Ummbila Emoyeni Renewable Energy Farm (Pty) Ltd

PROPOSED UMMBILA EMOYENI RENEWABLE ENERGY FARM – SOLAR PV FACILITY, MPUMALANGA PROVINCE

LANDSCAPE & VISUAL IMPACT ASSESSMENT REPORT

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1 INTRODUCTION

1.1 GENERAL

This Landscape and Visual Impact Baseline Report forms part of the Environmental Impact Assessment process that is being undertaken for the proposed Solar PV component of the Ummbila Emoyeni Renewable Energy Farm. The process is being undertaken by Savannah Environmental on behalf of Emoyeni Renewable Energy Farm (Pty) Ltd.

1.2 PROJECT LOCATION

Emoyeni Renewable Energy Farm (Pty) Ltd is proposing the development of a commercial Solar Energy Facility and associated infrastructure on a site located ~6km south-east of Bethal and 1km east of Morgenzon, within the Mpumalanga Province. The project site is located across the Govan Mbeki, Lekwa, and Msukaligwa Local Municipalities within the Gert Sibande District (Map 1: Locality Map). The project is planned as part of a larger cluster of renewable energy projects (to be known as the Ummbila Emoyeni Renewable Energy Farm), which include one 666MW Wind Energy Facility, one 150MW Solar Energy Facility, and a grid connection solution for both facilities.

The approximate geographic coordinates of the centre of the proposed Renewable Energy Project Focus Area are;

South	26^0	32′	23.42″
East	29^0	33′	48.47″

The Project Focus Area over which the Ummbila Emoyeni Renewable Energy Farm is proposed comprises the following farm portions:

Parent Farm Number	Farm Portions
Farm 261 – Naudesfontein	15, 21
Farm 264 – Geluksplaats	0, 1, 3, 4, 5, 6, 8, 9, 11, 12
Farm 268 – Brak Fontein Settlement	6,7,10,11,12
Farm 420 – Rietfontein	8,9,10,11,12,15,16,18,19,22,32
Farm 421 - Sukkelaar	2, 2, 7, 9, 9 10, 10 11, 11 12, 12 22 ,25, 34, 35, 36, 37, 37, 38, 39, 40, 42, 42
Farm 422 – Klipfontein	0, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 13, 14, 16, 17, 18, 19, 20, 21, 22, 23
Farm 423 – Bekkerust	0, 1, 2, 4, 5, 6, 10, 11, 12, 13 14, 15, 17, 19, 20, 22, 23, 2425
Farm 452 – Brakfontein	5
Farm 454 – Oshoek	4, 13, 18
Farm 455 – Ebenhaezer	0, 1, 2, 3
Farm 456 – Vaalbank	1, 2, 3, 4, 7, 8, 13, 15, 16, 17, 18, 19
Farm 457 – Roodekrans	0, 1, 4, 7, 22, 23, 23
Farm 458 – Goedgedacht	0, 2, 4, 4, 5, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 21, 21, 22, 25, 26, 27, 28, 29, 31, 32, 33, 34, 35, 37, 39
Farm 467 – Twee Fontein	0, 1, 4, 5, 6, 7, 8, 10

Farm 469 – Klipkraal	5, 6, 7, 8
Farm 548 – Durabel	0

The development footprint for the Solar PV comprises the following farm properties:

Parent Farm Number	Farm Portions
Farm 264 – Geluksplaats	0, 11
Farm 423 – Bekkerust	0, 1, 5, 22,
Farm 420 – Rietfontein	8,9,10, 32

The Solar PV section of the project is located to the north of the Project Focus Area. No site alternatives are under consideration and no layout alternatives are being considered for the Solar PV project.

1.3 BACKGROUND OF SPECIALIST

Jon Marshall (Pr. LArch, CMLI, Dip LA) qualified as a Landscape Architect in 1978. He has been a Chartered Member of the Landscape Institute (UK) since 1986. He is also a registered Landscape Architect and has extensive experience of environmental impact assessment in South Africa.

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

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

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

A brief CV is attached for information (**Appendix I**).

1.4 BRIEF AND RELEVANT GUIDELINES

The brief is to determine the sensitivity of the affected landscape and review the possible nature of landscape and visual impacts that the proposed project could result in and specifically to;

- Characterise the affected landscape;
- Identify potential sensitive landscapes and receptors that may be impacted by the proposed facility and the types of impacts that are most likely to occur; and
- Provide sensitivity mapping identifying 'No-Go' areas, and areas for development that will minimise landscape and visual impacts.

Work has been undertaken in accordance with the following guideline documents;

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

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

Refer to **Appendix II** for the Western Cape Guideline.
The required specialist reports will be undertaken in accordance with Appendix 6 of the EIA Regulations, as amended (GN No. 326 of 7 April 2017).

From reference to the Western Cape Guideline, a Level 4 Assessment should be considered which includes the following input:

1. Identification of issues raised in scoping phase, and site visit;
2. Description of the receiving environment and the proposed project;
3. Establishment of view catchment area, view corridors, viewpoints and receptors;
4. Indication of potential visual impacts using established criteria;
5. Inclusion of potential lighting impacts at night;
6. Description of alternatives, mitigation measures and monitoring programmes;
7. 3D modelling and simulations with and without mitigation; and
8. Review by independent, experienced visual specialist (if required).

From the site visit, the proposed solar component of the project appears to be relatively well screened by landform. Where it seems that sensitive receptors are unlikely to be significantly impacted, typically an assessment might be undertaken at Level 3 and elevated to Level 4 should impacts be larger than anticipated or potential receptors express significant concern.

A Level 3 Assessment requires the same input as Level 4 excluding input 7 (3D modelling and simulations with and without mitigation).

1.5 LIMITATIONS AND ASSUMPTIONS

The following limitations and assumptions should be noted:

A site visit was undertaken over a two day period (1st and 2nd October 2021).

The timing of photography was planned to ensure that the sun was as far as possible behind the photographer to ensure that as much detail as possible was recorded in the photographs.

GIS data sets used in the assessment are either available on line to the public or have been sourced from relevant government departments.

Photographs were taken with a Canon EOS M50 camera fitted with a 22mm lens.

The following GIS data sets were used in undertaking and presenting the assessments:

DATA SET	SOURCE	YEAR
South Africa Protected Areas Database (SAPAD)	Department of Environmental Affairs	2021
SRTM Worldwide Elevation Data	CIAT-CCAFS	2018
World Imagery	ESRI	2009 (updated 2021)
Renewable Energy EIA Applications	Department of Environmental Affairs	February 2021
REDZ Database	Department of Environmental Affairs	2016 and 2020
SA NLC (National Land Cover)	Department of Environmental Affairs	2018

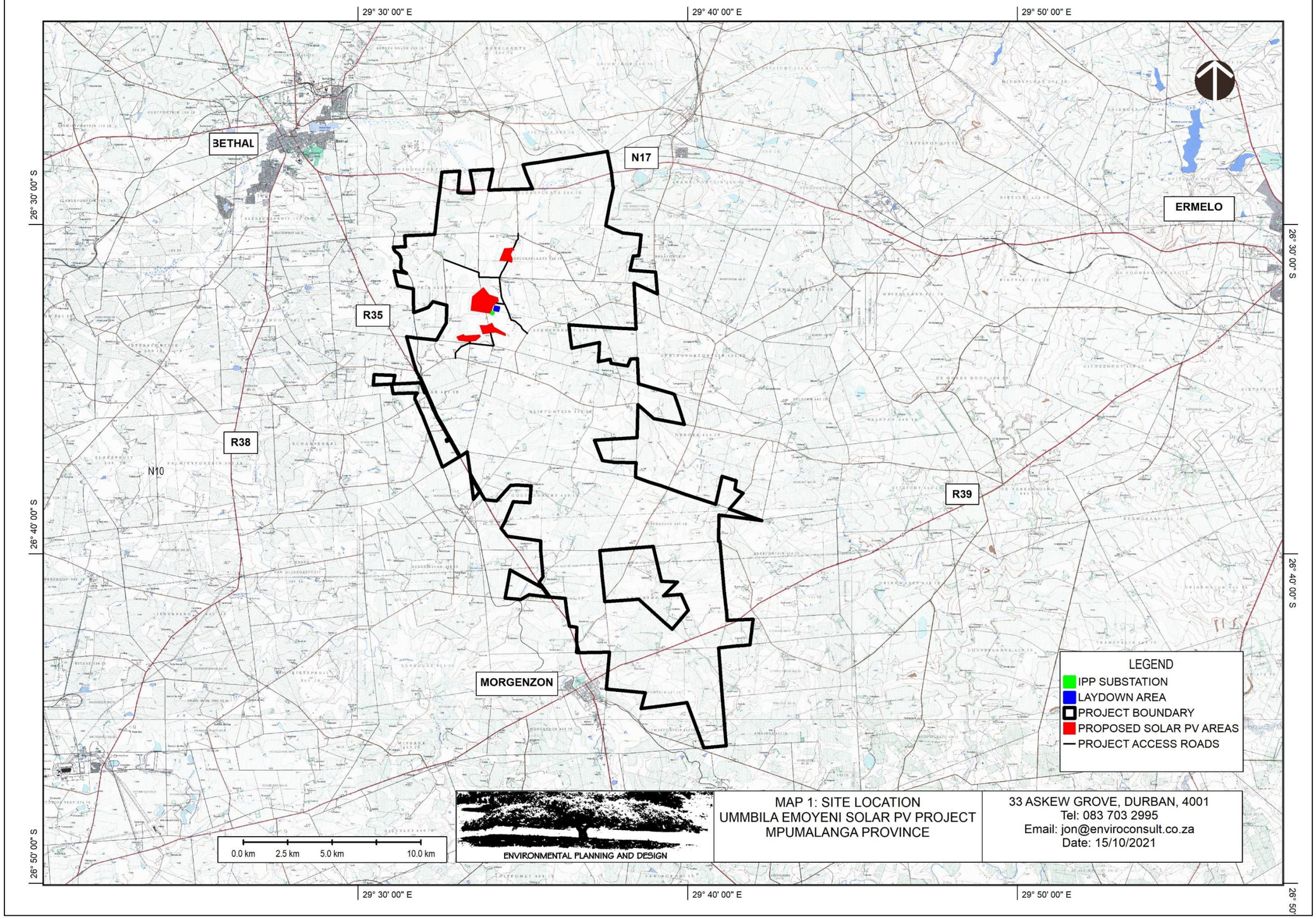
1:50,000 raster mapping	Chief Directorate National Geo-Spatial Information of South Africa	Unknown
South African rivers in drainage region ALL	Department of Water Affairs	2012
Free State Cadastral	Chief Surveyor-General, Department of Rural Development and Land Reform	August 2021 (last updated)
Update of vegm2009	South African National Biodiversity Institute	2015
South Africa /Lesotho Roads	Open Street Map	2014

Visibility of the proposed facilities has been assessed using the Global Mapper Viewshed tool.

The majority of data sets have been used for assessment context. This has largely been sourced from government departments. Whilst this has been mainly mapped at national scale it was found to be largely sufficient to provide context for the assessments. Where additional detail was required, such as the location of local roads and homesteads, this was mapped on site and / or captured from online mapping.

The visibility assessments were based on terrain data that has been derived from satellite imagery (STRM Worldwide Elevation Data). This data was originally prepared by NASA and is freely available on the CIAT-CCAFS website (http://www.cgiar-csi.org). This data has been ground truthed using a GPS as well as online mapping. This is the key data on which the definition of possible affected landscapes and receptors was based and is considered sufficient for this purpose.

Calculation of visibility is based purely on the Digital Elevation Model and does not take into account the screening potential of vegetation or other development.


29° 30' 00" E
29° 40' 00" E
29° 50' 00" E
26° 30' 00" S
26° 40' 00" S
26° 50' 00" S
BETHAL
N17
ERMELO
R35
R38
N10
R39
MORGENZON
LEGEND
IPP SUBSTATION
LAYDOWN AREA
PROJECT BOUNDARY
PROPOSED SOLAR PV AREAS
PROJECT ACCESS ROADS
0.0 km
2.5 km
5.0 km
10.0 km
ENVIRONMENTAL PLANNING AND DESIGN
MAP 1: SITE LOCATION
UMMBILA EMOYENI SOLAR PV PROJECT
MPUMALANGA PROVINCE
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Date: 15/10/2021

2 PROJECT DESCRIPTION

2.1 GENERAL

Emoyeni Renewable Energy Farm (Pty) Ltd is proposing the development of a commercial Solar Energy Facility and associated infrastructure.

The facility will have a contracted capacity of up to 150MW and will be known as the Ummbila Emoyeni Solar Energy Facility. The project is planned as part of a larger cluster of renewable energy projects (to be known as the Ummbila Emoyeni Renewable Energy Farm), which include one 666MW Wind Energy Facility and one 150MW Solar Energy Facility. The grid connection infrastructure for both facilities will include a 400/132kV Main Transmission Substation (MTS), to be located between Camden and SOL Substations, which will be looped in and out of the existing Camden-Sol 400kV transmission line; on-site switching stations (132kV in capacity) at each renewable energy facility (Eskom Portion); and 132kV power lines from the switching stations at each renewable energy facility to the new 400/132Kv MTS.

Infrastructure associated with the Ummbila Emoyeni Solar Energy Facility will include:

- PV modules in the range of 330Wp to 450Wp mounted on either a fixed tilt or single axis tracker structure, dependent on optimisation, technology available and cost.
- Inverters and transformers.
- 33kV cabling to connect to the onsite collector substation, to be laid underground where practical.
- 33kV/132kV onsite collector substation (IPP Portion).
- Cabling between project components.
- Laydown and O&M hub (approximately 300m x 300m):
    - Construction compound (temporary).
    - Maintenance office.
- Access roads (up to 12m wide) and internal distribution roads (up to 12m wide).

2.2 PROJECT COMPONENTS

The solar PV facility is proposed to accommodate the following infrastructure:

Infrastructure	Footprint and dimensions
Number of Panels	522 727 panels
Panel Height	Up to 5m
Technology	Use of fixed-tilt, single-axis tracking, and/or double-axis tracking PV technology. Monofacial or bifacial panels are both considered.
Contracted Capacity	Up to 150MW
Area occupied by the solar array	~255.2ha
Area occupied by the on-site facility substation	~5ha
Capacity of on-site facility substation	33kV/132kV
Underground cabling between the PV array and the onsite substation	Cabling will be installed underground where feasible at a depth of up to 1.5m to connect the PV panels to the on-site facility substation. Where not technically feasible to place cabling underground, this will

Infrastructure	Footprint and dimensions
	be installed above-ground. The cabling will have a capacity of up to 33kV.
Laydown and Operations and Maintenance (O&M) hub	~ 300m x 300m, comprising: * Construction compound (temporary) of approximately 6 ha. * O&M office of approximately 1.5ha.
Area occupied by laydown area	~75m x 120m
Access and internal roads	Wherever possible, existing access roads will be utilised to access the project site and development area. It is unlikely that access roads will need to be upgraded as part of the proposed development. Internal roads of up to 12-13m in width will be required to access the PV panels and the on-site substation.
Temporary infrastructure	Temporary infrastructure, including laydown areas, hardstand areas and a concrete batching plant, will be required during the construction phase. All areas affected by temporary infrastructure will be rehabilitated following the completion of the construction phase, where it is not required for the operation phase.

2.3 OVERVIEW OF SOLAR PV TECHNOLOGY

Solar energy facilities, such as those which utilise PV technology, use the energy from the sun to generate electricity through a process known as the **Photovoltaic Effect**. Generating electricity using the Photovoltaic Effect is achieved through the use of the following components:

Photovoltaic Modules

PV cells are made of crystalline silicon, the commercially predominant PV technology, that includes materials such as polycrystalline and monocrystalline silicon or thin film modules manufactured from a chemical ink compound. PV cells are arranged in multiples / arrays and placed behind a protective glass sheet to form a PV module (Solar Panel). Each PV cell is positively charged on one side and negatively charged on the opposite side, with electrical conductors attached to either side to form a circuit. This circuit captures the released electrons in the form of an electric current (i.e. Direct Current (DC)). When sunlight hits the PV panels free electrons are released and flow through the panels to produce direct electrical (DC) current.

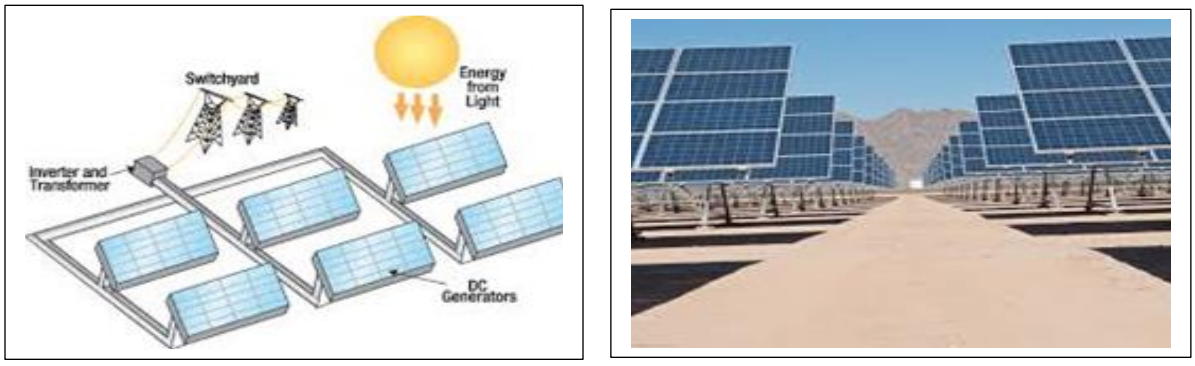


Figure 1: Overview of a typical/generic PV cell, module, and array/panel, noting that the photograph on the right appears to depict a single axis tracking mount, but it is not

clear from the angle of the photograph. Whether these depict mono- or bi- facial modules is also unclear (pveducation.com).

Inverters

Inverters are used to convert electricity produced by the PV panels from Direct Current (DC) into Alternating Current (AC), to enable the facility to be connected to the national electricity grid. In order to connect a large solar facility such as the one being proposed to the national electricity grid, numerous inverters will be arranged in several arrays to collect, and convert power produced by the facility.

Support Structures

PV panels will be fixed to a support structure. PV panels can either utilise fixed / static support structures, or alternatively they can utilise single or double axis tracking support structures. PV panels which utilise fixed / static support structures are set at an angle (fixed-tilt PV system) so as to optimise the amount of solar irradiation. With fixed / static support structures the angle of the PV panel is dependent on the latitude of the proposed development, and may be adjusted to optimise for summer and winter solar radiation characteristics. PV panels which utilise tracking support structures track the movement of the sun throughout the day so as to receive the maximum amount of solar irradiation.

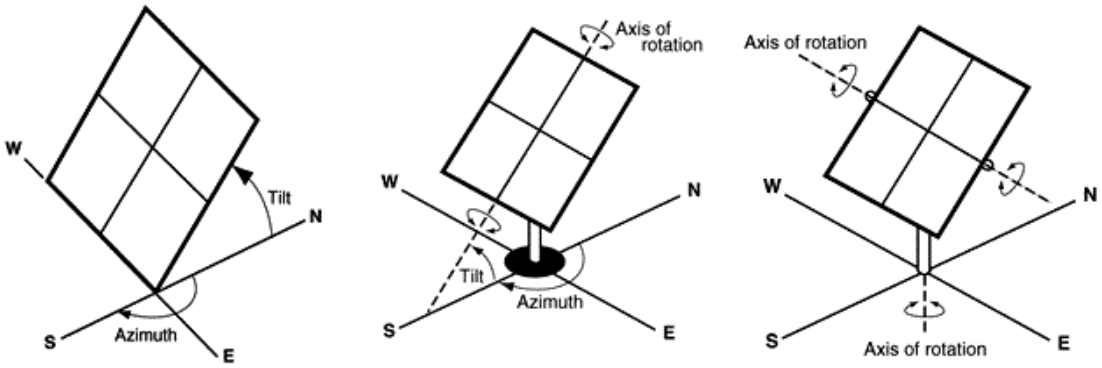


Figure 2: Overview of different PV tracking systems (from left to right: fixed-tilt, single-axis tracking, and double-axis tracking (Source: pveducation.com)).

PV panels are designed to operate continuously for more than 20 years and with low maintenance.

2.4 33KV / 132KV ON-SITE SUBSTATION

The client needs to build on on-site substation facility in order to increase the voltage from 33kV as delivered from the inverters to 132kV to connect to the MTS.

