Visual Scoping Study

for the Proposed BioTherm Wind Energy Projects near Sutherland, Western and Northern Cape

Maralla West WEF

July 2016

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FINAL

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1. INTRODUCTION

BioTherm Energy (Pty) Ltd. is proposing the development of three Wind Energy Facilities (WEF) in the Moordenaars Karoo, in the Western and Northern Cape. The projects include the Maralla West WEF, Maralla East WEF and the Esizayo WEF. Each WEF will have a maximum capacity of 250MW. This report only focuses on the Maralla West WEF.

The Maralla West WEF lies within the Moordenaars Karoo within the Northern Cape, in the Karroo Hoogland Municipality. The site is situated approximately 45,5km north of the N1, 32km south of the town of Sutherland and 15km east of the R354, which runs between Matjiesfontein and Sutherland (See Figure 1). The sites extend over an area of about 10 103ha and are situated on the farms: Drie Roode Heuvels 180 Remaining Extent, Annex Drie Roode Heuvels 181, Wolven Hoek 182 Portion 1 and Wolven Hoek 182 Portion 2.

The Maralla West WEF is situated within the proposed Komsberg Renewable Energy Development Zone (REDZ), one of the eight areas that have been identified through an extensive process for the development of renewable energy installations. In addition, the site falls within the Central Electricity Grid Infrastructure (EGI) Corridor.

The National Environmental Management Act ("NEMA") and Environmental Impact Assessment ("EIA") Regulations require that an EIA be undertaken for the proposed project and associated infrastructure, since it includes listed activities in terms of these regulations. The environmental assessment is being conducted by WSP | Parsons Brinckerhoff.

This Visual Scoping Study is one of many baseline investigations that have been undertaken by specialists as part of the Scoping Phase of the assessment. The scoping environmental and social studies will inform the proposed layout of the facility and specify requirements for future impact assessments. This Scoping Study should be read in conjunction with the relevant Scoping Reports and other specialist studies. The Scoping Phase study will be followed by a Visual Impact Assessment in the next phase of the project application.

1.1. SCOPE AND LIMITATIONS

SCOPE OF WORK

The principal objectives of the study were to establish a detailed visual baseline description of the project's zone of influence and to screen potential visual impacts to inform the impact assessment phase.

The scope of work included:

- Undertaking a field study to establish a baseline description of the visual characteristics of the landscape;
- Defining the visual resources and sense of place of the area;
- Identifying and mapping existing sensitive receptors and areas, important viewpoints and view corridors;
- Identifying and screening potential visual concerns;
- Ensuring that the visual assessment will be in compliance with relevant standards, policies, laws and regulations; and
- Providing recommendations for the impact assessment phase.

LIMITATIONS AND ASSUMPTIONS

The following assumptions and limitations are relevant to the report:

1. The scoping report is based on background information supplied by WSP/Parsons Brinkerhoff regarding the proposed wind energy developments.

2. This report is confined to a baseline description and screening of potential visual sensitivities and does not include a full visual impact assessment. Impact ratings in the next project phase may differ from the screening rating presented in this report.

3. Preliminary determination of the Zone of Visual Influence (ZVI) has assumed a maximum hub height of 120m and a further 75m radius for the rotor blades (150m diameter). This results in a total turbine height of 195m.

4. Comments and concerns from interested and affected parties have not yet been tabulated and will be considered in the assessment phase.

5. Visual guidelines for wind facilities in the Northern Cape are not currently available. Guidelines and draft guidelines for wind energy in the Western Cape have therefore been used as a benchmark / guide.

6. Planning impacts are not considered within the scope of the visual study.

7. The following proposed projects were considered when looking at cumulative impact: the development of three Preferred Bidder projects; Roggeveld Wind 140MW WEF, Kurusa 140MW WEF and the Soetwater 140MW WEF. Other WEFs in the area that have approval but have not been awarded Preferred Bidder, including the Mainstream WEF that received initial approval in 2010.

2. APPROACH AND METHODOLOGY

2.1. APPROACH

The assessment was conducted in accordance with the Guideline for Involving Visual and Aesthetic Specialists in EIA Processes (2005) and other relevant regulations and guidelines (see Section 3 below).

The focus of the scoping study was on establishing the character and sensitivity of the visual environment, identifying the visual catchment area and identifying visual resources in order to inform the next design phase as well as the impact assessment.

2.2. METHODOLOGY

In order to meet the terms of reference, the following methodology was applied:

1. All the required **data were collected**, which included data on topography, existing visual character and quality, plans of the proposed development and other background information;

2. **Fieldwork** (a site visit) was conducted from 10-13 March 2016. The objectives of the fieldwork were to:

    - familiarise the author with the site and its surroundings;

    - to identify key viewpoints/ corridors and visual receptors;

- groundtruth the sensitivity of the landscape; and
- determine the distance from which visual impacts are likely to become discernible.

3. **Landscape characterisation** was done by mapping the site location and context and describing the landscape character and sense of place. This considered geological and topographical features, vegetation and land-use.

4. The **landscape quality** was described using visual appeal criteria, based on Ramsay, Crawford, Arriaza and Young and explained in the text below.

5. **Visual 'sampling'** was undertaken using photography from a number of viewpoints within approximately 30km of the site. The location of the viewpoints was recorded with a GPS and photographs were taken at a depth of field between 45-55mm. A selection of these will be used in the assessment phase of the VIA to illustrate the likely zone of influence and visibility.

6. The **sensitivity of the landscape** was analysed, taking the following factors into consideration:
   - Slope and elevation;
   - Proximity of visual receptors (farmsteads and towns);
   - Proximity of major roads and scenic routes;
   - Nature reserves and National Parks; and
   - Other relevant features and buffer guidelines.

7. Visual **concerns and potential impacts** were identified; and

8. Potential visual impacts for each project phase were **screened** using WSP's screening methodology (see below).

IMPACT SCREENING TOOL

The screening methodology below was developed by WSP in order to give an indication of which impacts require detailed assessment and which impacts of very low significance can be excluded from the detailed studies in the impact assessment phase. The screening tool is based on two criteria, namely probability and severity.

It is important to note that given the nature of visual impacts, they are usually definite (i.e. a structure that will be built). Therefore for visual impacts, probability considers the probability of potential viewers being significantly affected rather than the probability of the structure being built. In addition, the efficacy of possible mitigation measures is also taken in consideration.

