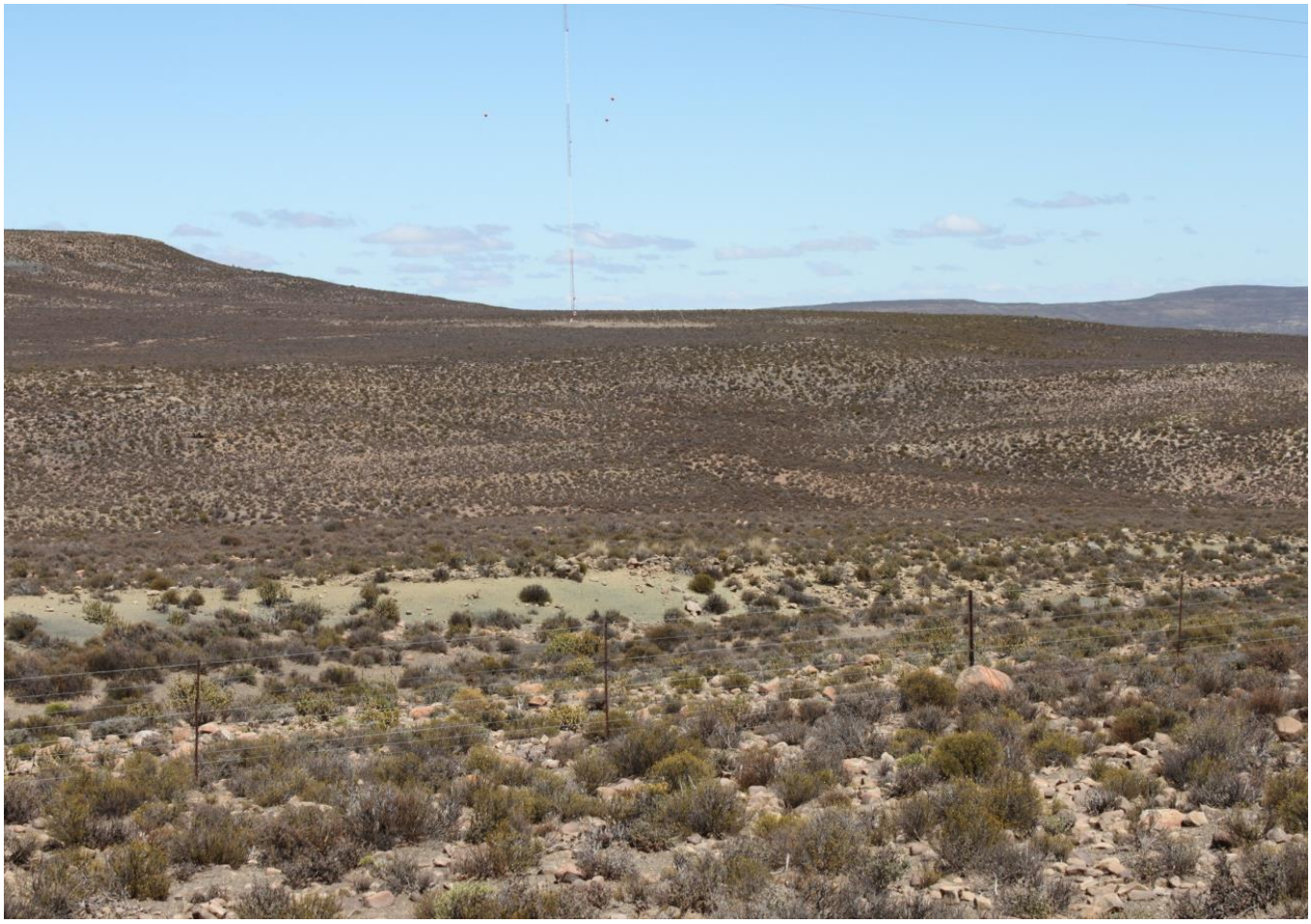

Visual Impact Assessment

for the Proposed BioTherm Maralla East Wind Energy Project, near Sutherland, Northern and Western Cape

JANUARY 2017

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FINAL

January 2017

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WSP | Parsons Brinckerhoff

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LIST OF ABBREVIATIONS AND ACRONYMS

BioTherm	BioTherm Energy (Pty) Ltd
CSP	Concentrated Solar Power
DEADP	Department of Environmental Affairs and Development Planning
ECO	Environmental Control Officer
EGI	Electricity Grid Infrastructure
EIA	Environmental Impact Assessment
EIR	Environmental Impact Report
EMPr	Environmental Management Programme Report
EWR	Environmental Water Requirement
GPS	Global Positioning System
ha	hectares
I&APs	Interested and Affected Parties
km	kilometers
kV	kilovolt
m	meters
m^3	Cubic meter
Ma	Mega-annum
masl	Meters above sea level
mm	millimetres
MW	Megawatt
NEMA	National Environmental Management Act
PGWC	Provincial Government of the Western Cape

PSDF	Provincial Spatial Development Framework
PV	Photovoltaic
REDZ	Renewable Energy Development Zone
SACAA	South African Civil Aviation Authority
SACAR	South African Civil Aviation Regulations
SDF	Spatial Development Framework
ToR	Terms of Reference
VAC	Visual Absorption Capacity
VIA	Visual Impact Assessment
WEF	Wind Energy Facility
ZVI	Zone of Visual Influence

1. INTRODUCTION

BioTherm Energy (Pty) Ltd. (BioTherm) is proposing the development of a Wind Energy Facility (WEF) in the Western Cape; namely Maralla East. The facility initially proposed had a maximum generation capacity of 250MW, with 125 turbines, this way then reduced to 70 turbines. In the most recent version of the layout plan only 56 turbines are proposed with a generation capacity of 140MW. It is one of three wind projects being proposed by BioTherm in the greater area; these projects include: Esizayo, Maralla West and Maralla East.

The Maralla East WEF lies within the Moordenaars Karoo across the border between the Northern and Western Cape, in the Karroo Hoogland and Lainsburg Local Municipalities. It is situated approximately 46km north of the N1, 34km south of the town of Sutherland, 20km east of the R354, which runs between Matjiesfontein and Sutherland, and adjacent to Maralla West (See **Figure 1**). The site extends over an area of about 7 634 ha and is situated on the farms: Farm Welgemoed 268, Remainder; Farm Schalkwykskraal 204, Remainder and Farm Drie Roode Heuvels 180, Remainder. The power lines extend from the sites in a westerly and south-westerly direction, traversing additional properties.

The project is situated within the Central Electricity Grid Infrastructure (EGI) Corridor, one of 5 corridors earmarked for electricity infrastructure development. It also falls 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.

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 they include listed activities in terms of these regulations. A separate assessment is being conducted for the power lines as well as for the other two BioTherm WEF projects. The environmental assessments are being conducted by WSP | Parsons Brinckerhoff.

This Visual Impact Assessment (VIA) is one of many specialist studies that have been undertaken by specialists as part of the EIA. It should be read in conjunction with the relevant Environmental Impact Report (EIR) and other specialist studies. This report has been preceded by a Visual Scoping Study that was undertaken in the first phase of the assessment.

1.1 SCOPE OF WORK

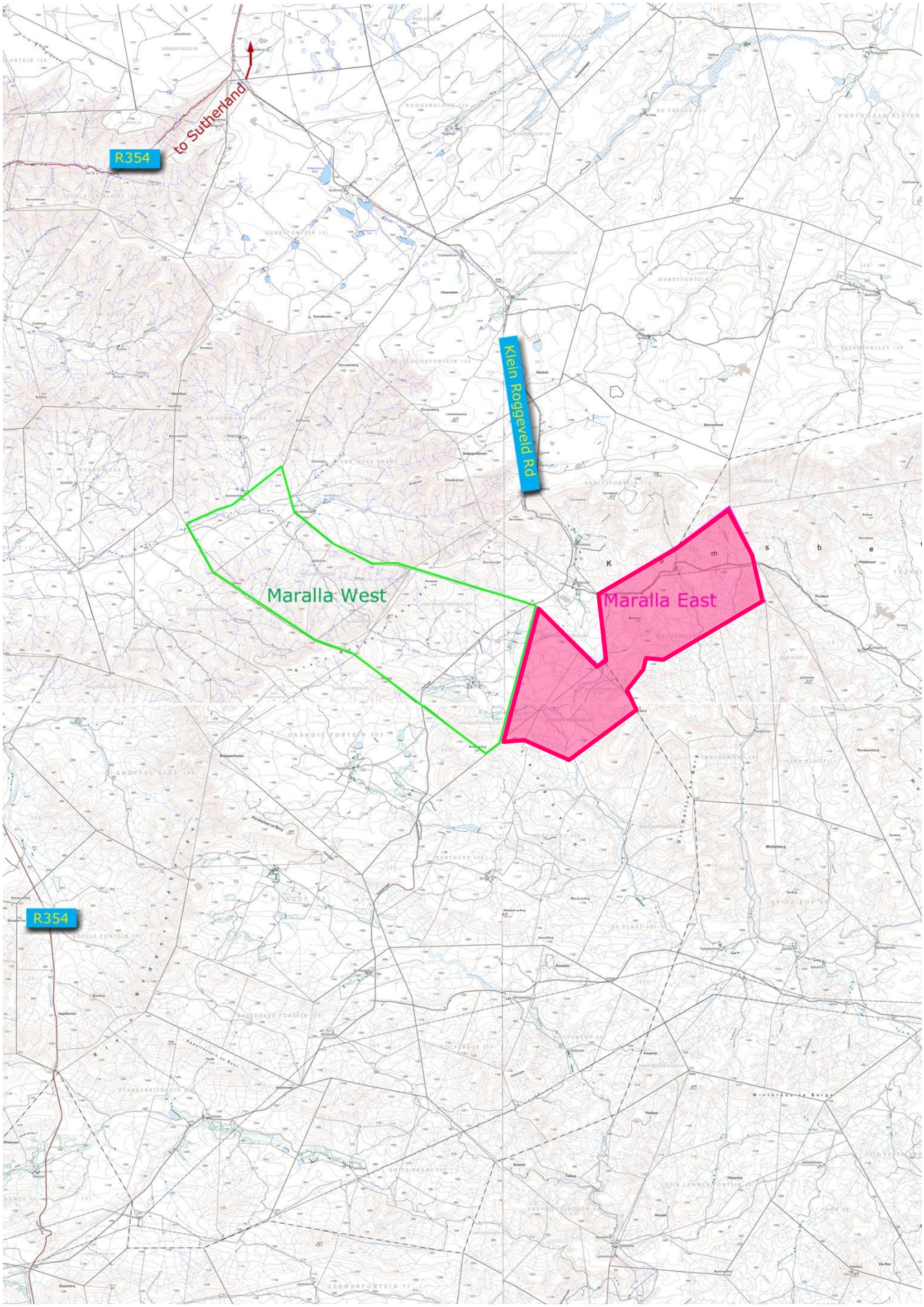
During the first phase of the assessment (Scoping Phase) the scope of work included:

1. Undertaking a field study to establish a baseline description of the visual characteristics of the landscape. The site visit was conducted in summer from 10-13 March 2016;
2. Defining the visual resources and sense of place of the area;
3. Identifying and mapping existing sensitive receptors, buffers, important viewpoints and view corridors;
4. Identifying and screening potential visual concerns;
5. Ensuring that the visual assessment will be in compliance with relevant standards, policies, laws and regulations; and
6. Providing recommendations for the impact assessment phase.

During the second phase of the assessment (Assessment Phase) the scope of work included:

1. Refining the baseline (Scoping) description of the visual character of the site and zone of visual influence (ZVI);

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



BIOTHERM ENERGY

Maralla East Location Plan

Date: Dec 2016	Complied by: GEBH
Revision: 2	Fig No: 1

3. Evaluating the 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;
    - Visibility – including:
        - the ZVI as defined in the scoping report;
        - viewshed analysis – the geographic area from which the project may be visible (view catchment);
        - visibility from selected viewpoints;
    - Visual intrusion (or integrity) – the level of congruence or integration with existing landscape; and
    - Viewer sensitivity – the level of viewer sensitivity as influenced by the type and number of visual receptors.

4. Assessing the significance of the visual impacts, rated according to the Hacking Methodology (provided by the 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. Developing mitigation measures to reduce visual impacts and enhance any positive visual benefits; and

6. Responding to stakeholder's queries and concerns, as required.

1.2 OBJECTIVES OF THE REPORT

The goal of visual assessment is not to predict whether individual receptors 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 the proposed project will affect those scenic values (Vissering, 2011).

Thus the primary aim of the 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 WEF has unreasonable or undue visual impacts. The secondary aim is to identify effective and practical mitigation measures, where possible.

1.3 LEGISLATIVE FRAMEWORK

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 EIA Regulations contain three listing notices (GNR 983, 984 and 985) which identify activities that are subject to either a Basic Assessment or Scoping and EIA in order to obtain environmental authorisation. Maralla East includes activities listed in GNR 983, GNR 984 and GNR 985 and therefore a Scoping and EIA process is required for authorisation. The NEMA EIA Regulations also contain broad guidelines for the preparation of specialist studies that are relevant to this study.
- **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. In terms of the Section 38 of NHRA, any person who intends to undertake a linear development exceeding 300m in length or a development that exceeds 5000m^2 must notify the heritage resources authority and undertake the necessary assessment requested by that authority. For this assessment a detailed Heritage Impact Assessment has been undertaken by ACO Associates and this VIA will address some of the issues relevant to the NHRA requirements.

- **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.

- **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 East falls within the Central EGI Corridor and the Komsberg Wind 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. The proposed Maralla East is situated approximately 36,5km 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 facilities 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:** This report prepared by the Provincial Government provides some helpful indicators for wind energy facilities and 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.

- **The Karoo Hoogland Integrated Development Plan (IDP) 2014/ 2015** identifies a number of socioeconomic development focus areas and is aiming for economic development, based primarily on the tourism potential of the area. Three key investment priorities have been outlined within the IDP:
  - Investment in infrastructure to provide a basic level of infrastructure services;
  - Investment in human capital to promote economic growth; and
  - Investment in human capital to promote general welfare and stimulate the local economy.

  Further detail regarding IDP and the implications for renewable energy are contained within the Scoping Report (WSP, 2016).

1.4 STUDY APPROACH AND METHODOLOGY

In order to meet the terms of reference and the DEA&DP's Guideline for Involving Visual and Aesthetic Specialists in EIA Processes (2005), 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;
   - ground truth 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 is explained in the text below.

5. **Visual sampling** was undertaken using photography from a number of viewpoints within approximately 40km of the site. The location of the viewpoints was recorded with a GPS and/or mapped on Google Earth Pro and photographs were taken at a depth of field between 45-55mm. A selection of these are used in the assessment phase of the VIA to illustrate the likely zone of influence and visibility.

6. ArcGIS Spatial Analyst extension was used to calculate the **viewshed** making use of a 20m contour interval SRTM Digital Elevation Model (DEM) as the input raster.

7. 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.

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

9. The potential magnitude of visual impacts were **evaluated using standard VIA criteria** and rating methodologies, explained briefly in Chapter 5 below and further explained in **Annexure A**; and

10. Potential visual impacts for each project phase as well as cumulative impacts were **assessed** using a methodological framework developed by WSP | Parsons Brinckerhoff to meet the combined requirements of international best practice and NEMA, Environmental Impact Assessment Regulations, 2014 (GN No. 982). This methodology is explained in detail in **Annexure B**.