A substation can have circuit breakers that are used to switch generation and transmission circuits in and out of service as needed or for emergencies requiring shut-down of power to a circuit or redirection of power.

The main elements of the On-Site Substation include:

- The incoming 33kV power line which is likely to be underground.
- A security fence line which typically will be a steel palisade or mesh fence approximately 3m high;
- Transformers that will be used to step the power up from 33kV to 132kV.These are likely to be large solid structures in the order of 5m high.
- Buildings to house control and switching infrastructure, stores, restrooms and staff facilities. These are likely to be single storey buildings up to approximately 5-6m high.
- Security lighting which is likely to be mounted on masts surrounding the on-site substation. These are likely to be in the order of 10m high.
- Bus bars that will support the outgoing power transmission lines. These are likely to be comprised of a steel lattice structure in the order of 10m high.

The various elements can therefore be divided into:

- Lower transparent and opaque elements up to approximately 5-6m high, including the security fence, buildings, and transformers; and
- Taller, relatively transparent elements up to approximately 10m high, including bus bars, and lighting towers.

Because of their visual mass, the lower elements are likely to be highly visible whereas taller more transparent elements are not likely to be as visible over a distance.

PLATE 1, BUS BARS ARE THE HIGHEST SUBSTATION ELEMENTS IN PICTURE

3 AFFECTED LANDSCAPE

3.1 THE STUDY AREA

The study area is comprised of the area over which the proposed development may be visible.

The Approximate Limit of Visibility (ALV) is dictated by height and visual mass of the proposed development, surrounding landscape and built features such as vegetation, ridgelines and buildings as well as the curvature of the earth.

As the terrain is relatively flat, the vegetation relatively low and built elements few and far between, the height of the highest proposed elements and the earth's curvature have been used to set the initial study area.

Whilst hard layout information was not available at the time of reporting, from experience of similar projects, the highest elements of the proposed development are likely to be the bus bars associated with on-site substation. \ The PV solar panels, small operational buildings and the BESS are likely to be substantially lower.

A mathematical calculation has been used to indicate the Approximate Visual Horizon due to the earth's curvature as seen from the highest point of the proposed development. The formula used is a universally accepted formula that is used widely for navigation and is indicated in **Appendix III**. This indicates that in a flat landscape the tallest elements noted above are likely to be visible from the distances indicated below:

DEVELOPMENT ELEMENT	APPROXIMATE LIMIT OF VISIBILITY/ LIMIT OF VISUAL EFFECT
Taller transparent elements associated with the On-Site Substation, approximately 10m high	11.3km (ALV)
PV array & lower opaque sections of the On-Site Substation, approximately 5m high	8km (ALV)

A total study limit of 11.3km from the proposed solar projects boundaries has therefore been used.

It should be noted that other elements associated with the proposed development are highly unlikely to be visible to this extent. The proposed Solar Array is likely to form the bulk of the proposed development.

In reality these distances will be reduced by:

- Landform, vegetation and other structures that may screen views;
- Weather conditions that limit visibility. This could include hazy conditions during fine weather as well as mist and rain;
- Scale and colour of individual elements making it difficult to differentiate structures from the background; and
- The fact that as the viewer gets further away, the apparent height of visible elements reduce. At the limit of visibility it will only be possible that the very tip of an object

may be visible. This reducing scale means that an object will become increasingly more difficult to see as the distance from it increase.

3.2 THE NATURE OF LIKELY IMPACTS

Landscape and Visual Impacts could include general degradation of the Landscape Character Areas due to the development that may detract from the existing character as well as change of view for affected people and / or activities:

a. Generally landscape change or degradation. This is particularly important for protected areas where the landscape character might be deemed to be exceptional or rare. However it can also be important in non-protected areas particularly where landscape character is critical to a specific broad scale use such as tourism areas or for general enjoyment of an area. This is generally assessed by the breaking down of a landscape into components that make up the overall character and understanding how proposed elements may change the balance of the various elements. The height, mass, form and colour of new elements all help to make new elements more or less obvious as does the structure of an existing landscape which can provide screening ability or texture that helps to assimilate new elements. This effect is known as **Visual Absorption Capacity (VAC).**

b. Change in specific views within the affected area from which the character of a view may be important for a specific use or enjoyment of the area.

    - Visual intrusion is a change in a view of a landscape that reduces the quality of the view. This can be a highly subjective judgement. Subjectivity can be removed as far as is possible by classifying the landscape character of each area and providing a description of the change in the landscape that will occur due to the proposed development. The subjective part of the assessment is to define whether the impact is negative or positive. Again to make the assessment as objective as possible, it is proposed that the judgement is based on the level of dependency of the use in question on existing landscape characteristics.

    - Visual obstruction is the blocking of views or foreshortening of views. This can generally be measured in terms of extent.

    Due to the nature of the proposed development, visual impacts are expected to relate largely to intrusion.

3.3 LANDSCAPE CHARACTER

Defining the character of the landscape is the first step in understanding the landscape and visual implications of the proposed development.

Landscape character is defined as "a distinct, recognisable and consistent pattern of elements in the landscape that makes one landscape different from another".

Landscape character has been defined from the author's knowledge of the area and from reference to available online mapping and aerial photography. The key character components have been identified but they will be subject to verification and a more detailed assessment.

Landscape Character is a composite of a number of influencing factors including;

- Landform and drainage.
- Nature and density of development.
- Vegetation patterns.

3.3.1 Landform and Drainage

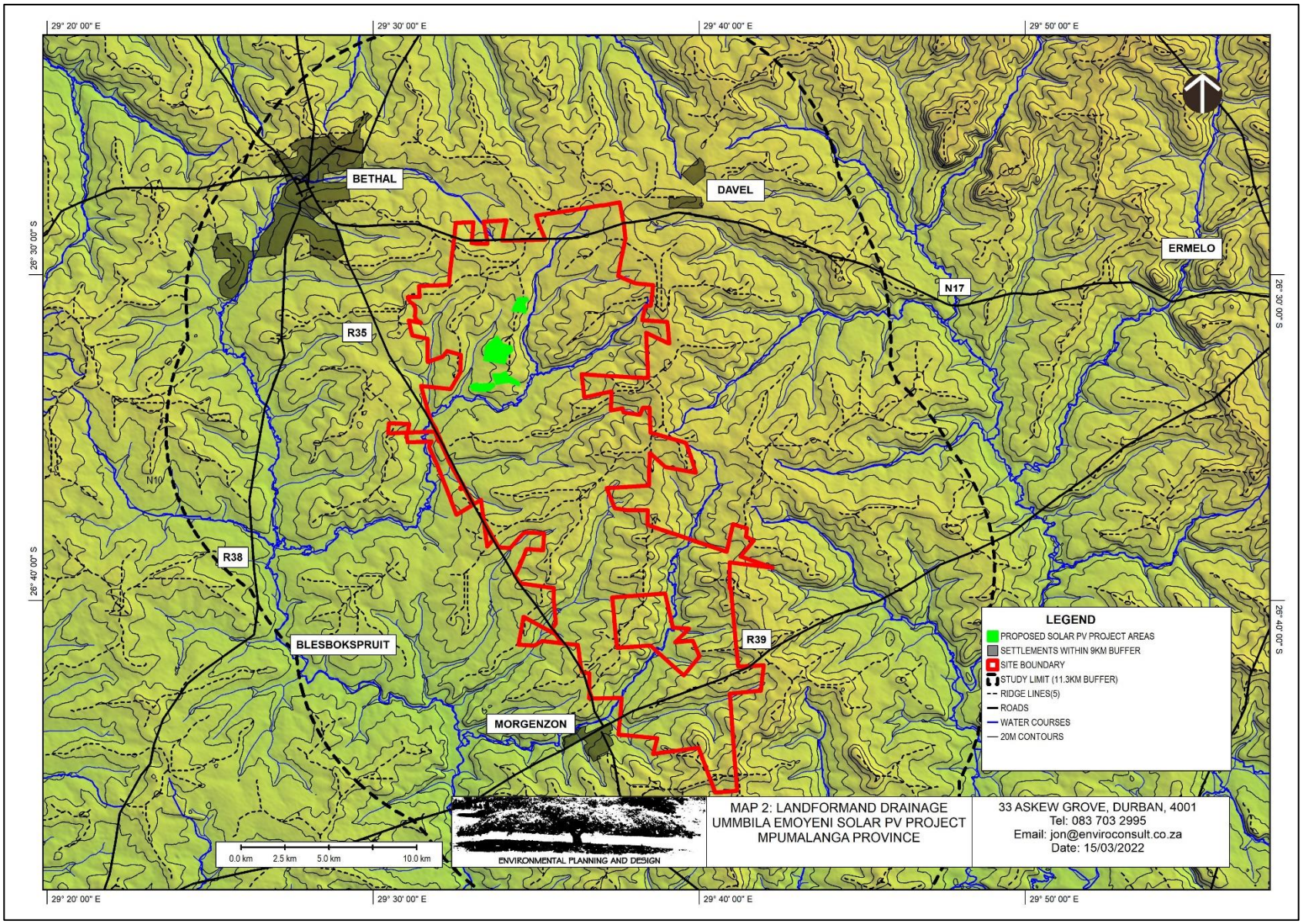
The general landform is undulating and is comprised of a series of similar size rounded ridgelines that extend approximately 20-30m above broad valley lines.

The proposed focus area is located across a series of valley and ridgelines that run in a general east to west direction. The valley lines all feed into the Bleboksprui which flows in a north to south direction approximately 8.5km to the west of the proposed site.

The Blesbokspruit flows into the Vaal River approximately 15km to the south-west of the site.

The landform described above is only likely to screen the proposed development when the viewer is within a minor valley. As a viewer rises up the valley side, views of the proposed development are likely to become possible. The landform described may have greatest screening capacity to the north and south and mean that the proposed project may be more widely visible to the east and west.

Refer to Map 2, Landform and Drainage.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BETHAL
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ERMELO
N17
R35
N10
R38
R39
BLESBOKSPRUIT
MORGENZON
0.0 km 2.5 km 5.0 km 10.0 km
LEGEND
PROPOSED SOLAR PV PROJECT AREAS
SETTLEMENTS WITHIN 9KM BUFFER
SITE BOUNDARY
STUDY LIMIT (11.3KM BUFFER)
RIDGE LINES(5)
ROADS
WATER COURSES
20M CONTOURS
ENVIRONMENTAL PLANNING AND DESIGN
MAP 2: LANDFORMAND DRAINAGE
UMMBILA EMOYENI SOLAR PV PROJECT
MPUMALANGA PROVINCE
33 ASKEW GROVE, DURBAN, 4001
Tel: 083 703 2995
Email: jon@enviroconsult.co.za
Date: 15/03/2022

3.3.2 Nature of Development and Land Cover

Land cover can broadly be divided into four main categories, including:

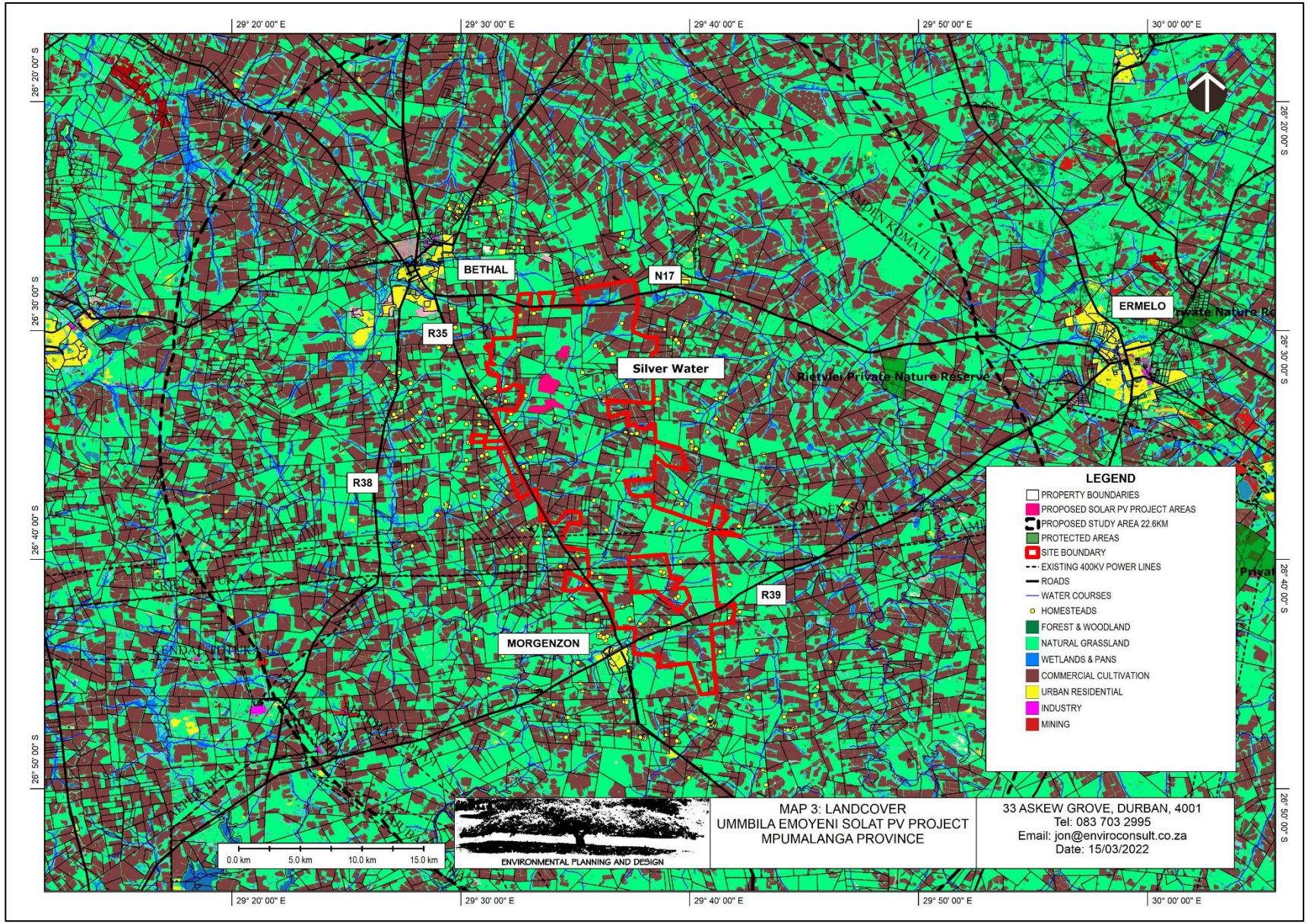
- Natural Grassland which is interspersed with areas of cultivation but is largely uninterrupted by cultivation;
- Arable agriculture / cultivation which in interspersed within the natural grassland matrix. Main crop types include sunflower seed production, sorghum, rye and potatoes;
- Settlement that occurs in the form of isolated homesteads throughout the study area that are generally related to agricultural uses. There is a tourism related establishment (Silver Water Game Lodge) located within the north-eastern section of the proposed site. This facility appears to be focused around a dam.
- Settlement in the form of towns and villages is limited. The closest settlements include:
    - Morgenzon which is a small town on the R39 less than 1km to the west of the proposed focus area. Residential areas of the town are located on the eastern side facing towards the proposed site. Also on the eastern side of the settlement is a land fill site as well as industrial operations;
    - Bethal which is also a small town is located on the N17 approximately 6.2km to the north west of the proposed focus area. Residential areas are located on the eastern side of the town facing towards the proposed site; and
    - Ermelo which 1s located approximately 32km to the east of the proposed focus area. This settlement is the district centre of the Sibande District.

Local roads in the area include:

- The N17 which is a major national distributor route linking Springs and areas to the west through Bethal and Ermelo to Eswatini in the east. This is a busy road that carries business, tourism and local traffic. The road runs through the northern section of the proposed focus area;
- The R35 which links Bethal and areas to the north with Morgenzon and the N11 to the south. This regional distributor runs close to and through western sections of the proposed focus area;
- The R38 which links Bethal with the R39 and Standerton to the south west; and
- The R39 which links Errmelo, Morgenzon and Standerton to the south. This road runs through the southern section of the proposed focus area.

All of these roads are busy national / regional distributors that are likely to carry a full range of traffic types including tourism related traffic. However, it needs to be stated that tourism related traffic is most likely to be using these routes as a means to travelling to more distant attractions. It is unlikely that much of this traffic will view travelling through this area as a tourism experience.

Electrical infrastructure is relatively common in the area including low voltage and medium voltage lines in close proximity to roads.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BETHAL
N17
R35
Silver Water
ERMELO
Rietvlei Private Nature Reserve
R38
R39
MORGENZON
LEGEND
PROPERTY BOUNDARIES
PROPOSED SOLAR PV PROJECT AREAS
PROPOSED STUDY AREA 22.6KM
PROTECTED AREAS
SITE BOUNDARY
EXISTING 400KV POWER LINES
ROADS
WATER COURSES
HOMESTEADS
FOREST & WOODLAND
NATURAL GRASSLAND
WETLANDS & PANS
COMMERCIAL CULTIVATION
URBAN RESIDENTIAL
INDUSTRY
MINING
0.0 km
5.0 km
10.0 km
15.0 km
ENVIRONMENTAL PLANNING AND DESIGN
MAP 3: LANDCOVER
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Other land cover includes heavy industry including mining operations and electricity generation. However, these uses are generally located some distance from the proposed focus area. These industrial uses are generally large, isolated, individual industrial operations within the surrounding rural landscape.

Major high voltage overhead power lines cross the proposed focus area including:

- The Camden Sol 2 400kV power line; and
- The Camden Tutuka 400kV power line

There is one protected area, the Rietvlei Private Nature Reserve, that is located approximately 15.7km to the east of the proposed site. This protected area is highly unlikely to be affected by the proposed PVSEF.

Refer to Map 3, Landcover.

3.3.3 Vegetation Patterns

The following vegetation types are evident within the proposed study area;

a) Natural vegetation that is generally associated with natural areas indicated on Map 3 (Landcover);
b) Agricultural vegetation that is comprised of cultivated fields as indicated on Map 3 and vegetation which is largely comprised of alien trees and shrubs around homesteads and on field boundaries; and
c) Vegetation associated with settlement areas which is generally comprised of alien vegetation.

a) Natural Vegetation

Mucina and Rutherford[1] indicate that the predominant vegetation types within the vicinity of the proposed site include:

- Soweto Highveld Grassland
- Amersfoort Highveld Clay Grassland
- Eastern Highveld Grassland

Whilst botanically these vegetation types are different, from a visual perspective, they are all similar, appearing as monocultures of low grasses. This helps to create an open landscape within which vegetation contributes very little towards Visual Absorption Capacity.

b) Agricultural Vegetation

Agriculture in the proposed study area is largely arable crop production including sunflower seed, sorghum, rye and potatoes.

[1] The Vegetation of South Africa, Lesotho and Swaziland

Both Sorghum and Sun Flowers grow to approximately 1.5m. This means that views from areas planted with crops are likely to be screened as the crops reach their ultimate height but after harvesting and during the early growth stage, views are likely to be open.

Within the agricultural areas there are small patches of alien species including gum trees on field edges, along roads and around homesteads. There are also patches of woody vegetation along main drainage lines.

In visual terms therefore, agricultural areas generally contribute to an open landscape with occasional screening.

c) Vegetation Associated with Settlement Areas

This largely includes ornamental and alien shrubs and trees. Within and adjacent to settlement areas this vegetation can provide a large degree of screening.

3.3.4 Landscape Character

The affected landscape can be divided into the following general character types:

Rural Landscape Areas. This is the type of landscape that dominates the affected landscape. It is typified by relatively uniform rolling topography that is covered by a matrix of arable agriculture set in a framework natural grassland.

Due to the relatively low topography, and generally low vegetation, it is an open landscape over which long views are possible particularly when the viewer is located on the summit of a ridgeline.

Within this general pattern homesteads are located that are made obvious due to their associated alien and ornamental vegetation.

There are also stands of alien trees many of which are Eucalyptus that are largely located along property boundaries and unused agricultural land.

The rolling topography generally provides a large degree of VAC particularly for relatively low development such as the proposed array.

Urban Landscape Areas those are generally densely developed residential areas with small commercial areas. There are also small areas of industry also associated with urban areas. VAC is generally high, with views of the surrounding landscape generally only possible from urban edges.

Industrial Landscape Areas Mpumalanga is known for its mining industry as well as other heavy industrial operations. These industries generally create their own visual presence that can over-ride surrounding characteristics. The closest large scale mining / industrial operation is Tutuka Power Station which has the New Denmark Coat Mine immediately to the north of it from which is fed coal by conveyor belt.