Probability Scale	Severity / Beneficial Scale			
	1	2	3	4
1	Very Low	Very Low	Low	Medium
2	Very Low	Low	Medium	Medium
3	Low	Medium	Medium	High
4	Medium	Medium	High	High

Probability Scale

4	**Definite**
	Where the impact will occur regardless of any prevention measures
3	**Highly Probable**
	Where it is most likely that the impact will occur
2	**Probable**
	Where there is a good possibility that the impact will occur
1	**Improbable**
	Where the possibility of the impact occurring is very low

Severity / Beneficial Scale

4	**Very severe**	**Very beneficial**
	An irreversible and permanent change to the affected system(s) or party (ies) which cannot be mitigated.	A permanent and very substantial benefit to the affected system(s) or party(ies), with no real alternative to achieving this benefit.
3	**Severe**	**Beneficial**
	A long term impacts on the affected system(s) or party(ies) that could be mitigated. However, this mitigation would be difficult, expensive or time consuming or some combination of these.	A long term impact and substantial benefit to the affected system(s) or party(ies). Alternative ways of achieving this benefit would be difficult, expensive or time consuming, or some combination of these.

2	**Moderately severe**	**Moderately beneficial**
	A medium to long term impacts on the affected system(s) or party (ies) that could be mitigated.	A medium to long term impact of real benefit to the affected system(s) or party(ies). Other ways of optimising the beneficial effects are equally difficult, expensive and time consuming (or some combination of these), as achieving them in this way.
1	**Negligible**	**Negligible**
	A short to medium term impacts on the affected system(s) or party(ies). Mitigation is very easy, cheap, less time consuming or not necessary.	A short to medium term impact and negligible benefit to the affected system(s) or party(ies). Other ways of optimising the beneficial effects are easier, cheaper and quicker, or some combination of these.

3. LEGAL REVIEW

There is little legislation relating directly to visual impact assessment. However there are guidelines that provide direction for visual assessment as well as a number of laws which aim to protect visual resources and others that apply to specialists in general. The most relevant guidelines and laws are listed below; however the list is not exhaustive:

- **The National Environmental Management Act (107 of 1998) EIA Regulations No. R 543 (2010)**: The NEMA EIA Regulations contain broad guidelines for the preparation of specialist studies that are relevant to this study and particularly the assessment in the next phase of the project.

- **The National Heritage Resources Act (25 of 1999)** is applicable to visual resources including cultural landscapes, proclaimed buildings and sites, nature reserves, proclaimed scenic routes and urban conservation areas. This has relevance to scenic routes and nature reserves in the area, which are referred to below. Heritage resources are also dealt with in detail in the Heritage Scoping Report undertaken by ACO Associates.

- **The NEMA Protected Areas Act (57 of 2003)** Section 17 of the Act is intended to protect natural landscapes.

- **D:EA&DP Guideline for Involving Visual and Aesthetic Specialists in EIA Processes (CSIR, 2005):** These guidelines are applicable in the Western Cape, but give good general guidance for the preparation of visual specialist input into EIA processes. The guidelines document the requirements for visual impact assessment, factors that trigger the need for specialist visual input, timing and nature of visual input as well as choice of visual specialists, preparation of terms of reference and guidance for specialist input / visual assessment methodology. At the pre-application / planning phase the guidelines recommend visual input is used to identify scenic resources, visually sensitive areas and visual receptors. Additionally the visual input at this phase in the project cycle should identify fatal flaws, impacts requiring further assessment and provide input to design.

- **Renewable Energy Development Zones (REDZ) and Electricity Grid Infrastructure (EGI) Corridors:** In February 2016 the Cabinet approved the gazetting of 8 REDZ and 5 EGI Corridors. These are geographical areas where wind and solar technologies are to be incentivized and where grid expansion is to be directed. The REDZs and Power Corridors support 2 of the 18 Strategic Integrated Projects (SIPs) which were identified in the Infrastructure Development Plan, aimed at promoting catalytic infrastructure development to

stimulate economic growth and job creation. Once gazetted, regulatory processes within these zones will be streamlined and environmental authorisation will only require a Basic Assessment, not a full EIA. Maralla West falls within both the Central EGI Corridor and the Komsberg REDZ.

- **Astronomy Geographic Advantage areas Act (No. 21 of 2007):** In February 2010, the Minister of Science and Technology declared all land in the Northern Cape Province situated 250km from the centre of the South African Large Telescope (SALT) dome as an astronomy advantage area and the whole of the territory of the Northern Cape Province, excluding Kimberly, as an astronomy advantage area for radio astronomy purposes. Maralla West is situated about 35km away from the SALT.

- **Civil Aviation Act (No.13 of 2009):** This Act provides for the establishment of a stand-alone authority mandated with controlling, promoting, regulating, supporting, developing, enforcing and continuously improving levels of safety and security throughout the civil aviation industry. All proposed developments or activities in South Africa that potentially could affect civil aviation must thus be assessed by SACAA in terms of the SACARs and South African Civil Aviation Technical Standards (SA CATS) in order to ensure aviation safety. Potential impacts from the wind turbines must be reviewed by these authorities.

- **Government of the Western Cape (PGWC), 2006: A Strategic Initiative to Introduce Commercial and Land Based Wind Energy Development to the Western Cape:** Although the proposed wind energy farms fall within the Northern , the report prepared by the Provincial Government may be helpful in providing some indicators for wind energy facilities. The Guidelines also recommend buffers for sensitive visual and ecological resources.

- **Environmental Impact Assessment Guideline for Renewable Energy Projects (Notice 989 of 2015):** This guideline provides guidance on the environmental management legal framework applicable to renewable energy operations. It aims to ensure that all potential environmental issues pertaining to renewable energy projects are adequately and timeously assessed and addressed so as to ensure sustainable roll-out of these technologies.

4. REGIONAL OVERVIEW

The following chapter describes the basic elements that have created and shaped the visual character and quality of the area and establishes the visual context against which visual impacts can be assessed.

4.1 GEOLOGY, CLIMATE AND TOPOGRAPHY

The climate of the region is arid to semi-arid. Rainfall is low and occurs throughout the year but predominantly in the winter months. Mean annual precipitation is approximately 290mm, ranging from 180 – 410mm rainfall per year. Sutherland is known as one of the coldest towns in South Africa and has a minimum average of -6^{o}C.

The study area falls within the Main Karoo Basin of South Africa which is almost entirely underlain by Late Palaeozoic bedrocks of the Karoo Supergroup. This 12km-thick succession of sediments is world famous for its rich fossil heritage (Cluver 1978, MacRae 1999, McCarthy & Rubidge 2005 *in* Almond, 2010).

Geologically the study area is underlain by the continental sediments (shales, sandstones and mudstones) of the Beaufort (Adelaide Subgroup) and Ecca Series of the Karoo System, which are Middle to Late Permian in age. Igneous dolerite intrusions in the sedimentary formations occur throughout the area. These are more resistant to erosion, creating the scenic ridges and koppies and can be recognised as hard dark grey/black rocks (Geological Survey, 1983).

Topographically, the greater study area is a comparatively low-lying, flat to hilly region situated between the mountains of the Cape Fold Belt in the south and the Great Escarpment in the north. The local topography is dominated by the Klein Roggeveld Mountains to the east and the Komsberg Mountains to the north, with peaks ranging from 1300 to 1500masl. East of the Klein Roggeveld Mountains and north of Laingsburg is a deeply dissected region, drained by the Buffels River, which is known as the Moordenaars Karoo. The Maralla West site is situated within this region. Many of the rivers are seasonal or dry, indicative of the arid nature of the area. The geology and topography result in a fairly mountainous to gently undulating landscape that is typical of the Karoo.