1.5 ASSUMPTIONS AND LIMITATIONS OF THIS STUDY

The following assumptions and limitations are relevant to the report:

1. Documentation and project information supplied by WSP | Parsons Brinckerhoff and BioTherm is assumed to be accurate and representative of the project.

2. The Zone of Visual Influence (ZVI) and visual assessment has assumed a maximum turbine height of 195m.

3. Comments and concerns from interested and affected parties have been tabulated by WSP | Parsons Brinckerhoff and are assumed to be a complete and accurate representation of public comment.

4. Visual guidelines for wind facilities are not currently available. Rough guidelines for the potential visibility of wind facilities have been adapted from available literature.

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

6. For cumulative impacts:

    - Proposed projects in close proximity to the site that have been considered in the evaluation of cumulative impacts are tabulated in **Table 11**. These include all approved and ongoing environmental authorisations within an 80km radius.
    - Due to the number of different significance rating methodologies utilised across the various projects, significance ratings have been simplified to include only Low, Medium and High ratings and were tabulated by WSP.
    - In the event that specialist studies were unable to be obtained, this has been noted.

1.6 DECLARATION OF INDEPENDENCE

I Belinda Gebhardt, as the appointed independent visual specialist, do hereby declare that:

- I act/have acted as the independent specialist in this application;
- I have perform the work relating to the application in an objective manner, even if this results/has resulted 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 have complied 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 have disclosed/will 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 48 and is punishable in terms of section 24F of the Act.

Signature of Specialist:

Date:

10/01/2017

The Visual Specialist was assisted by Mildred Goes with the preparation of some of the figures prepared in ArchView (GIS).

I Mildred Goes (GIS Practitioner), do hereby declare that:

- I act/have acted as the independent specialist in this application;
- I have perform the work relating to the application in an objective manner, even if this results/has resulted 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 have complied 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 have disclosed/will 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 48 and is punishable in terms of section 24F of the Act.

Signature of Specialist: 

Date: 23/11/2016

Specialist experience and expertise detailed within **Annexure C.**

2. DESCRIPTION OF THE PROJECT

As indicated in the Introduction above, Maralla East is situated in the Moerdenaars Karoo approximately 34km south of Sutherland. In falls across the border of the Western and Northern Cape in two local Municipalities: the Hoogland Local Municipality under the jurisdiction of the Namakwa District Municipality and the Lainsburg Local Municipality under the jurisdiction of the Central Karoo District Municipality (**Figure 1**). The site is located within the Komsburg REDZ and is therefore considered to be located within the renewable energy hub that is developing in the area.

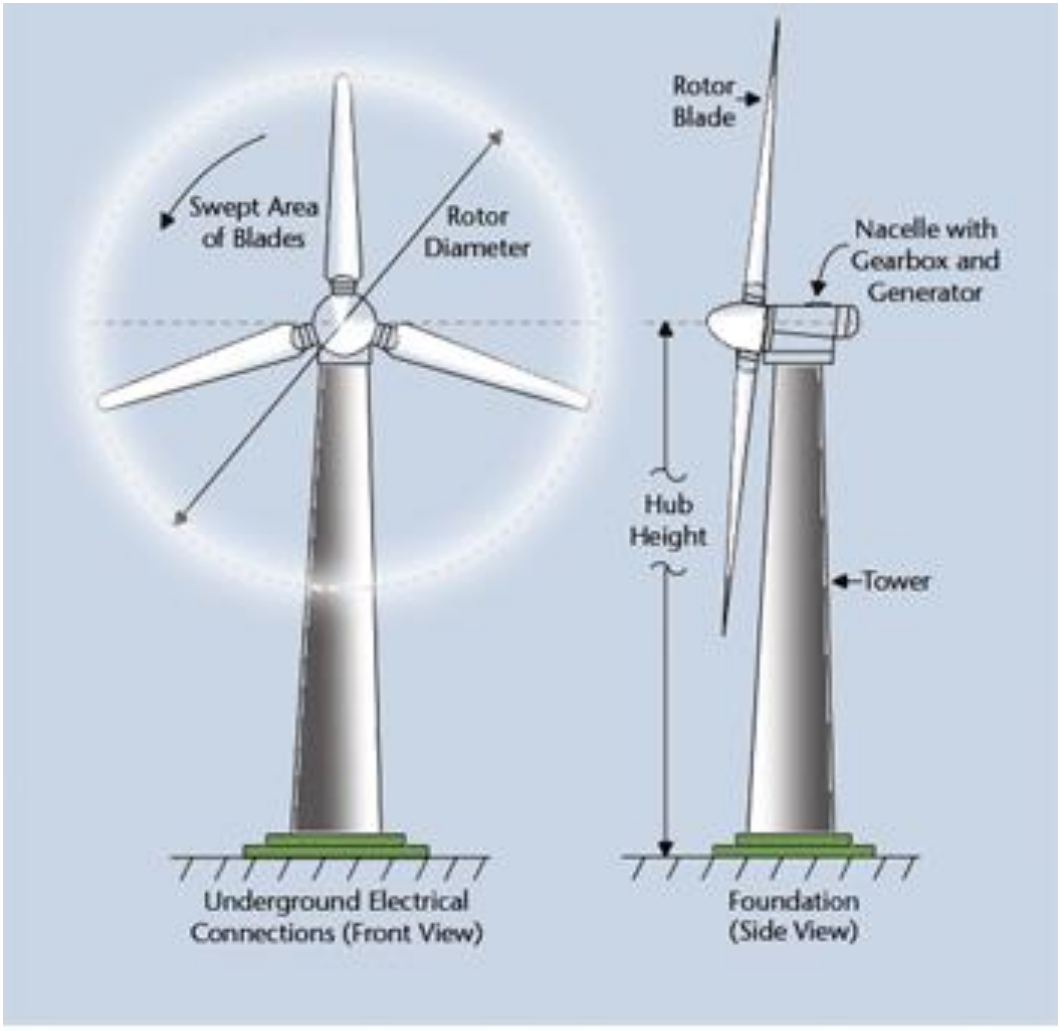
In the most recent layout, the proposed wind energy facility project will comprise 56 wind turbines and a generating capacity of up to 140MW. However the assessment below was based on the layout plan that included 70 turbines with a generation capacity of 250MW. A detailed description of the project and wind energy technology is contained within the EIR (WSP, 2016). A brief summary of the project elements, as relevant to the visual assessment, is provided in the text and **Table 1** below.

Table 1: Description of Project Facilities (WSP, 2016)

INFRASCRUCTURE	HEIGHT	DIMENSIONS AND DETAILS
Turbines	Hub height – up to 120m Rotor diameter – up to 150m ***Total height – up to 195m***	The number of turbines has been reduced from 125 to 70 and finally turbines. Each turbine will occupy an area of 0.5ha (85m x 60m). Turbine foundations will have a diameter of 20m and be 3m deep. Excavation area will be approximately 100m^2 in sandy soils due to access requirements and safe slope stability requirements.
Operations and Maintenance building(s)	single storey (assume 8m)	The O&M buildings will be situated in close proximity to the Substation and will include: • Operations buildings (160m^2) • Workshops (96m^2) • Stores (120m^2)
Cement Batching Plant	Silo max 20m	Gravel and sand located in separate heaps whilst the cement will be contained in a silo. Mixing of concrete will take place in a concrete truck. Footprint area approximately 2500m^2.
Laydown areas	Roughly level with ground	The laydown area will include: • Staging area (11 250m^2) • Laydown for concrete towers (if required) (40 000m^2) A temporary construction camp will also be required with an area of approximately 2 400m^2.
Internal Roads	Roughly level with ground	The total length of the internal roads will be approximately 60km. The roads will be between 4 and 6m wide, which may be increased to 8m on the bends.
Sewage		Septic tanks (with portable toilets during construction)
Security Fencing	Assume 5m	Palisade or mesh fencing, where required.
Lighting	Unknown. Red flashing lights will be mounted at highest practical point on turbines. i.e. ~ 120m.	Lighting has not yet been specified and will be prescribed by the SACAA. Usually wind turbines are required to be lit at night only (provided the turbines are white or off-white) with flashing red lights located at intervals along the turbine strings. Until the turbines are connected and functioning, randomly flashing red temporary lighting is required for all objects over 25m high. Some security lighting may also be installed.

Internal onsite substation	15m	There will be an onsite substation connected to the facility, with a footprint area of approximately 2.25ha. It will have a capacity of up to 132 kV. Cables connecting turbines to the substation will run underground, except where a technical assessment indicates overhead lines are necessary.
Powerlines	132kV – approximately 25m 400kV – approximately 35-40m	The powerline servitude will have a width of 31m. The following 132kV tower structure alternatives are available for the internal powerlines: • Steel / concrete monopole single circuit structure; • Steel / concrete monopole double circuit structure; and • H-pole structure (usually wooden poles).

An image of a typical wind turbine is provided below. Please note this is ***not*** a representation of the proposed Maralla East site but is provided as an example to give visual context (**Plate i**).



Drawing of the rotor and blades of a wind turbine, courtesy of ESN

Plate i: The Main Components of a Wind Turbine (Source: http://ec.europa.eu/research/energy)

The main activities for the Construction, Operation and Decommissioning Phases of the project are briefly summarised below, further detail is contained within the EIR.

2.1 CONSTRUCTION PHASE

- **Establishment of an access road to the site** – The site is already easily accessible via the tarred R354 National Road. However, the regional gravel road connecting the site to the R354 will need to be upgraded.
- **Establishment of internal roads** – Internal road access will be constructed onsite. These roads will be between 4 and 6m in width. The length of the internal road network is approximately 60km.
- **Site preparation** – Site preparation includes the clearance of vegetation and any bulk earthworks (including blasting if required) within the footprint of each construction area that is required in terms of the facility design.
- **Transport of components and equipment to site** – All construction material (i.e. masts, blades and associated infrastructure), machinery and equipment (i.e. graders, excavators, trucks, cement mixers etc.) will be transported to site utilising the national, regional and local road network. Large components (such as substation transformers and tower sections) may be defined as abnormal loads in terms of the Road Traffic Act (No. 29 of 1989). In such cases a permit may be required for the transportation of these loads on public roads.
- **Establishment of a laydown area on site** – Construction materials, machinery and equipment will be kept at relevant laydown and/or storage areas. A 1.1ha laydown and storage area has been proposed for this project, with an additional 40 000m^2 for concrete towers if required. The laydown area will limit potential environmental impacts associated with the construction phase by limiting the extent of the activities to one designated area.
- **Construct foundation** – Concrete foundations will be constructed at each turbine location. Foundation holes will be mechanically excavated to a depth of 3m, depending on the local geology. Concrete will be batched on site. The reinforced concrete foundation will have a footprint of approximately 550m^2.
- **Construction of the turbine** – A large lifting crane will be brought onto site to lift each of the tower parts into place.
- **Construct IPP substation and invertors** – Invertors will be installed to facilitate the connection between the wind turbines and the Eskom Grid. The turbines will be connected to the substation via underground cabling (where possible). The substation will be constructed with a maximum footprint of approximately 150m x 150m.
- **Establishment of ancillary infrastructure** – Ancillary infrastructure will include a workshop, storage areas, office and a temporary laydown area for contractor's equipment.
- **Undertake site rehabilitation** – The site will be rehabilitated once the construction phase is complete and all construction equipment and machinery have been removed from site.

2.2 OPERATIONAL PHASE

The proposed Maralla East wind facility is anticipated to have a minimum life of 20 years. The facility will operate 7 days a week. While the project is considered to be self-sufficient, maintenance and monitoring activities will be required. Potable water requirements for permanent staff will be limited and provided by bottled water.

2.3 DECOMMISSIONING PHASE

Following the initial 20 year operational period of the wind facility, the continued economic viability will be investigated. In the event that the facility is still deemed viable the life of the facility will be extended. The facility will only be decommissioned once it is no longer economically viable. In the event that a decision is made to completely decommission the facility all the components will be disassembled, reused and recycled or disposed. The site would be returned to its current use i.e. agriculture (grazing).

3. DESCRIPTION OF THE AFFECTED ENVIRONMENT

This 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.

3.1 STUDY AREA IN GENERAL

GEOLOGY, CLIMATE AND TOOGRAPHY

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, 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 west 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 East 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.

The Maralla East site, 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 1200 to1400masl.

VEGETATION

The vegetation in the study area is relatively homogeneous. According to the SANBI National Vegetation Map (2012) the prominent vegetation type on 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 site (close to the Komsberg Mountains), while the north-western portion of Maralla East 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 iv**).

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 and iii**). 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 v**). 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.

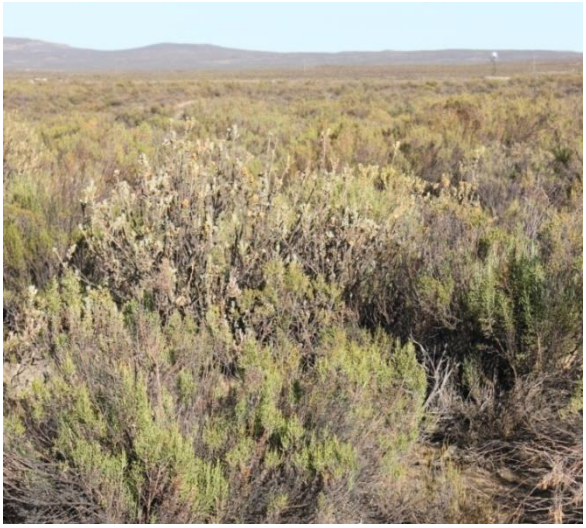


Plate ii: Low growing shrub and grasses

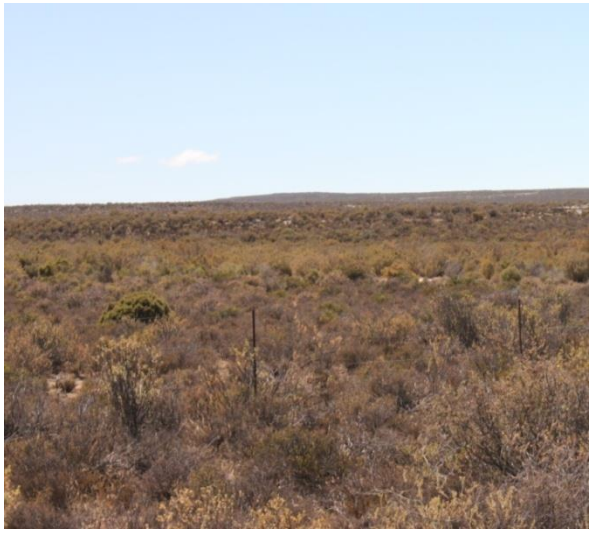


Plate iii: Muted yellows, browns, greens and greys

Plate iv: Clusters of tall exotics

Plate v: Sparse cover with rocky soils

LAND USE

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.

The Komsberg Wilderness Nature Reserve (private reserve) is located near the Komsberg Pass neighbouring the Maralla East 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.

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 East), which include 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.

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

3.2 MARALLA EAST

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, as discussed above. It focuses on the inherent nature of the land.

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 may dominate the immediate visual landscape.