Other large scale industrial operations include:

- The SASOL plant at Secunda which is approximately 32km to the west of the proposed site;
- The Sibonelo Colliery which is located approximately 30 km to the north-west of the proposed site; and
- The Sudor Coal Mine that is located approximately 20km to the north of the proposed site.

Due to distance, these activities have no apparent influence on landscape character in the vicinity of the proposed site. They may however influence people's perception of landscape character for some of the longer views particularly for the Wind Energy section of the overall project. However they are unlikely to have any influence on the Solar Energy Facility.

Within the Study Limit, the landscape character is comprised mainly of Rural Landscape Character Areas. The only exceptions to this are the settlements of Bethal and Morgonzon that are Urban Landscape Character Areas.

Plate 8, Rural Landscape Character Zone
This landscape is typified by low rolling hills and a matrix of natural grassland and arable crop production with isolated homesteads.

Plate 9, Urban Landscape Character Area

This landscape is typified by relatively dense development with street trees and garden vegetation. Buildings and vegetation largely screen external views.

Plate 10, Industrial Landscape Character Zone

Large scale industry (Tutuka Power Station) is located some distance from the proposed site and is unlikely to be visible.

3.4 VISUAL RECEPTORS

3.4.1 Definition

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

The significance of a change in a view for a visual receptor is likely to relate to use.

Uses such as guest houses, recreation and tourism related areas are likely to rely on the maintenance of an outlook for successfully attracting guests and users. Residential areas could depend on outlook for the enjoyment of the area by residents and for maintaining property values. A route that is particularly important for tourism may also be dependent on outlook for the maintenance of a suitable experience for users.

3.4.2 Identified visual receptors

This section is intended to highlight possible Receptors within the landscape which due to use could be sensitive to landscape change.

- Area Receptors may include;
    - The towns of **Bethal and Morgenzon;**
    - The **Silver Water Reserve**; and
    - The Protected Area of **Rietvlei Nature Reserve**.

- Point Receptors that include;
    - There are a number of **Local Farmsteads and Homesteads** located both within the focus area and the surrounding landscape.

- Linear Receptors or routes through the area that include;
    - **The N17, the R35, the R38 and the R39 as well as the unsurfaced local roads that that run through the study area.** All of these are used mainly by local people with little tourism / recreational importance.

Plate 11, Local Agricultural Homestead

Plate 12, Local Farm Workers Homestead

Plate 13, Silver Water Private Nature Reserve

Plate 14, Urban Edge of Bethal looking towards the proposed site

Plate 15, Local Roads including main roads such as the N17

Plate 16, Local Roads including unsurfaced roads such as this access road to Silver Waters Private Nature Reserve

3.5 Landscape and receptor sensitivity

It is difficult to define hard and fast criteria for assessment of subjective issues. In order to provide both consistency and transparency to the assessment process, the table below indicates the criteria that are proposed to guide the judgement as to the sensitivity of the landscape character areas and the various visual receptors in their interaction with the identified LCAs.

SIGNIFICANCE	LCA	RECEPTORS
Low	Areas not recognised as having specific landscape value. **The Urban and the Industrial LCAs;**	Viewers' attention not focused on landscape. These include: • **Residents of urban areas**
Medium	Landscape value is recognised locally, but is not protected; the landscape is relatively intact, with a distinctive character; and the landscape is reasonably tolerant of change. These areas include: • **The Rural Landscape LCA.**	Viewers' attention may be focused on landscape. These include: • **Homesteads; and** • **Users of main and unsurfaced roads.**
High	The qualities for which the landscape is valued are in a good condition, with a clearly apparent distinctive character. This distinctive character is susceptible to relatively small changes. **There are no character areas with a high significance.**	Viewer's attention very likely to be focused on landscape, e.g. people experiencing views from important landscape features of local physical, cultural or historic interest and beauty spots. Large number of viewers and/or location in a highly valued landscape could elevate viewer sensitivity to the highest level. These include: • **Visitors to the protected area of the Rietvlei Reserve; and** • **Visitors to the Silver Water Nature Reserve.**

4 THE NATURE OF POTENTIAL VISUAL IMPACTS

4.1 NATURE OF LIKELY VIEWS OF THE DEVELOPMENT

During the construction phase, it is expected that traffic will be slightly increased as trucks will be required to transport materials and equipment such as PV panels and frames to the site.

Site preparation will generally include the following activities:

- vegetation clearance – removal or cutting of any vegetation if present (bush cutting);
- levelling and grading of areas where the array will be sited would normally occur, the assessment indicates that the land is relatively flat so only minor grading should be required;
- levelling of hard-standing areas, e.g. for temporary laydown and storage areas, as indicated above only minor grading is likely to be necessary;
- erection of site fencing;
- construction of a temporary construction camp which could occur within a lay down area within the overall site.

These activities are only likely to be visible from the immediate vicinity of the site.

As the site is developed, concrete bases will be constructed (if required), the support structures will then be assembled and PV panels attached, ancillary structures and minor buildings will also be constructed.

The development will therefore appear on a progressive basis in the landscape, however once the concrete bases are constructed, the structures are likely to be assembled rapidly.

The construction of the proposed on-site substations will follow a similar pattern.

Construction of the proposed facility is likely to take up to approximately 12 months, the start date of which, is dependent upon award of a bid/procurement. Construction activities could take place concurrently for multiple facilities.

By the end of the construction process, the array will be assembled and minor buildings constructed and the full visual impact of the project will be experienced.

The operational phase (minimum 20 years) is highly unlikely to result in any significant additional impact. It is possible however, that work crews will be visible from time to time undertaking maintenance within the facility.

The main visible elements therefore are likely to include:

1. The solar array including minor buildings and structures located within a fence line with an associated on-site electrical infrastructure compound that is slightly taller than surrounding elements;
2. The proposed on-site Collector Substation; and
3. Operational and security lighting at night.

4.1.1 The likely Nature of Views of the Proposed Solar Array

The PV panels will be mounted on supports and orientated to face north (fixed system) and that the orientation would shift should tracking modules be used.

Continuous supports aligned in rows are generally used when the PV panels are fixed and are set at an angle and direction to maximise the average efficiency during the day or have a basic tracking set up that varies the angle of tilt of the unit in order to improve efficiency.

From areas to the north a solar array, whether constructed on individual supports or continuous rows, is likely to appear as a continuous structure in the landscape.

The nature of the impact is also likely to vary with location and elevation;

- If the array is located on a hillside or if it is viewed from a higher level, the rows of PV units are likely to visually combine and will be read as a single unit. From a distance this results in a PV array having a similar appearance as a large industrial structure when viewed from above. It should be noted that the proposed project will not be viewed from a higher elevation and so this type of view will not apply;

- From the north and if the project is viewed from a similar level, the front row of PV units will be seen in elevation. This is likely to result in the project being seen as a continuous dark line in the landscape possibly with slightly higher elements such as the on-site electrical infrastructure compound extending above the line. How prominent the dark line is, is likely to be dependent on the distance of the viewer from the project as well as the extent to which the view of the elevation is broken by other elements such as vegetation and landform.

- From the south, east and west the dark face of the PV units is not obvious and subject to the colour of the undersides of the units, the supporting structures are likely to become more apparent. With distance however, the shadow cast by the structures is likely to be more obvious and the facility will probably appear much as the northern face, a long dark structure.

- If the landscape does not have significant Visual Absorption Capacity (VAC), because of the contrast in colour with the surrounding landscape, the array could be visible to the limit of visibility. Subject to the colour and reflectivity of the underside of the PV units and supporting structure, it is possible that a similar level of impact could also be experienced from the south, east and west. It should be noted that the VAC of the landscape surrounding the proposed development is largely dependent on minor ridgelines.

- Mitigation or screening of views is possible at least from close views. This can be achieved either by earthworks berms by planting or by a combination of both. From a distance and particularly from elevated viewpoints as views over screening may be possible and excessively tall screening is likely to be less feasible as the it is likely to cast shadow over the PV units.

- In addition to the way that a solar array may change a landscape, the nuisance factor associated with resulting glare is often raised by stakeholders on similar projects. PV

units, however, are designed to absorb as much energy as possible and are designed not to reflect light. This issue is generally more likely to be associated with a focussed array which tracks the sun's path during the day and uses reflective surfaces to focus energy onto receptors. It is therefore not expected that this will be a significant issue with a PV array such as the one proposed.

The site and surrounding area is relatively flat. This means that the array is likely to be largely viewed either in elevation or at an acute elevated view from minor ridgelines .

A new solar array has been developed adjacent to Upington Airport. This array has been developed in two sections on either side of the airport runway. It is probably somewhat smaller than the subject project, covering approximately 25ha and the longest edge of the array being approximately 500m long. The PV panels are mounted on fixed frames approximately 2m high. Despite obvious differences compared with the proposed project, it does illustrate the effect of distance in mitigating the visibility of the solid line of solar panels.

Plate 17 indicates the location of the existing array at Upington Airport. **Plates 18, 19 and 20**, illustrate how the array is seen from distances of approximately 700m, 1500m and 5000m respectively.

The following effects are noted:

- From 700m the array is clearly visible. For the same effect relative to a 5.0m high array, this distance will be approximately 2100m.
- From 1500m, the array is visible but even with the minimal vegetation providing screening at the airport, the dark line of panels is starting to blend into the background. The array is visible but might be missed by a casual viewer. For the same effect relative to a 5.0m high array, this distance will be approximately 4500m.
- From 5000m, the line of panels is indistinguishable from the horizon. For the same effect relative to a 5.0m high array, this distance will be approximately 15000m.

A single axis tracking system could slightly increase the height of structures particularly during late afternoon and early morning when the units are tilted to their fullest extent.

Plate 17, Existing solar arrays at Upington Airport as seen from the air

Plate 18, Existing array seen in a flat landscape from approximately 700m. The array is clearly visible.

Plate 19, Existing array seen in a flat landscape from approximately 1500m. The array is visible but even with the minimal vegetation providing screening at the airport, the dark line of panels is starting to blend into the background. The array is clearly visible but might be missed by a casual viewer who was not aware of its existence.

Plate 20, **Existing array seen in a flat landscape from approximately 5000m**. The line of panels is barely distinguishable. The viewer would have to know where to look to be able to differentiate the array from surrounding landscape features.

4.1.2 The likely Nature of Views of the Proposed On-Site Substation

On-site substation is likely to have elements up to 10m[2] high (bus bars). These will be viewed as an isolated higher section of the development.

The upper sections of these elements are comprised of steel lattice structures they are therefore likely to be relatively transparent.

4.1.3 Glare from the PV array

A common misconception about solar photovoltaic (PV) panels is that they inherently cause or create glare, posing a nuisance to neighbours. While in certain situations the glass surfaces of solar PV systems can produce glint (a momentary flash of bright light) and glare (a reflection of bright light for a longer duration).

Light absorption, rather than reflection, is central to the function of a solar PV panel to absorb solar radiation and convert it to electricity. Solar PV panels are constructed of dark-coloured (usually blue or black) materials and are covered with anti-reflective coatings. Modern PV panels reflect as little as two percent of incoming sunlight, about the same as water and less than soil. Some of the concern and misconception is likely due to the confusion between solar PV systems and concentrated solar power (CSP) systems. CSP systems typically use an array of mirrors to reflect sunlight to heat water or other fluids to create steam that turns an electric generator[3].

Glare experienced at ground level generally occurs when the sun is low in the sky and the angle of incidence is such that light is reflected rather than refracted through the panel surface. The risk of this occurring is therefore highest during early morning and late afternoon.

In South Africa affected areas during the early morning will generally vary from the west of the array during summer months to the north west of the array during winter months when the rising sun is further north.

Affected areas during the late afternoon will generally vary from the east of an array during summer months to the north east of an array during winter months.

Because glare is reflected light from an inclined panel, it will generally affect areas above the level of the panel surface.

[2] This is likely to be the highest structure, the majority of structures will be lower.

[3] US Department of Energy

Plate 21 - Glare experienced in the Control Tower at Boston Regional Airport from an adjacent PV array

4.1.4 Security Lighting

The facility will be lit by security lights to a level sufficient to ensure that security cameras can operate at night. This could result in the facility being obvious at night from surrounding areas.

4.1.5 Site Access Road

The proposed access road alignment is likely to cause relatively low levels of visual impact. Existing roads will be used as far as possible.

In a flat landscape, road construction is likely to only have an impact on the area immediately surrounding it. Whilst a busy road might be visible from a distance due to vehicles being obvious, for much of the time a road that is lightly used where disturbance of surrounding vegetation has been minimised is unlikely to be obvious past 100m from the road edge

The main issue issues relate to proximity to homesteads which could result in traffic being obvious to residents as well as the loss of vegetation which could have negative influence in terms of character change.

4.1.6 Site Lay Down Area

This will be used largely during the construction phase for storage of materials and equipment. It is possible that it could be maintained during the operational phase for maintenance use. It is likely that materials and equipment stored in this area will be lower or similar in height

to the solar array. Subject to the direction of view, it is likely that materials and equipment stored will either be screened or seen with the solar array as a backing.

4.1.7 Operational and Maintenance Buildings

These minor buildings are likely to be similar in height to the proposed array. Therefore they are likely to either be largely screened or seen with the solar array as a backing. They are therefore not likely to be highly conspicuous.

5 SITE SENSITIVITY

A review of the proposed project was undertaken during the initial stage of the assessment in order to indicate how site planning might minimise landscape and visual impacts.

5.1 NO GO AREAS

The directly affected landscape is neither protected nor is it rare so from a landscape perspective there are no no-go areas.

5.2 SENSITIVITY

Site sensitivity relates to:

- Protection of natural features; and
- Guiding development away from areas of the site that would make it most obvious to surrounding sensitive receptors.

Highly Sensitivity Areas include:

- Areas immediately surrounding settlement and homesteads development of which is likely to significantly change the character of views for residents. A 500m buffer is proposed which should be sufficient to ensure that development does not totally dominate views. It is possible that receptors (owners /residents) have no concern regarding the development of these areas, in which case the sensitivity rating will reduce; and
- Corridors beside the main roads that could be affected including the N2, the R35, the R 38 and the R39. This is deemed sensitive because development in this corridor is likely to be highly obvious to people travelling along the roads and because it is possible that motorists could be affected by glare and the proposed 250m corridor should be sufficient to enable mitigation in the form of screening to be undertaken.

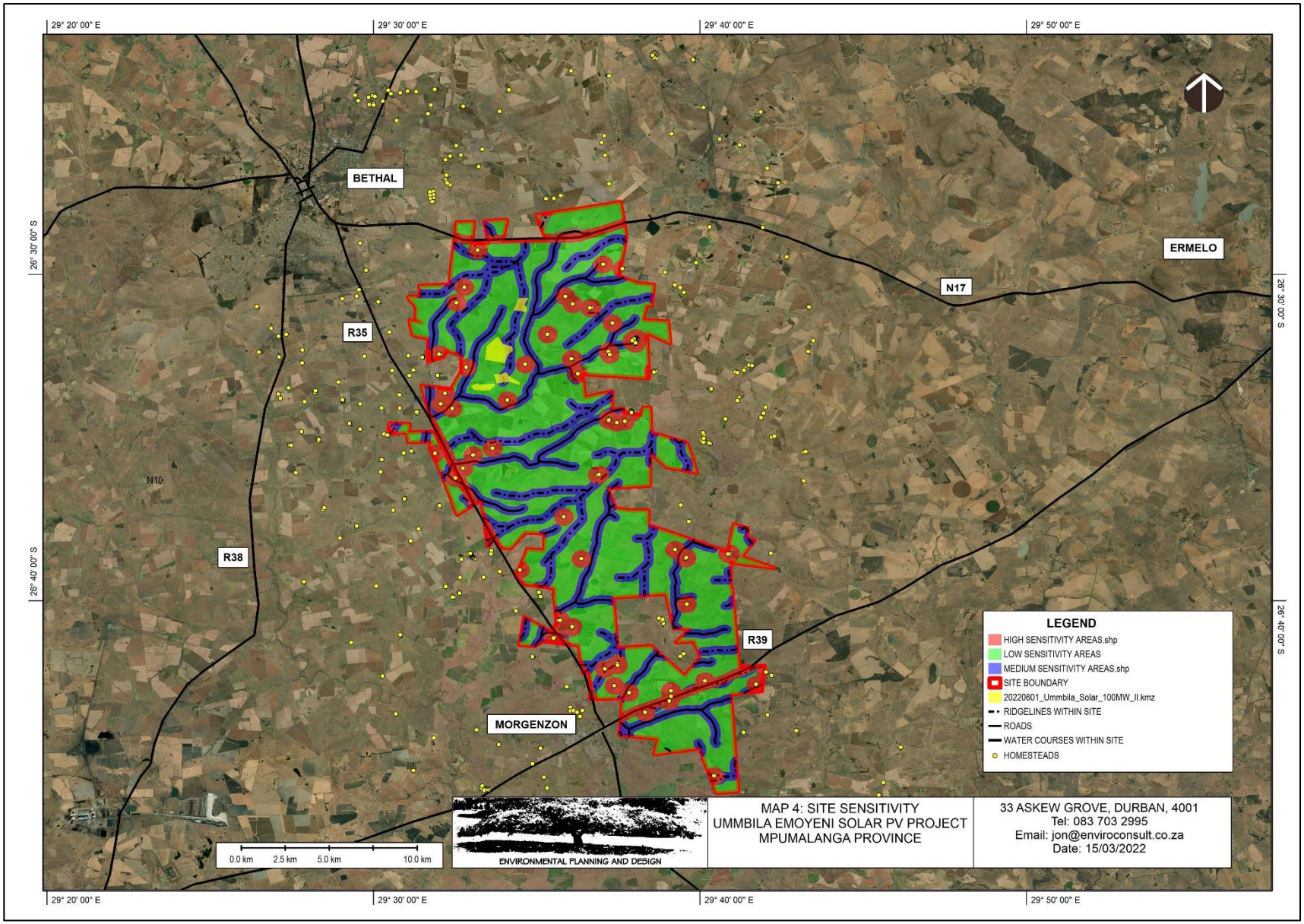
Medium Sensitivity Areas include:

- Watercourses and a buffer of 250m either side of watercourses. These areas are proposed in order to protect these natural features within the proposed focus area; and
- Areas on and immediately beside ridgelines as the development of these areas is likely to be more visible to surrounding areas including protected areas.

Low Sensitivity Areas include:

- Valley side slopes the development of which is likely to make the project least obvious from surrounding areas. The fact that development may be focused on areas with relatively low sensitivity does not preclude the necessity for mitigation.

Map 4, Site Sensitivity indicates the proposed Solar PV development areas overlaid on to Site Sensitivity mapping. This indicates that the proposed solar development areas are largely located on valley side slopes that are likely be the least visually sensitive areas. However, sections of the proposed development areas are located on ridgelines which is likely to make them more obvious to surrounding areas.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6 VISIBILITY AND VIEWS OF THE PROPOSED DEVELOPMENT

6.1 THE EXTENT OF POSSIBLE IMPACTS

No layout was available for the PV array. Therefore, in order to undertake the assessment, it had to be assumed that the solar array will fill the areas indicated.

The bulk of the proposed project is comprised of the array of PV panels. The majority of other elements including the inverters and buildings will be located amongst the array and will be a similar or lower height as the array.

The tallest elements are likely to be the transformers associated with the on-site sub station. These will be solid elements and could be in the order of 10m high. Other electrical infrastructure such as the bus bars to which the power lines which form part of the grid connection project will connect may be taller but these will be largely comprised of lattice structures that are likely to be relatively transparent.

The development can therefore be described as generally being comprised of elements of a similar height but with an isolated taller element.

In order to provide an indication of the likely limit of visibility, a universally accepted navigational formula has been used to calculate the likely distance that the proposed structures might be visible over (**Appendix III**). This indicates that in a flat landscape the proposed structures may be visible for the following distances;

Approximate limit of Visibility (ALV)

ELEMENT	APPROXIMATE LIMIT OF VISIBILITY
Solar PV panels, up to 5m high	8.0 kilometres
Substation, up to 10m high	11.3 kilometres

6.2 ZONES OF THEORETICAL VISIBILITY

Zones of Theoretical Visibility (ZTV) are defined as "a map usually digitally produced showing areas of land within which a development is theoretically visible"[4].

ZVTs of the proposed development have been assessed using Global Mapper GIS.