Maralla West, situated at the base of the Klein Roggeveld and Komsberg Mountains, is heavily dissected creating a dramatic landscape with rugged ridges and koppies. Elevation rages from approximately 1000masl to 1500masl on Maralla West.

4.2 VEGETATION

The vegetation in the study area is relatively homogeneous. According to the SANBI National Vegetation Map (2012) the prominent vegetation type on the Maralla West site is Central Mountain Shale Renosterveld. This vegetation type is not well protected, but is largely intact (99%) and is classified as Least Threatened. Roggeveld Shale Renosterveld is also found within the northern portion of the sites (close to the Komsberg Mountains), while the north-western portion of Maralla West has some Tanqua Escarpment Shrubland and Tanqua Wash Riviere (SANBI, 2012 and Mucina and Rutherford, 2006).

Clusters and rows of poplars, gums and willow trees are also found in the landscape, close to roads, homesteads, windmills and water/feeding troughs (Plate iii).

Visually, the plants comprise low growing, small arid shrubs and tufted grasses, with scattered slightly taller shrubs. Colours of the vegetation are predominantly browns, greys and muted yellows and greens (Plate ii). Although there is diversity, when viewed from a distance the vegetation is monotonous as plants tend to be small and indistinguishable from afar. Given the arid conditions and rocky shallow soil, vegetation cover is sparse in some areas with rocks and open land between vegetation (Plate iv). The natural vegetation therefore provides little visual cover for structures but the clusters or rows of trees (usually close to farm houses, roads or windmills) provide height and effective visual screening.

Plate i: Low growing shrub and grasses

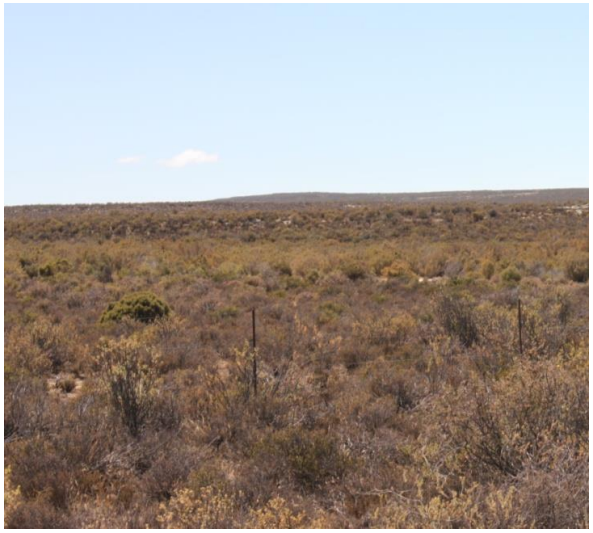

Plate ii: Muted yellows, browns, greens and greys

Plate iii: Clusters of tall exotics

Plate iv: Sparse cover with rocky soils

4.3 LANDUSE

The predominant land use in the area is stock farming (predominantly sheep, game or goat farming). Since rainfall is low and water is scarce, crop farming accounts for only a small portion of the land use and is largely confined to the more fertile valleys. Due to the low carrying capacity, farms are large and usually at least about 10km apart.

Current land-use on the Maralla West site includes sheep farming and some production of lucerne and they are all zoned for agriculture.

The Komsberg Wilderness Nature Reserve (private reserve) is located near the Komsberg Pass neighbouring the Maralla West site. There are no other National Parks or conservation areas in close proximity to the proposed site. The Tanqua Karooo National Park lies to the north-west of the R354, and the Anysberg Nature Reserve south of Matjiesfontein. Prominent Eskom power lines zigzag through the landscape running in an east-westerly direction, south of Maralla West.

Most infrastructure present in the greater study area stems from farming activities and the towns of Sutherland and Matjiesfontein. Generally the farming activities in the area have a low impact on the natural visual environment, as farms are large and carrying capacity low. Prominent visual features

resulting from farming activities typical of the region include windmills, power lines, sheep kraals and fences and occasional clusters of shade trees. Farm houses and buildings vary but tend to be located in the warmer valleys and are most often surrounded by gardens and sheltering trees.

The towns of Sutherland and Matjiesfontein are both local tourism destinations. Matjiesfontein is a historical town/transportation hub preserved for its Victorian charm and was declared a National Monument in 1975. Sutherland's arid climate and remote location make its' night skies among the world's clearest and darkest and is a destination for star gazing and observation. The telescopes of the Southern African Astronomical Observatory are nearby (~35km from Maralla West), which includes the Southern African Large Telescope (SALT), the largest single optical telescope in the southern hemisphere.

It should also be noted that the area falls within the Komsberg REDZ and Central EGI Corridor. These areas are targeted for renewable energy and electricity grid infrastructure development and so this future intended land use will alter the visual landscape. Although construction has not yet commenced, three Wind Energy Farms, in close proximity to the proposed sites, have been approved and are due to be constructed. These will significantly alter the vertical landscape and character of the area.

Plate v, vi and vii: Agriculture, sheep farming.

Plate viii: Rural homesteads, nestled in valleys and often surrounded by tall, sheltering trees.

4.4 VISUAL CHARACTER

Landscape character is the description of the pattern of the landscape, resulting from particular combinations of natural (physical and biological) and cultural (land use) factors. It focuses on the inherent nature of the land. The basis for the visual character of the area is therefore provided by the underlying geology and climate.

The climate of the area together with the geology, described above, has resulted in rugged landforms with low growing, karoo shrub extending over an expansive, undulating landscape. The uninhabited nature of the wide open spaces gives a feeling of remoteness and isolation.

The mountainous areas to the north provide topographic interest. The rugged skyline ridges against the high clear skies serve as backdrops to the undulating plains. The colours of the land are soft greys, browns and muted greens which contrast with the high blue skies. Occasional clusters or shelterbelts of trees, the only taller vegetation in the region, are visually conspicuous features in the landscape and are often situated close to the homesteads which are nestled in the valleys.

The current land-use in the area does not significantly alter the natural visual character. The study area is remote and sparsely populated. The patterns created by the winding power lines, fences and roads, with few dwellings or other man-made structures add to the sense of wilderness and isolation.

As noted above, this character is likely to change when other approved WEFs in the vicinity are constructed. The tall, clean lines of the turbines will create a more futuristic, modern character which is likely to dominate the immediate visual landscape.

Plate ix: Visual Character: remote, arid and undulating.

4.5 SENSE OF PLACE

An area will have a stronger sense of place if it can easily be identified, that is to say if it is unique and distinct from other places. Lynch defines 'sense of place' as "*the extent to which a person can recognise or recall a place as being distinct from other places – as having a vivid or unique, or at least a particular, character of its own*" (Lynch, 1992:131).

