GENESIS WOODHOUSE SOLAR 2 (PTY) LTD

THE PROPOSED WOODHOUSE SOLAR 2 PV FACILITY, NEAR VRYBURG IN THE NORTH WEST PROVINCE

VISUAL IMPACT ASSESSMENT REPORT

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TABLE OF CONTENTS

1 INTRODUCTION 5
1.1 GENERAL 5
1.2 PROJECT LOCATION 5
1.3 BACKGROUND OF SPECIALIST 5
1.4 BRIEF AND RELEVANT GUIDELINES 5
1.5 ISSUES IDENTIFIED AT THE SCOPING STAGE 6
2. PROJECT DESCRIPTION 8
2.1 MOTIVATION AND CONTEXT 8
2.2 DESCRIPTION 9
2.3 MAIN PROJECT COMPONENTS 10
2.3.6 Other Infrastructure 11
2.3.7 Temporary Works 11
3 DESCRIPTION OF RECEIVING ENVIRONMENT AND RECEPTORS 15
3.1 LANDSCAPE CHARACTER 15
3.1.1 Landform and Drainage 15
3.1.2 Nature and Density of Development 15
3.1.3 Vegetation Patterns 17
3.2 LANDSCAPE CHARACTER AREAS 17
3.2.1 Landscape Character Area and Visual Absorption Capacity 17
3.3 Likely significance of the Landscape 18
3.3.1 Rural Landscape Character Area. 18
3.3.2 Semi- Rural LCA 19
3.3.3 Urban LCA 19
3.4 VISUAL RECEPTORS 19
3.4.1 Identified visual receptors 19
3.4.2 Likely significance of visual receptors 20
4 **THE NATURE OF POTENTIAL VISUAL IMPACTS 26**
4.1 GENERAL 27
4.2 THE NATURE OF LIKELY VIEWS OF THE DEVELOPMENT 27
4.2.1 Overhead Power Lines 28
4.2.2 The Solar Array 28
4.2.3 Security Lighting 30
5 VISIBILITY OF THE PROPOSED DEVELOPMENT 32
5.1 ZONES OF THEORETICAL VISIBILITY 32
5.2 ASSESSMENT LIMIT 32
5.3 APPROACH TO THE ASSESSMENT 32
5.3.1 ZTV for Proposed Array 32
5.3.2 ZTV for Overhead Power Line and On Site Sub Station 32
5.4 VISIBILITY 33
5.4.1 Zones of Theoretical Visibility (ZTV) 33
5.5 MODIFYING EFFECT DUE TO VAC OF THE LANDSCAPE AND THE NATURE OF THE DEVELOPMENT 33
5.5.1 Views of the Array and on site infrastructure and buildings. 33
5.5.2 Views of the Grid Connection. 34
5.7 KEY VIEWPOINTS 37
6 VISUAL IMPACT ASSESSMENT 44
6.1 ISSUES TO BE ADDRESSED 44
6.2 ASSESSMENT METHODOLOGY 44
6.2 VISUAL IMPACT ASSESSMENT 46
6.2.1 Impact of the Proposed Development on General Landscape Character 46
6.2.2 The proposed development could be visible to and impact on an extensive area of small holdings to the north 48
6.2.3 The proposed development could change the character of the landscape as seen from the urban edge of Vryburg. 50
6.2.4 The proposed project is likely to be visible to and impact on a short length (approximately 3km) of the N14 52

6.2.5 The proposed project is likely to be visible intermittently to and impact on approximately 5-6km of the R34. 53
6.2.6 The proposed project is likely to be visible to and impact on the N18. 55
6.2.7 The project is likely to impact on agricultural homesteads however, homesteads within 5km of the proposed study area are less likely to be affected by the proposed project than homesteads at a greater distance. 57
6.2.8 Glare from the proposed project could cause nuisance on adjacent roads and for flightpaths associated with the Vryburg airport. 59
6.2.9 The potential visual impact of operational, safety and security lighting of the facility at night on observers. 61
7 IMPACT STATEMENT 64
7.1 VISIBILITY 64
7.2 LANDSCAPE CHARACTER AREAS AND VISUAL ABSORPTION CAPACITY 64
7.3 VISUAL IMPACT 64
7.4 CONCLUSION 66

APPENDICES
I SPECIALIST'S BRIEF CV
II GUIDELINES FOR INVOLVING VISUAL AND AESTHETIC SPECIALISTS IN EIA PROCESSES (CONTENTS PAGES ONLY)
III FORMULA FOR DERIVING THE APPROXIMATE VISUAL HORIZON
IV CUMULATIVE ASSESSMENT

FIGURES
1 VP1
2 VP2
3 VP3
4 VP4

MAPS
1 SITE LOCATION
2 SITES SUBJECT TO APPLICATIONS
3 SITE LAYOUT
4 STRATEGIC LANDFORM
5 LANDFORM AND DRAINAGE
6 LANDCOVER
7 LANDSCAPE CHARACTER AREAS
8 ZTV PROPOSED WOODHOUSE PV2A ARRAY
9 ZTV PROPOSED WOODHOUSE PV2B SOUTH ARRAY
10 ZTV PROPOSED WOODHOUSE PV2B NORTH ARRAY
11 ZTV, INTERNAL 132KV POWER LINE