SENSITIVITIES

Visual constraints or sensitive features have been mapped in the Scoping Phase and helped to inform the final layout. These included:

- 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 the sensitivity map in the Scoping Report.
  - 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 East[1]: Komsberg, Wilgeboom, Gemsbokfontein, Rondawel, Koornplaats, Banksdrift, Spitskopfontien, Kareedoornkraal, Weltevreden, Damslaagte, De Hoop, De Plaat, Oranjefontein. 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, Beerfontein, Scholtzenhof, and Ou Plaas are within the ZVI but are on the other side of the Komsberg Mountains.
  - Welgemoed (Maralla East) and De Kom (Maralla West) are situated within the boundaries of the Maralla sites.
- **Roads**
  - The R354 runs between Matjiesfontein and Sutherland and is therefore considered a local tourism route. The road is indicated as a recommended Grade III local scenic route in a study on Heritage and Scenic Resources of the Western Cape (Winter and Oberholzer, 2013). However, it is approximately 20km away and outside the viewshed area.
  - 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), the Spitzkopfontein Road and the Old Lainsburg (Koornplaats Road). Additional farm roads in the area will also be affected. These roads carry low traffic volumes.

[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.

- 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. 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. Klein Roggeveldberg and Komsberg is recommended as a Grade III Local Scenic Landscape in a study on Heritage and Scenic Resources of the Western Cape (Winter and Oberholzer, 2013). 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 Impact Assessment.

[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.

4. IDENTIFICATION OF IMPACTS (FINDINGS)

During the Scoping Phase of the EIA, the following potential impacts were identified.

4.1 CONSTRUCTION PHASE

1. **Construction equipment and dust:** construction vehicles, dust and equipment will have a visual impact on viewers and general visibility (clarity of the air) within close proximity to the site. The visual impacts during construction are over a limited time period and will be temporary.

2. **Clearing**: loss of vegetation during land clearing increases the visibility of contrasting soils, resulting in changes to the colour and texture of the site. Clearing vegetation will also result in increased windblown dust, reducing visibility of both day and night skies.

3. **Physical impact on landforms**: Roads, turbine platforms and other earthworks may impact on the physical landscape form particularly of steeper slopes, where cut and fill is required.

4.2 OPERATIONAL PHASE

1. **Intrusion on the sense of place and scenic landscape**: The remote and rural character of the area is typical of the Moordenaars Karoo. It is characterised by the rugged topography with low vegetation and clear air. The repeated patterns of the strong vertical structures will differ from the current visual landscape and will have an impact on the current nature of the landscape.

2. **Wind Turbines**: The clean lines of the turbines and the repetition of like elements, often results in greater unity and less clutter than many other types of development. However, the 195m high turbines will be visible in the landscape. The number of turbines has been reduced from 125 in the preliminary plans to 70 in the layout plan, on which the assessment is based[3]. Turbines at higher elevation and on ridgelines will be more visible against the skyline. The revised layout has attempted to avoid the very highest tips of the ridges, but due to other sensitivities and wind requirements a limited number of turbines remain in elevated positions. Turbines likely to be the most visible will be a string of about 11 turbines that run along the northern and western site boundary.

3. **Shadow Flicker**: Shadow flicker occurs when the sun is shining directly behind a wind turbine and the turning blades cast moving or flickering shadows on nearby residences through constrained openings such as windows. This occurs only during low sun angles (just after dawn and before sunset) and usually only a few hours per year, but it can present an annoyance to nearby residents or places of work. Shadow flicker has been proven to occur only within ten rotor diameters of a turbine position (UK Department of Energy and Climate Change). The Maralla East turbines have a maximum diameter of 150m, which means that beyond 1,5km shadow flicker will not be experienced.

4. **Lighting**: The SACAA determines the required hazard lighting on turbines. Usually wind turbines are required to be lit at night only (provided the turbines are white or off-white) with flashing red lights located at intervals along the turbine strings. Until the turbines are connected and functioning, randomly flashing red temporary lighting is required for all objects over 25m high.

   At night the landscape is observed differently as there is less visible context and lights are more likely to be seen in isolation. While red lights have less contrast than white lights in the

[3] Most recent plans indicate that only 56 turbines will be constructed with a generation capacity of 140MW.

night sky, they differ markedly from colours typically observed in the night landscape; the flashing on and off makes them particularly noticeable. However there are few viewers in close proximity to the site that could potentially be affected by lighting.

5. **Substation and other buildings and infrastructure:** 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.
6. **Roads and /or road widening**: Access and on-site roads could also contribute to visual impacts during operations. In addition to vegetative clearing, roads may introduce long-term visual contrasts to the landscape colour and texture.

4.3 DE-COMMISSIONING PHASE

1. **Construction equipment and dust:** In terms of visual impact the decommissioning process is anticipated to be broadly similar to that of the construction phase, effects on visual receptors and landscape character during decommissioning are anticipated to be consistent with those assessed for the construction phase.

4.4 CUMULATIVE IMPACTS

Please see **Section 5.3**.

5. ASSESSMENT OF IMPACTS

5.1 MAGNITUDE OF THE VISUAL IMPACTS EVALUATED USING VISUAL CRITERIA

The following section outlines the evaluation that was done to inform the magnitude (or severity) of all of the identified visual impacts resulting from the proposed development activities. Various quantitative and qualitative factors were considered in the evaluation including; visual quality, visual absorption capacity, visibility, integrity with the existing landscape and sensitivity of viewers.

These criteria are explained and applied below and the visual criteria rating tables that were utilised in the study are included in **Annexure A**.

VISUAL QUALITY

Visual value is frequently addressed by reference to international, national, regional and local policy designations determined by statutory and planning agencies. Absence of such a designation, however, does not imply that the landscape lacks quality or value. People's perceptions and experiences of landscapes vary. In addition to responding to the visual qualities of landscapes, people also perceive landscapes through the senses of hearing, smell, touch and taste. Memory and association are also important. As such, value is difficult to quantify in absolute terms. Studies in perceptual psychology have shown that humans prefer landscapes with higher complexity and 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).

The visual quality of the area is summarised in **Table 2** below.

Table 2: Visual Quality Maralla East

VISUAL CRITERIA	COMMENT	RATING
Visual Quality	• 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.	High

	• Topographical interest and views are created by the Klein Roggeveld and Komsberg Mountains. • While not symbolic, the vastness of this remote landscape is evocative. • Many of the 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. • Few intrusive man-made features, although the area is ear-marked for wind energy and energy infrastructure development. • Some areas close to the site have been vertically compromised, due the extensive power lines on high towers which zigzag through the landscape. • The R354 is indicated as a recommended Grade III local scenic route in a study on Heritage and Scenic Resources of the Western Cape (Winter and Oberholzer, 2013) and the Klein Roggeveldberg and Komsberg as a Grade III Local Scenic Landscape.	

VISUAL ABSORPTION CAPACITY

Visual absorption capacity (VAC) is the potential for an area to conceal additional human intervention (activities and structures) without significant loss of character or visual quality. Landscapes or townscapes that have a high VAC (i.e. are able to conceal activities and structures) are visually less sensitive than environments that have a low VAC (i.e. are unable to conceal activities and structures).

Factors contributing to the VAC include:

- Topography and vegetation that is able to provide screening in a landscape. A topographically diverse landscape is better able to absorb visual impacts and is less sensitive;
- The degree of urbanisation compared to open space / undeveloped land. A highly urbanised landscape is better able to absorb the visual impacts of similar developments; and
- The scale and density of surrounding development. A developed urban fabric that is dense or where buildings and structures are large is better able to offer visual screening.

The VAC of the landscape around the site is summarised in **Table 3** below.

Table 3: Visual Absorption Capacity Maralla East

VISUAL CRITERIA	COMMENT	RATING
Visual Absorption Capacity	• The topography is rugged and undulating, providing excellent screening. The Klein Roggeveld and Komsberg Mountains provide good screening from the north and east. • The low growing, sparse natural vegetation, provides little to no screening. • Many homesteads and dwellings are situated at low elevation and surrounded by trees and shelterbelts for shade and protection from the wind. These provide excellent visual screening from many homesteads. • There is little to no urban development in the immediate area, but many powerlines cross the landscape close to the site.	Medium-High

VISIBILITY AND VISUAL EXPOSURE

Visibility is partially determined by the Zone of Visual Influence (ZVI) and viewshed area.

Zone of Visual Influence (ZVI)

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 ZVI is the maximum extent around an object, beyond which the visual impact will be insignificant, primarily due to distance. This was determined and discussed in greater detail in the Scoping Phase (see Visual Scoping Report) and was defined for the WEF (primarily due to turbine height) as a ***10km radius, with 20km being the outer limit of analysis***. This is further defined as follows:

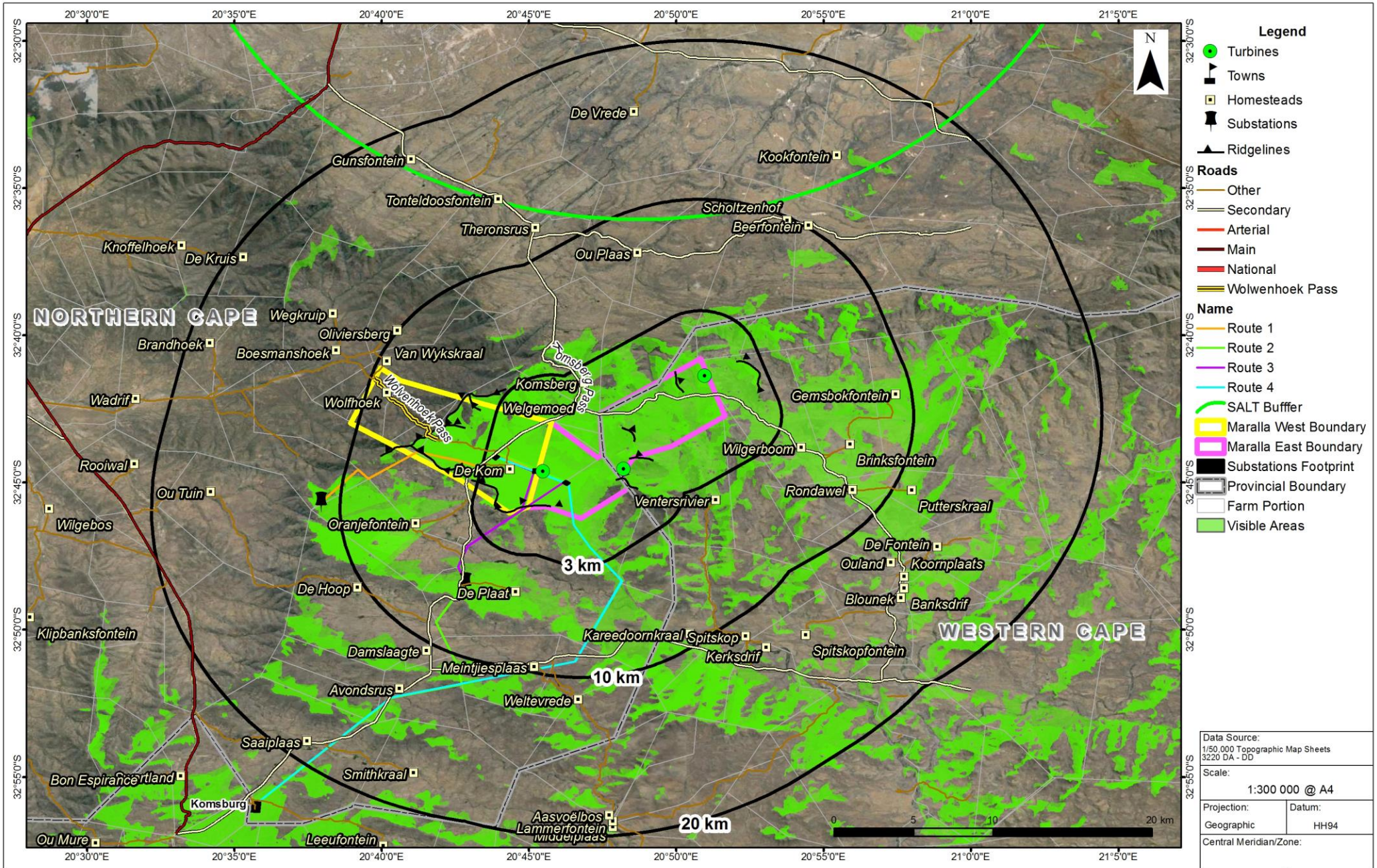
- less than 3km – WEF likely to be a prominent feature, dominating perception;
- between 3km and 10km – WEF likely to dominate perception to some extent; and
- more than 10km – WEF may be marginally visible, but the nearest objects generally would dominate perception.

The Viewshed

The viewshed is the topographically defined area, including all the major observation sites, from which proposed structures/activities may be visible. The boundary of the viewshed connects high points in the landscape and demarcates an area of potential visibility. The viewshed calculations are based on worst-case scenario using 360º line-of-sight calculations on a Digital Elevation Model (at 20m contour intervals). The height of existing buildings, trees and small undulations in the surrounding area are not included in the calculation of the viewshed. *It is therefore important to remember that the proposed development will not be visible from all points within the viewshed*, as views may be obstructed by visual elements such as built structures, minor local variations in topography and vegetation. For this reason it is often referred to as the 'zone of theoretical visibility'.

The viewshed for Maralla East (**Figure 2**) indicates the area from which a selection of turbines (at 195m high) may potentially be visible; it is calculated within a 20km radius, but visibility beyond **10km** will be marginal (see ZVI). As can be seen from the figure:

- Except for small pockets (predominantly on ridges or elevated viewpoints), most of the area beyond a 10km radius is excluded from the viewshed area. This is due to the undulating nature of the landscape, which screens the facility.
- The viewshed area lies primarily to the east of the site, with a section of the Old Lainsburg (Koornplaats) Road included in the viewshed.
- A stretch of the Klein Roggeveld Road, from just before the Komsberg Pass to just after De Kom (and again for a short stretch at De Plaat turn-off) is included in the viewshed area.
- Within the 20km radius, none of the R345 falls within the viewshed area.
- The proposed development is likely to be visible from elevated points on the Klein Roggeveld and Komsberg Mountains (particularly the southern slopes).