The greater area, known as the Moordenaars Karoo, has a strong sense of place defined by its dry, undulating landscape and feeling of remote stillness and isolation. The mountains to the north and west define the greater area but the sites themselves are not easily recognisable from the surrounding landscape.

4.6 VISUAL QUALITY

Aesthetic value is an emotional response derived from our experience and perceptions. As such, it is subjective and difficult to quantify in absolute terms. Studies in perceptual psychology have shown that humans prefer landscapes with higher complexity (Crawford, 1994). Landscape quality can be said to increase when:

- Natural landscape increases and man-made landscape decreases;
- Well-preserved, compatible man-made structures are present;
- Diverse or vivid patterns of grasslands and trees occur;
- Water forms are present;
- Topographic ruggedness and relative relief increases; and
- Where land use compatibility increases (Crawford, 1994, Arriaza, 2004).

Greater aesthetic value is also attached to places where:

- Rare, distinguished or uncommon features are present;
- The landscape/townscape evokes particularly strong responses in community members or visitors;
- The landscape/townscape has existing, long-standing meaning or significance to a particular group; and
- Landmark quality features are present. (Ramsay, 1993).

Visual quality therefore is an estimation of the composition of landscape and man-made elements and their resulting visual or scenic excellence.

The undulating, arid plains of the Moordenaars Karoo with the backdrop of the rugged rocky mountains of the Great Escarpment contrast dramatically with the strikingly clear skies and create a landscape which is appealing in its expanse and remote nature. While not symbolic, the vastness of this remote landscape is evocative. Generally the majority of inhabitants can be said to have a strong connection with, and affinity for, the land and the large, undisturbed open spaces that are characteristic of the landscape.

The Great Escarpment, here represented by the Klein Roggeveld and Komsberg Mountains, has high visual value, due to the scenic physical forms, un-spoilt and remote nature of the area and excellent views.

The visual features which create the landscape pattern are therefore considered to currently have a high visual quality due to:

- the compatibility of the land-use,
- the general absence of intrusive, man-made features;
- The rugged nature of the topography; and
- the evocative visual character of the undulating, arid plains.

Some areas close to the sites have been vertically compromised, due the extensive power lines on high towers which zigzag through the landscape. When the area is developed as a REDZ the concentration of turbines will alter the visual character, compromising the rural character and providing a cleaner, more futuristic or modern character.

5. IMPACTS AND ISSUES IDENTIFICATION

The following section indicates the zone of visual influence and visual sensitivity for each site. Potential visual issues are then identified and the impacts for each project phase broadly screened, using the methodology provided by WSP.

5.1. MARALLA WIND: MARALLA WEST

Maralla West comprises 125 wind turbine generators, each with an output capacity of 2-4MW, which will be mounted on a concrete foundation. The maximum height of the turbines will be 195m (120m hub height with a maximum 150m rotor diameter).

An Independent Power Producer (IPP) Substation (150 x 150m) will be located on the for Maralla West site. This will have a 132kV power line leading to a Common Eskom Substation (250 x 250m). A single double circuit 132kV power line will then go from the Common Eskom Substation to the Komsberg Substation. Other project facilities and infrastructure includes:

- A laydown area for the temporary storage of materials during the construction activities (~11250m^2);
- Temporary site compound for contractors(~2400m^2);
- Administration, control and warehouse buildings;
- Operations and Maintenance compound area including an O&M building, car park and storage area;
- Fencing (~ max height of 5m);
- Access roads and internal roads (see Section 5.5); and
- Transmission lines (see Section 5.4).

ZONE OF VISUAL INFLUENCE

The distance of a viewer from an object is an important determinant of the visibility, sometimes referred to as the visual exposure. This is due to the visual impact of an object diminishing/attenuating as the distance between the viewer and the object increases. The Zone of Visual Influence (ZVI) is the maximum extent around an object, beyond which the visual impact will be insignificant, primarily due to distance.

Apparent size reduces linearly however, there is a large body of literature illustrating that visual *impact* reduces exponentially, rather than linearly. A recently published Scottish Guideline states; “It is important to emphasize, however, that visibility and distance do not follow a linear relationship.” (Scottish Government, 2011). According to Hull and Bishop (1988) the visual impact can be said to decrease at an exponential rate and so at 1000m would, nominally, be 25% of the impact as viewed from 500m. At 2000m it would be 10% of the impact at 500m (Hull and Bishop 1988). More recent studies on viewing distance for wind farms have built on these early estimations and all emphasise the role that elevation, the angle of the sun and landscape characteristics play in determining visibility over distance.

Internationally the appropriate ZVI (or suggested limit of analysis) for wind projects is often legislated, but thresholds vary greatly. Many guidelines and studies indicate that beyond approximately 20km wind turbines are not visible to the naked eye. However some studies suggest 10km or 15km as a limit of analysis and others recommend a greater area (30km or more), in order to include theoretical visibility (Sullivan, 2012 and Vissering, 2011).

The Northern Cape has no specified ZVI, but according to the PGWC Guidelines (2006) “Distance is a major mitigating factor in wind turbine location due to the fact that the human eye will not perceive wind turbines in the landscape over 20km away, and that from 10km a turbine will only be perceived as small element of a large landscape ‘composition’.”

Given the undulating character of the proposed sites, the PGWC Guidelines’ threshold or suggested limit of assessment is appropriate for this study area and is further defined, for the purposes of this VIA, as follows:

- less than 3km – wind facility an extremely prominent feature, dominating perception;
- between 3km and 10km – wind turbines prominent and dominate perception to some extent; and
- more than 10km – wind turbines may be marginally visible, but the nearest objects generally would dominate perception, with 20km being the outer limit of analysis.

These distances are indicated on Figure 3.

VISUAL SENSITIVITY

Visual constraints or sensitive features have been mapped on Figure 3. The main scenic resources, ridgelines, steep slopes and key receptors are indicated.

TOPOGRAPHIC FEATURES

- Prominent ridgelines in the landscape are visually sensitive and should be avoided if possible, when positioning turbines and other infrastructure. The highest ridgelines on the site are indicated on Figure 3.
- Steep slopes (gradients steeper than 1:5) are visually sensitive as construction activities (building of roads, turbine platforms etc.) require cut and fill which can result in scars that are visually prominent on steep slopes.

SURROUNDING HOMESTEADS

- The following homesteads may be visually affected by the proposed wind turbines on Maralla West[1]: Komsberg, Wilgeboom, Kareedoornkraal, Weltevreden, Damslaagte, De Hoop, De Plaat, Oranjefontein, Boesmanshoek, Wegkruip, Wadrift, Brandhoek, Van Wykskraal and Oliviersberg. Most homesteads are situated at a low elevation in the valleys, often surrounded by large trees, which will significantly reduce visibility of the proposed development.
- Tondeldoosfontein, Theronsrus, Knoffelhoek, Die Kruis and Ou Plaas are within the ZVI but are on the other side of the Komsberg Mountains.
- De Kom is situated within the boundaries of the Maralla West site.