PHOTOGRAPHIC PLATES
1 EXISTING MOOKODI 400/132kV SUBSTATION
2 EXISTING ESKOM MV OVERHEAD POWER LINE ON THE NORTHERN BOUNDARY
3 ESKOM 132kV LATTICE TOWER
4 ESKOM 132kV MONOPOLE
5 HUHUDI - URBAN LCA
6 VRYBURG SOUTH – URBAN LCA
7 RIDGELINE NORTH – NATURAL LCA
8 RIDGELINE SOUTH – NATURAL LCA
9 TRANSPORT BUSINESS – SEMI NATURAL LCA
10 TRANSPORT BUSINESS – SEMI NATURAL LCA
11 FARMSTEAD AND GUESTHOUSE CLOSE TO THE R34 TO THE NORTH OF THE PROPOSED DEVELOPMENT
12 RESIDENTIAL USE CLOSE TO THE R34 ON SMALLHOLDING TO THE WEST OF THE PROPOSED DEVELOPMENT
13 HOMESTEAD CLOSE TO THE N18 TO THE SOUTH WEST OF THE PROPOSED DEVELOPMENT

14 THE HUHUDI TOWNSHIP TO THE NORTH WEST OF THE PROPOSED DEVELOPMENT
15 HOMESTEAD ON AGRICULTURAL LAND TO THE SOUTH OF THE PROPOSED DEVELOPMENT
16 ROADS TO THE EAST AND WEST OF THE PROPOSED DEVELOPMENT INCLUDING THE N18, THE R34 AND THE N14
17 PV ARRAY VIEWED FROM APPROXIMATELY THE SAME GROUND LEVEL AS THE ARRAY
18 PV ARRAY VIEWED FROM ABOVE
19 PV ARRAY VIEWED FROM BEHIND AND THE SIDE
20 PV ARRAY SCREENED BY LOW VEGETATION
21 EXISTING SOLAR ARRAYS AT UPINGTON AIRPORT AS SEEN FROM THE AIR
22 EXISTING ARRAY SEENIN A FLAT LANDSCAPE FROM APPROXIMATELY 700M
23 EXISTING ARRAY SEENIN A FLAT LANDSCAPE FROM APPROXIMATELY 1500M
24 EXISTING ARRAY SEENIN A FLAT LANDSCAPE FROM APPROXIMATELY 5000M
25 VIEW OF A 132KV OVERHEAD POWER LINE SIMILAR LINE TO THAT PROPOSED

1 INTRODUCTION

1.1 GENERAL

This visual impact assessment (VIA) study forms part of the Scoping and Environmental Impact Assessment that is being undertaken for the proposed Woodhouse Solar 2 PV Facility and associated infrastructures by Savannah Environmental (Pty) Ltd on behalf of Genesis Woodhouse Solar 2 (Pty) Ltd.

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

This Visual Impact Assessment Report has been prepared for inclusion in the project Environmental Impact Assessment Report following approval of the Scoping Report.

1.2 PROJECT LOCATION

The proposed Solar Photovoltaic PV Facility will be located on the Remaining Extent of the Farm Woodhouse 729, near Vryburg in the North West Province.

The Remaining Extent of the Farm Woodhouse 729 is located approximately 10km south east of Vryburg. **(Map 1: Site Location Map).**

1.3 BACKGROUND OF SPECIALIST

Jon Marshall qualified as a Landscape Architect in 1978. He is also a certified Environmental Impact Assessment Practitioner of South Africa. He has been involved in Visual Impact Assessment over a period of approximately 30 years. He has developed the necessary computer skills to prepare viewshed analysis and three dimensional modelling to illustrate impact assessments. He has undertaken visual impact assessments for major buildings, mining projects, industrial development, and infrastructure and has been involved in the preparation of visual guidelines for large scale developments.

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

1.4 BRIEF AND RELEVANT GUIDELINES

The brief is to assess the visual impact that the facility will have on surrounding areas.

Work was 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 III** for the Western Cape Guideline.

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

1.5 ISSUES IDENTIFIED AT THE SCOPING STAGE

Anticipated issues related to the potential visual impact of the proposed Albany Solar Photovoltaic PV Facility include the following:

1) The proposed development could change the character of a relatively natural area;

2) The proposed development could be visible to an extensive area of small holdings;

3) The proposed development could change the character of the landscape as seen from the urban edge of Vryburg;

4) The proposed project is likely to be visible to a short length (approximately 3km) of the N14 only;