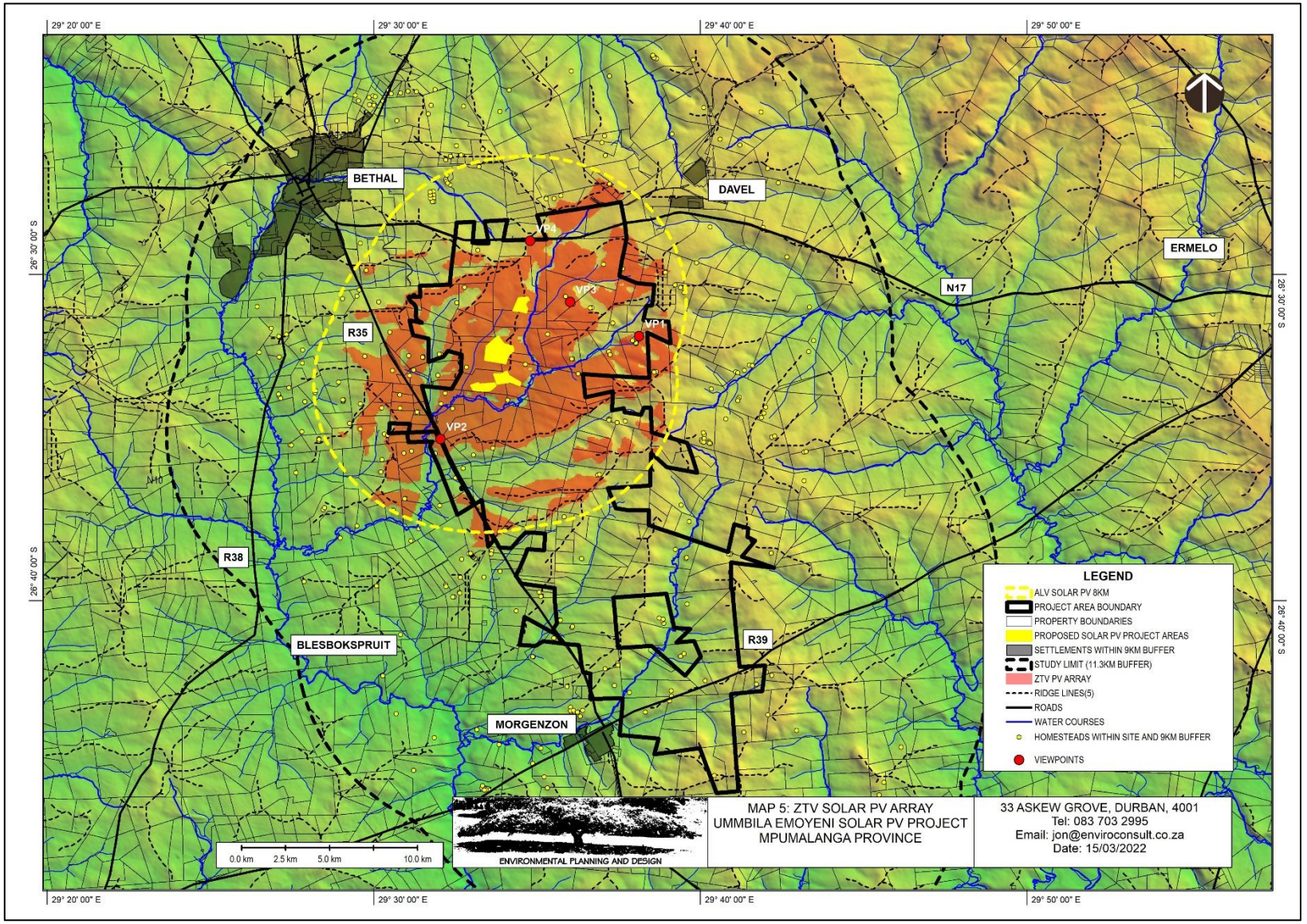
The assessment is based on terrain data that has been derived from satellite imagery. This data was originally prepared by NASA and is freely available on the CIAT-CCAFS website (http://www.cgiar-csi.org). This data has been ground truthed using a GPS as well as online mapping.

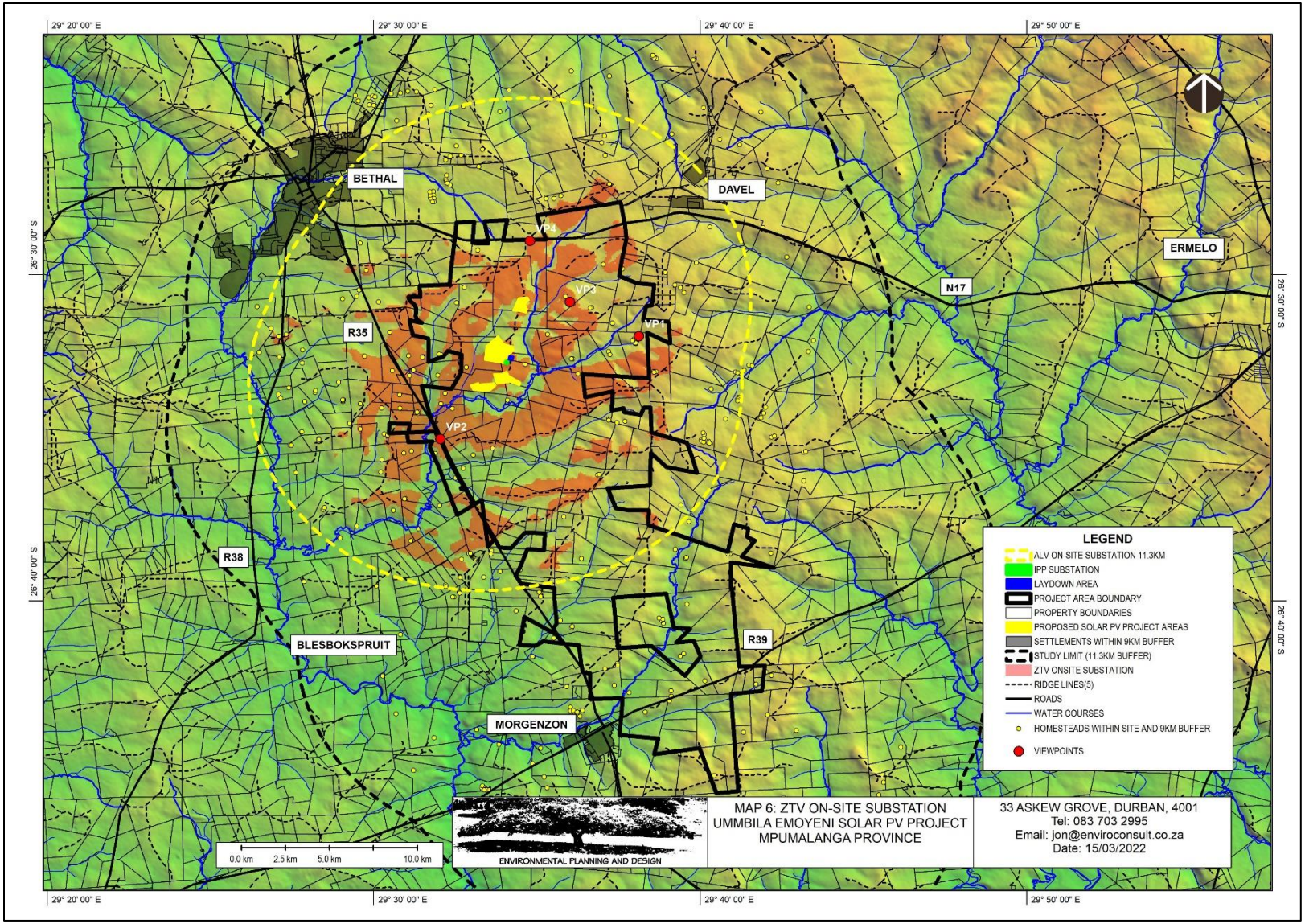
The ZTV has been calculated from terrain data only, existing vegetation and / or other development could have a modifying effect on the areas indicated. However, other than existing and proposed Wind Energy Facilities which are relatively transparent visual obstructions that could modify the ZTV are limited.

The ZTV analysis is indicated on the following maps:

[4] UK Guidelines

- **Map 5** indicates the ZTV for the proposed PV Array, and internal infrastructure; and
- **Map 6** indicates the ZTV of the proposed On Site Substation.


29° 20' 00" E
29° 30' 00" E
29° 40' 00" E
29° 50' 00" E
26° 30' 00" S
26° 40' 00" S
BETHAL
DAVEL
ERMELO
N17
R35
R38
R39
N11
BLESBOKSPRUIT
MORGENZON
VP1
VP2
VP3
VP4
LEGEND
ALV SOLAR PV 8KM
PROJECT AREA BOUNDARY
PROPERTY BOUNDARIES
PROPOSED SOLAR PV PROJECT AREAS
SETTLEMENTS WITHIN 9KM BUFFER
STUDY LIMIT (11.3KM BUFFER)
ZTV PV ARRAY
RIDGE LINES(5)
ROADS
WATER COURSES
HOMESTEADS WITHIN SITE AND 9KM BUFFER
VIEWPOINTS
0.0 km 2.5 km 5.0 km 10.0 km
ENVIRONMENTAL PLANNING AND DESIGN
MAP 5: ZTV SOLAR PV ARRAY
UMMBILA EMOYENI SOLAR PV PROJECT
MPUMALANGA PROVINCE
33 ASKEW GROVE, DURBAN, 4001
Tel: 083 703 2995
Email: jon@enviroconsult.co.za
Date: 15/03/2022


29° 20' 00" E
29° 30' 00" E
29° 40' 00" E
29° 50' 00" E
26° 30' 00" S
26° 40' 00" S
BETHAL
DAVEL
ERMELO
N17
R35
R38
R39
BLESBOKSPRUIT
MORGENZON
VP1
VP2
VP3
VP4
LEGEND
ALV ON-SITE SUBSTATION 11.3KM
IPP SUBSTATION
LAYDOWN AREA
PROJECT AREA BOUNDARY
PROPERTY BOUNDARIES
PROPOSED SOLAR PV PROJECT AREAS
SETTLEMENTS WITHIN 9KM BUFFER
STUDY LIMIT (11.3KM BUFFER)
ZTV ONSITE SUBSTATION
RIDGE LINES(5)
ROADS
WATER COURSES
HOMESTEADS WITHIN SITE AND 9KM BUFFER
VIEWPOINTS
0.0 km 2.5 km 5.0 km 10.0 km
ENVIRONMENTAL PLANNING AND DESIGN
MAP 6: ZTV ON-SITE SUBSTATION
UMMBILA EMOYENI SOLAR PV PROJECT
MPUMALANGA PROVINCE
33 ASKEW GROVE, DURBAN, 4001
Tel: 083 703 2995
Email: jon@enviroconsult.co.za
Date: 15/03/2022

6.3.1 Visibility

The assessment indicates the following:

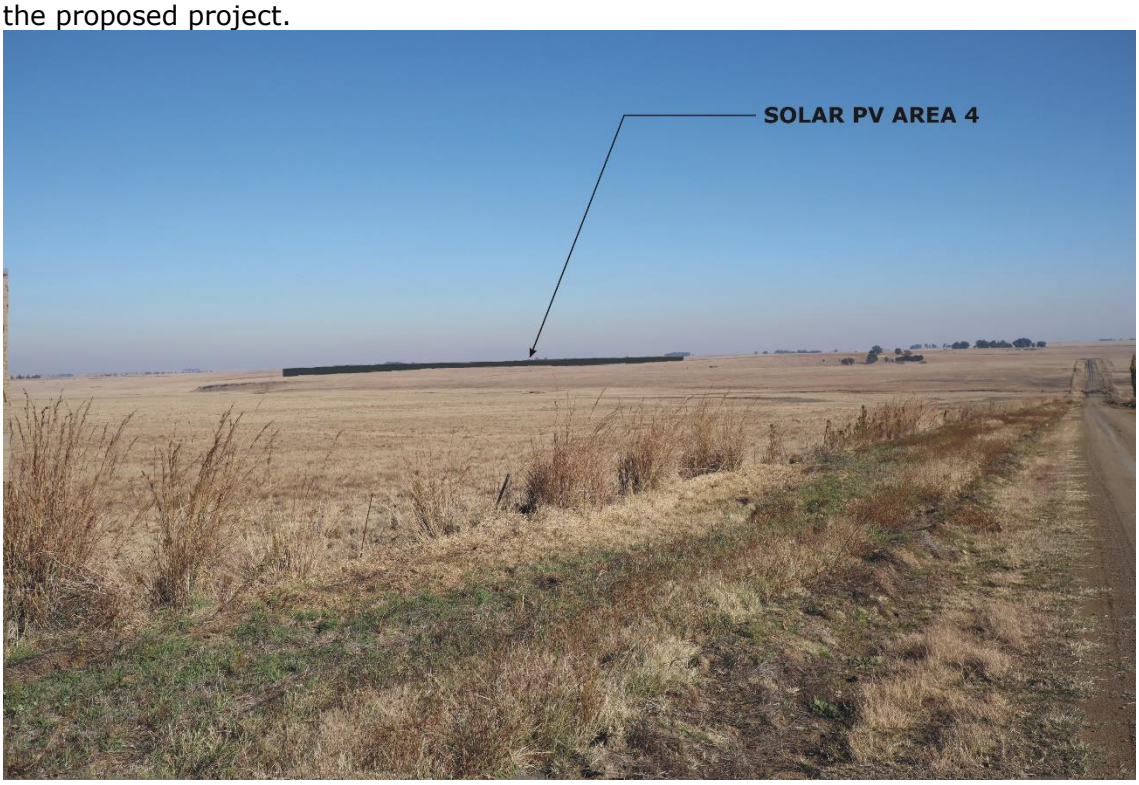
i. The proposed array and substation are likely to be visible over similar areas;
ii. Views of the proposed array and the substation will be significantly constrained by ridgelines, they are both likely to be mainly visible to the northern section of the project area. to the north and east by a relatively continuous minor ridgeline.
iii. Neither the proposed substation or the solar array will be visible from an urban area.
iv. Neither the proposed substation or the solar array will be visible from the N17 or the R39.
v. Both the proposed substation or the solar array may be visible from a short section of the R35 (approximately 6.4km).
vi. Both the proposed substation and solar array could be visible to up to 28 homesteads, the closest being from a distance of approximately 1km.
vii. Both the proposed substation and solar array could be visible from the Silver Waters private nature reserve.
viii. Both the proposed substation and solar array are likely to be visible to unsurfaced roads within the ZTV.

As indicated previously, the ZTV analysis is based on landform only. Visibility is likely to be modified by vegetation.

From the site visit it was obvious that the extent to which the project will be visible to the R35, and local roads and homesteads will be significantly lower than indicated.

It was also obvious that the proposed development is unlikely to be visible from Silver Waters private nature reserve due to screening vegetation.

VIEWPOINT 1 - View looking across Silver Waters towards the proposed solar PV project. The vegetation on the far side of the dam screens all views towards the proposed project.



VIEWPOINT 2 - View looking to the west towards the proposed solar PV Area 4 from the unsurfaced road next to the Qhakaza Primary School. This is one of the sections of local roads from which the solar project is likely to be most obvious.

VIEWPOINT 3 - View looking to the north-east from the R35 towards the proposed solar PV Area 3. This is one of the sections of thr R35 from which the solar project is likely to be most obvious.

VIEWPOINT 4 - View looking to the south-west from the N17 towards the proposed solar PV Area 4. Views of the proposed project from the N17 are unlikely.

6.3.2 Glare

The closest receptors that could be affected by glare are travellers on local unsurfaced roads. These roads are not heavily trafficked. Possible speeds are also low. It is unlikely that glare will pose a significant safety issue on these roads.

The only main road from which views of the project are likely to be possible is the R35. Potentially affected sections of the road are approximately 4km from the closest section of the array. At this distance it is unlikely that glare will be problematic. However, if it should prove problematic, screening, either with vegetation or an opaque fence structure on the western side of PV Area 3, will be sufficient to mitigate the issue.

7 VISUAL IMPACT ASSESSMENT

The previous section of the report identified specific areas where visual impacts may occur as well as their likely nature. This section will attempt to quantify these potential visual impacts in their respective geographical locations and in terms of the identified issues.

7.1 ISSUES TO BE ADDRESSED

The following list of possible impacts have been identified;

a) The proposed development could change the character and sense of place of the landscape setting;
b) The proposed development could change the character of the landscape as seen from the local roads;
c) The proposed development could change the character of the landscape as seen from local agricultural homesteads;
d) The proposed development could change the character of the landscape as seen from private nature reserves;
e) Glare impacts; and
f) Lighting impacts.

These impacts have to be addressed in terms of the proposed solar array and associated infrastructure, the alternative substation locations and the temporary lay down areas.
It should be noted that the impacts identified will all gradually increase from the current situation to the impact level indicated during the construction phase, be consistent at the impact levels indicated during the operational phase and decrease again from the levels indicated to close to the current situation during the decommissioning phase.

7.2 ASSESSMENT METHODOLOGY

The methodology for the assessment of potential visual impacts includes:

- The **nature**, which shall include a description of what causes the effect, what will be affected and how it will be affected.
- The **extent**, wherein it will be indicated whether the impact will be local (limited to the immediate area or site of development) or regional:
    - local extending only as far as the development site area – assigned a score of 1;
    - limited to the site and its immediate surroundings (up to 10 km) – assigned a score of 2;
    - will have an impact on the region – assigned a score of 3;
    - will have an impact on a national scale – assigned a score of 4; or
    - will have an impact across international borders – assigned a score of 5.
- The **duration**, wherein it will be indicated whether:
    - the lifetime of the impact will be of a very short duration (0–1 years) – assigned a score of 1;
    - the lifetime of the impact will be of a short duration (2-5 years) - assigned a score of 2;
    - medium-term (5–15 years) – assigned a score of 3;
    - long term (> 15 years) - assigned a score of 4; or
    - permanent - assigned a score of 5.
- The **magnitude**, quantified on a scale from 0-10, where a score is assigned:

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

- The **probability** *of occurrence*, which shall describe the likelihood of the impact actually occurring. Probability will be estimated on a scale, and a score assigned:
  - Assigned a score of 1–5, where 1 is very improbable (probably will not happen);
  - Assigned a score of 2 is improbable (some possibility, but low likelihood);
  - Assigned a score of 3 is probable (distinct possibility);
  - Assigned a score of 4 is highly probable (most likely); and
  - Assigned a score of 5 is definite (impact will occur regardless of any prevention measures).
- The **significance**, which shall be determined through a synthesis of the characteristics described above (refer formula below) and can be assessed as low, medium or high.
- The **status**, which will be 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.
- 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; where S = Significance weighting, E = Extent, D = Duration, M = Magnitude, P = Probability

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

- < 30 points: Low (i.e. where this impact would not have a direct influence on the decision to develop in the area),
- 30-60 points: Medium (i.e. where the impact could influence the decision to develop in the area unless it is effectively mitigated),
- > 60 points: High (i.e. where the impact must have an influence on the decision process to develop in the area).

7.3 LANDSCAPE & VISUAL IMPACT ASSESSMENT

7.3.1 The proposed development could change the character and sense of place of the landscape setting (Landscape Change)

Nature of impact:
The proposed solar project is located within a landscape area with an overriding rural character.
The character of the affected area is relatively typical within the region.
The proposed development areas are relatively hidden from possible receptors.
Other large scale industrial operations including mining operations and power stations are relatively obvious in the region.

Whilst the proposed project will create a new large scale industrial operation and change the character of an area of rural landscape, this is not entirely out of character with the region.

	Without mitigation	**With mitigation**
Extent	Site and immediate surroundings, **(2)**	Site and immediate surroundings, **(2)**
Duration	Long term, **(4)**	Long term, **(4)**
Magnitude	Low, **(4)**	Minor to Low, **(3)**
Probability	Probable, **(3)**	Probable, **(3)**
Significance	Medium, **(30)**	Low, **(27)**
Status	**Negative**	**Negative**
Reversibility	High	High
Irreplaceable loss	The proposed development can be dismantled and removed at the end of the operational phase. There will therefore be **no irreplaceable loss**. However, given the likely long term nature of the project, it is likely that a proportion of stakeholders will view the loss of view as irreplaceable.	**No irreplaceable loss**
Can impacts be mitigated?	**Yes**	**N/A**

Mitigation / Management:

Planning:

- Plan site levels to minimise earthworks to ensure that levels are not elevated.
- Plan to maintain the height of structures as low as possible.
- Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development.

Operations:

- Reinstate any areas of vegetation that have been disturbed during construction.
- Remove all temporary works.
- Monitor rehabilitated areas for vegetation cover post-construction and implement remedial actions.
- Minimise disturbance and maintain existing vegetation as far as is possible both within and surrounding the development area.