TOWNS/URBAN AREAS

- The closest town, Sutherland is situated approximately 32km away and so is too far away to be significantly impacted by the proposed development. Additionally the Komsberg Mountains screen the town from the proposed site.

[1] These homesteads were identified based on 1:50 000 topographic maps, Google Earth images and during the field visit. Some homesteads may have been excluded and if within a 10km radius may be affected.

ROADS

- The R354 runs between Matjiesfontein and Sutherland and is therefore considered a local tourism route. However, it is approximately 12,5km away from the proposed site at its closest point. The proposed development at Maralla West may be marginally visible from short sections of the road, but is likely to be screened by local undulations between the road and site.

- District and farm roads in the area from which the proposed development will be visible include stretches of the Klein Roggeveld Road (which runs through the site) and the Spitzkopfontein Road. Additional farm roads in the area will also be affected. These roads all carry very low traffic volumes.

- Although it also carries low traffic volumes, the Komsberg Pass has high scenic value (see cultural landscapes below) and is considered visually sensitive. Additionally the pass through the Wolvenhoek Mountains has scenic value, but is within the boundaries of the proposed site with no access to the public.

NATURE RESERVES

- There are no conservation areas within the study area[2].

OTHER

- The South African Large Telescope (SALT) has an astronomy advantage area of 250km. However, it is situated about 35km away from the site, on the other side of the mountain range.

- Cultural landscapes may include the portions of the warmer valleys which have historically been occupied and farmed. The scenic passes through the mountains and sections of the Great Escarpment could also be regarded as cultural landscapes. Historically sensitive areas within the valleys will be considered in the Heritage Scoping Study and scenic passes are indicated on Figure 3.

POTENTIAL VISUAL ISSUES

Potential visual issues and impacts identified by the visual consultant are summarised in the table below. Not all of these can be classified as visual impacts, but are concerns and issues that should be considered.

Table 1: Potential Visual Impacts for Maralla West:

Visual Issue	Comment
Visual impact on the physical landscape.	Roads, turbine platforms and other earthworks may impact on the physical landscape form.
Visual intrusion on the sense of place, including scenic passes and cultural/historical landscapes.	Given the size and scale of the proposed wind farm it will be visually prominent and will differ from the current visual landscape and the remote and rural character of the area. This impact will however, be reduced once the other proposed wind farms within the REDZ are constructed.
Visual impacts of wind turbines on inhabitants and motorists.	Given the size and scale of Maralla West (125 turbines with a maximum height of 195m), it will be visually prominent within the landscape. The area is however sparsely populated, with few scattered

- [2] The Komsberg Wilderness Nature Reserve is situated close to the site but has no formal conservation status and is not open to the public.

	homesteads (indicated on Figure 5). Motorists on the Klein Roggeveld Road, the Spitzkopfontein Road and other farm roads will be affected by the proposed turbines along stretches of these roads.
Visual impacts of substation and O&M buildings on inhabitants and motorists.	The proposed substations are located at relatively low elevation, and have a maximum height of 15m. They are therefore not anticipated to be highly visible beyond 3km, so will not affect many receptors.
Visual impact of lighting and flicker effect of the wind turbines.	Lighting on turbines, or lighting for security at the site may have a visual impact on the particularly clear, dark skies of the Sutherland area. Detailed information regarding lighting has not yet been specified and will be considered in the EIA phase.
Visual impact during construction.	There will be some visual impacts on motorists and inhabitants during the construction period resulting from the temporary laydown areas, the site camp, construction vehicles, dust and equipment. These will be a temporary impact.
Cumulative visual impacts.	Many solar and wind energy projects are being proposed in the area. Three of these are highly likely to proceed to construction in the near future. The proposed development will contribute to the cumulative visual impact in the area. This needs to be considered in the context of this area having been selected as a REDZ.

The above potential impacts have been broadly rated for each project phase using the screening methodology provided by WSP and explained in Section 2.2 above. It should be noted, that due to their nature, visual impacts are usually definite (i.e. structures that will be built). So probability also considers how easily the impact can be mitigated and how likely it will be to affect many visual receptors.

Table 2: Visual Screening of Impacts of Maralla West:

IMPACT	SEVERITY	PROBABILITY	IMPACT RATING FOR SCREENING
Visual impact on the physical landscape	2	2	(-ve) Low
Visual impact on sense of place and scenic resources/cultural landscapes	3	3	(-ve) Medium
Visual impacts during construction	3	2	(-ve) Medium
Visual impact during operation (turbines)	3	3	(-ve) Medium
Visual impact during operation (substations and other buildings)	2	2	(-ve) Low
Visual impact during operation (light and flicker effect)	*Currently not enough detail to assess, will be addressed in EIA*		
Visual impact during decommission	2	2	(-ve) Low
Cumulative visual impacts	4	3	(-ve) High

5.6. ACCESS ROADS

Access roads have not yet been finalised. Where possible existing roads will be used to access sites, but may need to be upgraded. Additionally a number of internal roads will be constructed. These will comprise roads each approximately 60km in length, with a width of between 4-6m excluding any V-drains. Double width roads will be constructed in strategic places, where required for passing (WSP, 2015).

ZONE OF VISUAL INFLUENCE

Due to their nature, the visibility of the access roads will be dependent on the elevation and steepness of the landscape they transverse rather than height of the roads themselves. Guidelines relating to wind farm zones of visual influence are therefore not applicable.

For the purposes of this VIA the following thresholds are relevant:

- less than 1km – roads may be a prominent feature, dominating perception;
- between 1km and 3km – roads may be relatively prominent and dominate perception to some extent; and
- more than 3km – roads may be visible but not dominant.

VISUAL SENSITIVITY

Visual constraints or sensitive features have been mapped on Figure 3 and **Error! Reference source not found.**. The main scenic resources, ridgelines, steep slopes and key receptors are indicated.

TOPOGRAPHIC FEATURES

- Prominent ridgelines in the landscape are visually sensitive and should be avoided, if possible, when planning road routes. The highest ridgelines on the site are indicated on Figure 3 and **Error! Reference source not found.**.
- Steep slopes (gradients steeper than 1:5) are visually sensitive as construction activities, especially the building of roads, require and cut and fill which can result in scars that are visually prominent on steep slopes.

SURROUNDING HOMESTEADS AND TOWNS

- Homesteads within approximately 3km of the access roads may be affected by the proposed roads.
- There are no towns likely to be affected by the proposed access roads.

OTHER

- Roads running through valleys which have historically been occupied and farmed may be affected by the proposed access roads. Historically sensitive areas within the valleys will be considered in the Heritage Scoping Study.