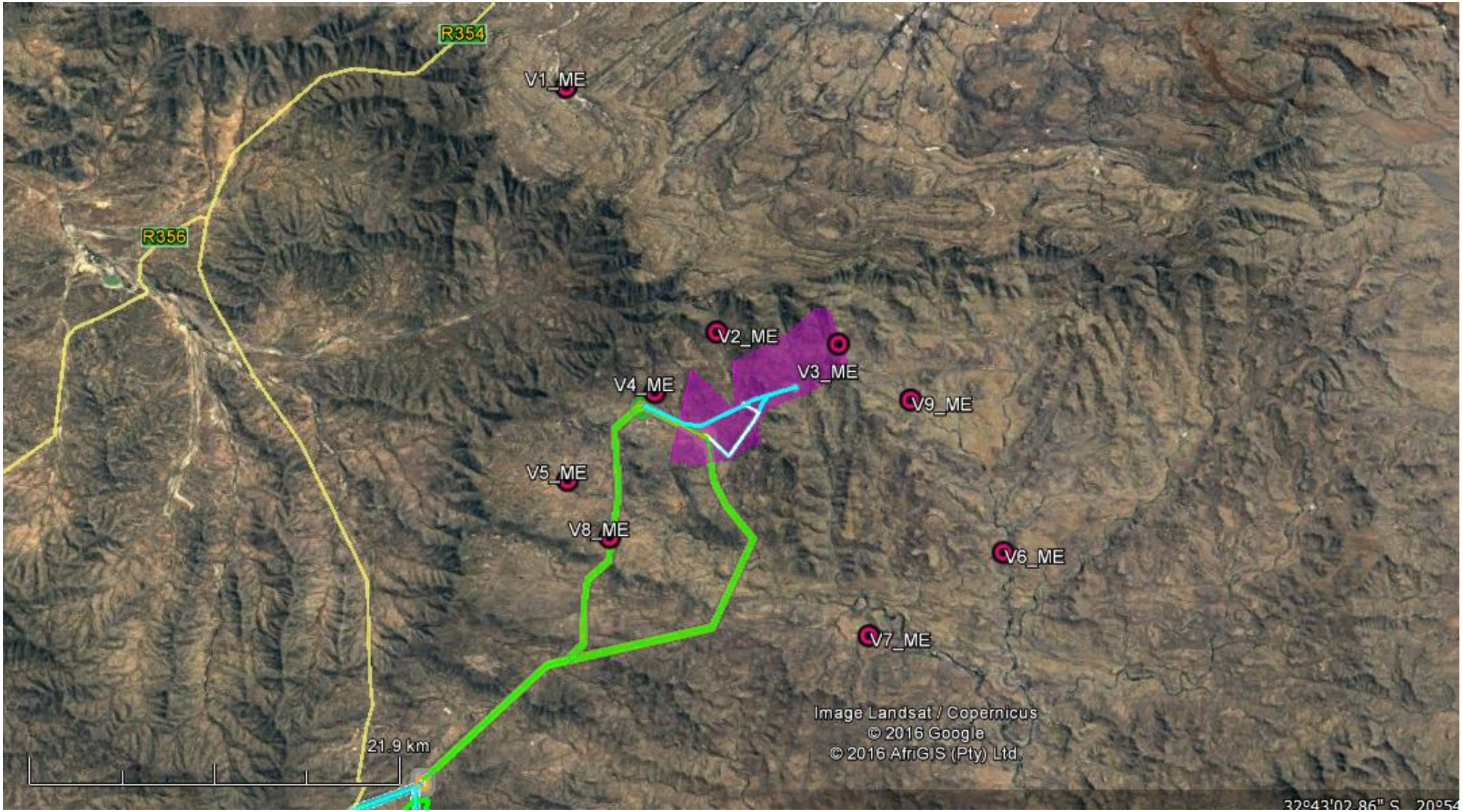


BIOTHERM SOLAR/WIND ENERGY

MARALLA EAST VIEWSHED

Data Source: 1/50,000 Topographic Map Sheets 3220 DA - DD	
Scale: 1:300 000 @ A4	
Projection: Geographic	Datum: HH94
Central Meridian/Zone:	
Date: 04/04/2016	Compiled by: GOES
Revision: A Date: 26 10 2016	Fig No: 3

Path: C:\Users\Mildred\Documents\Projects\Belinda_Gebhardt\MXDs\Maralla_east_viewshed.mxd



BIOTHERM ENERGY

Location of Viewpoints for Maralla East

Date: Nov 2016	Complied by: GEBH
Revision: 1	Fig No: 3

Visibility from Viewpoints

The potential visibility of the proposed project was further gauged by photographs, taken from over 50 viewpoints. From these photographs 9 viewpoints were included in the report. These are indicated on **Figure 3**, represented in the accompanying photographs (**Plates ix - xvii**) and discussed in the **Table 4** below.

Table 4: Visibility from Viewpoints for Maralla East

VIEWPOINT	WAYPOINT REFERENCE	LOCATION DESCRIPTION	DIRECTION	APPROXIMATE DISTANCE FROM SITE	VISIBILITY
VP 1	25	Gunsfontein	SE	18,5km	Not visible
VP 2	30	Klein Roggeveld Road (Komsberg Nature Reserve Entrance)	SSE	2km	Visible
VP 3	36	Eastern border	SW	0km	Highly visible
VP 4	38	Klein Roggeveld Road close to De Kom	E	1,8km	Highly visible
VP 5	39	Oranjefontein	NE	6,9km	Marginally visible
VP 6	-	Banksdrift	NW	14,2km	Marginally visible
VP 7	-	Spitzkop	NW	13km	Not visible
VP 8	41	Klein Roggeveld Road (De Plaat)	NE	5,6km	Visible
VP 9	-	Wilgeboom	NE	4,2km	Visible

Plate ix: Viewpoint 1 (site not visible beyond undulations to left of road)

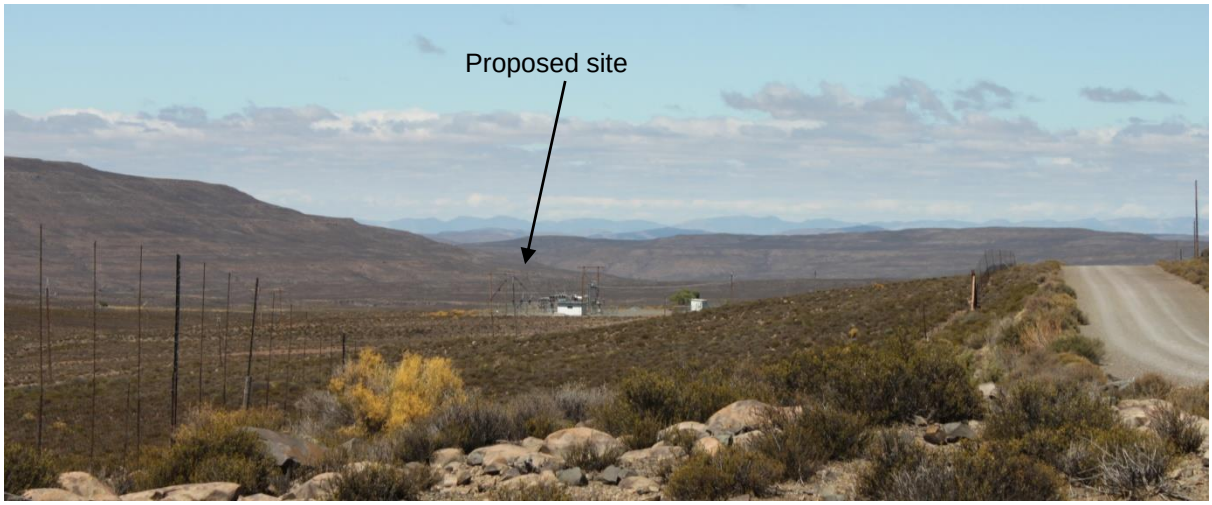


Plate x: Viewpoint 2

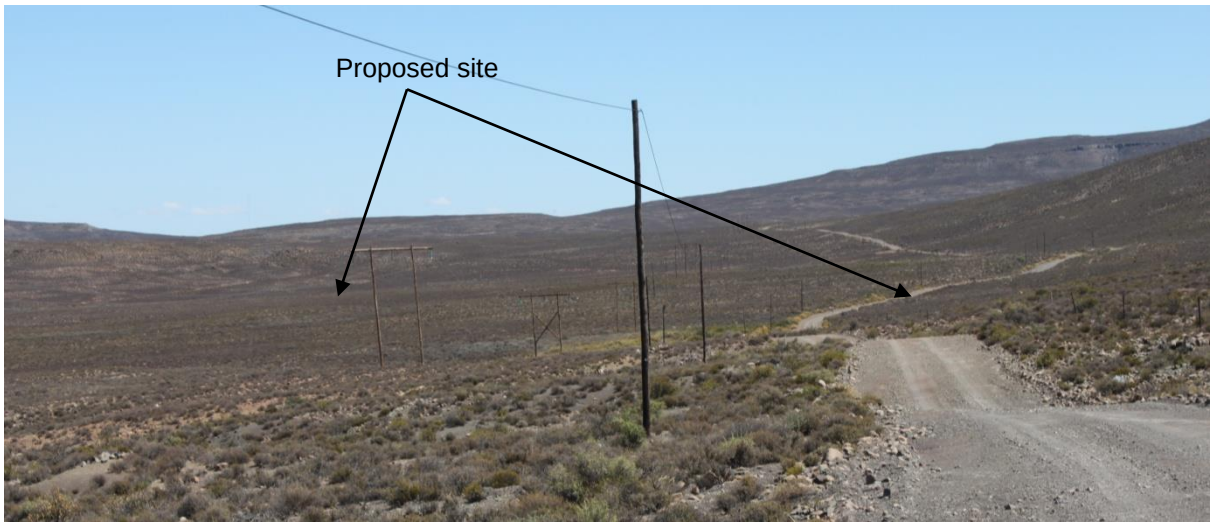


Plate xi: Viewpoint 3

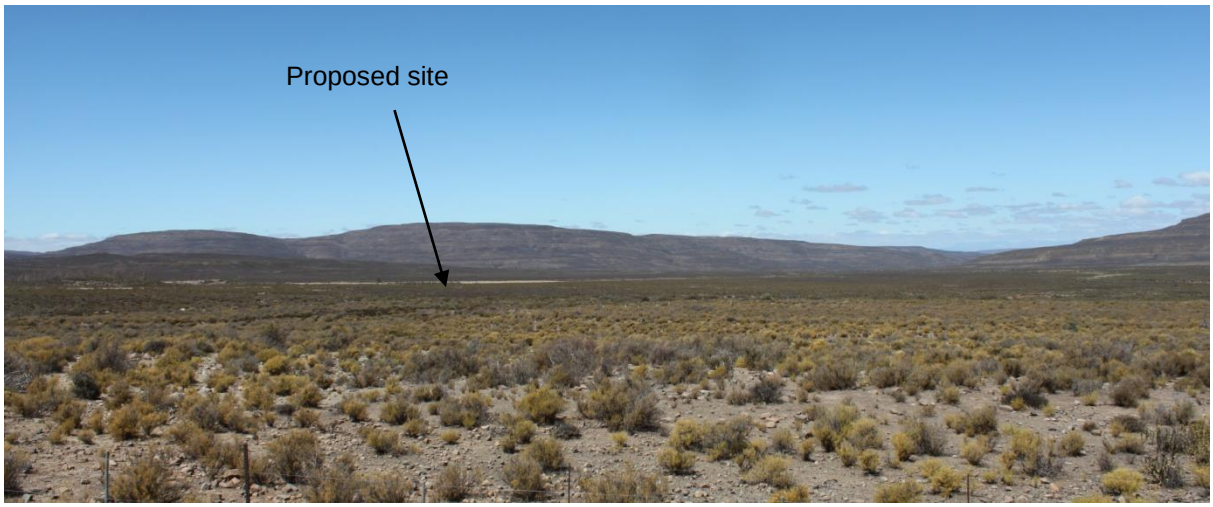


Plate xii: Viewpoint 4

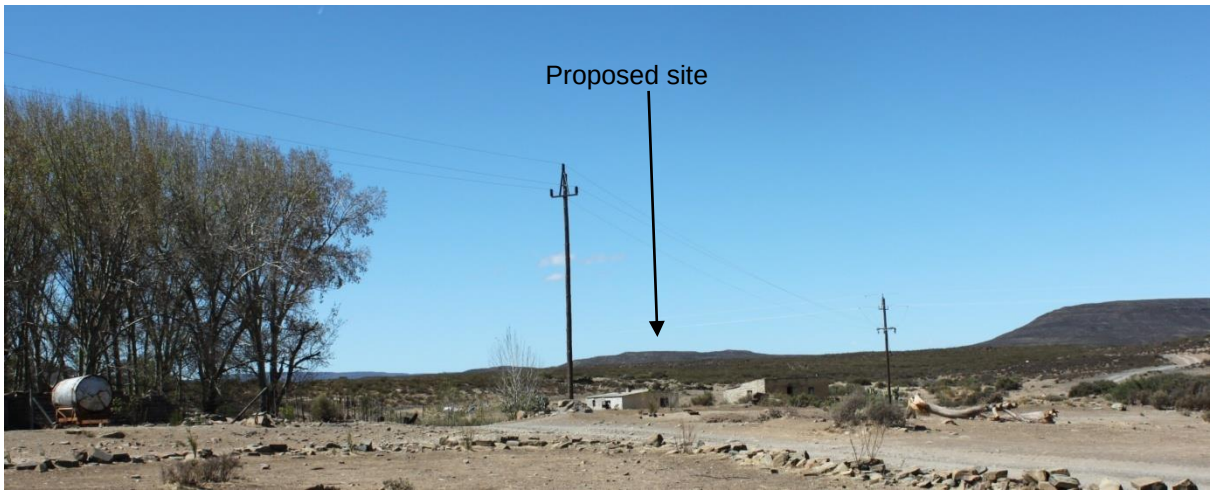


Plate xviii: Viewpoint 5

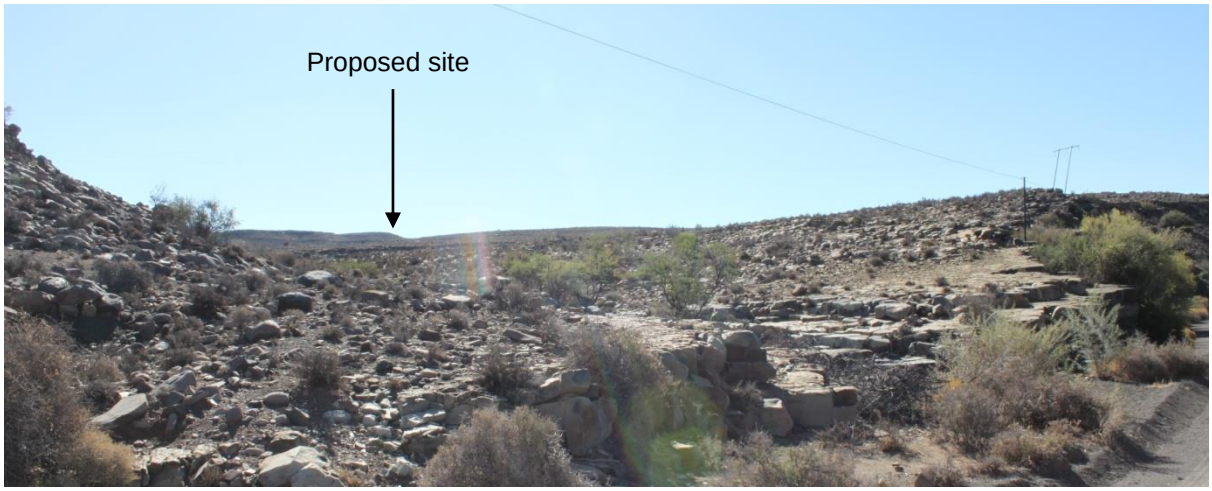


Plate xiv: Viewpoint 6

Plate xv: Viewpoint 7 (site not visible)

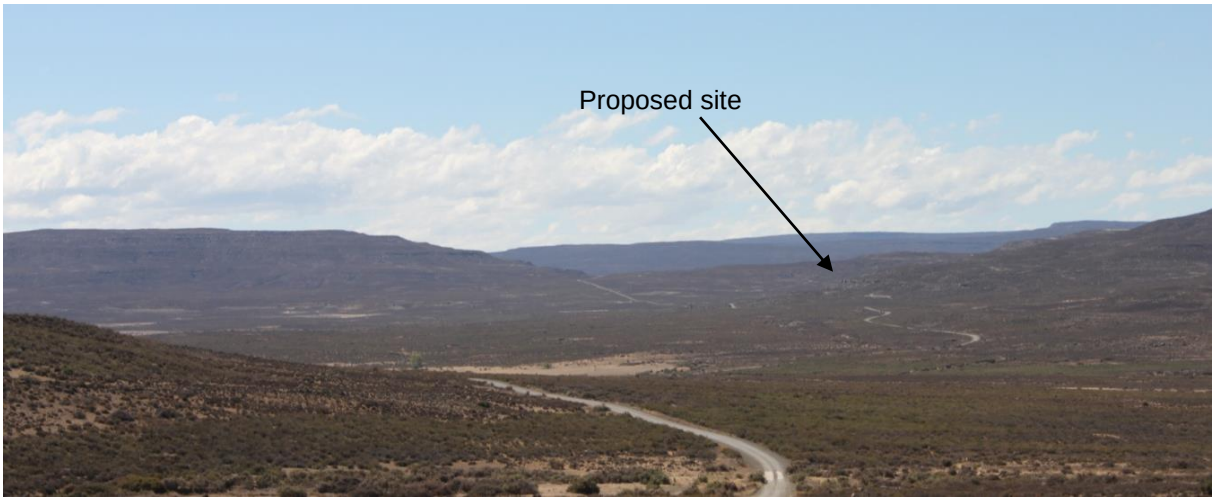


Plate xvi: Viewpoint 8

Plate xvii: Viewpoint 9

VISUAL INTRUSION (INTEGRITY)

The previous section considers how visible the proposed activities will be in the landscape. This should be considered together with what effect this visibility will have on the existing visual character/landscape. This is referred to as the level of visual intrusion (or visual integrity). Thus landscape (or visual) intrusion refers to the compatibility of the proposed activities with the existing landscape and/or townscape.