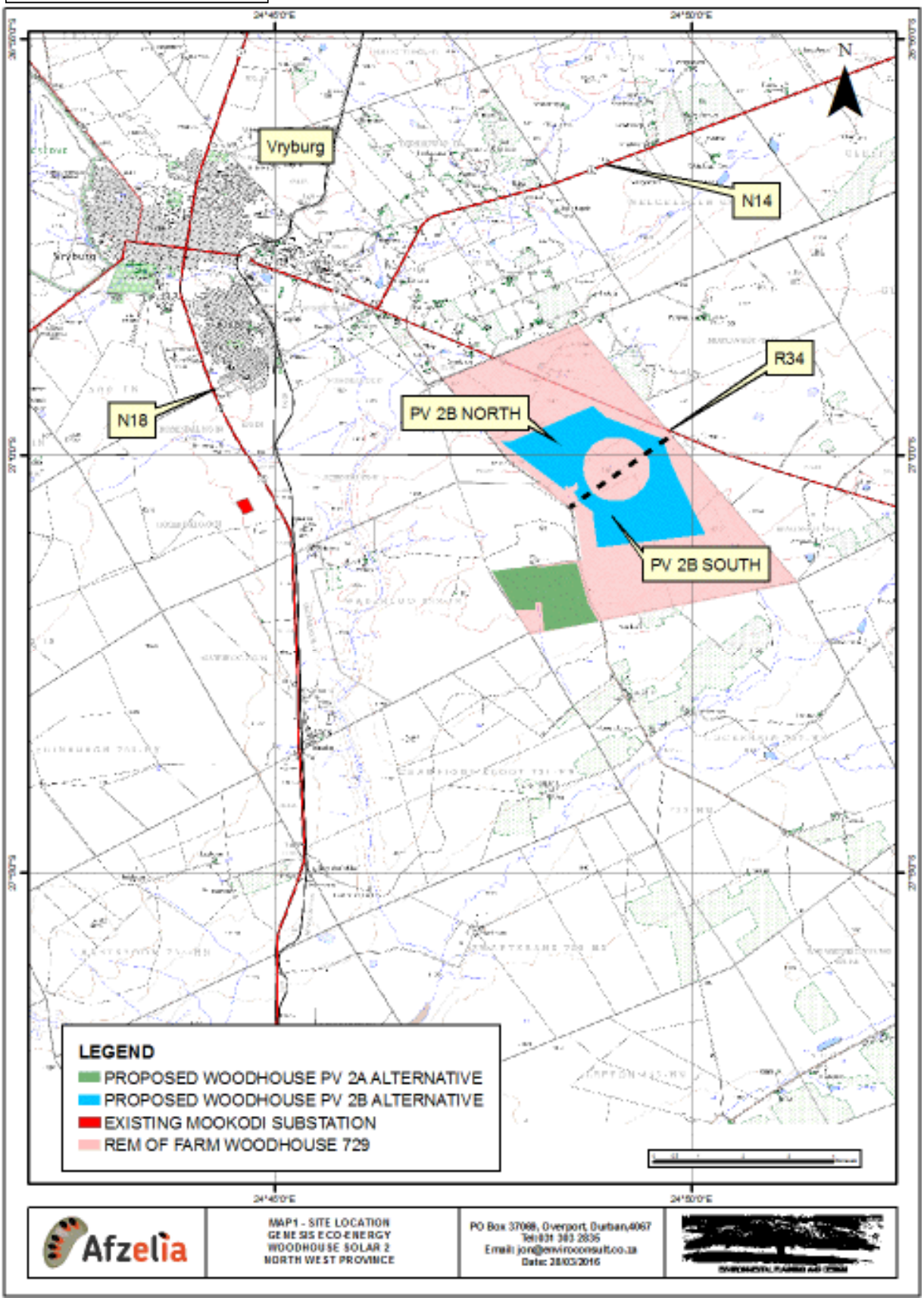
5) The proposed project is likely to be visible intermittently to approximately 5-6km of the R34;

6) The proposed project is likely to be visible to approximately 9km of the N18;

7) Farmsteads within 5km of the proposed study area are less likely to be affected by the proposed projects than farmsteads at a greater distance; and

8) Glare from the proposed projects could cause nuisance on adjacent roads and for flightpaths associated with the Vryburg airport.

MAP 1, SITE LOCATION



2. PROJECT DESCRIPTION

2.1 MOTIVATION AND CONTEXT

The supply of electricity in South Africa has recently become constrained, primarily because of insufficient generation capacity, but also due to constraints on the transmission and distribution of electricity. This situation and its repercussions (load shedding and tariff increase) threaten economic development of the country.

Considering this situation and the impact that carbon emissions from existing coal-fired power stations have on the environment, the applicant is proposing the establishment of a Solar Photovoltaic PV Facility to generate electricity for input into the national grid to augment Eskom's power supply. Furthermore, the PV panels are designed to operate continuously for more than 20 years, unattended and with low maintenance.

The project is proposed to be part of the Department of Energy's (DoE) Renewable Energy Independent Power Producer Programme (REIPPP).

The area within which the project is proposed has been identified as a key area for wind and solar generation by the South African Department of Environmental Affairs in their strategic assessment which identifies seven Renewable Energy Development Zones (REDZ). The area in which this project is located is the Vryburg REDZ 6.