Decommissioning:

- Remove infrastructure not required for the post-decommissioning use of the site.
- Rehabilitate and monitor areas for vegetation cover post-decommissioning and implement remedial actions.

Cumulative Impacts:

The proposed project will add to the relatively isolated areas of the large scale industrialisation that is located within the rural landscape. However, the distance between these large scale industrial operations will remain large (25 -30km). It is therefore unlikely to change the viewer's perception of the broader landscape character.

The proposed project was assessed as likely to have a cumulative impact contribution of low significance to an overall cumulative impact of medium significance. **See appendix IV.**
Residual Impacts: The residual risk relates to loss of natural vegetation cover being obvious on decommissioning of the proposed project. It is therefore critical that effective rehabilitation is undertaken.

7.3.2 The proposed development could change the character of the landscape as seen from local main roads

Nature of impact:
The low nature of the majority of the proposed development combined with surrounding rolling topography with low, relatively regular ridgelines will mean that the solar PV areas and the on-site substation will be screened from a large proportion of surrounding areas.
In terms of main roads, the proposed PV section of the project is only likely to be visible to a relatively short section of the R35 from a distance of approximately 4km.

It is highly unlikely to be visually obvious to either the N17 or the R39.

	Without mitigation	**With mitigation**
Extent	Site and immediate surroundings, **(2)**	Site and immediate surroundings, **(2)**
Duration	Long term, **(4)**	Long term, **(4)**
Magnitude	Small to Minor, **(1)**	Small, **(0)**
Probability	Improbable, **(2)**	Improbable, **(2)**
Significance	Low, **(14)**	Low, **(12)**
Status	**Negative**	**Negative**
Reversibility	High	High
Irreplaceable loss	The proposed development can be dismantled and removed at the end of the operational phase. There will therefore be **no irreplaceable loss**.	**No irreplaceable loss.**
Can impacts be mitigated?	**Yes**	**N/A**

Mitigation / Management:
Planning:

- Design /modify layout to keep PV panels off the low ridgeline that runs across the central section of the site.
- Plan site levels to minimise earthworks to ensure that levels are not elevated.
- Plan to maintain the height of structures as low as possible.
- Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development.

Operations:

- Reinstate any areas of vegetation that have been disturbed during construction.

- Remove all temporary works.
- Monitor rehabilitated areas for vegetation cover post-construction and implement remedial actions.
- Minimise disturbance and maintain existing vegetation as far as is possible both within and surrounding the development area.

Decommissioning:

- Remove infrastructure not required for the post-decommissioning use of the site.
- Rehabilitate and monitor areas for vegetation cover post-decommissioning and implement remedial actions

Cumulative Impacts:

The proposed project will add to the relatively isolated areas of the large scale industrialisation that is located within the rural landscape. However, the distance between these large scale industrial operations will remain large (25 -30km).

As the project is unlikely to be obvious, it is unlikely to contribute to cumulative impacts experienced from main roads.

The proposed project was assessed as likely to have a cumulative contribution of low significance to an overall cumulative impact of medium significance**.**
See appendix IV.

Residual Impacts:

The residual risk relates to loss of natural vegetation cover being obvious on decommissioning of the proposed project. It is therefore critical that effective rehabilitation is undertaken.

7.3.3 The proposed development could change the character of the landscape as seen from local minor unsurfaced roads.

Nature of impact:
The low nature of the majority of the proposed development combined with surrounding rolling topography with low, relatively regular ridgelines will mean that the solar PV areas and the on-site substation will be screened from a large proportion of surrounding areas.
There are several unsurfaced roads that run close to the proposed solar PV areas. They are therefore likely to be more highly impacted than main roads. Whilst some sections of roads are important for local recreation and tourism, the relatively low numbers of vehicles make the impacts relatively less significant.

	Without mitigation	**With mitigation**
Extent	Site and immediate surroundings, **(2)**	Site and immediate surroundings, **(2)**
Duration	Long term, **(4)**	Long term, **(4)**
Magnitude	Minor, **(2)**	Minor **(2)**
Probability	Probable, **(3)**	Probable, **(3)**
Significance	Low, **(24)**	Low, **(24)**
Status	Because the majority of views will still be over agricultural	**Neutral to Negative**

	land and because some road users are unlikely to be concerned regarding change of use, some road users are unlikely to view the project in a negative light. **Neutral to Negative**	
Reversibility	High	High
Irreplaceable loss	The proposed development can be dismantled and removed at the end of the operational phase. There will therefore be **no irreplaceable loss**.	**No irreplaceable loss.**
Can impacts be mitigated?	**N/A –** this impact cannot be mitigated; however, best practice guidelines can be applied	

Best Practice:

Planning:

- Design /modify layout to keep PV panels off the low ridgeline that runs across the central section of the site.
- Plan site levels to minimise earthworks to ensure that levels are not elevated.
- Plan to maintain the height of structures as low as possible.
- Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development.

Operations:

- Reinstate any areas of vegetation that have been disturbed during construction.
- Remove all temporary works.
- Monitor rehabilitated areas for vegetation cover post-construction and implement remedial actions.
- Minimise disturbance and maintain existing vegetation as far as is possible both within and surrounding the development area.

Decommissioning:

- Remove infrastructure not required for the post-decommissioning use of the site.
- Rehabilitate and monitor areas for vegetation cover post-decommissioning and implement remedial actions

Cumulative Impacts:

The proposed project will add to the relatively isolated areas of the large scale industrialisation that is located within the rural landscape. However, the distance between these large scale industrial operations will remain large (25-30km). It is therefore unlikely to change the viewer's perception of the broader landscape character. However, it will add to the perception of industrialisation as experienced by minor road users.

The project was assessed as likely to result in a low level contribution to an overall cumulative impact of medium significance.

See appendix IV.

Residual Impacts:

The residual risk relates to loss of natural vegetation cover being obvious on decommissioning of the proposed project. It is therefore critical that effective rehabilitation is undertaken.

7.3.4 The proposed development could change the character of the landscape as seen from

agricultural homesteads.

Nature of impact:
The ZTV analysis indicates that the array and substation could be visible to up to 28 homesteads within the ALV, the two closest being within 1km of the site.
Most homesteads are located amongst trees which will help screen views.
Whilst the proposed project is likely to be visually obvious to a number of people living in these homesteads, it is unlikely to dominate the view totally as views will have a significant agricultural content.
It is also likely that the majority of residents of agricultural homesteads will be more concerned with the productivity of the land rather than the view.

	Without mitigation	**With mitigation**
Extent	Site and immediate surroundings, **(2)**	Site and immediate surroundings, **(2)**
Duration	Long term, **(4)**	Long term, **(4)**
Magnitude	Low, **(4)**	Minor to Low, **(3)**
Probability	Probable, **(3)**	Probable, **(3)**
Significance	Medium, **(30)**	Low, **(27)**
Status	Because the majority of views will still be over agricultural land and because some residents at these homesteads are likely to be concerned with the productivity of the land rather than the view, some residents are unlikely to view the project in a negative light. **Neutral to Negative**	**Neutral to Negative**
Reversibility	High	High
Irreplaceable loss	The proposed development can be dismantled and removed at the end of the operational phase. There will therefore be **no irreplaceable loss**.	**No irreplaceable loss.**
Can impacts be mitigated?	**Yes**	

Mitigation / Management:

- Design /modify layout to keep PV panels off the low ridgeline that runs across the central section of the site.
- Plan site levels to minimise earthworks to ensure that levels are not elevated.
- Plan to maintain the height of structures as low as possible.
- Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development.

Operations:

- Reinstate any areas of vegetation that have been disturbed during construction.

• Remove all temporary works. • Monitor rehabilitated areas for vegetation cover post-construction and implement remedial actions. • Minimise disturbance and maintain existing vegetation as far as is possible both within and surrounding the development area. Decommissioning: • Remove infrastructure not required for the post-decommissioning use of the site. • Rehabilitate and monitor areas for vegetation cover post-decommissioning and implement remedial actions
Cumulative Impacts: Visual impacts of the proposed infrastructure on homesteads were assessed as having a low significance. From the majority of affected homesteads other industrial development is unlikely to be obvious. However, because views of major electrical infrastructure are likely to be obvious from a proportion of homesteads in the area the impact is assessed as medium. Low level contribution to an overall cumulative impact of medium significance. **See Appendix IV.**
Residual Impacts: The residual risk relates to loss of natural vegetation cover being obvious on decommissioning of the proposed project. It is therefore critical that effective rehabilitation is undertaken.

7.3.5 The proposed development could change the character of the landscape as seen from Private Nature Reserves (Silver Waters Private Nature Reserve)

The Silver Waters Nature Reserve is primarily a local tourism facility offering accommodation in tranquil surroundings around a large dam. The view from the area towards the proposed development is relatively well screened by existing vegetation comprising of groups of large trees.
It is possible that a glimpse of the project could be possible from close to the screening trees; however, the project is still unlikely to be obvious.

	Without mitigation	**With mitigation**
Extent	Site and immediate surroundings, **(2)**	Site and immediate surroundings, **(2)**
Duration	Long term, **(4)**	Long term, **(4)**
Magnitude	Small to Minor, **(1)**	Small **(0)**
Probability	Very Improbable, **(1)**	Very Improbable, **(1)**
Significance	Low, **(7)**	Low, **(6)**
Status	Because the proposed development is unlikely to be visually obvious, it is unlikely to be seen as a negative impact. **Neutral**	**Neutral**
Reversibility	High	High

Irreplaceable loss	The proposed development can be dismantled and removed at the end of the operational phase. There will therefore be **no irreplaceable loss**.	**No irreplaceable loss.**
Can impacts be mitigated?	**Yes**	

Mitigation / Management:

- Design /modify layout to keep PV panels off the low ridgeline that runs across the central portion of the site.
- Plan site levels to minimise earthworks to ensure that levels are not elevated.
- Plan to maintain the height of structures as low as possible.
- Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development.

Operations:

- Reinstate any areas of vegetation that have been disturbed during construction;
- Remove all temporary works.
- Monitor rehabilitated areas for vegetation cover post-construction and implement remedial actions.
- Minimise disturbance and maintain existing vegetation as far as is possible both within and surrounding the development area.

Decommissioning:

- Remove infrastructure not required for the post-decommissioning use of the site.
- Rehabilitate and monitor areas for vegetation cover post-decommissioning and implement remedial actions

Cumulative Impacts:

As the proposed project is unlikely to be visible to the Silver Waters Private Nature Reserve, it will have a negligible contribution to an overall cumulative impact of low significance.

See Appendix IV.

Residual Impacts:

The residual risk relates to loss of natural vegetation cover being obvious on decommissioning of the proposed project. It is therefore critical that effective rehabilitation is undertaken.

7.3.6 Glare Impacts.

Nature of impact:

There are two areas where glare could be a concern to receptors, including:

a) Travellers on the R35; and
b) Travellers on adjacent local roads.

The potentially affected section of the R35 is approximately 4km from the proposed array. Should the road be affected by glare, due to the road alignment, it is only likely to be visible in the peripheral vison of a vehicle driver. It is therefore unlikely to be a concern for road safety. If it should prove problematic, screen fencing / planting on the western edge of Solar PV area 3 will be sufficient to mitigate the impact.

	Without mitigation	**With mitigation**
Extent	Site and immediate surroundings, **(2)**	Site and immediate surroundings, **(2)**

Duration	Long term, **(4)**	Long term, **(4)**
Magnitude	Small, **(0)**	Small, **(0)**
Probability	Very Improbable, **(1)**	Very Improbable, **(1)**
Significance	Low, **(6)**	Low, **(6)**
Status	**Negative**	**Negative**
Reversibility	High	High
Irreplaceable loss	**no irreplaceable loss**.	**No irreplaceable loss.**
Can impacts be mitigated?	Yes	

Mitigation / Management:
Operations:

- Should glare prove problematic which is more likely with a tracking system, the trackers need to be programmed to prevent early morning reflection towards the roads.

Cumulative Impacts:
The impact of glare arising from the proposed project is unlikely. The impact of glare from other solar projects in the vicinity is also highly unlikely.

The project was therefore assessed as being likely to have a cumulative contribution of low significance to and overall cumulative impact of low significance.

See appendix IV.

Residual Impacts:
There are no residual risks.

7.3.7 The potential visual impact of operational, safety and security lighting of the facility at night on observers.

Nature of impact:
The facility could be lit by security lights to a level sufficient to ensure that security cameras can operate at night. This is likely to result in the array being obvious at night from surrounding areas.
The area is relatively dark during the night. Obvious lighting includes:

- Other industrial operations that are some distance away;
- Urban areas that are also some distance away; and
- Occasional lighting from homesteads.

There is potential therefore for lighting to make the project obvious in the landscape at night.

The most sensitive receptors to this effect are likely to be the Private Nature Reserves.

	Without mitigation	**With mitigation**
Extent	Region **(3)**	Site **(1)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Low **(4)**	Small to minor **(1)**
Probability	Probable **(3)**	Improbable **(2)**
Significance	Medium **(33)**	Low **(12)**

Status	**Negative**	If the lights are generally not visible then the occasional light is unlikely to be seen as negative. **Neutral**
Irreplaceable loss	It would be possible to change the lighting / camera system so the impact cannot be seen as an irreplaceable loss.	No irreplaceable loss
Reversibility	High	High
Can impacts be mitigated?	Yes	

Mitigation / Management:

- Use low key lighting around buildings and operational areas that is triggered only when people are present.
- Plan to utilise infra-red security systems or motion sensor triggered security lighting.
- Ensure that lighting is focused on the development with no light spillage outside the site.
- No tall mast lighting should be used.

Cumulative Impact:

There are no other large lit facilities in the vicinity of the proposed development. Lighting levels are therefore relatively low.

Without mitigation, it is possible that the project could result in a significant cumulative increase to existing lighting levels.

However, with mitigation lighting levels under normal circumstances will appear similar to existing lighting associated with local homesteads. This will result in a small contribution to low cumulative lighting levels.

See appendix IV.

Residual Impacts:

No residual risk has been identified.

8 IMPACT STATEMENT

8.1 VISIBILITY

The natural grain of the landform is formed by small ridgelines that run approximately east to west.

The limited height of the bulk of the proposed development helps to limit visibility which means that these minor ridgelines play a significant role in screening the development.

The analysis also indicates that:

The assessment indicates the following:

i. The proposed array and substation are likely to be visible over similar areas;
ii. Views of the proposed array and the substation will be significantly constrained by ridgelines, they are both likely to be mainly visible to the northern section of the project area. to the north and east by a relatively continuous minor ridgeline.
iii. Neither the proposed substation nor the solar array will be visible from an urban area;
iv. Neither the proposed substation or the solar array will be visible from the N17 or the R39;
v. Both the proposed substation or the solar array may be visible from a short section of the R35 (approximately 6.4km);
vi. Both the proposed substation and solar array could be visible to up to 28 homesteads, the closest being from a distance of approximately 1km;
vii. Both the proposed substation and solar array could be visible from the Silver Waters private nature reserve;
viii. Both the proposed substation and solar array are likely to be visible to unsurfaced roads within the ZTV.

As indicated previously, the ZTV analysis is based on landform only. Visibility is likely to be modified by vegetation.

From the site visit it was obvious that the extent to which the project will be visible to the R35, and local roads and homesteads will be significantly lower than indicated.

It was also obvious that the proposed development is unlikely to be visible from Silver Waters private nature reserve due to screening vegetation.

8.2 LANDSCAPE CHARACTER AREAS AND VISUAL ABSORPTION CAPACITY

The affected landscape can generally be divided into the following LCAs:

Rural Landscape Areas. This is the type of landscape that dominates the affected landscape. It is typified by relatively uniform rolling topography that is covered by a matrix of arable agriculture set in a framework natural grassland.

Due to the relatively low topography, and generally low vegetation, it is an open landscape over which long views are possible particularly when the viewer is located on the summit of a ridgeline.

Within this general pattern homesteads are located that are made obvious due to their associated alien and ornamental vegetation.

There are also stands of alien trees many of which are Eucalyptus that are largely located along property boundaries and unused agricultural land.

The rolling topography generally provides a large degree of VAC particularly for relatively low development such as the proposed array.

Urban Landscape Areas those are generally densely developed residential areas with small commercial areas. There are also small areas of industry also associated with urban areas. VAC is generally high, with views of the surrounding landscape generally only possible from urban edges.

Industrial Landscape Areas Mpumalanga is known for its mining industry as well as other heavy industrial operations. These industries generally create their own visual presence that can over-ride surrounding characteristics. The closest large scale mining / industrial operation is Tutuka Power Station which has the New Denmark Coat Mine immediately to the north of it from which is fed coal by conveyor belt.

8.3 VISUAL RECEPTORS

This section is intended to highlight possible Receptors within the landscape which due to use could be sensitive to landscape change.

- Area Receptors may include;
    - The towns of **Bethal and Morgenzon;**
    - The **Silver Water Reserve**; and
    - The Protected Area of **Rietvlei Nature Reserve**.

- Point Receptors that include;
    - There are a number of **Local Farmsteads and Homesteads** located both within the focus area and the surrounding landscape.

- Linear Receptors or routes through the area that include;
    - **The N17, the R35, the R38 and the R39 as well as the unsurfaced local roads that that run through the study area.** All of these are used mainly by local people with little tourism / recreational importance.

8.4 Impacts

8.4.1 Landscape Impacts

The proposed solar project is located within a landscape area with an overriding rural character.

The character of the affected area is relatively typical within the region.

The proposed development areas are relatively hidden from possible receptors.

Other large scale industrial operations including mining operations and power stations are relatively obvious in the region.

Whilst the proposed project will create a new large scale industrial operation and change the character of an area of rural landscape, this is not entirely out of character with the region.

The impact was assessed as having a Low Negative Significance.

8.4.2 Views from Local Main Roads

The low nature of the majority of the proposed development combined with surrounding rolling topography with low, relatively regular ridgelines will mean that the solar PV areas and the on-site substation will be screened from a large proportion of surrounding areas.

In terms of main roads, the proposed PV section of the project is only likely to be visible to a relatively short section of the R35. It is highly unlikely to be visually obvious to either the N17 or the R39.

The impact was assessed as having a Low Negative Significance.

8.4.3 Views from Local Unsurfaced Minor Roads

The low nature of the majority of the proposed development combined with surrounding rolling topography with low, relatively regular ridgelines will mean that the solar PV areas and the on-site substation will be screened from a large proportion of surrounding areas.

There are several unsurfaced roads that run close to the proposed solar PV areas, they are therefore likely to be more highly impacted than main roads. Whilst some sections of roads are important for local recreation and tourism, the relatively low numbers of vehicles makes the impacts relatively less significant.

The impact was assessed as having a Low Negative Significance.

8.4.4 Views from Local Agricultural Homesteads

The ZTV analysis indicates that the array and substation could be visible to up to 28 homesteads within the ALV, the two closest being within 1km of the site.

Most homesteads are located amongst trees which will help screen views.

Whilst the proposed project is likely to be visually obvious to a number of people living in these homesteads, it is unlikely to dominate the view totally as views will have a significant agricultural content.

It is also likely that the majority of residents of agricultural homesteads will be more concerned with the productivity of the land rather than the view.

The impact was assessed as having a Medium Negative Significance without mitigation and a Low Significance after mitigation.

8.4.5 Views from Private Nature Reserves (Silver Waters)

The Silver Waters Nature Reserve is primarily a local tourism facility offering accommodation in tranquil surroundings around a large dam. The view from the area towards the proposed development is relatively well screened by existing vegetation comprising of groups of large trees.

It is possible that a glimpse of the project could be possible from close to the screening trees, however, the project is still unlikely to be obvious.

The impact was assessed as having a Low Neutral Significance.

8.4.6 Glare

There are two areas where glare could be a concern to receptors, including:

a) Travellers on the R35; and
b) Travellers on adjacent local roads

The potentially affected section of the R35 is approximately 4km from the proposed array. Should the road be affected by glare, due to the road alignment, it is only likely to be visible in the peripheral vison of a vehicle driver. It is therefore unlikely to be a concern for road safety. If it should prove problematic, screen fencing / planting on the western edge of Solar PV area 3 will be sufficient to mitigate the impact.

The impact was assessed as having a Low Negative Significance.

8.4.7 Lighting

The facility could be lit by security lights to a level sufficient to ensure that security cameras can operate at night. This is likely to result in the array being obvious at night from surrounding areas.
The area is relatively dark during the night. Obvious lighting includes:

- Other industrial operations that are some distance away;
- Urban areas that are also some distance away; and
- Occasional lighting from homesteads.

