Date: 19th September 2011

Addendum 3: CV

Karen Hansen, Independent Consultant Landscape Architect

Qualifications

Chartered Membership of the Landscape Institute, UK, in 1982, registered nr. 11994.
Strathclyde University, Scotland, 1995, attended a tutorial based course in Environmental Impact Assessment covering the legislative background to, and practice of, Environmental Impact Assessment, with particular reference to Visual Impact Studies.

Experience in South Africa

2011 onward: Independent Consultant Landscape Architect specialising in, inter alia, Visual Assessments
2010 to 2011: Consultant Landscape Architect to Viridian Consulting (Pty) Ltd.
2006 to 2010: Senior Landscape Architect with Viridian Consulting, Somerset West, undertaking a number of landscape design projects as well as environmental studies.

Environmental Studies:
Visual Impact Assessment, level 3, for residential development at L' Avenir Winery, Stellenbosch
Visual Impact Assessment, level 3, for Mixed Use Development at Mandalay, Khayelitsha, Cape Town
Visual Scoping Study for Industrial Uses at Blackheath, Cape Town
Visual Impact Assessment, level 2, of transmission lines for De Wijnlanden Residential Estate, Somerset West
University of Cape Town Middle Campus, Rondebosch, for Urbanscapes, MLH Architects and UCT; to assess impacts derived from change of use of multi-level piazza to new lecture theatre and administration buildings
Visual baseline study for tourism development at Kogel Bay Tourist Resort, Western Cape as part of the Development Framework Policy document
Visual Impact Assessment, level 3, for proposed residential development over 3,460ha at St Helena Bay, a core project of the St Helena SDI.
Visual Impact Assessment, level 3, for Phase 2 of De Zalze Golf Estate, Stellenbosch.
Visual Impact Assessment, level 3, for change of use to Mixed Use Development for Crammix Brickworks, Cape Town.
Visual Impact Assessment, level 3, for Agri-Industrial uses at Klapmuts, Paarl
Visual Scoping Study for Wind Turbines and Wind Measuring Masts in the N and W Cape
Visual impact Assessment, baseline studies, for Wind Measuring Masts, Vredendal, Worcester, and De Aar
Visual Impact Assessments, level 3, for the establishment of Renewable Energy sites: Windfarms, Photo-voltaic installations, Concentrating Solar Power Installations in six centres in the Western and the Northern Cape, (De Aar, Vredendal, Worcester, Namaqualand, Springbok, and Copperton/Prieska)
Visual Impact Assessment, Baseline Study, for a Photovoltaic Installation in Vredendal, W Cape, (2011).
Visual Impact Assessment, Baseline Study, for the extension of Palmiet Quarry, Grabouw, W Cape, (2011).

Experience in UK

2000 to 2006: Landscape Architect and Team Leader with Glasgow City Council. Master planning, design, implementation of the Heritage Lottery funded urban parks and urban dual carriageways.

1992 to 2000: Partner with Kirklee Landscape Architects, undertaking a number of landscape design projects as well as environmental studies.

Selected Environmental Studies:
Visual Impact Assessment, level 3, design and Implementation of landscape works for major new road, Western Distributor Road, Glenrothes, Fife, Scotland.
Visual Impact Assessment, level 2, of proposed golf and housing estate in Prestwick, Scotland.
Visual Impact Assessment, level 2, of hotel in airport context at Edinburgh Airport.

Visual Impact Assessment, level 2, study of landscape aspects of felling and restocking of several areas of existing coniferous woodlands and change to native woodland species in loch catchment area for West of Scotland Water at Loch Katrine, Strathclyde.
Visual Impact Assessment, level 3, for Central Scotland Countryside Trust as part of the process to determine future access and tree planting policy in the Greenbelt surrounding Falkirk, Scotland.
Visual baseline studies for abandoned open cast mines for British Coal Opencast, at Knockshinnoch Nature Reserve, Ayrshire, Scotland and others.

Karen Hansen has no business, financial, personal or other interest other than fair remuneration for work performed in connection with these studies and there are no circumstances that may compromise her objectivity in pursuing and serving the interests of the public.