The objective of this strategic assessment is to focus renewable energy projects within the most suitable areas. This also has the benefit of ensuring that less suitable areas are likely to be relatively undeveloped.

Due to this focus area there are also a number of solar applications that are being considered for the area including;

- Proposed 60MW Carocraft PV Solar Park and associated infrastructure (a.k.a. the Carocraft Solar Park) on the Remaining Extent and Portion 1 of Farm Weltevrede 681.
- Construction of the 75MW Photovoltaic facility and associated infrastructure in Naledi (a.k.a. the Sediba Solar Energy Facility) on the Remaining Extent of the Farm Rosendal 673.
- Proposed Tiger Kloof Solar Photovoltaic energy facility near Vryburg, North West Province (a.k.a. the Tiger Kloof Solar Energy Facility) on Portion 3 (RE) and Portion 4 of the Farm Waterloo 730.
- Proposed construction of the 75MW Photovoltaic Solar Plant and associated infrastructure on a Portion of the Farm Waterloo 992 in the Naledi Local Municipality of the North West Province (a.k.a. the Waterloo Solar Park) on the Remaining Extent of Farm Waterloo 992.
- Proposed Woodhouse Solar 1 PV Facility, North West Province on the Remaining Extent of the farm Woodhouse729.

These projects are all located in close proximity to Vryburg and to the proposed site **(refer to Map 2, Sites Subject to Applications).**

2.2 DESCRIPTION

The application is for the construction of a commercial photovoltaic (PV) solar energy facility as well as all associated infrastructure. The contracted capacity of the proposed solar energy facility will be up to 100 MW.

The proposed development is one of two projects that are proposed on the site. Each project being comprised of approximately 375,000 photovoltaic (PV) panels (2m X 1m). The location of the PV1 Project is indicated on Map 1 for background information. However, PV 1 is subject to a separate application.

The proposed PV 2 Project will cover an approximate area of 295ha.

The Solar PV array will be comprised of three components namely:

a. Mounting structures to support the PV panels. Each structure could be up to 5m high;
b. A PV array with a capacity of up to 100MW;
c. On-site inverters to step up the power and a substation to facilitate the connection between the solar energy facility and the Eskom electricity grid;
d. A new 132kV power line between the on-site substation and the national grid is proposed in order to ensure that power generated by the PV 2 project can be evacuated to the National Grid . the four gird connection options considered for the facility includes: i) a direct connection to the authorised Eskom Bophirima Substation to be constructed within the northern portion of the affected property, ii) a direct connection to the existing Woodhouse 88/22kV Substation located north of the boundary of the affected property; iii) a turn-in turn-out connection to the existing Delareyville Munic / Vryburg 1 88kV Feeder located along the northern boundary of the affected property; and a turn-in turn-out connection to the authorised 132kV Eskom Bophirima–Mookodi power line, to be constructed by Eskom.
e. Cabling between the projects components, to be laid underground where practical;
f. Offices and workshop areas for maintenance and storage;
g. Temporary laydown areas; and
h. Internal access roads and fencing around the development area.

It is possible that the facility could either be developed as static, fixed mounted PV systems or tracking PV systems.

Tracking systems can utilise single axis or duel access trackers. A 'single axis tracker' will track the sun from east to west, while a dual axis tracker will in addition be equipped to account for the seasonal waning of the sun. These systems utilise moving parts and complex technology, including solar irradiation sensors to optimise the exposure of PV panels to sunlight.

Single axis systems simply tilt the PV panels from side to side with little change in the effective height of the structure.

2.3 MAIN PROJECT COMPONENTS

A solar energy facility typically uses the following primary components:

2.3.1 Photovoltaic Panels

Solar photovoltaic (PV) panels consist primarily of glass and various semiconductor materials and in a typical solar PV project, will be arranged in rows to form solar arrays. The PV panels are designed to operate continuously for more than 25 years with minimal maintenance required. It is envisaged that the plant will operate after this design lifetime

2.3.2 Support Structure

The photovoltaic (PV) modules will be mounted to steel support structures. These can either be mounted at a fixed tilt angle, optimised to receive the maximum amount of solar radiation and dependent on the latitude of the proposed facility, or a tracking mechanism where at a maximum tilt angle of 45°.

2.3.3 Inverters

The photovoltaic effect produces electricity in direct current (DC). Therefore inverters must be used to change it to alternating current (AC) for transmission in the national grid. The inverters convert the DC electric input into AC electric output. The PV combining switchgear (PVCS), which is dispersed among the arrays, collects the power from the arrays for transmission to the project's substation.

The inverters have a height of approximately 2.1m.

It is estimated that 48 inverters will be distributed amongst each project. It is likely that the inverters will be bolted to concrete pads that are similar in footprint size to the inverters.

2.3.4 Transformer

The inverters feed AC current to the onsite substation which steps it up to up for transmission of the power to the national grid.