There is potential therefore for lighting to make the project obvious in the landscape at night. The most sensitive receptors to this effect are likely to be the Private Nature Reserves.

The impact was assessed as having a Medium Negative Significance without mitigation and a Low Significance after mitigation.

8.5 CUMULATIVE IMPACTS

The proposed project will result in loss of rural landscape. However, it will not change the character of the broader landscape that is generally comprised of islands of large scale industrial operations surrounded by extensive rural areas.

Because the project is relatively screened from most receptors it is also unlikely to significantly increase receptors exposure to industrial development. The cumulative contribution of the proposed project to industrialisation of the landscape was therefore generally assessed as having a low significance with the overall cumulative impacts assessed as having a medium significance.

It should be noted that other renewable energy projects are also proposed within the Ummbila Project Area including a large windfarm. This will create a significant degree of potential industrialisation in the vicinity of the solar PV project. This is also in keeping with the regional landscape character which is typified by islands of large scale industry within the setting of contiguous rural landscape. It is therefore likely to locally increase overall cumulative impacts to a high significance.

8.6 CONCLUSION

The proposed project will generally result in a relatively limited level of visual impact.

In general terms therefore the proposed project is in keeping with its surroundings and will not impact significantly on receptors that are likely to be sensitive to landscape change associated with the project.

Subject to mitigation measures being undertaken, from a Landscape and Visual Impact perspective, there is no reason why the proposed project cannot be authorised.

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APPENDIX I

SPECIALIST'S BRIEF CV

Name	JONATHAN MARSHALL
Nationality	British
Year of Birth	1956
Specialisation	Landscape Architecture / Landscape & Visual Impact Assessment / Environmental Planning / Environmental Impact Assessment.
Qualifications	
Education	Diploma in Landscape Architecture, Gloucestershire College of Art and Design, UK (1979) Environmental Law, University of KZN (1997)
Professional	Registered Professional Landscape Architect (SACLAP) Chartered Member of the Landscape Institute (UK) Member of the International Association of Impact Assessment, South Africa
Languages	English - Speaking - Excellent - Reading - Excellent - Writing - Excellent
Contact Details	Post: 13 Askew Grove Glenwood Durban 4001 Cell: +27 83 7032995

General

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

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

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

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

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

Select List of Visual Impact Assessment Projects

- **Coega Power Ship** – Landscape and Visual Impact Assessment for the proposed Coega Power Ship project in the Eastern Cape Province.
- **Saldanha Power Ship** - Landscape and Visual Impact Assessment for the proposed Coega Power Ship project in the Western Cape Province.
- **Modderfontein Wind Energy Facility** - Landscape and Visual Impact Assessment for a proposed amendment to the layout and wind turbine specification of a previously authorised project near Beaufort West.
- **Western Cape Wind Energy Facility** – Due diligence assessment for a proposed wind energy facility near Swellendam in the Western Cape Province.
- **Hyperion Thermal Generation Facility** - Landscape and Visual Impact Assessment for a proposed gas powered power generation plant near Kathu in the Northern Cape Province.
- **Beachfront House on ERF 766 Scarborough -** Landscape and Visual Impact Assessment for a proposed development of beachfront house on the edge of the Table Mountain National Park in Scarbourough, Western Cape Province.
- **Springs Special Economic Zone -** Landscape and Visual Impact Assessment for the proposed Springs SEZ in the Gauteng Province.
- **Makapanstad Agri- Hub –** Landscape and Visual Impact Assessment for proposed Agri-Hub development at Makapanstad in the North West Province for the Department of Rural Development and Land Reform.
- **Madikwe Sky Bubble -** Landscape and Visual Impact Assessment for proposed development of up-market accommodation at the Molori concession within the Madikwe Game Reserve.
- **Hartebeest Wind Energy Facility** – Landscape and Visual Impact Assessment Addendum Report for the proposed upgrading of turbine specifications for an authorised WEF near Mo0rreesburg in the Western Cape Province for a private client.
- **Selati Railway Bridge** - Landscape and Visual Impact Assessment for proposed development of up-market accommodation on a railway bridge at Skukuza in the Kruger Park.
- **Kangala Mine Extension -** Landscape and Visual Impact Assessment for a proposed extension to the Kangala Mine in Mpumalanga for Universal Coal.
- **Khunab Solar Developments** – Landscape and Visual Impact Assessment for four proposed solar PV projects near Upington in the Northern Cape Province for a private client.
- **Sirius Solar Developments** – Landscape and Visual Impact Assessment for four proposed solar PV projects near Upington in the Northern Cape Province for Sola Future Energy.
- **Aggeneys Solar Developments** – Landscape and Visual Impact Assessment for two proposed solar PV projects near Aggeneys in the Northern Cape Province for a private client.
- **Hyperion Solar Developments** – Landscape and Visual Impact Assessment for four proposed solar PV projects near Kathu in the Northern Cape Province for Building Energy South Africa.
- **Eskom Combined Cycle Power Plant** - Landscape and Visual Impact Assessment for proposed gas power plant in Richards Bay, KwaZulu Natal Province.
- **N2 Wild Coast Toll Road, Mineral Sources and Auxiliary Roads – L**VIA for the Pondoland Section of this project for the South African National Roads Agency.
- **Mpushini Park Ashburton –** LVIA for a proposed amendment to an authorised development plan which included residential, office park and light industrial uses to logistics and warehousing.
- **Moedeng PV Solar Project -** LVIA for a solar project near Vryburg in the North West Province for a private client.
- **Establishment of Upmarket Tourism Accommodation on the Selati Bridge, Kruger National Park** – Assessment of visual implications of providing tourism accommodation in 12 railway carriages on an

existing railway bridge at the Skukuza Rest Camp in the Kruger Park.

- **Jozini TX Transmission Tower** – Assessment of visual implications of a proposed MTN transmission tower on the Lebombo ridgeline overlooking the Pongolapoort Nature reserve and dam.
- **Bhangazi Lake Development** – LVIA for a proposed tourism development within the iSimangaliso Wetlend Park World Heritage Site.
- **Palesa Power Station** - LVIA for a new 600MW power station near Kwamhlanga in Mpumalanga for a private client.
- **Heuningklip PV Solar Project** – LVIA for a solar project in the Western Cape Province for a private client.
- **Kruispad PV Solar Project** – LVIA for a solar project in the Western Cape Province for a private client.
- **Doornfontein PV Solar Project** – LVIA for a solar project in the Western Cape Province for a private client.
- **Olifantshoek Power Line and Substation** – LVIA for a new 10MVA 132/11kV substation and 31km powerline, Northern Cape Province, for Eskom.
- **Noupoort Concentrating Solar Plants -** Scoping and LVIAs for two proposed parabolic trough projects.
- **Drakensberg Cable Car –** Preliminary LVIA and draft terms of reference as part of the feasibility study.
- **Paulputs Concentrating Solar Plant (tower technology)** – LVIA for a new CSP project near Pofadder in the Northern Cape.
- **Ilanga Concentrating Solar Plants 1, 2, 3, 4 & 5** – Scoping and LVIAs for the proposed extension of five authorised CSP projects including parabolic trough and tower technology within the Karoshoek Solar Valley near Upington in the Northern Cape.
- **Ilanga Concentrating Solar Plants 1, 2, 3, 4 & 5 Shared Infrastructure** –LVIA for the necessary shared infrastructure including power lines, substation, water pipeline and roads for these projects.
- **Ilanga Concentrating Solar Plants 7, 8 & 9** - Scoping and LVIAs for three new CSP projects including parabolic trough and tower technology within the Karoshoek Solar Valley near Upington in the Northern Cape.
- **Sol Invictus Solar Plants** - Scoping and LVIAs for three new Solar PV projects near Pofadder in the Northern Cape.
- **Gunstfontein Wind Energy Facility** – Scoping and LVIA for a proposed WEF near Sutherland in the Northern Cape.
- **Moorreeesburg Wind Energy Facility** – LVIA for a proposed WEF near Moorreeesburg in the Western Cape.
- **Semonkong Wind Energy Facility** - LVIA for a proposed WEF near Semonkong in Southern Lesotho.
- **Great Karoo Wind Energy Facility** – Addendum report to the Visual Impact Assessment Report for amendment to this authorised WEF that is located near Sutherland in the Northern Cape. Proposed amendments included layout as well as rotor diameter.
- **Perdekraal East Power Line** – LVIA for a proposed power line to evacuate power from a wind energy facility near Sutherland in the Northern Cape.
- **Tshivhaso Power Station** – Scoping and LVIA for a proposed new power station near Lephalale in Limpopo Province.
- **Saldanha Eskom Strengthening** – Scoping and LVIA for the upgrading of strategic Eskom infrastructure near Saldanha in the Western Cape.
- **Eskom Lethabo PV Installation** - Scoping and LVIA for the development of a solar PV plant within Eskom's Lethabo Power Station in the Free State.
- **Eskom Tuthuka PV Installation** - Scoping and LVIA for the development of a solar PV plant within Eskom's Thutuka Power Station in Mpumalanga.

- **Eskom Majuba PV Installation** - Scoping and LVIA for the development of a solar PV plant within Eskom's Majuba Power Station in Mpumalanga.
- **Golden Valley Power Line** - LVIA for a proposed power line to evacuate power from a wind energy facility near Cookhouse in the Eastern Cape.
- **Mpophomeni Shopping Centre** – LVIA for a proposed new shopping centre close to the southern shore of Midmar Dam in KwaZulu Natal.
- **Rheeboksfontein Power Line** - Addendum report to the Visual Impact Assessment Report for amendment to this authorised power line alignment located near Darling in the Western Cape.
- **Woodhouse Solar Plants** – Scoping and LVIA for two proposed solar PV projects near Vryburg in the North West Province.
- **AngloGold Ashanti, Dokyiwa (Ghana)** – LVIA for proposed new Tailings Storage Facility at a mine site working with SGS as part of their EIA team.
- **Gateway Shopping Centre Extension (Durban)** – LVIA for a proposed shopping centre extension in Umhlanga, Durban.
- **Kouroussa Gold Mine (Guinea)** – LVIA for a proposed new mine in Guinea working with SGS as part of their EIA team.
- **Mampon Gold Mine (Ghana)** - LVIA for a proposed new mine in Ghana working with SGS as part of their EIA team.
- **Telkom Towers** – LVIAs for numerous Telkom masts in KwaZulu Natal.
- **Eskom Isundu Substation** – LVIA for a proposed major new Eskom substation near Pietermaritzburg in KwaZulu Natal.
- **Eskom St Faiths Power Line and Substation** – LVIA for a major new substation and associated power lines near Port Shepstone in KwaZulu Natal.
- **Eskom Ficksburg Power Line** – LVIA for a proposed new power line between Ficksburg and Cocolan in the Free State.
- **Eskom Matubatuba to St Lucia Power Line** – LVIA for a proposed new power line between Mtubatuba and St Lucia in KwaZulu Natal.
- **Dube Trade Port, Durban International Airport** – Landscape & Visual Impact Assessment.
- **Sibaya Precinct Plan** – LVIA as part of Environmental Impact Assessment for a major new development area to the north of Durban.
- **Umdloti Housing** – LVIA as part of Environmental Impact Assessment for a residential development beside the Umdloti Lagoon to the north of Durban.
- **Tata Steel Ferrochrome Smelter** - LVIA of proposed new Ferrochrome Smelter in Richards Bay as part of EIA undertaken by the CSIR.
- **Durban Solid Waste Large Landfill Sites –** LVIAs of proposed development sites to the North and South of the Durban Metropolitan Area. The project utilised 3d computer visualisation techniques.
- **Hillside Aluminium Smelter, Richards Bay -** LVIA of proposed extension of the existing smelter. The project utilised 3d computer visualisation techniques.
- **Estuaries of KwaZulu Natal Phase 1 –** Visual character assessment and GIS mapping as part of a review of the condition and development capacity of eight estuary landscapes for the Town and Regional Planning Commission. The project was extended to include all estuaries in KwaZulu Natal.
- **Signage Assessments** – Numerous impact assessments for proposed signage developments for Blast Media.
- **Signage Strategy** – Preparation of an environmental strategy report for a national advertising campaign on National Roads for Visual Image Placements.
- **Zeekoegatt, Durban** - EDP acted as advisor to the Province of KwaZulu Natal in an appeal brought

about by a developer to extend a light industrial development within a 60 metre building line from the National N3 Highway.

- **La Lucia Mall Extension** - LVIA using three dimensional computer modelling / photo realistic rendering and montage techniques for proposed extension to shopping mall for public consultation exercise.
- **Redhill Industrial Development** - LVIA assessment using three dimensional computer modelling / photo realistic rendering and montage techniques for proposed new industrial area for public consultation exercise.
- **Avondale Reservoir** - LVIA using three dimensional computer modelling / photo realistic rendering and montage techniques for proposed hilltop reservoir as part of Environmental Impact Assessment for Umgeni Water.
- **Hammersdale Reservoir** - LVIA using three dimensional computer modelling / photo realistic rendering and montage techniques for proposed hilltop reservoir as part of Environmental Impact Assessment for Umgeni Water.
- **Southgate Industrial Park, Durban** - LVIA and Landscape Design for AECI.
- **Sainsbury's Bryn Rhos** - Computer Aided Landscape & Visual Impact Assessment/ Planning Application for the development of a new store within the Green Wedge North of Swansea.
- **Ynyston Farm Access** - Computer Aided Landscape & Impact Assessment of visual intrusion of access road to proposed development of Cardiff for the Land Authority for Wales.
- **Cardiff Bay Barrage** – Preparation of the Visual Impact Statement for inclusion in the Impact Statement for debate by parliament (UK) prior to the passing of the Cardiff Bay Barrage Bill.
- **A470, Cefn Coed to Pentrebach** - Preparation of landscape frameworks for the assessment of the impact of the proposed alignment on the landscape for The Welsh Office.
- **Sparkford to Illchester Bye Pass** - The preparation of the landscape framework and the draft landscape plan for the Department of Transport.
- **Green Island Reclamation Study** - Visual Impact Assessment of building massing, Urban Design Guidelines and Masterplanning for a New Town extension to Hong Kong Island.
- **Route 3** - Visual Impact Assessment for alternative road alignments between Hong Kong Island and the Chinese Border.
- **China Border Link** - Visual Impact Assessment and initial Landscape Design for a new border crossing at Lok Ma Chau.
- **Route 81, Aberdeen Tunnel to Stanley** - Visual Impact Assessment for alternative highway alignments on the South side of Hong Kong Island.

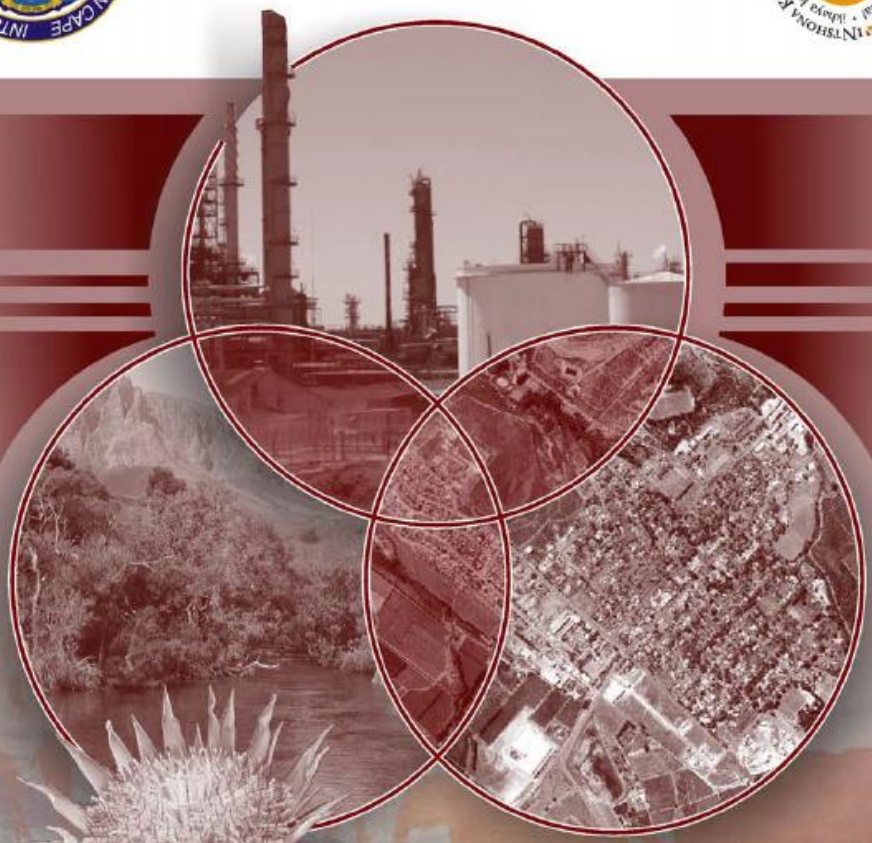
APPENDIX II

GUIDELINES FOR INVOLVING VISUAL AND AESTHETIC SPECIALISTS IN EIA PROCESSES

(Preface, Summary and Contents for full document go to the Provincial Government of the Western Cape, Department of Environmental Affairs and Development Planning web site, http://eadp.westerncape.gov.za/your-resource-library/policies-guidelines)

GUIDELINE FOR INVOLVING VISUAL AND AESTHETIC SPECIALISTS IN EIA PROCESSES

PROVINCIAL GOVERNMENT OF THE WESTERN CAPE:
DEPARTMENT OF ENVIRONMENTAL AFFAIRS
AND DEVELOPMENT PLANNING



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CSIR

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GUIDELINE FOR INVOLVING VISUAL AND AESTHETIC SPECIALISTS IN EIA PROCESSES

Edition 1

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Stakeholders engaged in the guideline development process:

These guidelines were developed through a consultative process and have benefited from the inputs and comments provided by a wide range of individuals and organizations actively working to improve EIA practice. Thanks are due to all who took the time to engage in the guideline development process.

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Finalisation of report figures and formatting:

Magdel van der Merwe and Elna Logie, DTP Solutions

PREFACE

The purpose of an Environmental Impact Assessment (EIA) is to provide decision-makers (be they government authorities, the project proponent or financial institutions) with adequate and appropriate information about the potential positive and negative impacts of a proposed development and associated management actions in order to make an informed decision whether or not to approve, proceed with or finance the development.

For EIA processes to retain their role and usefulness in supporting decision-making, the involvement of specialists in EIA needs to be improved in order to:

- Add greater value to project planning and design;
- Adequately evaluate reasonable alternatives;
- Accurately predict and assess potential project benefits and negative impacts;
- Provide practical recommendations for avoiding or adequately managing negative impacts and enhancing benefits;
- Supply enough relevant information at the most appropriate stage of the EIA process to address adequately the key issues and concerns, and effectively inform decision-making in support of sustainable development.

It is important to note that not all EIA processes require specialist input; broadly speaking, specialist involvement is needed when the environment could be significantly affected by the proposed activity, where that environment is valued by or important to society, and/or where there is insufficient information to determine whether or not unavoidable impacts would be significant.

The purpose of this series of guidelines is to improve the efficiency, effectiveness and quality of specialist involvement in EIA processes. The guidelines aim to improve the capacity of roleplayers to anticipate, request, plan, review and discuss specialist involvement in EIA processes. Specifically, they aim to improve the capacity of EIA practitioners to draft appropriate terms of reference for specialist input and assist all roleplayers in evaluating whether or not specialist input to the EIA process is appropriate for the type of development and environmental context. Furthermore, they aim to ensure that specialist inputs support the development of effective, practical Environmental Management Plans where projects are authorised to proceed (refer to *Guideline for Environmental Management Plans*).

The guidelines draw on best practice in EIA in general, and within specialist fields of expertise in particular, to address the following issues related to the timing, scope and quality of specialist input. The terms "specialist involvement" and "input" have been used in preference to "specialist assessment" and "studies" to indicate that the scope of specialists' contribution (if required) depends on the nature of the project, the environmental context and the amount of available information and does not always entail detailed studies or assessment of impacts.

The guidelines draw on best practice in EIA in general, and within specialist fields of expertise in particular, to address the following issues related to the timing, scope and quality of specialist input. The terms "specialist involvement" and "input" have been used in preference to "specialist

assessment" and "studies" to indicate that the scope of specialists' contribution depends on the nature of the project, the environmental context and the amount of available information.