Factors which influence visual intrusion include:

- Consistency of type of development with the existing land use of the area;
- Sensitivity of facility design to the natural environment;
- The extent to which the texture (density) and layout of the proposed design is congruent with the current built environment;
- Congruency of proposed buildings with other buildings and architectural styles, if relevant; and
- The scale and size of the activities in comparison to nearby existing activities.

The visual intrusion or integrity is summarised in **Table 5** below.

Table 5: Visual Intrusion for Maralla East

VISUAL CRITERIA	COMMENT	RATING
Visual Intrusion	• The proposed WEF differs in scale, size and function to the existing rural character of the landscape; it will however be slightly more consistent with other power related facilities in the area. • The strong vertical patterns of the facility are different to the existing open spaces of the landscape. However, the clean lines of the turbines and the repetition of like elements, often results in greater unity and less clutter than many other types of development. • The area is earmarked as an energy development zone, and the proposed facility is visually consistent with this intended land-use and resulting character.	Medium

VIEWER SENSITIVITY

Visual receptors are important insofar as they inform visual sensitivity. They can include human viewers or valued viewpoints. The level of visual impact considered acceptable is dependent to some degree on the sensitivity of the visual receptors.

Table 6 below indicates the categories of viewer sensitivity as identified in the DEA&DP Guidelines of 2005.

Table 6: General categories of sensitivity for visual receptors (DEA&DP, 2005):

HIGH	MODERATE	LOW
• Residential areas • Nature reserves • Scenic routes / trails	• Sporting and recreational areas • Places of work	• Industrial areas • Active mining areas • Visually severely degraded areas

Various groups of viewers have been identified for the proposed solar development and their sensitivity is summarised in **Table 7** below.

Table 7: Viewer Sensitivity for Maralla East

VISUAL RECEPTOR	COMMENT	RATING
Motorists on R354	• Motorists on the R354 are considered sensitive viewers as it is a tourism route. However the Maralla East site is situated over 20km and mostly excluded from the viewshed area.	Very low
Motorists on Klein Roggeveld Road and other farm roads	• Although stretches of the Klein Roggeveld Road and other small farm roads are within the viewshed area, traffic levels are low, with few visitors/ tourists travelling these routes. The development may be visible from a short stretch of the Komsberg Pass.	Medium
Town of Sutherland	• The town of Sutherland is a small town, known for its clear skies and as an astronomy observation area. However, it falls well beyond the ZVI and the proposed WEF will not be visible from the town.	Very Low
Farmsteads	• Given the low density in the area, few homesteads will be affected by the proposed facility but inhabitants generally have a great affinity for the land and landscape. Homesteads in the area are indicated on the viewshed map. It should however be noted that some of these are unoccupied. Most affected will be De Kom, Oranjefontein,	Medium-high

	De Plaat, Ventersrivier, Wilgeboom, Rondewal, Brinksfontein, Gemsbokfontein (also Welgemoed which is situated on the site and occupied by the property owner).	

5.2 ASSESSMENT OF THE SIGNIFICANCE OF THE VISUAL IMPACTS

Based on the assessment in the section above, the visual impacts for each phase of the proposed project are assessed in the section below (see **Table 8, Table 9 and Table 10**). A detailed explanation of the impact rating methodology is provided in **Annexure B.**

Table 8: Impact Rating for Maralla East: Construction Phase

Construction Phase									
Maralla East									
Potential Impact		**Extent (E)**	**Duration (D)**	**Magnitude (M)**	**Probability (P)**	**Significance (S=(E+D+M)*P)**		**Status (+ve or -ve)**	**Confidence**
Visual impact during construction due to dust, vehicles and equipment	**Nature of impact:**	direct							
	Without Mitigation	2	2	6	4	**40**	**Medium**	-	medium-high
	degree to which impact can be reversed:	The visual impact can be completely reversed if vehicles, equipment, rubble and any other construction materials are removed after construction.							
	degree of impact on irreplaceable resources:	Dust and equipment are not likely to impact on any irreplaceable visual resources.							
	Mitigation Measures	See Section 6							
	With Mitigation	2	2	4	3	**24**	**Low**	-	medium-high
Visual impact during construction due to vegetation clearing	**Nature of impact:**	direct							
	Without Mitigation	2	2	4	4	**32**	**Medium**	-	medium-high
	degree to which impact can be	The visual impact can be completely reversed after closure of facility, if vegetation is rehabilitated.							

	reversed:								
	degree of impact on irreplaceable resources:	Vegetation is classified as Least Threatened, and from a visual perspective can be re-established. The value of vegetation loss is considered in the ecological report.							
	Mitigation Measures	See Section 6							
	With Mitigation	2	2	2	4	**24**	**Low**	-	medium-high
Visual impact during construction on landforms	**Nature of impact:**	direct							
	Without Mitigation	1	5	2	4	**32**	**Medium**	-	medium
	degree to which impact can be reversed:	Visual impacts on landforms can be reversed with effective rehabilitation measures.							
	degree of impact on irreplaceable resources:	Most visual impacts completely reversible, some cut and fill scars may remain if rehabilitation insufficient.							
	Mitigation Measures	See Section 6							
	With Mitigation	1	4	2	4	**28**	**Low**	-	Medium

Maralla East - No-Go

Potential Impact	**Mitigation**	**Extent (E)**	**Duration (D)**	**Magnitude (M)**	**Probability (P)**	**Significance (S=(E+D+M)*P)**	**Status (+ve or -ve)**	**Confidence**
No visual impacts	**Nature of impact:**	no impact						

are associated with the no-go alternative	**Without Mitigation**								
	degree to which impact can be reversed:	n/a							
	degree of impact on irreplaceable resources:	n/a							
	Mitigation Measures	n/a							
	With Mitigation								

Table 9: Impact Rating for Maralla East: Operational Phase

Operational Phase									
Maralla East									
Potential Impact		**Extent (E)**	**Duration (D)**	**Magnitude (M)**	**Probability (P)**	**Significance (S=(E+D+M)*P)**		**Status (+ve or -ve)**	**Confidence**
Intrusion on sense of place and rural landscape	**Nature of impact:**	direct							
	Without Mitigation	2	4	8	4	**56**	**Medium**	-	medium-high
	degree to which impact can be reversed:	The visual impact can be completely reversed after closure of facility, if structures and buildings removed and vegetation rehabilitated.							
	degree of impact on irreplaceable resources:	No impact on irreplaceable resource, if site effectively rehabilitated.							

	Mitigation Measures	See Section 6							
	With Mitigation	2	4	6	4	**48**	**Medium**	-	medium-high
Visual impact of wind turbines	**Nature of impact:**	direct							
	Without Mitigation	2	4	8	5	**70**	**High**	-	medium-high
	degree to which impact can be reversed:	The visual impact can completely reversed after closure of facility, if turbines removed.							
	degree of impact on irreplaceable resources:	No impact on irreplaceable resource, if site effectively rehabilitated.							
	Mitigation Measures	Mitigation is mostly due to revised layout, some additional measures are suggested in Section 6.							
	With Mitigation	2	4	6	5	**60**	**Medium**	-	medium-high
Visual impact of substation and other buildings and infrastructure	**Nature of impact:**	direct							
	Without Mitigation	2	4	6	4	**48**	**Medium**	-	medium-high
	degree to which impact can be reversed:	The visual impact can be completely reversed after closure of facility, if structures and buildings removed.							
	degree of impact on irreplaceable resources:	No impact on irreplaceable resource, if site effectively rehabilitated.							
	Mitigation Measures	See Section 6							

	With Mitigation	2	4	4	4	**40**	**Medium**	-	medium-high
Visual impact of shadow flicker	**Nature of impact:**	direct							
	Without Mitigation	2	4	2	1	**8**	**Low**	-	medium-high
	degree to which impact can be reversed:	The visual impact can completely reversed after closure of facility, if turbines removed.							
	degree of impact on irreplaceable resources:	No impact on irreplaceable resource.							
	Mitigation Measures	No dwellings are within 1,5km of turbines, but if required, shadow flicker can be mitigated. See Section 6							
	With Mitigation	2	4	2	1	**8**	**Low**	-	medium-high
Visual impact of lighting from facility	**Nature of impact:**	direct							
	Without Mitigation	2	4	6	4	**48**	**Medium**	-	medium
	degree to which impact can be reversed:	The visual impact can completely reversed after closure of facility, if lighting removed.							
	degree of impact on irreplaceable resources:	No impact on irreplaceable resource.							
	Mitigation Measures	Mitigation options for lighting are limited, See Section 6							
	With Mitigation	2	4	6	4	**48**	**Medium**	-	medium
Visual impact of	**Nature of impact:**	direct							

additional roads and road widening	**Without Mitigation**	2	4	4	3	**30**	**Low**	-	medium-high
	degree to which impact can be reversed:	The visual impact can completely reversed after closure of facility.							
	degree of impact on irreplaceable resources:	No impact on irreplaceable resource, but visible roads may remain.							
	Mitigation Measures	See Section 6							
	With Mitigation	2	4	2	3	**24**	**Low**	-	medium-high

Maralla East - No-Go

Potential Impact	**Mitigation**	**Extent (E)**	**Duration (D)**	**Magnitude (M)**	**Probability (P)**	**Significance (S=(E+D+M)*P)**		**Status (+ve or -ve)**	**Confidence**
No visual impacts are associated with the no-go alternative	**Nature of impact:**	no impact							
	Without Mitigation								
	degree to which impact can be reversed:	n/a							
	degree of impact on irreplaceable resources:	n/a							
	Mitigation Measures	n/a							
	With Mitigation								

Table 10: Impact Rating for Maralla East: Decommissioning Phase

Decommissioning Phase									
Maralla East									
Potential Impact		**Extent (E)**	**Duration (D)**	**Magnitude (M)**	**Probability (P)**	**Significance (S=(E+D+M)*P)**		**Status (+ve or -ve)**	**Confidence**
Visual impact during decommissioning due to dust, vehicles and equipment	**Nature of impact:**	direct							
	Without Mitigation	2	2	6	4	**40**	**Medium**	-	medium-low
	degree to which impact can be reversed:	The visual impact can be almost completely reversed after closure of facility, if structures and buildings removed and vegetation rehabilitated.							
	degree of impact on irreplaceable resources:	Low visual impact if cut and fill scars remain.							
	Mitigation Measures	See Section 6							
	With Mitigation	2	2	4	3	**24**	**Low**	-	medium-low
Maralla East - No-Go									
Potential Impact	**Mitigation**	**Extent (E)**	**Duration (D)**	**Magnitude (M)**	**Probability (P)**	**Significance (S=(E+D+M)*P)**		**Status (+ve or -ve)**	**Confidence**
No visual impacts are associated with the no-go	**Nature of impact:**	no impact							
	Without Mitigation								

alternative	**degree to which impact can be reversed:**	n/a							
	degree of impact on irreplaceable resources:	n/a							
	Mitigation Measures	n/a							
	With Mitigation								

5.3 CUMULATIVE IMPACTS

Cumulative effects, relate to alterations to the perception of character arising from the visibility of the proposed development in conjunction with other solar and wind farms within the study area. Such cumulative effects would be expected to arise during the latter stages of the construction phase and throughout the operational phase.

The assessment considers two types of cumulative visual effects, namely effects arising from combined and sequential views. These comprise:

- combined views which "occur where the observer is able to see two or more developments from one viewpoint. Combined visibility may either be in combination (where several wind farms are within the observer's arc of vision at the same time) or in succession (where the observer has to turn to see the various wind farms)"

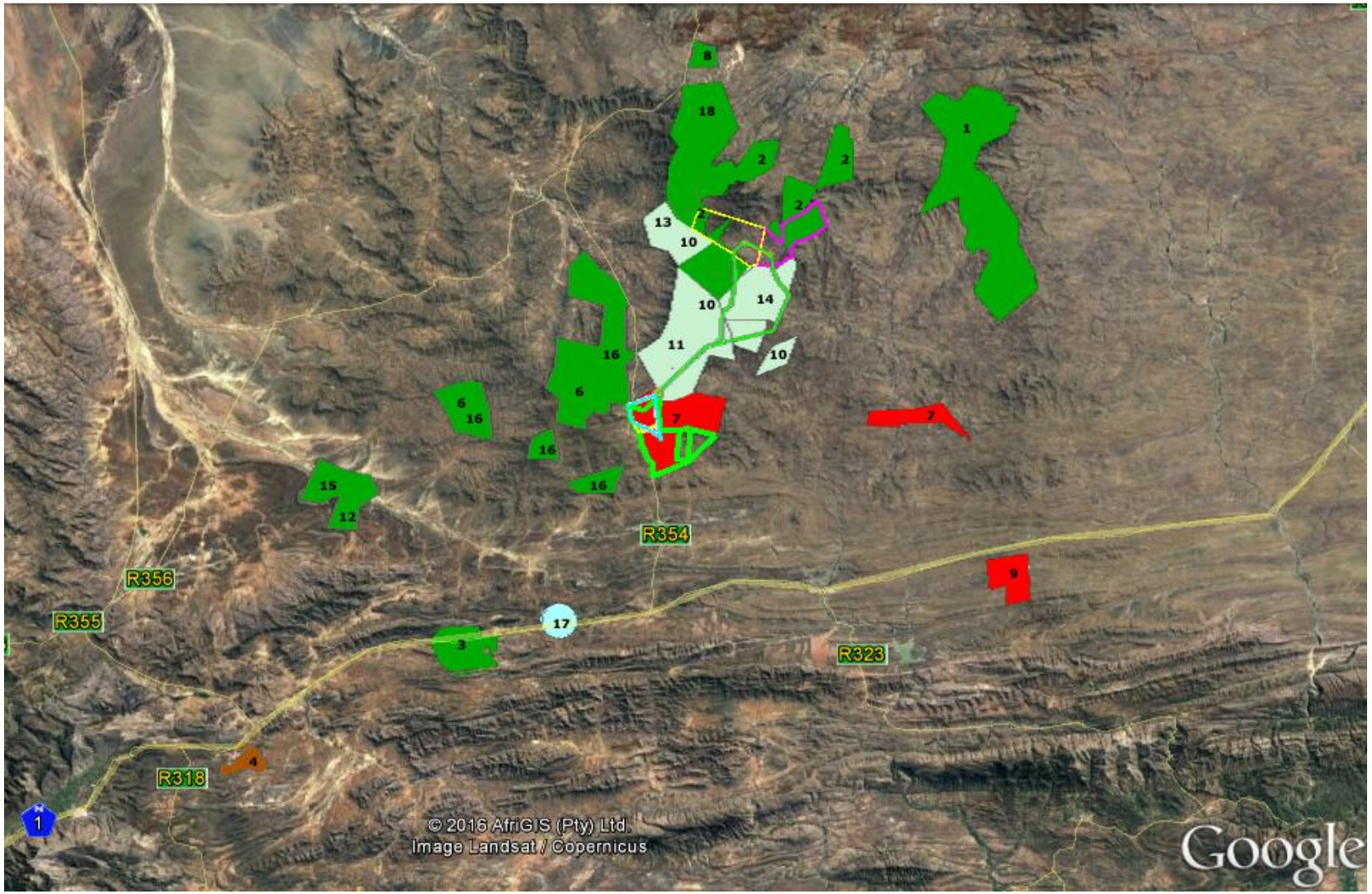
- sequential views which "occur when the observer has to move to another viewpoint to see different developments" (Vissering, 2011).