No detail of the substation has been provided, however, it is assumed that;

- The main elements of the substation will be similar in height to other on site infrastructure.
- The tallest elements associated with the substation are likely to be bus bars for connecting between the substation and overhead power line. These bus bars are likely to be in line with and slightly lower than the power line gantries. For all intense and purposes they will be visually read as part of the power line.

2.3.5 Grid Connection

As part of the PV 2 project a 132kV overhead power line will be constructed to link the project via the facility on-site substation to the national grid. The power line, which connects to the facility on-site substation will be located along the western boundary of the affected property, and will move towards the northern portion of the affected property where the proposed grid connection points are located.

The height of the gantries of a 132kV power line is 28m. Monopole or lattice towers might be used for this line.

2.3.6 Other Infrastructure

Other infrastructure will include a small office building and control room, a work shop a 2m to 3m high fence and a permanent access road linking to the local road to the south of the site.

2.3.7 Temporary Works

A lay down area of 500m x 100m will be required during the construction phase.

Refer to **Map 3** for the proposed site layout.

Plate 1, Existing Mookodi 400/132kV Substation.

Plate 2, Existing Eskom MV overhead powerline on the northern boundary of the site. A number of alternatives are under consideration for the necessary grid connection which are subject to Eskom's plans for the construction of a new substation (Bophirima) in the area indicated as well as a new 132kV overhead power line link to the existing Mookodi Substation. The proposed internal power line will be viewed in the context of this infrastructure.

Plate 3, Eskom 132kV Lattice Tower 25-28m high. 132kV structures will be slightly higher than existing and will follow the existing power line servitude.