	ISSUES
TIMING	▪ When should specialists be involved in the EIA process; i.e. at what stage in the EIA process should specialists be involved (if at all) and what triggers the need for their input?
SCOPE	▪ Which aspects must be addressed through specialist involvement; i.e. what is the purpose and scope of specialist involvement? ▪ What are appropriate approaches that specialists can employ? ▪ What qualifications, skills and experience are required?
QUALITY	▪ What triggers the review of specialist studies by different roleplayers? ▪ What are the review criteria against which specialist inputs can be evaluated to ensure that they meet minimum requirements, are reasonable, objective and professionally sound?

The following guidelines form part of this first series of guidelines for involving specialists in EIA processes:

- Guideline for determining the scope of specialist involvement in EIA processes
- Guideline for the review of specialist input in EIA processes
- Guideline for involving biodiversity specialists in EIA processes
- Guideline for involving hydrogeologists in EIA processes
- Guideline for involving visual and aesthetic specialists in EIA processes
- Guideline for involving heritage specialists in EIA processes
- Guideline for involving economists in EIA processes

The *Guideline for determining the scope of specialist involvement in EIA processes* and the *Guideline for the review of specialist input in EIA processes* provide generic guidance applicable to any specialist input to the EIA process and clarify the roles and responsibilities of the different roleplayers involved in the scoping and review of specialist input. It is recommended that these two guidelines are read first to introduce the generic concepts underpinning the guidelines which are focused on specific specialist disciplines.

Who is the target audience for these guidelines?

The guidelines are directed at authorities, EIA practitioners, specialists, proponents, financial institutions and other interested and affected parties involved in EIA processes. Although the guidelines have been developed with specific reference to the Western Cape province of South Africa, their core elements are more widely applicable.

What type of environmental assessment processes and developments are these guidelines applicable to?

The guidelines have been developed to support project-level EIA processes regardless of whether they are used during the early project planning phase to inform planning and design decisions (i.e. during pre-application planning) or as part of a legally defined EIA process to obtain statutory approval for a proposed project (i.e. during screening, scoping and/or impact assessment). Where specialist input may be required the guidelines promote early, focused and appropriate involvement of specialists in EIA processes in order to encourage proactive consideration of potentially significant impacts, so that negative impacts may be avoided or

effectively managed and benefits enhanced through due consideration of alternatives and changes to the project.

The guidelines aim to be applicable to a range of types and scales of development, as well as different biophysical, social, economic and governance contexts.

What will these guidelines not do?

In order to retain their relevance in the context of changing legislation, the guidelines promote the principles of EIA best practice without being tied to specific legislated national or provincial EIA terms and requirements. They therefore do not clarify the specific administrative, procedural or reporting requirements and timeframes for applications to obtain statutory approval. They should, therefore, be read in conjunction with the applicable legislation, regulations and procedural guidelines to ensure that mandatory requirements are met.

It is widely recognized that no amount of theoretical information on how best to plan and coordinate specialist inputs, or to provide or review specialist input, can replace the value of practical experience of coordinating, being responsible for and/or reviewing specialist inputs. Only such experience can develop sound judgment on such issues as the level of detail needed or expected from specialists to inform decision-makers adequately. For this reason, the guidelines should not be viewed as prescriptive and inflexible documents. Their intention is to provide best practice guidance to improve the quality of specialist input.

Furthermore, the guidelines do not intend to create experts out of non-specialists. Although the guidelines outline broad approaches that are available to the specialist discipline (e.g. field survey, desktop review, consultation, modeling), specific methods (e.g. the type of model or sampling technique to be used) cannot be prescribed. The guidelines should therefore not be used indiscriminately without due consideration of the particular context and circumstances within which an EIA is undertaken, as this influences both the approach and the methods available and used by specialists.

How are these guidelines structured?

The specialist guidelines have been structured to make them user-friendly. They are divided into six parts, as follows:

- **Part A**: Background;
- **Part B**: Triggers and key issues potentially requiring specialist input;
- **Part C**: Planning and coordination of specialist inputs (drawing up terms of reference);
- **Part D**: Providing specialist input;
- **Part E**: Review of specialist input; and
- **Part F**: References.

Part A provides grounding in the specialist subject matter for all users. It is expected that authorities and peer reviewers will make most use of Parts B and E; EIA practitioners and project proponents Parts B, C and E; specialists Part C and D; and other stakeholders Parts B, D and E. Part F gives useful sources of information for those who wish to explore the specialist topic.

SUMMARY

This guideline document, which deals with specialist visual input into the EIA process, is organised into a sequence of interleading sections. These follow a logical order covering the following:

- the background and context for specialist visual input;
- the triggers and issues that determine the need for visual input;
- the type of skills and scope of visual inputs required in the EIA process;
- the methodology, along with information and steps required for visual input;
- finally, the review or evaluation of the visual assessment process.

Part A is concerned with defining the visual and aesthetic component of the environment, and with principles and concepts relating to the visual assessment process. The importance of the process being logical, holistic, transparent and consistent is stressed in order for the input to be useful and credible.

The legal and planning context within which visual assessments take place indicate that there are already a number of laws and bylaws that protect visual and scenic resources. These resources within the Western Cape context have importance for the economy of the region, along with the proclaimed World Heritage Sites in the Province.

The role and timing of specialist visual inputs into the EIA process are outlined, with the emphasis being on timely, and on appropriate level of input, from the early planning stage of a project, through to detailed mitigation measures and management controls at the implementation stage.

Part B deals with typical factors that trigger the need for specialist visual input to a particular project. These factors typically relate to:

(a) the nature of the receiving environment, in particular its visual sensitivity or protection status;
(b) the nature of the project, in particular the scale or intensity of the project, which would result in change to the landscape or townscape.

The correlation between these two aspects are shown in a table, in order to determine the varying levels of visual impact that can be expected, i.e. from little or no impact, to very high visual impact potential.

Part C deals with the choice of an appropriate visual specialist, and the preparation of the terms of reference (TOR) for the visual input. Three types of visual assessment are put forward, each requiring different expertise, namely:
Type A: assessments involving large areas of natural or rural landscape;
Type B: assessments involving local areas of mainly built environment;
Type C: assessments involving smaller scale sites with buildings, or groups of buildings.

The scope of the visual input would in summary relate to the following:

- the issues raised during the scoping process;
- the time and space boundaries, i.e. the extent or zone of visual influence;

- the types of development alternatives that are to be considered;
- the variables and scenarios that could affect the visual assessment;
- the inclusion of direct, indirect and cumulative effects.

Approaches to the visual input relate to the level of potential impact and range from minimal specialist input, to a full visual impact assessment (VIA). A list of the typical components of a visual assessment is given, and the integration with other studies forming part of the EIA process is discussed.

Part D provides guidance for specialist visual input, and on the information required by specialists. Notes on predicting potential visual impacts are given, along with suggested criteria for describing and rating visual impacts. The assessment of the overall significance of impacts, as well as thresholds of significance are discussed.

Further aspects that need to be considered by visual specialists in EIA processes include:

- affected parties who stand to benefit or lose,
- risks and uncertainties related to the project,
- assumptions that have been made, and their justification,
- levels of confidence in providing the visual input or assessment,
- management actions that can be employed to avoid or mitigate adverse effects and enhance benefits, and
- the best practicable environental option from the perspective of the visual issues and impacts.

Finally, pointers for the effective communication of the findings are given.

Part E lists specific evaluation criteria for reviewing visual input by a specialist, where this becomes necessary. Further guidance on this is given in the document on *Guideline for the review of specialist input in EIA processes.*

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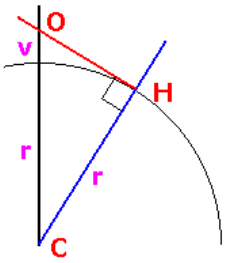
APPENDIX III

FORMULA FOR DERIVING THE APPROXIMATE VISUAL HORIZON

The Mathematics behind this Calculation

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

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



APPENDIX IV

CUMULATIVE IMPACT ASSESSMENT

CUMULATIVE IMPACTS

Cumulative visual impacts have considered the current impacts of **renewable energy and** electrical infrastructure **projects** as well as the future proposed development of other planned renewable energy projects and infrastructure development.

Proposed mitigation measures relate to mitigation necessary to minimise the cumulative contribution of the project under consideration only.

Note: where alternative viewpoint locations result in differing levels of impact, the worst case is indicated.

1) General cumulative change the in the character and sense of place of the landscape setting (Landscape Change).

Nature:
The proposed solar project is located within a landscape area with an overriding rural character.
Other large scale industrial operations including mining operations and power stations are relatively obvious in the region.
Whilst the proposed project will create a new large scale industrial operation and change the character of an area of rural landscape, this is not entirely out of character with the region.
It should be noted that other renewable energy projects are also proposed within the Ummbila Project Area including a large windfarm. This will create a significant degree of potential industrialisation in the vicinity of the solar PV project. This is also in keeping with the regional landscape character which is typified by islands of large scale industry within the setting of contiguous rural landscape. It is therefore likely to locally increase overall cumulative impacts to a high significance.

	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Site and immediate surroundings, **(2)**	Region **(3)**
Duration	Long term, **(4)**	Long term **(4)**
Magnitude	Low **(3)**	Low **(4)**
Probability	Probable, **(3)**	Definite, **(5)**
Significance	**Low, (27)**	**Medium (55)**
Status (positive or negative)	**Negative**	**Negative**
Reversibility	High	Low
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	**Yes,** Possible mitigation will not change the level of significance	Unknown

Mitigation:
Planning:
» Plan levels to minimise earthworks to ensure that levels are not elevated.
» Plan to maintain the height of structures as low as possible.
» Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development.

Operations:
» Reinstate any areas of vegetation that have been disturbed during construction.
» Remove all temporary works.
» Monitor rehabilitated areas post-construction and implement remedial actions.
» Minimise disturbance and maintain existing vegetation as far as is possible both within and surrounding the development area.

Decommissioning:
» Remove infrastructure not required for the post-decommissioning use of the site.
» Rehabilitate and monitor areas post-decommissioning and implement remedial actions.

2) The cumulative impact on views from main roads.

Nature:
the proposed PV section of the project is only likely to be visible to a relatively short section (6km) of the R35 from a distance of approximately 4km.

It is highly unlikely to be visually obvious to either the N17 or the R39.

It should be noted that other renewable energy projects are also proposed within the Ummbila Project Area including a large windfarm. This will create a significant degree of potential industrialisation in the vicinity of the solar PV project. This is also in keeping with the regional landscape character which is typified by islands of large scale industry within the setting of contiguous rural landscape. It is therefore likely to locally increase overall cumulative impacts to a high significance.

	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other industrial development in the area**
Extent	Site and immediate surroundings **(2)**	Region, **(3)**
Duration	Long term **(4)**	Long term, **(4)**
Magnitude	Minor **(0)**	Low, **(4)**
Probability	Improbable **(2)**	Definite, **(5)**
Significance	Low **(12)**	Medium, **(55)**
Status (positive or negative)	Negative	Negative
Reversibility	High	Low
Irreplaceable loss of resources?	No irreplaceable loss.	No irreplaceable loss.
Can impacts be mitigated?	**Yes** Possible mitigation will not change the level of significance.	Unknown

Mitigation:
Planning:
» Design /modify layout to keep PV panels off the low ridgeline on the south-west side of the site.
» Plan levels to minimise earthworks to ensure that levels are not elevated.
» Plan to maintain the height of structures as low as possible.
» Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development.

Operations:
» Reinstate any areas of vegetation that have been disturbed during construction.

» Remove all temporary works.
» Monitor rehabilitated areas post-construction and implement remedial actions.
» Minimise disturbance and maintain existing vegetation as far as is possible both within and surrounding the development area.
» Control the height of stored materials and the use of large equipment particularly within Laydown Area 3.

Decommissioning:

» Remove infrastructure not required for the post-decommissioning use of the site.
» Rehabilitate and monitor areas post-decommissioning and implement remedial actions

3) Cumulative impact on views from local unsurfaced roads.

Nature:
There are several unsurfaced roads that run close to the proposed solar PV areas. They are therefore likely to be more highly impacted than main roads. Whilst some sections of roads are important for local recreation and tourism, the relatively low numbers of vehicles make the impacts relatively less significant.

It should be noted that other renewable energy projects are also proposed within the Ummbila Project Area including a large windfarm. This will create a significant degree of potential industrialisation in the vicinity of the solar PV project. This is also in keeping with the regional landscape character which is typified by islands of large scale industry within the setting of contiguous rural landscape. It is therefore likely to locally increase overall cumulative impacts to a high significance.

	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other industrial development in the area**
Extent	Site and immediate surroundings **(2)**	Region, **(3)**
Duration	Long term **(4)**	Long term, **(4)**
Magnitude	Minor **(2)**	Low, **(4)**
Probability	Probable **(3)**	Definite, **(5)**
Significance	Low **(24)**	Medium, **(55)**
Status (positive or negative)	Negative	Negative
Reversibility	High	Low
Irreplaceable loss of resources?	No irreplaceable loss.	No irreplaceable loss.
Can impacts be mitigated?	**Yes** Possible mitigation will not change the level of significance.	Unknown

Mitigation:

Planning:

» Design /modify layout to keep PV panels off the low ridgeline on the south-west side of the site.
» Plan levels to minimise earthworks to ensure that levels are not elevated.
» Plan to maintain the height of structures as low as possible.
» Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development.

Operations:

» Reinstate any areas of vegetation that have been disturbed during construction.
» Remove all temporary works.
» Monitor rehabilitated areas post-construction and implement remedial actions.
» Minimise disturbance and maintain existing vegetation as far as is possible both within and surrounding the development area.
» Control the height of stored materials and the use of large equipment particularly within Laydown Area 3.

Decommissioning:
» Remove infrastructure not required for the post-decommissioning use of the site;
» Rehabilitate and monitor areas post-decommissioning and implement remedial actions

4 Cumulative impact on local homesteads

Nature:

Visual impacts of the proposed infrastructure on homesteads were assessed as having a low significance. From the majority of affected homesteads other industrial development is unlikely to be obvious. However, because views of major electrical infrastructure are likely to be obvious from a proportion of homesteads in the area the impact is assessed as medium.

It should be noted that other renewable energy projects are also proposed within the Ummbila Project Area including a large windfarm. This will create a significant degree of potential industrialisation in the vicinity of the solar PV project. This is also in keeping with the regional landscape character which is typified by islands of large scale industry within the setting of contiguous rural landscape. It is therefore likely to locally increase overall cumulative impacts to a high significance.

	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Site and immediate surroundings **(2)**	Region, **(3)**
Duration	Long term **(4)**	Long term, **(4)**
Magnitude	Minor to Low **(3)**	Low, **(4)**
Probability	Probable **(3)**	Definite, **(5)**
Significance	Low **(27)**	Medium, **(55)**
Status (positive or negative)	negative	negative
Reversibility	Medium	Low
Irreplaceable loss of resources?	No irreplaceable loss	No irreplaceable loss
Can impacts be mitigated?	Yes	Unknown

Mitigation:

Planning:

- Design /modify layout to keep PV panels off the low ridgeline on the south-west side of the site.
- Plan levels to minimise earthworks to ensure that levels are not elevated.
- Plan to maintain the height of structures as low as possible.
- Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development.

Operations:

- Reinstate any areas of vegetation that have been disturbed during construction.
- Remove all temporary works.
- Monitor rehabilitated areas post-construction and implement remedial actions.
- Minimise disturbance and maintain existing vegetation as far as is possible both within and surrounding the development area.
- Control the height of stored materials and the use of large equipment particularly within Laydown Area 3.

Decommissioning:

- Remove infrastructure not required for the post-decommissioning use of the site.
  Rehabilitate and monitor areas post-decommissioning and implement remedial actions.

5 Cumulative impact on Private Reserves (Silver Waters)

Nature:
The proposed development is unlikely to be visible and will have negligible impact on Silver Waters.

No other major industry is visible from the Private Reserve.

It should be noted that other renewable energy projects are also proposed within the Ummbila Project Area including a large windfarm. This will create a significant degree of potential industrialisation in the vicinity of the solar PV project. This is also in keeping with the regional landscape character which is typified by islands of large scale industry within the setting of contiguous rural landscape. It is therefore likely to locally increase overall cumulative impacts to a high significance.

	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Site and immediate surroundings, **(2)**	Site and immediate surroundings, **(2)**
Duration	Long term, **(4)**	Long term, **(4)**
Magnitude	Small to Minor, **(1)**	Small to Minor, **(1)**
Probability	Very Improbable, **(1)**	Very Improbable, **(1)**
Significance	Low, **(7)**	Low, **(7)**
Status (positive or negative)	negative	negative
Reversibility	Medium	Low
Irreplaceable loss of resources?	No irreplaceable loss	No irreplaceable loss
Can impacts be mitigated?	Yes	Unknown
Mitigation: Planning:		

- Design /modify layout to keep PV panels off the low ridgeline on the south-west side of the site.
- Plan levels to minimise earthworks to ensure that levels are not elevated.
- Plan to maintain the height of structures as low as possible.
- Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development.

Operations:

- Reinstate any areas of vegetation that have been disturbed during construction.
- Remove all temporary works.
- Monitor rehabilitated areas post-construction and implement remedial actions.
- Minimise disturbance and maintain existing vegetation as far as is possible both within and surrounding the development area.
- Control the height of stored materials and the use of large equipment particularly within Laydown Area 3.

Decommissioning:

- Remove infrastructure not required for the post-decommissioning use of the site.
- Rehabilitate and monitor areas post-decommissioning and implement remedial actions.

6 Glare Impacts

Nature:

The impact of glare arising from the proposed project is highly unlikely.

It is possible that glare associated with other projects in the region could impact on roads. However, from experience within the region, the only other PV projects proposed within 30km are at Tutuka and Majuba Power Stations which are in excess of 25km from the proposed site.

The overall cumulative impact is assessed as having a low significance. The contribution of the proposed project to this cumulative impact is assessed as low.

	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Site and immediate surroundings, **(2)**	Region **(3)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Small, **(0)**	Small **(0)**
Probability	Very Improbable, **(1)**	Improbable **(2)**
Significance	Low **(6)**	Low **(14)**
Status (positive or negative)	negative	negative
Reversibility	High	High
Irreplaceable loss of resources?	No irreplaceable loss	No irreplaceable loss
Can impacts be mitigated?	Yes	Unknown

Mitigation:
Should glare prove problematic which is more likely with a tracking system. The trackers need to be programmed to prevent early morning reflection towards the roads.

5 Lighting Impacts

Nature:
There is small potential for security lighting and operational lighting associated with other industrial development to impact significantly on the area.

With mitigation the contribution of this project to possible cumulative impacts is likely to be of low significance.

	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Site **(1)**	Region **(3)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Small to minor **(1)**	Minor **(2)**
Probability	Improbable **(2)**	Probable **(3)**
Significance	Low **(12)**	Low **(27)**
Status (positive or negative)	negative	negative
Reversibility	High	High
Irreplaceable loss of resources?	No irreplaceable loss	No irreplaceable loss
Can impacts be mitigated?	Yes	Unknown

Mitigation:

- Use low key lighting around buildings and operational areas that is triggered only when people are present.
- Plan to utilise infra-red security systems or motion sensor triggered security lighting.
- Ensure that lighting is focused on the development with no light spillage outside the site.
- No tall mast lighting should be used.

APPENDIX V

ENVIRONMENTAL MANAGEMENT PLAN

Project component/s	Ummbila PV, Construction, Operation and Decommissioning
Potential Impact	Change in Landscape Character and the nature of stakeholder views: • Change in character and sense of place of the landscape setting; • Changing the nature of views from local roads; • Changing the nature of views from agricultural homesteads; • Changing the nature of views from Private Reserves; • Glare impacts; and • Lighting impacts.
Activity/risk source	• The proposed array and substation may be obvious from local roads, local homesteads and private reserves; • Glare impacts are unlikely but could affect the R35 and adjacent unsurfaced roads; • Engineered change in landform being obvious against natural contours; • Vegetation clearance and lack of rehabilitation during construction and decommissioning making the development more obvious particularly from a distance; • The development industrialising the outlook for stakeholders; and • Security lighting exacerbating light pollution;
Mitigation: Target/Objective	• Plan platforms and earthworks to blend into surrounding natural contours. • Minimise and reinstate vegetation loss. • Maintain and augment exiting surrounding natural vegetation in order to soften views of the development and maintain continuity with the surrounding natural landscape. • Remove structures and rehabilitate site to its natural condition on decommissioning. • Ensure PV panels use non reflective surfaces in order to minimise the potential for glint and glare. • Ensuring that under normal conditions, lighting appears similar to existing agricultural homesteads.