There are a number of Environmental Authorisations (EAs) (either issued or in progress) within area around the proposed project site. These EAs are illustrated in **Figure 4** and detailed in **Table 11** (WSP, 2016)**.** The site is located within the Komsberg REDZ and is therefore considered to be located within the renewable energy hub that is intended for the Komsberg area.

Table 11: Other Proposed Renewable Energy Projects in the Area (WSP, 2016)

DEA REFERENCE NUMBER	EIA PROCESS	PROJECT TITLE	EAP	TECHNOLOGY	MEGA WATT	PROJECT STATUS
14/12/16/3/3/2/395	S&EIR	Proposed 280 MW Gunstfontein Wind Energy Project.	Savannah Environmental Consultants (Pty) Ltd	Onshore Wind	280 MW	Approved
12/12/20/1782/AM1	S&EIR	Proposed development of renewable energy facility at the Sutherland site, Western and Northern Cape.	Environmental Resource Management (Pty) Ltd	Onshore Wind	811 MW	Approved
12/12/20/2370/2	S&EIR	Proposed Hidden Valley Wind Energy Facility, Northern Cape	Environmental Resource Management (Pty) Ltd	Onshore Wind	150 MW	In Process
12/12/20/2370/3	S&EIR	Proposed Hidden Valley Wind Energy Facility, Northern Cape	Savannah Environmental Consultants (Pty) Ltd	Onshore Wind	150 MW	In Process
12/12/20/2370/1	S&EIR	Proposed Hidden Valley Wind Energy Facility, Northern Cape	Aurecon South Africa (Pty) Ltd	Onshore Wind	150 MW	Approved
12/12/20/2370	S&EIR	Proposed Hidden Valley Wind Energy Facility, Northern Cape	Environmental Resource Management (Pty) Ltd	Onshore Wind	650 MW	Approved
12/12/20/2228	S&EIR	Proposed wind energy facility near Komsberg, Western Cape	Environmental Resource Management (Pty) Ltd	Onshore Wind	300 MW	Withdrawn or Lapsed
12/12/20/1988/1/AM1	Amendment	Proposed Construction Of The up to 250MW Roggeveld Wind	Environmental Resource	Onshore Wind	140 MW	Approved

		Farm Within The Karoo Hoogland Local Municipality Of The Northern Cape Province And Within The Laingsburg Local Municipality Of The Western Cape Province	Management (Pty) Ltd			
12/12/20/2235	BAR	Proposed Photovoltaic (PV) Solar Energy Facility On A Site South Of Sutherland, Within The Karoo Hoogland Municipality Of The Namakwa District Municipality, Northern Cape Province	Environmental Evaluation Unit: UCT	Solar PV	10 MW	Approved
12/12/20/1583	S&EIR	Proposed establishment of the Suurplaat wind energy facility and associated infrastructure on a site near Sutherland, Western Cape and Northern Cape.	Savannah Environmental Consultants (Pty) Ltd	Onshore Wind	120 MW	Approved
12/12/20/2328	S&EIR	Proposed wind and solar project near Laingsburg, Western Cape	CSIR	Onshore Wind	50 MW	Withdrawn or Lapsed
12/12/20/1966 /A2	Amendment	Proposed establishment of the Witberg Bay wind energy facility, Laingsburg Local Municipality, Central Karoo District, Western cape	Environmental Resource Management (Pty) Ltd	Onshore Wind	Unknown	In Process
12/12/20/1787	S&EIR	Proposed renewable energy facility at Konstabel	Environmental Resource Management (Pty) Ltd	Onshore Wind and Solar PV	170 MW	Approved
12/12/20/1783 /2/AM1	Amendment	Proposed development of a renewable Energy facility at Perdekraal, Western Cape - Split 1	Environmental Resource Management (Pty) Ltd	Onshore Wind	Unknown	Approved
12/12/20/1956	S&EIR	Proposed Touwsrivier Solar energy facility	Environmental Evaluation Unit: UCT	Solar PV	36 MW	



Legend

- PB_R1
- Approved
- Withdrawn/lapsed
- In process

ID	DEA NUMBER
1	12/12/20/1583
2	12/12/20/1782
3	12/12/20/1787
4	12/12/20/1956
5	12/12/20/1966
6	12/12/20/1988
7	12/12/20/2228
8	12/12/20/2235
9	12/12/20/2328
10	12/12/20/2370
11	12/12/20/2370/1
12	12/12/20/1783/2
13	12/12/20/2370/2
14	12/12/20/2370/3
15	12/12/20/1783/2/AM1
16	12/12/20/1988/1/AM1
17	12/12/20/1966/A2
18	14/12/16/3/3/2/395

BIOTHERM ENERGY

Other Proposed Energy Projects in Area

Date: Dec 2016	Complied by: GEBH
Revision: 1	Fig No: 4

A summary of the status, extent, capacity and visual impact rating for each of these projects is summarised in **Table 12** below. An estimation of the total area is then ascribed to each significance rating. Please note that as stated in the limitations above, the rating have been simplified, as rating methodologies and scoring methods differ from project to project. The table was compiled by WSP.

Table 12: Summary of Visual Impacts of Projects within an 80km Radius (WSP, 2016)

Proposed Development Name	DEA Reference	Current EA Status	Proponent	Extent	Proposed Capacity	Impacts													
						Construction					Operation					Decommissioning			
						Overall	Infrastructure	Visibility of lights at night	Landscape	Shadow flicker	Overall	Infrastructure	Visibility of lights at night	Landscape	Shadow flicker	Overall			
Proposed 280 MW Gunstfontein Wind Energy Project	14/12/16/3/3/2/395	S&EIR	Networx Eolos Renewables (Pty) Ltd	12 000	280 MW	L					L								
Proposed development of renewable energy facility at the Sutherland site, Western and Northern Cape.	12/12/20/1782/AM1	S&EIR	Mainstream Power Sutherland	28 600	811 MW						H								
Proposed Hidden Valley Wind Energy Facility, Northern Cape	12/12/20/2370/2	S&EIR	Hidden Valley Wind- African Clean Energy Developments (Pty) Ltd	9 530	150 MW	M		M	M	L	M		M	M	L				
Proposed Hidden Valley wind energy facility , Northern	12/12/20/2370/3	S&EIR	Hidden Valley Wind- African Clean Energy Developments	9 180	150 MW	M		M	M	L	M		M	M	L				

Proposed Development Name	DEA Reference	Current EA Status	Proponent	Extent	Proposed Capacity	Impacts												
cape			(Pty) Ltd															
Proposed Hidden Valley wind energy facility , Northern cape	12/12/20/2370/1	S&EIR	Hidden Valley Wind- African Clean Energy Developments (Pty) Ltd	16 620	150MW	M		M	M	L	M		M	M	L			
Proposed Hidden Valley wind energy facility , Northern cape	12/12/20/2370	S&EIR	Hidden Valley Wind- African Clean Energy Developments (Pty) Ltd		650 MW	M		M	M	L	M		M	M	L			
Proposed Construction Of The 140Mw Roggeveld Wind Farm Within The Karoo Hoogland Local Municipality Of The Northern Cape Province And Within The Laingsburg Local Municipality Of The Western Cape Province	12/12/20/1988/1 /AM1	Amendment	G7 Renerable Energies (Pty) Ltd	26 529	140 MW	H	H	H	H		H	H	H	H				
Proposed Photovoltaic (PV) Solar Energy Facility On A Site South Of Sutherland, Within The Karoo Hoogland Municipality Of The Namakwa District Municipality,	12/12/20/2235	BAR	Inca Komsberg Wind (Pty) Ltd	2	10 MW	L												

Proposed Development Name	DEA Reference	Current EA Status	Proponent	Extent	Proposed Capacity	Impacts
Northern Cape Province						
Proposed establishment of the Suurplaat wind energy facility and associated infrastructure on a site near Sutherland, Western Cape and Northern Cape.	12/12/20/1583	S&EIR	Moyeng Energy (Pty) Ltd	28 600	120 MW	Could not be sourced
Proposed establishment of the Witberg Bay wind energy facility, Laingsburg Local Municipality, Central Karoo District, Western cape	12/12/20/1966/A 2	Amendment	Witberg Wind Power (Pty) Ltd		Unknown	Could not be sourced
Proposed renewable energy facility at Konstabel	12/12/20/1787	S&EIR	South Africa Mainstream Renewable Power Development		170 MW	Could not be sourced
Proposed development of a renewable Energy facility at Perdekraal, Western Cape - Split 1	12/12/20/1783/2 /AM1	Amendment	South Africa Mainstream Renewable Power Development		Unknown	Could not be sourced

PROPOSED DEVELOPMENT NAME	DEA REFERENCE	CURRENT EA STATUS	PROPONENT	EXTENT	PROPOSED CAPACITY	IMPACTS													
Proposed Touwsrivier Solar energy facility	12/12/20/1956	S&EIR	Unknown	215	36 MW				M					M					
				Total Ha	**Total MW**														
				128 276	2667 MW														

SIGNIFICANCE TOTALS PER IMPACT	SIGNIFICANCE RATING			**TOTAL HECTARES PER IMPACT**													
	High Significance			26 529	26 529	26 529	26 529		55 129	26 529	26 529	26 529					
	Medium Significance			35 330		35 330	35 545		35 330		35 330	35 545					
	Low Significance			12 002				35 330	12 000				35 330				
	Positive Impacts																

The following EAs (as listed in **Table 13**) surrounding the solar developments have been either withdrawn or have lapsed and are therefore not been considered as part of the cumulative impact assessment:

Table 13: Lapsed or Withdrawn Projects not considered in Cumulative Assessment

PROPOSED DEVELOPMENT NAME	DEA REFERENCE	CURRENT EA STATUS	PROPONENT	EXTENT	PROPOSED CAPACITY	FARMS
Proposed wind energy facility near Komsberg, Western Cape	12/12/20/2228	S&EIR	Inca Komsberg Wind (Pty) Ltd		300 MW	
Proposed wind and solar project near Laingsburg, Western Cape	12/12/20/2328	S&EIR	Unknown		50 MW	

It is not possible to accurately estimate the significance of the cumulative impacts as not all facilities granted environmental approval will be constructed. Without knowing which combination of the 16 applications (14 listed above and 2 other potential BioTherm projects) will be built, there are 65 535 possible scenarios. However, what should be taken into consideration by the decision making authorities regarding cumulative visual impact is noted below:

- The total area affected by all 14 projects considered above is 128 276 ha. If all the BioTherm wind projects are approved that will result in a total area of 143 688 ha.
- A high concentration of solar and wind energy developments will have a greater impact on the visual landscape and will alter the visual character to a greater degree.
- If all the approved projects are constructed they are likely to be sequentially visible particularly when driving along the Klein Roggeveld Road. In relation to Maralla West the Hidden Valley Proposals (4 projects), Networx Eolos Renewable's Gunstfontein, Mainstream's Sutherland Renewable Facility and G7's Roggeveld Wind Farm, Maralla East and Esizayo are most likely to contribute to sequential visual impacts.
- Projects within a 10km radius of Maralla East may have a combined visual impact from some viewpoints, these include Maralla East, Gunstfontein, some of the Hidden Valley sites and some of the Maintream Sutherland sites.
- The impact of Maralla East on the landscape is rated as medium impact in this VIA and it is reasonable to assume that the cumulative impact of any combination of the above projects will therefore have a high impact on the landscape. Maralla East will contribute to this impact primarily from the Klein Roggeveld Road.
- There are not many mitigation measures that can significantly reduce the cumulative visual impact of wind turbines, but the consistent implementation of mitigation measures across all projects can help to reduce visual impact to some extent. Additionally the dissected nature of the topography breaks up views and will partially obscure developments from viewpoints. Mitigation measures are discussed in Chapter 6 below.
- In considering the bigger picture, having energy projects concentrated in indentified areas or zones can be preferable, but opinion regarding this differs and some literature indicates that from a visual perspective greater distance between projects is less visually intrusive.
- If the planning and environmental authorities have decided and approved the REDZ as a guiding tool/strategy, it follows that there will be higher cumulative visual impact within these zones. The other alternative is to ensure developments are specified distances away from any other development, which would result in lower cumulative visual impact but smaller visual impacts scattered across a greater area. Guidelines specific to this are not yet available

and given the high number of approved applications that are never constructed, this could put potential renewable energy providers at a significant and unnecessary disadvantage. Guidelines and timeframes will therefore need to be carefully considered.

6. MITIGATION AND MANAGEMENT MEASURES

The visual impacts of the wind turbines are difficult to mitigate. The biggest visual mitigation is natural mitigation provided by the surrounding mountains and koppies. On a smaller scale there are some measures that can be implemented, particularly in the design and construction phase, to ensure the visual impacts are reduced as far as possible. These are listed in **Table 14** below.

Table 14: Mitigation and Management Measures for Maralla East:

ACTIVITY	MITIGATION AND MANAGEMENT MEASURE	RESPONSIBLE PERSON	APPLICABLE DEVELOPMENT PHASE	INCLUDE AS CONDITION OF AUTHORISATION	MONITORING REQUIREMENTS
Detailed design and specification	1. Design structures and buildings close together in clusters as far as possible. 2. Cables and pipelines should be located underground wherever possible. 3. Cluster or group turbines to break up overly long lines of turbines. 4. Ensure that the *revised alternative layout*, with reduced number of turbines, and fewer turbines in elevated positions, is approved. 5. Create visual order and unity among turbine clusters. 6. Ensure uniformity in shape and colour of turbines. 7. No corporate or advertising signage is to be permitted on turbines. 8. Use non-reflective paints and coatings on turbines and other structures to minimise visibility and avoid reflectivity and glare. 9. If security lighting is required: • Use light fixtures that provide precisely directed illumination; • If possible, use lighting that is activated only on movement of illegal entry to the site; • Avoid high pole top security lighting if possible; 10. Specify wire mesh or Clear-Vu type fencing for perimeter fencing.	Design Team/ECO	Planning and Design	1. Yes 2. Yes 3. Yes 4. Yes 5. Yes 6. Yes 7. Yes 8. Yes 9. Yes 10. Yes 11. Yes	Specifications to be incorporated by Design Team and verified by ECO prior to construction.