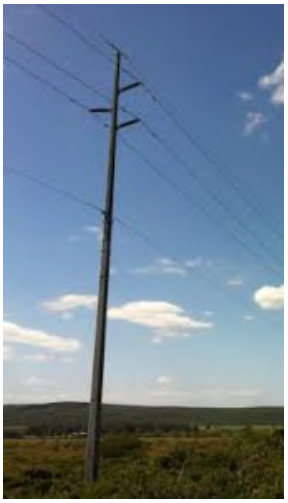
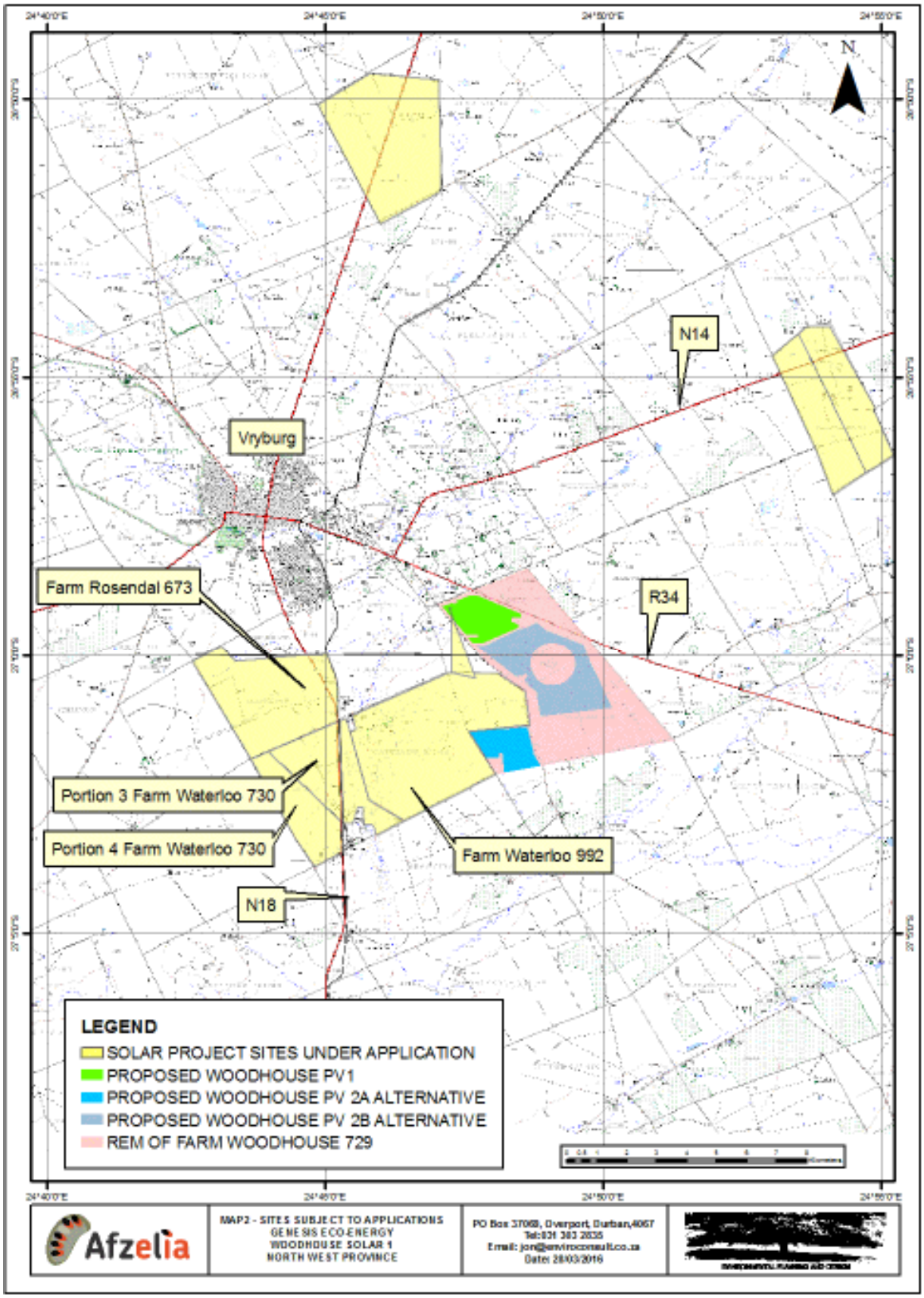
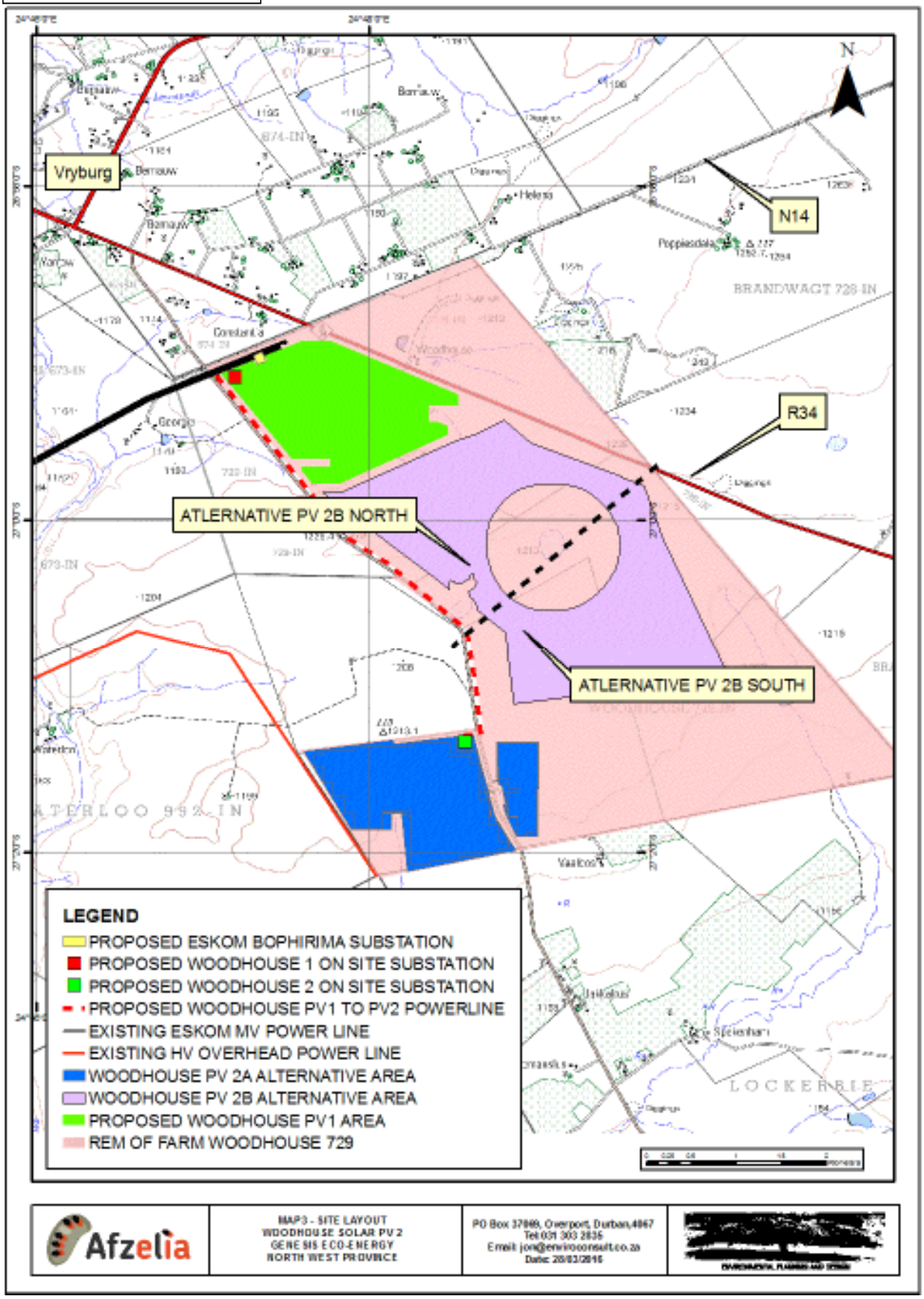


Plate 4, Eskom 132kV Monopole.