Mitigation: Action/control	**Responsibility** Contractor (C) Environmental Officer (EO) Environmental Liaison Officer (ELO)	**Timeframe** Construction Phase (C) Operational Phase (O) Decommissioning Phase (D)
Minimise disturbance and maintain existing vegetation as far as is possible both within and surrounding the development area.	C, EO	C
Reinstate any areas of vegetation that have been disturbed during construction.	C, EO	C

Maintain and augment vegetation within the area surrounding the development.	C, EO	D
Rehabilitate disturbed areas to their natural state on decommissioning.	C, EO	C, D
Monitor rehabilitated areas post-construction and post-decommissioning and implement remedial actions.	C, EO	D
Remove all temporary works.	C, EO	D
Remove infrastructure not required for the post-decommissioning use of the site.	C, EO	D
Plan lighting to utilise infra-red security systems or motion sensor triggered security lighting	C, EO	C, EO
Adjust trackers as necessary to minimise the risk of glare impacting on the R35	EO	EO
Design /modify layout to keep PV panels off the low ridgeline that runs across the central section of the site	EO	EO

Performance Indicators	Visibility of the PV array from the R35. Natural contours rather than rigid engineered land form. Vegetation presence and density. Visibility of the development from surrounding areas. Presence of unnecessary infrastructure. Lighting appearing similar to existing farmsteads under normal conditions
Monitoring	Evaluate visibility from the R35, adjacent unsurfaced roads and homesteads. Evaluate vegetation before, during and after construction. Evaluate vegetation growth and reinstatement during decommissioning and for a year thereafter. Evaluate lighting impacts. Evaluate glare impacts on the R35 and adjacent unsurfaced roads. Take regular time-line photographic evidence. Responsibility: EO and ELO. Prepare regular reports.

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APPENDIX I

ASSESSOR'S CURRICULUM VITAE

ENVIRONMENTAL PLANNING AND DESIGN

Name	JONATHAN MARSHALL
Nationality	British
Year of Birth	1956
Specialisation	Landscape Architecture / Landscape & Visual Impact Assessment / Environmental Planning / Environmental Impact Assessment.
Qualifications	
Education	Diploma in Landscape Architecture, Gloucestershire College of Art and Design, UK (1979) Environmental Law, University of KZN (1997)
Professional	Registered Professional Landscape Architect (SACLAP) Chartered Member of the Landscape Institute (UK) Member of the International Association of Impact Assessment, South Africa
Languages	English - Speaking - Excellent - Reading - Excellent - Writing - Excellent
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General

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

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

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

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

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

Select List of Visual Impact Assessment Projects

- **Geelkop Solar PV projects –** Landscape and Visual Impact Assessment for seven proposed solar PV projects near Upington in the Northern Cape Province for Atlantic Renewable Energy Partners.
- **Makapanstad Agri- Hub –** Landscape and Visual Impact Assessment for proposed Agri-Hub development at Makapanstad in the North West Province for the Department of Rural Development and Land Reform.
- **Madikwe Sky Bubble -** Landscape and Visual Impact Assessment for proposed development of up-market accommodation at the Molori concession within the Madikwe Game Reserve.
- **Hartebeest Wind Energy Facility** – Landscape and Visual Impact Assessment Addendum Report for the proposed upgrading of turbine specifications for an authorised WEF near Mo0rreesburg in the Western Cape Province for a private client.
- **Selati Railway Bridge** - Landscape and Visual Impact Assessment for proposed development of up-market accommodation on a railway bridge at Skukuza in the Kruger Park.
- **Kangala Mine Extension -** Landscape and Visual Impact Assessment for a proposed extension to the Kangala Mine in Mpumalanga for Universal Coal.
- **Khunab Solar Developments** – Landscape and Visual Impact Assessment for four proposed solar PV projects near Upington in the Northern Cape Province for a private client.
- **Sirius Solar Developments** – Landscape and Visual Impact Assessment for four proposed solar PV projects near Upington in the Northern Cape Province for Sola Future Energy.
- **Aggeneys Solar Developments** – Landscape and Visual Impact Assessment for two proposed solar PV projects near Aggeneys in the Northern Cape Province for a private client.
- **Hyperion Solar Developments** – Landscape and Visual Impact Assessment for four proposed solar PV projects near Kathu in the Northern Cape Province for Building Energy South Africa.
- **Eskom Combined Cycle Power Plant** - Landscape and Visual Impact Assessment for proposed gas power plant in Richards Bay, KwaZulu Natal Province.
- **N2 Wild Coast Toll Road, Mineral Sources and Auxiliary Roads –** VIA for the Pondoland Section of this project for the South African National Roads Agency.
- **Mpushini Park Ashburton –** VIA for a proposed amendment to an authorised development plan which included residential, office park and light industrial uses to logistics and warehousing.
- **Moedeng PV Solar Project -** VIA for a solar project near Vrybury in the North West Province for a private client.
- **Establishment of Upmarket Tourism Accommodation on the Selati Bridge, Kruger National Park** – Assessment of visual implications of providing tourism accommodation in 12 railway carriages on an existing railway bridge at the Skukuza Rest Camp in the Kruger Park.
- **Jozini TX Transmission Tower** – Assessment of visual implications of a proposed MTN transmission tower on the Lebombo ridgeline overlooking the Pongolapoort Nature reserve and dam.
- **Bhangazi Lake Development** – Visual Impact Assessment for a proposed tourism development within the iSimangaliso Wetlend Park World Heritage Site.
- **Palesa Power Station** - VIA for a new 600MW power station near Kwamhlanga in Mpumalanga for a private client.
- **Heuningklip PV Solar Project** – VIA for a solar project in the Western Cape Province for a private client.
- **Kruispad PV Solar Project** – VIA for a solar project in the Western Cape Province for a private client.
- **Doornfontein PV Solar Project** – VIA for a solar project in the Western Cape Province for a private client.
- **Olifantshoek Power Line and Substation** – VIA for a new 10MVA 132/11kV substation and 31km

powerline, Northern Cape Province, for Eskom.

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

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

Impact Assessment for Umgeni Water.

- **Hammersdale Reservoir** - Visual impact assessment using three dimensional computer modelling / photo realistic rendering and montage techniques for proposed hilltop reservoir as part of Environmental Impact Assessment for Umgeni Water.
- **Southgate Industrial Park, Durban** - Computer Aided Visual Impact Assessment and Landscape Design for AECI.
- **Sainsbury's Bryn Rhos** - Computer Aided Visual Impact Assessment/ Planning Application for the development of a new store within the Green Wedge North of Swansea.
- **Ynyston Farm Access** - Computer Aided Impact Assessment of visual intrusion of access road to proposed development of Cardiff for the Land Authority for Wales.
- **Cardiff Bay Barrage** – Preparation of the Visual Impact Statement for inclusion in the Impact Statement for debate by parliament (UK) prior to the passing of the Cardiff Bay Barrage Bill.
- **A470, Cefn Coed to Pentrebach** - Preparation of landscape frameworks for the assessment of the impact of the proposed alignment on the landscape for The Welsh Office.
- **Sparkford to Illchester Bye Pass** - The preparation of the landscape framework and the draft landscape plan for the Department of Transport.
- **Green Island Reclamation Study** - Visual Impact Assessment of building massing, Urban Design Guidelines and Masterplanning for a New Town extension to Hong Kong Island.
- **Route 3** - Visual Impact Assessment for alternative road alignments between Hong Kong Island and the Chinese Border.
- **China Border Link** - Visual Impact Assessment and initial Landscape Design for a new border crossing at Lok Ma Chau.
- **Route 81, Aberdeen Tunnel to Stanley** - Visual Impact Assessment for alternative highway alignments on the South side of Hong Kong Island.

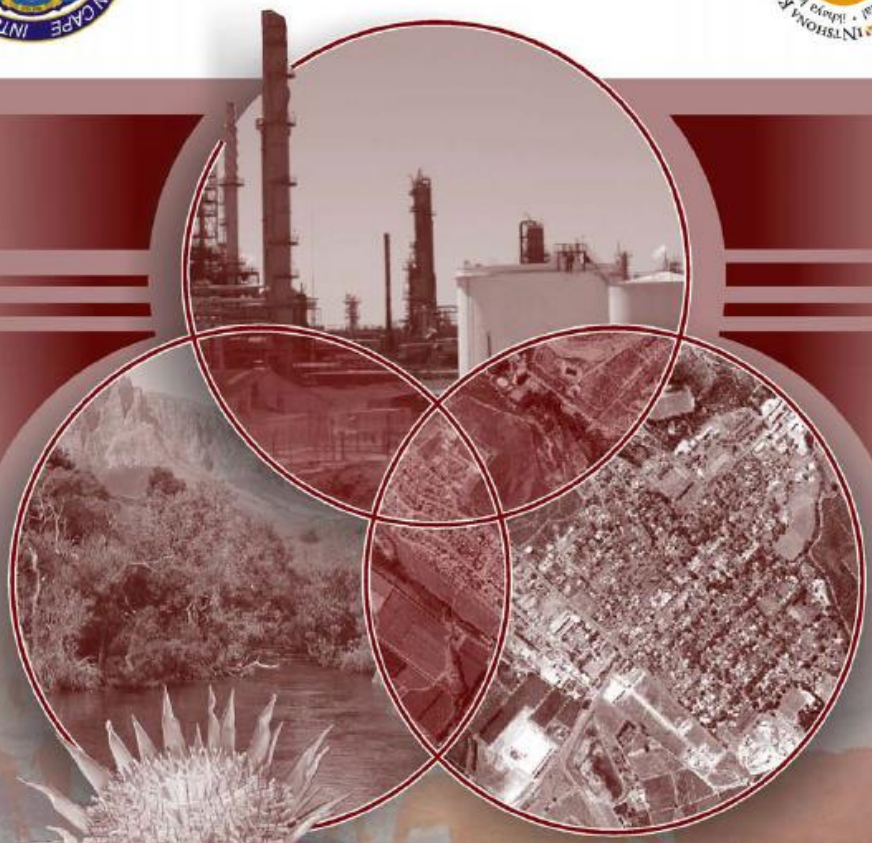
APPENDIX II

GUIDELINES FOR INVOLVING VISUAL AND AESTHETIC SPECIALISTS IN EIA PROCESSES

(Preface, Summary and Contents for full document go to the Provincial Government of the Western Cape, Department of Environmental Affairs and Development Planning web site, http://eadp.westerncape.gov.za/your-resource-library/policies-guidelines)

GUIDELINE FOR INVOLVING VISUAL AND AESTHETIC SPECIALISTS IN EIA PROCESSES

PROVINCIAL GOVERNMENT OF THE WESTERN CAPE:
DEPARTMENT OF ENVIRONMENTAL AFFAIRS
AND DEVELOPMENT PLANNING



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Edition 1

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Stakeholders engaged in the guideline development process:

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PREFACE

The purpose of an Environmental Impact Assessment (EIA) is to provide decision-makers (be they government authorities, the project proponent or financial institutions) with adequate and appropriate information about the potential positive and negative impacts of a proposed development and associated management actions in order to make an informed decision whether or not to approve, proceed with or finance the development.

For EIA processes to retain their role and usefulness in supporting decision-making, the involvement of specialists in EIA needs to be improved in order to:

- Add greater value to project planning and design;
- Adequately evaluate reasonable alternatives;
- Accurately predict and assess potential project benefits and negative impacts;
- Provide practical recommendations for avoiding or adequately managing negative impacts and enhancing benefits;
- Supply enough relevant information at the most appropriate stage of the EIA process to address adequately the key issues and concerns, and effectively inform decision-making in support of sustainable development.

It is important to note that not all EIA processes require specialist input; broadly speaking, specialist involvement is needed when the environment could be significantly affected by the proposed activity, where that environment is valued by or important to society, and/or where there is insufficient information to determine whether or not unavoidable impacts would be significant.

The purpose of this series of guidelines is to improve the efficiency, effectiveness and quality of specialist involvement in EIA processes. The guidelines aim to improve the capacity of roleplayers to anticipate, request, plan, review and discuss specialist involvement in EIA processes. Specifically, they aim to improve the capacity of EIA practitioners to draft appropriate terms of reference for specialist input and assist all roleplayers in evaluating whether or not specialist input to the EIA process is appropriate for the type of development and environmental context. Furthermore, they aim to ensure that specialist inputs support the development of effective, practical Environmental Management Plans where projects are authorised to proceed (refer to *Guideline for Environmental Management Plans*).

The guidelines draw on best practice in EIA in general, and within specialist fields of expertise in particular, to address the following issues related to the timing, scope and quality of specialist input. The terms "specialist involvement" and "input" have been used in preference to "specialist assessment" and "studies" to indicate that the scope of specialists' contribution (if required) depends on the nature of the project, the environmental context and the amount of available information and does not always entail detailed studies or assessment of impacts.

The guidelines draw on best practice in EIA in general, and within specialist fields of expertise in particular, to address the following issues related to the timing, scope and quality of specialist input. The terms "specialist involvement" and "input" have been used in preference to "specialist

assessment" and "studies" to indicate that the scope of specialists' contribution depends on the nature of the project, the environmental context and the amount of available information.

	ISSUES
TIMING	▪ When should specialists be involved in the EIA process; i.e. at what stage in the EIA process should specialists be involved (if at all) and what triggers the need for their input?
SCOPE	▪ Which aspects must be addressed through specialist involvement; i.e. what is the purpose and scope of specialist involvement? ▪ What are appropriate approaches that specialists can employ? ▪ What qualifications, skills and experience are required?
QUALITY	▪ What triggers the review of specialist studies by different roleplayers? ▪ What are the review criteria against which specialist inputs can be evaluated to ensure that they meet minimum requirements, are reasonable, objective and professionally sound?

The following guidelines form part of this first series of guidelines for involving specialists in EIA processes:

- Guideline for determining the scope of specialist involvement in EIA processes
- Guideline for the review of specialist input in EIA processes
- Guideline for involving biodiversity specialists in EIA processes
- Guideline for involving hydrogeologists in EIA processes
- Guideline for involving visual and aesthetic specialists in EIA processes
- Guideline for involving heritage specialists in EIA processes
- Guideline for involving economists in EIA processes

The *Guideline for determining the scope of specialist involvement in EIA processes* and the *Guideline for the review of specialist input in EIA processes* provide generic guidance applicable to any specialist input to the EIA process and clarify the roles and responsibilities of the different roleplayers involved in the scoping and review of specialist input. It is recommended that these two guidelines are read first to introduce the generic concepts underpinning the guidelines which are focused on specific specialist disciplines.

Who is the target audience for these guidelines?

The guidelines are directed at authorities, EIA practitioners, specialists, proponents, financial institutions and other interested and affected parties involved in EIA processes. Although the guidelines have been developed with specific reference to the Western Cape province of South Africa, their core elements are more widely applicable.

What type of environmental assessment processes and developments are these guidelines applicable to?

The guidelines have been developed to support project-level EIA processes regardless of whether they are used during the early project planning phase to inform planning and design decisions (i.e. during pre-application planning) or as part of a legally defined EIA process to obtain statutory approval for a proposed project (i.e. during screening, scoping and/or impact assessment). Where specialist input may be required the guidelines promote early, focused and appropriate involvement of specialists in EIA processes in order to encourage proactive consideration of potentially significant impacts, so that negative impacts may be avoided or

effectively managed and benefits enhanced through due consideration of alternatives and changes to the project.

The guidelines aim to be applicable to a range of types and scales of development, as well as different biophysical, social, economic and governance contexts.

What will these guidelines not do?

In order to retain their relevance in the context of changing legislation, the guidelines promote the principles of EIA best practice without being tied to specific legislated national or provincial EIA terms and requirements. They therefore do not clarify the specific administrative, procedural or reporting requirements and timeframes for applications to obtain statutory approval. They should, therefore, be read in conjunction with the applicable legislation, regulations and procedural guidelines to ensure that mandatory requirements are met.

It is widely recognized that no amount of theoretical information on how best to plan and coordinate specialist inputs, or to provide or review specialist input, can replace the value of practical experience of coordinating, being responsible for and/or reviewing specialist inputs. Only such experience can develop sound judgment on such issues as the level of detail needed or expected from specialists to inform decision-makers adequately. For this reason, the guidelines should not be viewed as prescriptive and inflexible documents. Their intention is to provide best practice guidance to improve the quality of specialist input.

Furthermore, the guidelines do not intend to create experts out of non-specialists. Although the guidelines outline broad approaches that are available to the specialist discipline (e.g. field survey, desktop review, consultation, modeling), specific methods (e.g. the type of model or sampling technique to be used) cannot be prescribed. The guidelines should therefore not be used indiscriminately without due consideration of the particular context and circumstances within which an EIA is undertaken, as this influences both the approach and the methods available and used by specialists.

How are these guidelines structured?

The specialist guidelines have been structured to make them user-friendly. They are divided into six parts, as follows:

- **Part A**: Background;
- **Part B**: Triggers and key issues potentially requiring specialist input;
- **Part C**: Planning and coordination of specialist inputs (drawing up terms of reference);
- **Part D**: Providing specialist input;
- **Part E**: Review of specialist input; and
- **Part F**: References.

Part A provides grounding in the specialist subject matter for all users. It is expected that authorities and peer reviewers will make most use of Parts B and E; EIA practitioners and project proponents Parts B, C and E; specialists Part C and D; and other stakeholders Parts B, D and E. Part F gives useful sources of information for those who wish to explore the specialist topic.

SUMMARY

This guideline document, which deals with specialist visual input into the EIA process, is organised into a sequence of interleading sections. These follow a logical order covering the following:

- the background and context for specialist visual input;
- the triggers and issues that determine the need for visual input;
- the type of skills and scope of visual inputs required in the EIA process;
- the methodology, along with information and steps required for visual input;
- finally, the review or evaluation of the visual assessment process.

Part A is concerned with defining the visual and aesthetic component of the environment, and with principles and concepts relating to the visual assessment process. The importance of the process being logical, holistic, transparent and consistent is stressed in order for the input to be useful and credible.

The legal and planning context within which visual assessments take place indicate that there are already a number of laws and bylaws that protect visual and scenic resources. These resources within the Western Cape context have importance for the economy of the region, along with the proclaimed World Heritage Sites in the Province.

The role and timing of specialist visual inputs into the EIA process are outlined, with the emphasis being on timely, and on appropriate level of input, from the early planning stage of a project, through to detailed mitigation measures and management controls at the implementation stage.

Part B deals with typical factors that trigger the need for specialist visual input to a particular project. These factors typically relate to:

(a) the nature of the receiving environment, in particular its visual sensitivity or protection status;
(b) the nature of the project, in particular the scale or intensity of the project, which would result in change to the landscape or townscape.

The correlation between these two aspects are shown in a table, in order to determine the varying levels of visual impact that can be expected, i.e. from little or no impact, to very high visual impact potential.

Part C deals with the choice of an appropriate visual specialist, and the preparation of the terms of reference (TOR) for the visual input. Three types of visual assessment are put forward, each requiring different expertise, namely:

Type A: assessments involving large areas of natural or rural landscape;
Type B: assessments involving local areas of mainly built environment;
Type C: assessments involving smaller scale sites with buildings, or groups of buildings.

The scope of the visual input would in summary relate to the following:

- the issues raised during the scoping process;
- the time and space boundaries, i.e. the extent or zone of visual influence;

- the types of development alternatives that are to be considered;
- the variables and scenarios that could affect the visual assessment;
- the inclusion of direct, indirect and cumulative effects.

Approaches to the visual input relate to the level of potential impact and range from minimal specialist input, to a full visual impact assessment (VIA). A list of the typical components of a visual assessment is given, and the integration with other studies forming part of the EIA process is discussed.

Part D provides guidance for specialist visual input, and on the information required by specialists. Notes on predicting potential visual impacts are given, along with suggested criteria for describing and rating visual impacts. The assessment of the overall significance of impacts, as well as thresholds of significance are discussed.

Further aspects that need to be considered by visual specialists in EIA processes include:

- affected parties who stand to benefit or lose,
- risks and uncertainties related to the project,
- assumptions that have been made, and their justification,
- levels of confidence in providing the visual input or assessment,
- management actions that can be employed to avoid or mitigate adverse effects and enhance benefits, and
- the best practicable environental option from the perspective of the visual issues and impacts.

Finally, pointers for the effective communication of the findings are given.

Part E lists specific evaluation criteria for reviewing visual input by a specialist, where this becomes necessary. Further guidance on this is given in the document on *Guideline for the review of specialist input in EIA processes.*

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APPENDIX III

FORMULA FOR DERIVING THE APPROXIMATE VISUAL HORIZON

The Mathematics behind this Calculation

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

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