ACTIVITY	MITIGATION AND MANAGEMENT MEASURE	RESPONSIBLE PERSON	APPLICABLE DEVELOPMENT PHASE	INCLUDE AS CONDITION OF AUTHORISATION	MONITORING REQUIREMENTS
	11. Signage related the project must be discreet and confined to the entrances.				
Site clearing	1. The construction footprint must be kept as small as possible, to avoid unnecessary disruption to the existing vegetation. 2. No blanket clearing or removal of vegetation outside of the building zone is allowed.	Site Manager and ECO	Construction	1. Yes 2. Yes	Site inspection, to be specified in the EMPr
Excavation and construction of facility	1. Site perimeter (building zone) must be clearly demarcated. 2. The handling and transportation of materials which may generate dust must be avoided during high wind conditions. 3. Ground level at site boundary should remain natural ground level. 4. The building site and construction facilities must be well maintained and strictly controlled. 5. Dust and litter control measures must be included in the Environmental Management Programme (EMPr) 6. No dumping in unauthorised and/or highly visible areas is permitted.	Site Manager and ECO	Construction	1. Yes 2. Yes 3. Yes 4. Yes 5. Yes 6. Yes	Site inspection, to be specified in the EMPr
Operations	1. Establishing vegetative screens /shelterbelts around affected homesteads should be considered in consultation with the owners. 2. An ecologist (preferably the ecological specialist appointed to undertake the assessment) must be appointed to assist with the plant selection for vegetative screening. 3. Natural vegetation must be re-established on disturbed areas after construction; 4. Roads and drainage for runoff should be	ECO	Operational	1. No (only if accceptable /required by neighbouring land owners). 2. No (only if accceptable /required by neighbouring	Site inspection, to be specified in the EMPr

ACTIVITY	MITIGATION AND MANAGEMENT MEASURE	RESPONSIBLE PERSON	APPLICABLE DEVELOPMENT PHASE	INCLUDE AS CONDITION OF AUTHORISATION	MONITORING REQUIREMENTS
	appropriately stabilised to avoid erosion and visual scars. 5. Turbines must be kept in good repair and cleaned as required.			land owners). 3. Yes 4. Yes 5. Yes	
Rehabilitation	1. A detailed rehabilitation plan must be prepared. 2. An ecologist must be appointed to assist with the plant selection and methods for vegetative rehabilitation. 3. Mitigation measures applicable to the construction phase are also applicable to decommissioning.	ECO	Decommissioning	1. Yes 2. Yes	To be specified in the Decommissioning and Rehabilitation Plan

7. STAKEHOLDER CONSULTATION

7.1. STAKEHOLDER CONSULTATION PROCESS

A detailed description of the public participation process is contained in Comments and Responses Document for Maralla East (WSP, 2016). The objectives of the public participation process included:

- Identify relevant individuals, organisations and communities who may be interested in or affected by the Proposed Project;
- Clearly outline the scope of the Proposed Project, including the scale and nature of the existing and proposed activities;
- Identify viable Proposed Project alternatives that will assist the relevant authorities in making an informed decision;
- Identify shortcomings and gaps in existing information;
- Identify key concerns, raised by Stakeholders that should be addressed in the subsequent specialist studies;
- Highlight the potential for environmental impacts, whether positive or negative; and
- To inform and provide the public with information and an understanding of the Proposed Project, issues and solutions.

A list of notices send to registered stakeholders and a complete set of comments received to date are included in the Comments and Responses Document (WSP, 2016). A summary of the issues raised pertaining to visual concerns and impacts is summarised in **Table 15** below.

7.2. STAKEHOLDER COMMENTS AND RESPONSE

Table 15: Stakeholder Comments

STAKEHOLDER DETAILS	COMMENT	SPECIALIST RESPONSE
Department of Environmental Affairs: Ms Mmamohale Kabasa	Due to the number of similar applications in the area, all the specialist assessments must include a cumulative environmental impact assessment for all identified and assessed impacts. The cumulative impact assessment must indicate the following: - Identified cumulative impacts must be clearly defined, and where possible the size of the identified impact must be quantified and indicated, i.e. hectares of cumulatively transformed land. - Detailed process flow and proof must be provided, to indicate how the specialist's recommendations, mitigation measures and conclusions from the various similar developments in the area were taken into consideration in the assessment of cumulative impacts and when the conclusion and mitigation measures were drafted for this project. - The cumulative impacts significance rating must also inform the need and desirability of the proposed development. - A cumulative impact	From a visual perspective it is difficult to provide an accurate cumulative impact environmental statement on whether the proposed development must proceed, as it is not possible to assume which projects will be developed and which not. Many applications receiving approval do not get built. Of the 16 potential projects considered in the cumulative assessment, there are 65 535 possible scenarios or different combinations of projects that could be built. However, an overview of the cumulative impact and assessment is included in Chapter 5 of the VIA, with key factors relevant to decision making authorities highlighted.

STAKEHOLDER DETAILS	COMMENT	SPECIALIST RESPONSE
	environmental statement on whether the proposed development must proceed.	
Cape Nature: Requirements for Development Applications	All reports must firmly demonstrate how the proponent intends complying with the principles contained in section 2 of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended (NEMA), which, amongst other things, indicates that environmental management should: • In order of priority aim to: avoid, minimise or remedy disturbance of ecosystems and loss of biodiversity; • Avoid degradation of the environment; • Avoid jeopardising ecosystem integrity; • Pursue the best practicable environmental option by means of integrated environmental management; • ***Protect the environment as the people's common heritage;*** • Control and minimise environmental damage; and • Pay specific attention to management and planning procedures pertaining to sensitive, vulnerable, highly dynamic or stressed ecosystems. These principles serve as guidelines for all decision-making concerning matters that may affect the environment. As such, it is incumbent upon the proponent to show how proposed activities would comply with these principles and thereby contribute towards the achievement of sustainable development as defined by the NEMA.	Landscapes can be considered part of our common heritage and visual impacts on the landscape value are evaluated and assessed in the VIA.
Directorate: Development Facilitation – WCDEADP Adri La Meyer	***Visual and health impact*** - This Directorate supports the Visual Specialist Study (Gebhardt, July 2016) recommendation that prominent ridgelines in the landscape should be avoided when positioning turbines and other infrastructure. Furthermore, it is noted from the DSR that steep slopes are visually sensitive. This Directorate furthermore supports the exclusion of steep slopes from the development footprint. - This Directorate acknowledges the visual intrusion due to turbine size/height and visibility, and the lack of screening opportunities in the landscape. This Directorate therefore recommends the elimination of turbines from any high sensitivity areas. - This Directorate does not support the location of turbines within 800m from an occupied building and recommends that international standards and guidelines pertaining to shadow flickering be adopted.	- Prominent ridgelines and steep slopes are visually more sensitive than lower lying areas. However, the siting of turbines is constrained by wind farm efficiency which depends, in part, on precise turbine siting, based on local topography, the local wind regime, and other technical factors, which in turn influences the feasibility of the project. It is important for the site's sensitivities, including ridgelines, to be considered holistically to ensure the best possible ecological design. In the proposed site layout, the Applicant has reduced the number of turbines on the site from 125 to 70. Many of the turbines on higher lying areas have therefore been removed, but some remain. These will be more visible and have been discussed and rated accordingly in the VIA. - While the natural vegetation provides little screening, the undulating, highly dissected topography of the area provides very effecitve screening. Additionally many dwellings are situated within the low lying valleys and are often surrounded by windbreaks and shade trees which provide good screening.

STAKEHOLDER DETAILS	COMMENT	SPECIALIST RESPONSE
		- The PGWC guidelines recommend a buffer of 400m around rural dwellings. The unpublished draft National Wind and Solar PV Strategic Environmental Assessment recommends a buffer of 800m within the site boundary and 2 – 4km outside the site boundary, which can be relaxed depending on the viewshed and visibility. The draft Visual Scoping Report stipulated the PGWC buffer for dwellings as a minimum requirement on the sensitivity map. The closest dwelling to a turbine on Maralla East is Welgemoed, situated 1,5km from the closest turbine. - No dwellings more than 1,5km away from the turbines will be affeced by shadow flicker (10 times the rotor blade diameter). Shadow flicker is discussed and assessed in greater detail in the VIA.
Warren Petterson 11 October 2016	We are farmers in the area and are greatly concerned with the extent to which various companies such as your clients are attempting to establish WEF's in our area. Little regard is given to the potential impact of the proposals on the table. The accumulative presence of the various proposals will destroy a massive part of the Karoo. I am sure you are aware of the other proposals as your WEF's border on the others. Besides the significant visual impact, the destruction of the landscape, noise and the numerous significant environmental impacts of various Fauna and Flora, there is a social impact that seems to be ignored.	- Concerns regarding cumulative visual impact are noted. The issues pertinent to cumulative visual impact are disscussed in detail in Chapter 5 of the VIA.
Warren Petterson 17 October 2016	In the table highlighting the significance of the various impacts, the visual impact, impact on Fauna and Flora as well as some others are considered to be high. These are the most significant impacts and cannot be overlooked. One of your statements suggests that the fact that there will/may be other WEF adjacent to this one, will reduce the visual impact! What sort of argument is this; it will obviously increase the significance significantly? The positions are all high lying and will be seen from miles away. This includes the interlinking local power lines, access roads scarring the landscape as well as the turbine structures.	- The proximity of the proposed WEFs to other potential WEFs in the area will not reduce the visual impact. The cumulative visual impact on the landscape will be higher. - The comment referred to may have related to the degree of visual intrusion. Visual intrusion is an assessment of how similar the proposed structures are to other elements or landuses in the area. As discussed in the VIA, the WEF will differ in visual charater to current agricultural activities and infrastructure, but is more congruent with existing power related infrastructure. If the area is developed as a REDZ the proposal is visually consistent with this intended landuse. However this does not mean the visual impact on the landscape is less, the cumulative impact will be greater within this zone.
Steven Swanepoel 14 October 2016	Re proposed development of Maralla West, East and Esizayo wind projects. Please be advised that both myself and	- The cumulative visual concerns for the greater area are noted and assessed in Chapter 5 of the VIA. The proposed WEFs are however,

STAKEHOLDER DETAILS	COMMENT	SPECIALIST RESPONSE
	Gail Louw are vehemently opposed to any form of wind farms within an eighty kilometre radius of the farms Paalfontein and Keurkloof situated in the Matjiesfontein area. We object strongly in terms of environment, visual affects, security, ecology, fauna and flora. Kindly confirm receipt of our objection.	not likely to be visible from more than 10km away.

8. CONCLUSION

The following findings and recommendations are pertinent:

- The proposed facility is situated in a remote karoo landscape of high visual value. The visual absorption capacity is relatively good primarily due to the undulating nature of the topography.
- The area is remote and viewer numbers are low but inhabitants generally have a great affinity for the land and landscape.
- The regular vertical patterns of the turbines are of a scale and size that is not highly congruent with the natural environment and agricultural activities, but generally congruent with existing power facilities in the area.
- The revised layout is preferable to the previous layouts as the number of turbines has been significantly reduced (125 initially to 56 in most recent version). Turbines that will result in the highest impact are those situated at the most elevated positions along the northern and western border. The positioning of turbines is constrained by wind farm efficiency which depends, in part, on precise turbine positioning, based on local topography, the local wind regime, and other technical factors, which in turn influences the feasibility of the project.
- Other buildings and infrastructure associated with the facility will result in a number of lesser visual impacts which can be mitigated.
- The greatest visual concern is the cumulative impact on the landscape. If REDZ and ECI are established, containing the visual impacts within these zones has merit, but will increase the cumulative visual impact on the landscape within these zones.
- If the 16 potential projects within an 80 km radius of the site are considered, there are 65 535 possible scenarios or combinations of renewable energy projects that may be built. It is therefore not possible to accurately estimate the significance of the cumulative impact. However, given the location of the possible facilities, if constructed, many would result in sequential and / or combined visual impacts when considered with Maralla East. The significance of this impact on the landscape will be higher than the visual impact of Maralla East in isolation.
- The visual impacts can be completely reversed after decommissioning, if all the structures are removed and the land suitably rehabilitated and it is critical that decommissioning and rehabilitation are well controlled and enforced after the life of the facility.
- As with all natural resource evaluations, decisions regarding the project's appropriateness are complex, requiring the balancing of competing interests and values. Although the no-go option is preferred from a visual perspective, the visual impacts can be mitigated to an acceptable degree.

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ANNEXURE A

VISUAL ASSESSMENT RATING CRITERIA

Quality

Criteria
Visual quality is high when: • The landscape offers dramatic, rugged topography and /or visually appealing water forms are present; • Pleasing, dramatic or vivid patterns and combinations of landscape features and vegetation are found; • The landscape is without visually intrusive or polluting urban, agriculture or industrial development (i.e.it reveals a high degree of integrity); and/or • Outstanding or evocative features and landmarks are present; and • The landscape/townscape is able to convey meaning.

VAC

High	Moderate	Low
The area is effectively able to screen visual impacts: • Undulating or mountainous topography and relief; • Good screening vegetation (high and dense); • Is highly urbanised in character; and • Existing development is of a scale and density to absorb the visual impact.	The area is partially able to screen visual impacts: • Moderately undulating topography and relief; • Some or partial screening vegetation; • A relatively urbanised character; and • Existing development is of a scale and density to absorb the visual impact to some extent.	The area is not able to screen the visual impacts: • A flat topography; • Low growing or sparse vegetation; • Is not urbanised; and • Existing development is not of a scale and density to absorb the visual impact to some extent.

Visibility

Not Visible	Marginally Visible	Visible	Highly visible
Proposed activities cannot be seen	Proposed activities are only just visible / partially visible	Proposed activities are visible although parts may be partially obscured	Proposed activities are clearly visible (usually in foreground)

Integrity

High	Moderate	Low
The development/activity results in a noticeable change or is discordant with the surroundings: • Is not consistent with the existing land use of the area; • Is not sensitive to the natural environment; • Is very different to the urban texture and layout; • The buildings and structures are not congruent / sensitive to the existing architecture / buildings; and	The development/activity partially fits into the surroundings but is clearly noticeable : • Is moderately consistent with the existing land use of the area; • Is moderately sensitive to the natural environment; • Is moderately consistent with the urban texture and layout; • The buildings and structures are moderately congruent / sensitive to the existing	The development/activity results in a minimal change to the surroundings and blends in well: • Is consistent with the existing land use of the area; • Is highly sensitive to the natural environment; • Is consistent with the urban texture and layout; • The buildings and structures are congruent / sensitive to the existing architecture / buildings; and

• The scale and size of the activities are different to nearby existing activities.	architecture / buildings; and • The scale and size of the activities are moderately similar to nearby existing activities.	• The scale and size of the activities are similar to nearby existing activities.

Viewer Sensitivity

High	Moderate	Low
• Residential areas • Nature reserves • Scenic routes / trails	• Sporting and recreational areas • Places of work	• Industrial areas • Active mining areas • Visually severely degraded areas

ANNEXURE B

IMPACT RATING METHODOLOGY

IMPACT ASSESSMENT METHODOLOGY

The EIA uses a methodological framework developed by WSP | Parsons Brinckerhoff to meet the combined requirements of international best practice and NEMA, Environmental Impact Assessment Regulations, 2014 (GN No. 982) (the "EIA Regulations").

As required by the EIA Regulations (2014), the determination and assessment of impacts will be based on the following criteria:

- Nature of the Impact
- Significance of the Impact
- Consequence of the Impact
- Extent of the impact
- Duration of the Impact
- Probability if the impact
- Degree to which the impact:
  - can be reversed;
  - may cause irreplaceable loss of resources; and
  - can be avoided, managed or mitigated.

Following international best practice, additional criteria have been included to determine the significant effects. These include the consideration of the following:

- Magnitude: to what extent environmental resources are going to be affected;
- Sensitivity of the resource or receptor (rated as high, medium and low) by considering the importance of the receiving environment (international, national, regional, district and local), rarity of the receiving environment, benefits or services provided by the environmental resources and perception of the resource or receptor); and
- Severity of the impact, measured by the importance of the consequences of change (high, medium, low, negligible) by considering inter alia magnitude, duration, intensity, likelihood, frequency and reversibility of the change.