MAP 2, SITES SUBJECT TO APPLICATIONS FOR PV SOLAR PROJECTS



MAP 3, SITE LAYOUT



3 DESCRIPTION OF RECEIVING ENVIRONMENT AND RECEPTORS

3.1 LANDSCAPE CHARACTER

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

As indicated previously, the scoping assessment was undertaken without site visits. Landscape character was therefore defined from the author's knowledge of the area and from reference to available online mapping and aerial photography. Key character components identified were subject to verification through the EIA site visit

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

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

3.1.1 Landform and Drainage

The site is located close to the head of a shallow valley that breaks through a range of low hills that extend roughly in a south west to north-east direction towards Gauteng, dividing West Griqualand in the north from the Karoo in the south (**Refer to Map 4, Strategic Landform**)

The head of the valley is a watershed between catchments. The watercourse that runs south through the valley, the Harts River, which is a tributary of the Vaal River. A number of non-perennial streams flow through side valleys into this water course.

The topography can be described as gently undulating with the head of the valley being approximately 60m above the valley floor. Minor ridgelines that extend into the valley in the vicinity of the site are approximately 20 – 30m above the valley floor.

The proposed site straddles two low ridgelines close to the head of the valley on the eastern side of the main water course (**Refer to Map 5, Landform and Drainage**).

Given the relatively low nature of the proposed development, minor ridges within and in close proximity to the proposed site could play a major role in either helping to screen or make the development obvious in the landscape.

3.1.2 Nature and Density of Development

The general development pattern is evident on **Map 6, Landcover**, this includes;

The urban area of Vryburg which is highlighted in grey. This is a dense urban area which, typically of many towns, is set out on a grid pattern with roads running north/south and east/west. The two closest areas of the town to the proposed development site include;

- A light industrial area that extends along the N14 / R34 to the north west of the proposed site.
- The residential township of Huhudi that extends along the N18 to the west north west of the proposed site.

In terms of visual implications, the following conclusions may be drawn;

- The area of dense development which includes the Huhudi suburb is likely to result in views of the surrounding landscape from the town only being possible from the urban edges and possibly along the straight roads that are likely to channel narrow views of surrounding rural area into the urban area.
- The light industrial area to the north west is unlikely to be sensitive to the proposed development.

An area of small holdings directly to the east of Vryburg. These are indicated by the pink area on Map 6 that is keyed "Built-up". From reference to online aerial photograph and the site visit, it is evident that this area is comprised of smallholdings. Development in this area is mixed and includes;

- Social facilities including a local church;
- Semi-industrial uses associated with transportation; and
- Residential uses.

In terms of visual implications, the openness of this development means that views of the surrounding landscape are likely to be possible from within the area.

The rural area surrounding Vryburg. This is highlighted on the Map 4 as "natural". In fact the majority of this area is used for cattle grazing. The area is well known for cattle rearing and is referred to as the Texas of South Africa having some of the largest cattle herds in the world. Within the agricultural area there are numerous farmsteads that are comprised of farm houses, agricultural buildings and farm worker's accommodation.

In terms of visual implications, the farmsteads could be sensitive to landscape change that might be associated with the proposed development particularly if secondary uses include tourism related activities such as guest houses.

In addition to general uses that are evident on the Landcover map, there are a number of service and urban fringe uses that also have an influence on localised landscape character including:

- Adjacent roads;
- A railway line runs to the west of the proposed site;
- A local mine site;
- Agri-industrial areas including areas of stock pens;
- Existing electrical infrastructure including overhead power lines that run close to the southern boundary of the site; and
- Isolated transportation uses within the rural area.

These elements all have the effect of eroding the natural character of the area. From the site visit it is obvious that these elements have greatest impact on the area immediately around Vryburg. To the south of the town the main ridgeline that cuts across the southern portion of the subject property provides a distinct boundary, to the north of which the landscape is affected by these urban elements and to the south

of which the landscape appears relatively natural with little obvious development influence.

3.1.3 Vegetation Patterns

The following vegetation types are evident within the study area;

a) Natural vegetation that is generally associated with the rural landscape; and
b) Ornamental vegetation and street planting that is generally associated with the urban area as well as the homesteads that occur within the rural area.

a) Natural Vegetation

Low and Rebelo (Vegetation of South Africa) indicate that the natural vegetation of the area is Kalahari Plateau Bushveld.

This is a fairly dense bushveld composed of shrubs and sometimes small trees in a mixed grassland mosaic.

This natural vegetation is recorded as being under pressure from grazing. However, it is evident that the general pattern of small trees and shrubs in grassland exists over much of the area surrounding Vryburg.

Whilst the density of taller shrubs and small trees is relatively sparse, in a flat landscape and over distance, these are likely to combine to provide significant screening of low elements such as the proposed solar arrays.

b) Ornamental vegetation

Ornamental trees and shrubs are generally located within gardens in the urban area of Vryburg and surrounding farmsteads in the rural area. This has the following visual effects;

- It makes the location of farmsteads obvious in the landscape.
- It helps to screen views of the surrounding landscape from both farmsteads and from within the urban area.

3.2 LANDSCAPE CHARACTER AREAS

3.2.1 Landscape Character Area and Visual Absorption Capacity

Landscape Character Areas (LCAs) are defined as "single unique areas which are the discrete geographical areas of a particular landscape type".