POTENTIAL VISUAL ISSUES

Potential visual issues and impacts identified by the visual consultant are summarised in the table below. Not all of these can be classified as visual impacts, but are concerns and issues that should be considered.

Table 3: Potential Visual Impacts for Access Roads

Visual Issue	Comment
Visual impact on the physical landscape.	Cut and fill and other earthworks may impact on the physical landscape form when constructing roads, particularly on steep slopes.
Visual intrusion on the sense of place and cultural/historical landscapes.	Given that the area already contains a number of gravel farm roads criss-crossing the landscape, the additional internal roads are not expected to impact significantly on the sense of place. Depending on the road layout, culturally significant areas may be impacted on.

Visual impacts of roads on inhabitants.	Population density is low and the proposed roads are not expected to have a significant impact on many inhabitants.
Visual impact during construction	There will be some visual impacts on motorists and inhabitants during the construction period resulting from the construction vehicles, dust and equipment. These will be a temporary impact.
Cumulative visual impacts	Many solar and wind energy projects are being proposed in the area, each with their own road network. Three of these are likely to proceed to construction in the near future. The additional road will contribute to the cumulative visual impact in the area but not significantly.

The above potential impacts have been broadly rated for each project phase using the screening methodology provided by WSP and explained in Section 2.2 above. It should be noted, that due to their nature, visual impacts are usually definite (i.e. structures that will be built). So probability also considers how easily the impact can be mitigated and how likely it will be to affect many visual receptors.

Table 4: Visual Screening of Impacts of Access Roads

IMPACT	SEVERITY	PROBABILITY	IMPACT RATING FOR SCREENING
Visual impact on the physical landscape	*Currently not enough detail to assess, will be addressed in EIA.*		
Visual impact on sense of place and scenic resources/cultural landscapes	*Currently not enough detail to assess, will be addressed in EIA.*		
Visual impacts during construction	2	3	(-ve) Medium
Visual impact during operation	*Currently not enough detail to assess, will be addressed in EIA.*		
Cumulative visual impacts	2	2	(-ve) Low

6. TERMS OF REFERENCE FOR THE IMPACT ASSESSMENT PHASE

The goal of visual impact assessment is not to predict whether specific individuals will find wind energy projects attractive or not. Instead, the goal is to identify important visual characteristics of the surrounding landscape, especially the features and characteristics that contribute to scenic quality, as the basis for determining how and to what degree a particular project will affect those scenic values (Vissering, 2011).

Thus the primary aim of the visual impact assessment phase will be to ensure that visual impacts are adequately assessed and considered so that the relevant authorities can decide if the proposed wind energy facility has unreasonable or undue visual impacts.

The secondary aim is to identify effective and practical mitigation measures. The study will use the above analysis of the visual characteristics, value and sense of place of the receiving environment as a baseline. Emphasis will be placed on sensitive visual resources and community concerns.

Qualitative as well as quantitative techniques and criteria will be used in the evaluation and clearly documented to ensure the reliability and credibility of conclusions and recommendations. The VIA will comply with the Department of Environmental Affairs and Development Planning's Guideline For Involving Visual and Aesthetic Specialists in EIA Processes (2005).

The study will include the following:

1. Refining of the baseline study, description of the visual character of the sites and zone of visual influence, if required.

2. Refining the list of identified visual impacts resulting from the proposed installations (with consideration of any public and/or relevant authorities' concerns).

3. Assessment of visual impacts based on standard VIA rating criteria, namely:
    - Quality of landscape – the aesthetic excellence and significance of the visual resources and scenery;
    - Visual absorption capacity – the potential of the landscape to conceal the proposed development;
    - Viewshed analysis (visibility) – the geographic area from which the project may be visible (view catchment);
    - Visual intrusion (or integrity) – the level of congruence or integration with existing landscape; and
    - Viewer numbers and sensitivity – the level of acceptable visual impact is influenced by the type of visual receptors.

4. Assessment of the significance of the visual impacts, rated according to the Hacking methodology (provided by Environmental Consultants), which includes:
    - Severity, extent, duration and probability to determine consequence; and
    - Consequence considered with status (positive or negative impact) and confidence to determine significance.

5. Impacts will be rated before mitigation and after (assuming) mitigation if applicable.

6. Development of mitigation measures to reduce visual impacts and enhance any positive visual benefits.

7. CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

The following findings are pertinent and applicable to all the above projects:

- The project area currently has a high visual quality, characterised by the undulating topography and the desolate and arid nature of the landscape.
- The greater Moordenaars Karoo area has a strongly defined sense of place but the study area itself is not easily distinguishable from the area in general.
- There are few visual intrusions in the natural landscaping, but it is visually compromised in sections by existing transmission lines, telephone lines and windmills.
- The site is situated within the Komsberg REDZ and the Central EGI Corridor, earmarked for electricity grid infrastructure and renewable energy projects. Three wind farm preferred bidders have been approved in close proximity to the site. When constructed, these developments will significantly alter the visual landscape.

- The area is not densely populated and homesteads (some of which are uninhabited) occur about every 10km.
- The Zone of Visual Influence for wind turbines was defined as a 10km radius, with 20km being the outer limit of analysis.
- The Zone of Visual Influence for transmission lines was defined as a 6km radius.
- The Zone of Visual Influence for roads was defined as a 3km radius.
- Sensitive visual features include the R354, the Komsberg Pass, prominent ridgelines and steep slopes and well as some homesteads.
- Cultural landscapes in the valleys may be of scenic value and are considered in the Heritage Scoping Report.
- Only a preliminary 'screening' assessment has been made of the proposed wind energy facility in this study. A more detailed visual assessment of the wind turbines and related infrastructure will be made in the EIA Phase of the project. Ratings may differ from those contained in this report.
- Impacts likely to have the highest visual impact include the visual impact of the wind turbines on inhabitants and tourists (particularly from the R354), cumulative impacts, impacts on ridgelines and on scenic passes and cultural landscapes.
- Comment on possible visual impacts for aircraft must be obtained from the Civil Aviation authorities.

RECOMMENDATIONS

- Detailed viewsheds and analysis of visual impacts is required in the EIA Phase of the project, especially for the wind turbines at Maralla West.
- Given their height, effective mitigation measures for the visual impact of wind turbines is not possible. However impacts can be minimised to some extent, by where they are positioned.
- Detailed mitigation measures for other visual impacts must be developed in the next phase of the EIA process.
- The R354 is considered a local tourism route and runs from the N1 at the historical town of Matjiesfontein, to the town of Sutherland. Turbines located directly adjacent to the R354 will result in a very high visual impact for motorists. A minimum 800m set back with and additional 200m 'highly sensitive' zone for this road is strongly recommended.
- Visually sensitive corridors directly adjacent to gravel roads should be avoided and turbines set back as far from these as possible.
- Prominent ridgelines and high points in the landscape are visually sensitive and should be avoided where possible.
- Very steep slopes should be avoided as far as possible, because of the visibility of cut and fill embankments.
- The recommended buffers provided by PGWC's 2006 Guidelines and some of those being developed in the National Wind and Solar PV Strategic Environmental Assessment being compiled by the Bernard Oberholzer with the CSIR (still in process) are provided in Annexure

B, these provide a good benchmark, but should be considered in the context of the REDZ and EGI Corridor.