It should be noted that the definitions given are for guidance only, and not all the definitions will apply to all of the environmental receptors and resources being assessed. Impact significance was assessed with and without mitigation measures in place.

METHODOLOGY

Impacts are assessed in terms of the following criteria:

- The **nature**, a description of what causes the effect, what will be affected and how it will be affected

NATURE OR TYPE OF IMPACT	DEFINITION
Beneficial / Positive	An impact that is considered to represent an improvement on the baseline or introduces a positive change.

Nature or Type of Impact	Definition
Adverse / Negative	An impact that is considered to represent an adverse change from the baseline, or introduces a new undesirable factor.
Direct	Impacts that arise directly from activities that form an integral part of the Project (e.g. new infrastructure).
Indirect	Impacts that arise indirectly from activities not explicitly forming part of the Project (e.g. noise changes due to changes in road or rail traffic resulting from the operation of Project).
Secondary	Secondary or induced impacts caused by a change in the Project environment (e.g. employment opportunities created by the supply chain requirements).
Cumulative	Impacts are those impacts arising from the combination of multiple impacts from existing projects, the Project and/or future projects.

→ The physical **extent**, wherein it is indicated whether:

Score	Description
1	the impact will be limited to the site;
2	the impact will be limited to the local area;
3	the impact will be limited to the region;
4	the impact will be national; or
5	the impact will be international;

→ The **duration**, wherein it is indicated whether the lifetime of the impact will be:

Score	Description
1	of a very short duration (0 to 1 years)
2	of a short duration (2 to 5 years)

SCORE	DESCRIPTION
3	medium term (5–15 years)
4	long term (> 15 years)
5	permanent

→ The **magnitude of impact on ecological processes**, quantified on a scale from 0-10, where a score is assigned:

SCORE	DESCRIPTION
0	small and will have no effect on the environment.
2	minor and will not result in an impact on processes.
4	low and will cause a slight impact on processes.
6	moderate and will result in processes continuing but in a modified way.
8	high (processes are altered to the extent that they temporarily cease).
10	very high and results in complete destruction of patterns and permanent cessation of processes.

→ The **probability of occurrence**, which describes the likelihood of the impact actually occurring. Probability is estimated on a scale where:

SCORE	DESCRIPTION
1	very improbable (probably will not happen.
2	improbable (some possibility, but low likelihood).
3	probable (distinct possibility).
4	highly probable (most likely).

SCORE	DESCRIPTION
5	definite (impact will occur regardless of any prevention measures).

- the **significance**, which is determined through a synthesis of the characteristics described above (refer formula below) and can be assessed as low, medium or high;
- the **status**, which is described as either positive, negative or neutral;
- the degree to which the impact can be reversed;
- the degree to which the impact may cause irreplaceable loss of resources; and
- the *degree* to which the impact can be mitigated.

The **significance** is determined by combining the criteria in the following formula:

$$S = (E+D+M)*P$$

S = Significance weighting

E = Extent

D = Duration

M = Magnitude

P = Probability

The **significance weightings** for each potential impact are as follows:

OVERALL SCORE	SIGNIFICANCE RATING	DESCRIPTION
< 30 points	**Low**	where this impact would not have a direct influence on the decision to develop in the area
31-60 points	**Medium**	where the impact could influence the decision to develop in the area unless it is effectively mitigated
> 60 points	**High**	where the impact must have an influence on the decision process to develop in the area

The impact significance without mitigation measures will be assessed with the design controls in place. Impacts without mitigation measures in place are not representative of the Project's actual extent of impact, and are included to facilitate understanding of how and why mitigation measures were identified. The residual impact is what remains following the application of mitigation and management measures, and is thus the final level of impact associated with the development of the Project. Residual impacts also serve as the focus of management and monitoring activities during Project implementation to verify that actual impacts are the same as those predicted in this EIA Report.

ANNEXURE C

CV AND PROJECT EXPERIENCE

Belinda Gebhardt

Curriculum Vitae

I have over 15 years working experience in the environmental and development sectors. During this time I have had extensive experience in conducting and managing a broad range of environmental projects. I have particularly focussed on Visual Impact Assessment (VIA), Environmental Impact Assessment (EIA), State of the Environment Reporting and Environmental Management Frameworks. I also have experience in environmental training, capacity building and materials development, including experience with illiterate and semi-literate communities. For the past three years I have also been involved with voluntary work for the Botanical Society of South Africa.

Personal Details:

Physical Address:	15 Rover Road, Rondebosch, 7700
Postal Address:	PO Box 749 Rondebosch, 7701
Tel:	021 6863750 / 084 3052119
Email:	belinda@gebhardt.co.za
Nationality:	South African (ID No: 7406270049085)
Marital Status:	Married

Qualifications and Professional Affiliation:

- BL Hons (Landscape Architecture): University of Pretoria, 1996.
- MPhil in Environmental Management: University of Cape Town, 2003.
- SACLAP (South African Council for Landscape Architecture Professionals) Reg. No.: 99098.
- CEAPSA (Certified with the Board of Environmental Assessment Practitioners, South Africa).

Employment History:

• 2015 - current	**Independent Consultant**, Visual Impact Assessment.
• 2009 – 2011	**Independent Consultant**, Visual & Environmental Impact Assessment.
• 2003 - 2009	**SRK Consulting** Environmental Department Cape Town: Environmental Scientist. Environmental Planning and Monitoring, Environmental Impact Assessment, Visual Impact Assessment, State of the Environment Reporting. Primary duties included project management, management of specialist teams, conducting public participation processes, report writing and compilation, basic GIS, onsite inspections, assessment and analysis of environmental and social factors, budget management and client liaison.
• 2002 - 2003	**University of Cape Town:** Full-time student (MPhil).
• 1998 - 2002	**Abalimi Bezekhaya**, Khayelitsha Office, Cape Town: Greening Co-ordinator. Co-ordination and implementation of school and community greening projects and events, training and

	material development. Primary duties included management of the School and Community Greening Programme, facilitating workshops and training courses for children, teachers, caretakers and other community members. Planning and implementation of greening projects and community events such as Arbour Day and assistance with the running of the garden centre and urban agriculture programmes.
• 1997 - 1998	**South African Environmental Project**, Cape Town: Assisted in the Development of the draft EIA Guidelines for the Kingdom of Lesotho, assisted with the running of the volunteer programme and compilation of articles for the website and newsletter.

Summary of Expertise:

- Visual Impact Assessment;
- Project Management;
- Report Writing;
- Editing and Proof Reading;
- Public Consultation;
- Environmental Impact Assessment;
- Environmental Management Frameworks and State of the Environment Reporting; and
- Environmental Management and Monitoring Plans and Guidelines.
- Material Development and Training;

Key Skills:

- Excellent communication skills, verbal and written;
- Computer skills including working knowledge of MSWord, Excel, Photoshop Elements 9, PowerPoint;
- Outstanding organisational and administrative skills;
- Ability to work well in a team, as team leader or in support role; and
- Ability to take initiative.

Hobbies and Interests:

Gardening, reading and creative writing.

Key Projects :

A list of key project experience available on request.

References:

1. **Chris Dalgliesh:** SRK Consulting. CDalgliesh@srk.co.za 021 6593060
2. **Kate Steyn:** Independent Consultant. Katesteyn24@gmail.com 084 5730723
3. **Richard Hill:** UCT, EGS Dept. richard.hill@uct.ac.za 021 6502786

Belinda Gebhardt: Key Project Experience

Key Experience:	
Visual Impact Assessment	
Name of Project:	Visual Impact Assessment for Re-Development of Site 460 (St Helena Bay, Western Cape)
Client:	ACO Associates
Project Description:	Visual Impact Assessment
Project duration/date:	2016
Name of Project:	Visual Impact Assessment for the Robben Island Photovoltaic Plant (Cape Town)
Client:	WSP, Parsons Brinckerhoff
Project Description:	Visual Impact Assessment
Project duration/date:	2016
Name of Project:	Visual Impact Assessment for the Portion 15 of Farm 281, Suidestrand (Agalhas, Overberg)
Client:	Luchrist Eiendomsbeleggings
Project Description:	Visual Impact Assessment
Project duration/date:	2015
Name of Project:	Visual Impact Assessment for the Exxaro Eerstelingsfontein Coal Mine
Client:	WSP, Parsons Brinckerhoff
Project Description:	Visual Impact Assessment
Project duration/date:	2011
Name of Project:	Proposed Upgrade of R310 Corridor between the N2 and Polkadraai Road (Stellenbosch)
Client:	SRK Consulting
Project Description:	Visual Impact Assessment
Project duration/date:	2011
Name of Project:	Stellenbosch Landfill (Stellenbosch, Western Cape)
Client:	Stellenbosch Municipality
Project Description:	Visual Impact Assessment
Project duration/date:	2010
Name of Project:	Gamsberg Zinc Project (Aggeneys, Northern Cape)
Client:	Black Mountain Mining (Pty) Ltd
Project Description:	Visual Baseline
Project duration/date:	2009
Name of Project:	Worcester Hills Development (Worcester, Western Cape)
Client:	Worcester Land Trust
Project Description:	Visual Impact Assessment
Project duration/date:	2008
Name of Project:	Levendal (Suider-Paarl, Western Cape)
Client:	Levendal Developments
Project Description:	Visual Impact Assessment
Project duration/date:	2007
Name of Project:	Ben Schoeman Dock: Berth Deepening EIA (Cape Town)
Client:	Transnet Projects

Project Description:	Visual Impact Assessment
Project duration/date:	2007
Name of Project:	BRWM Municipal Landfill (Western Cape)
Client:	BRWM Municipality
Project Description:	Visual Impact Assessment
Project duration/date:	2006
Name of Project:	Anura Winelands Estate (Klapmuts, Western Cape)
Client:	Thymen Bothma
Project Description:	Visual Impact Assessment
Project duration/date:	2005
Name of Project:	Pulp United Paper Mill (Richards Bay, KZN)
Client:	Pulp United
Project Description:	Visual Impact Assessment
Project duration/date:	2005
Name of Project:	Redevelopment of several municipally owned precincts near the Mossel Bay Beachfront (Mossel Bay, Western Cape)
Client:	AttPower Developments
Project Description:	Visual Sensitivity
Project duration/date:	2005
Name of Project:	Pearly Beach Waste Water Treatment Works (Pearly Beach, Western Cape)
Client:	Overstrand Municipality
Project Description:	Visual Impact Assessment
Project duration/date:	2003 – 2004
Name of Project:	Erf 324 (Rooi Els, Western Cape)
Project Description:	Visual Impact Assessment
Project duration/date:	2003
Name of Project:	NDC Mining EIA (West Coast, Western Cape)
Client:	NDC Mining Company
Project Description:	Visual Impact Assessment
Project duration/date:	2003
Name of Project:	St Francis Bay Golf Estate (St Francis Bay, Eastern Cape)
Project Description:	Visual Impact Assessment
Project duration/date:	2003

Environmental Impact Assessment

Name of Project:	Klue Street Link Road (Worcester, Western Cape)
Client:	Worcester Land Trust
Project Description:	Basic Assessment
Project duration/date:	2008 – 2009
Name of Project:	Rochester Road (Philippi, Cape Town)
Client:	Rochester Park Pty. Ltd
Project Description:	Basic Assessment
Project duration/date:	2007 – 2009
Name of Project:	Altona Developments (Worcester, Western Cape)

Client:	Altona Developments Pty Ltd.
Project Description:	Environmental Impact Assessment
Project duration/date:	2006 – 2009
Name of Project:	Levendal Developments (Suider Paarl, Western Cape)
Client:	Levendal Developments Pty Ltd.
Project Description:	Environmental Impact Assessment
Project duration/date:	2006 – 2009
Name of Project:	Bakhuis Bauxite Mining ESIA (Suriname, South America)
Client:	BHP Billiton
Project Description:	Environmental and social impact assessment
Project duration/date:	2005 – 2009
Name of Project:	BHP Billiton Coermotibo Three Hills Bauxite Deposits (Coermotibo, Suriname, South America)
Client:	BHP Billiton
Project Description:	Environmental and Social Impact Assessment
Project duration/date:	2005
Name of Project:	Bordjiesrif Environmental Experiential Centre (Cape Point, Table Mountain National Park)
Client:	South African National Parks
Project Description:	Environmental Impact Assessment
Project duration/date:	2003-2005
Name of Project:	Buffels Bay Recreational Area Upgrade (Cape Point, Table Mountain National Park)
Client:	South African National Parks
Project Description:	Environmental Impact Assessment
Project duration/date:	2003-2004
Name of Project:	Vodacom Base Station Installations (Cape Town and surrounds)
Client:	Vodacom
Project Description:	Environmental Impact Assessments
Project duration/date:	2003 – 2006
Name of Project:	NDC Mining EIA (West Coast, Western Cape)
Client:	NDC Mining Company
Project Description:	EIA for the proposed diamond mining on the West Coast
Project duration/date:	2003
Name of Project:	Vissershok Landfill Extension (Cape Town)
Client:	City of Cape Town
Project Description:	EIA for the proposed landfill extension
Project duration/date:	2003 – 2004
Name of Project:	Worcester Effluent Disposal Site and Pipeline (Worcester, Western Cape)
Client:	KWV, Distell and Brenn-O-Kem
Project Description:	EIA for the proposed effluent disposal site and pipeline in Worcester
Project duration/date:	2004

State of the Environment Reporting and Environmental Management Frameworks

Name of Project:	City of Cape Town Environmental Management Frameworks (Districts A,D,G,H)
Client:	City of Cape Town
Project Description:	Environmental Management Frameworks
Project duration/date:	2009

Name of Project:	City of Cape Town Environmental Management Frameworks (Districts B, C , E)
Client:	City of Cape Town
Project Description:	Environmental Management Frameworks
Project duration/date:	2008 – 2009
Name of Project:	Western Cape State of the Environment Report (Western Cape)
Client:	Dept. Of Environmental Affairs and Development Planning
Project Description:	Management and compilation of Western Cape State of the Environment Report
Project duration/date:	2004 – 2005
Name of Project:	Knysna State of the Environment Report Framework (Knysna, Western Cape)
Project Description:	State of the Environment Report Framework and Guideline Document
Project duration/date:	2004 – 2005

Environmental Management and Monitoring Plans, Guidelines and Auditing

Name of Project:	Hopewell Conservation Project (Nelson Mandela Bay Municipality, Eastern Cape)
Client:	Hopewell Conservation Project Pty Ltd.
Project Description:	Landscaping Guidelines
Project duration/date:	2010
Name of Project:	Rochester Road EMP (Philippi, Cape Town)
Client:	Rochester Park Pty Ltd.
Project Description:	Environmental Management Plan
Project duration/date:	2008
Name of Project:	Kristensen Oceanfront Restaurants Environmental Audits (Cape Town)
Client:	Kristensen Oceanfront Restaurants
Project Description:	Environmental Audit
Project duration/date:	2004 / 2005 / 2006
Name of Project:	Kwanonquaba EMP (Mossel Bay, Western Cape)
Project Description:	Environmental Management Plan
Project duration/date:	2007
Name of Project:	Coermotibo Three Hills Bauxite Deposits EMP (Coermotibo, Suriname, South America)
Client:	BHP Billiton
Project Description:	Environmental Management Plan
Project duration/date:	2006