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ANNEXURE A:

LOCATION MAPS

ZONE OF VISUAL INFLUENCE MAPS

AND VISUAL SENSITIVITY MAPS

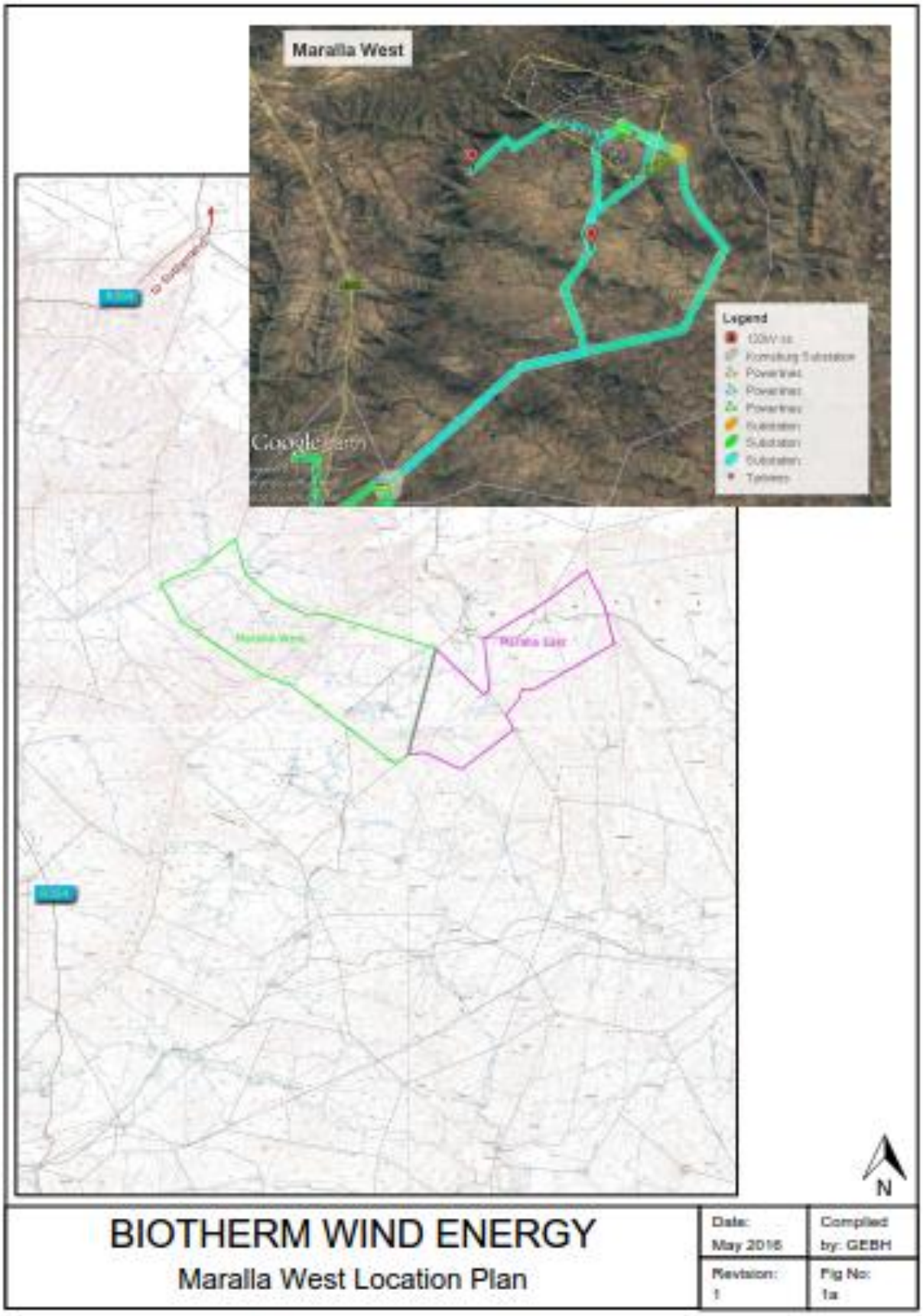

Figure 1: Location Maralla West

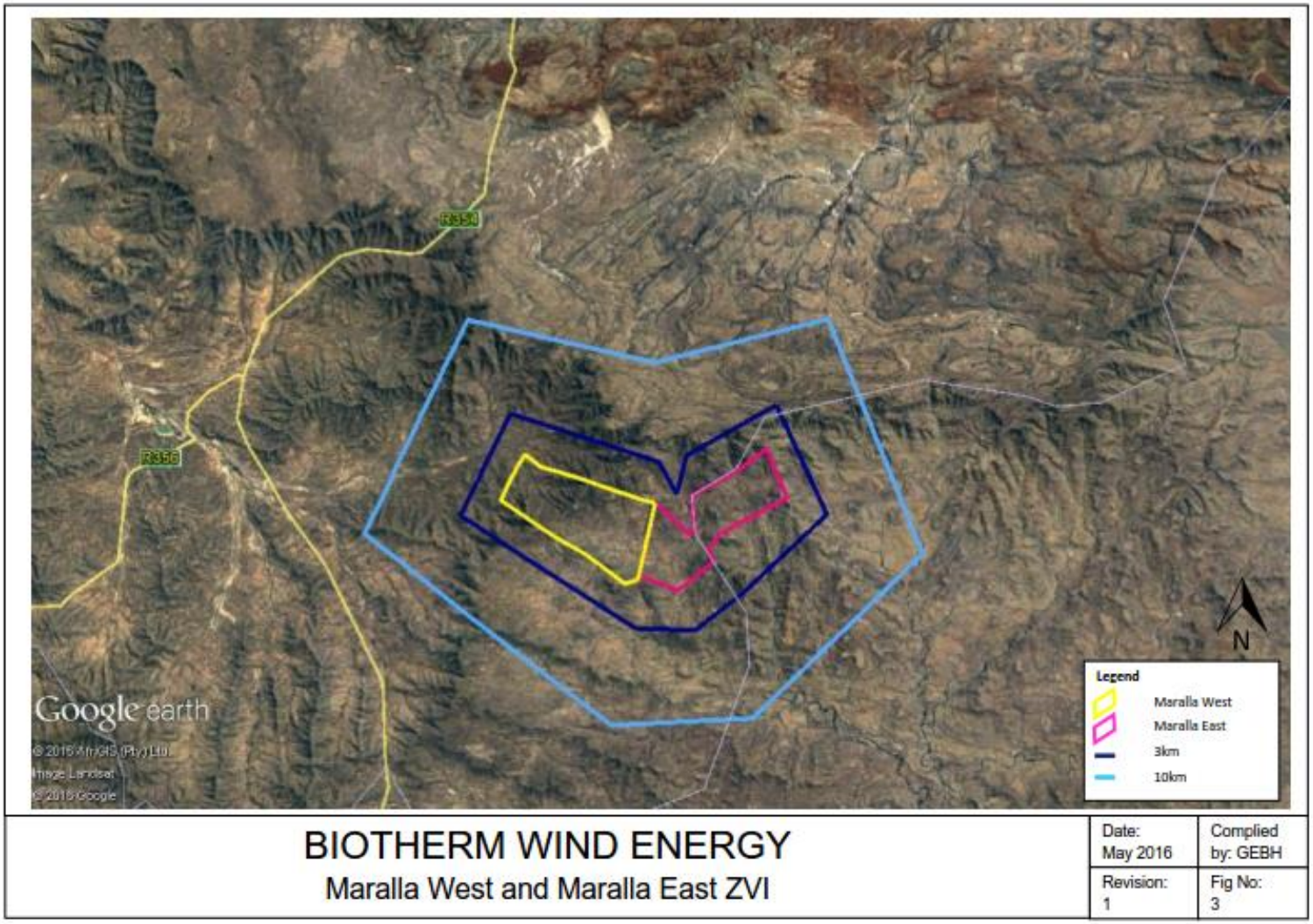

Figure 2: Zone of Visual Influence, Wind Turbines Maralla

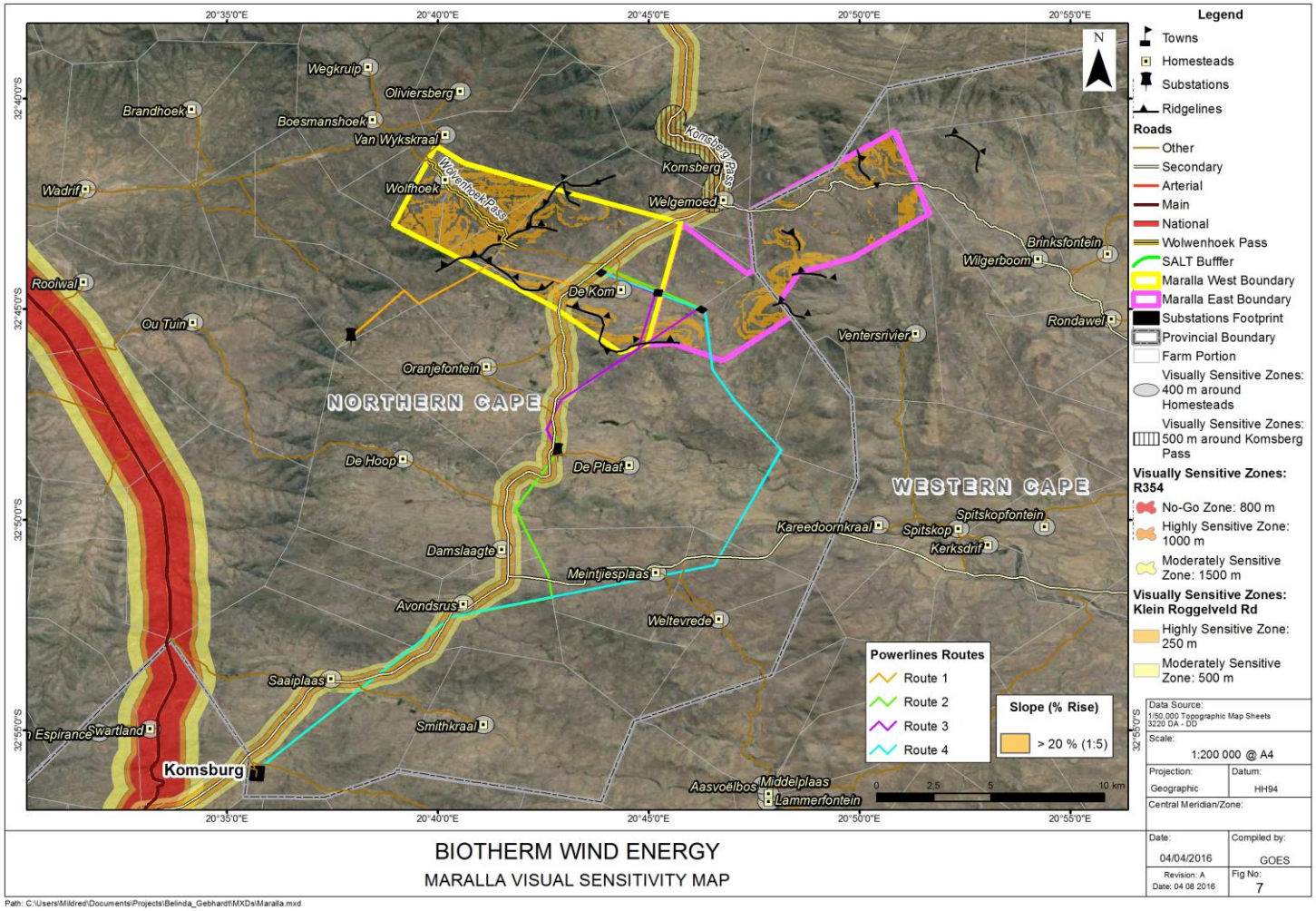

Figure 3: Visual Sensitivity Map: Maralla West and East

ANNEXURE B:

GUIDELINES

Table 5: Buffer Guidelines

	PGWC 2006 Guidelines	Draft Recommended Guidelines	Comment
Urban Areas	800m	-	Urban edge lines assumed where necessary for rural towns with no formal urban edge. This distance adequately covers noise and flicker criteria
Residential Areas, including rural dwellings (outside the project site)	400m	2 to 4km (can be less if outside the viewshed).	Threshold adequately covers noise and flicker criteria.
Residential Areas, including rural dwellings (inside the project site)	400m	800m	
National Roads	3km	3km	Should depend on scenic value of route. Can be reduced.
Local district roads/gravel roads	500m	500m	Review if high scenic value.
Provincial tourism routes	4km		Statutory scenic drives.
Local tourism routes	2,5km	1 to 3km (can be less if outside the viewshed).	Assumption made for local importance. Could be reduced.
Scenic passes and poorts	review if scenic	1 to 3km (can be less if outside the viewshed).	n/a
Major power lines	250m		
Local airfields	2,5km		To be confirmed with appropriate agency at local level.
Private nature reserves/ guest farms/ resorts	500m	2 to 5km (can be less if outside the viewshed).	Or as per statutory protection.
Heritage and Cultural Sites	500m	-	Includes fossil sites, nation (+ provincial) monument sites, graves and memorial sites.
Elevation and slopes	Map at local level		Map at local level
Major ridgelines, peaks and scarps	500m	500m.	Required and local scale.
South African Large Telescope (SALT)	-	25km.	