Visual Absorption Capacity (VAC) is *defined* as the landscape's ability to absorb physical changes without transformation in its visual character and quality. Where elements that contrast with existing landscape character are proposed, VAC is dependent on elements such as landform, vegetation and other development to provide screening of a new element. The scale and texture of a landscape is also critical in providing VAC, for example; a new large scale industrial development located within a rural small scale field pattern is likely to be all the more obvious due to its scale.

The affected landscape can generally be divided into the following LCAs that are largely defined by vegetation and drainage patterns.

- **Rural areas surrounding Vryburg**. These are likely to be used for cattle grazing and appear relatively natural. The flatness of the landscape combined with scattered shrubs and small trees are likely to help provide screening for low elements within the landscape. With relatively low vegetation and a shallow undulating topography, the height of the PV units is likely to be critical in maximising the little absorption capacity that exists. Vegetation is unlikely to provide significant screening for views over development from adjacent low ridgelines. This LCA can be further sub divided by the area of urban influence that occurs to the north of the ridgeline that bisects the southern section of the subject property and the rural area that is relatively free of urban influence to the south of the same ridgeline.
- **The urban area of Vryburg**. This area is generally inward looking drawing little character influence from external areas. It is unlikely that the proposed development will have much influence on these areas other than perhaps at the edges of the urban area that face onto the proposed development area.
- **The semi-rural area** that is comprised of the smallholdings to the east of Vryburg. This is a relatively open developed area from which views into the surrounding rural landscape are likely to be possible. VAC is generally therefore likely to be limited but will depend on localised features such as ornamental vegetation particularly around residential properties that could provide significant VAC for small areas.

These LCAs are indicated on **Map 7** and have been ground truthed during the site visit.

3.3 LIKELY SIGNIFICANCE OF THE LANDSCAPE

From review of existing mapping there do not appear to be any protected landscape areas.

3.3.1 Rural Landscape Character Area.

The majority of the affected area falls into the Rural LCA.

As indicated previously, this LCA is divided into:

- The area immediately south of Vryburg and north of the ridgeline that bisects the southern section of the subject property where there is significant urban influence; and
- The area to the south of the ridgeline that bisects the southern section of the subject property where there is a distinct lack of urban influence and the landscape appears relatively natural.

Both of these rural areas are important for agricultural production and particularly livestock rearing.

It is also noted that within the area closer to Vryburg, there are a number of guesthouses the outlook from which is likely to be important to owners and visitors.

In pure landscape terms however, the southern area that is relatively free of urban appears near natural which makes this area important in its own right.

3.3.2 Semi- Rural LCA

It is likely that this is a low density mixed use area. It is indicated as semi-rural due to the low density of development and the extent of green space.

In itself it is not a landscape of high value.

Sensitivities will depend on specific uses. It is possible that the relatively upmarket homes that occur within the area could depend on their natural outlook for their value. It is also likely that the more agri-industrial uses will not be sensitive to change in view.

3.3.3 Urban LCA

Whilst the quality of the urban area is important for residents and people who work or visit Vryburg, due to the largely inward looking nature of the area, the proposed development is unlikely to significantly impact on this.

3.4 VISUAL RECEPTORS

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

3.4.1 Identified visual receptors

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

This section highlights possible Receptors within the landscape which due to use could be sensitive to landscape change. They include;

- Area Receptors which include;
    - The Semi Rural LCA.
    - The Urban LCA and particularly the southern edges of Vryburg that overlook the northern section of the study area.
    - Linear Receptors or routes through the area that include the N14, the N18 and the R34. Both national roads (N14 & N18) are likely to carry a proportion of recreational and tourism related traffic. This elevates the importance of the landscape and particularly natural landscape areas as they are viewed from the road. The Regional Road (R34) is likely to carry less recreational and tourism related traffic so may not be as significant. In addition to a change in the character of existing views as seen from these roads, it is possible that the closest roads could be impacted by glare reflecting from the face of PV panels.

- Point Receptors that include isolated and small groups of farmsteads that are generally associated with and located within the Rural LCA.

Possible visual receptors or areas, places and routes that may be sensitive to landscape change are indicated on **Maps 7 and 8.**

3.4.2 Likely significance of visual receptors

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. Housing areas could depend on outlook for the enjoyment of the area by residents and for maintaining perceived 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.

The sensitivity to the possible change in view associated with the proposed development will be addressed in detail during the assessment stage.

LANDSCAPE CHARACTER AREAS

Plate 5, Huhudi - Urban LCA
Views along roads to surrounding landscape are largely blocked

Plate 6, Vryburg South - Urban LCA
Largely industrial / retail uses that are unlikely to be sensitive.

Plate 7, Ridgeline North - Natural LCA
The character is generally natural but there is influence by urban elements

Plate 8, Ridgeline South - Natural LCA
The character is generally natural with little influence by urban elements

Plate 9, Transport Business – Semi Natural LCA
Some smallholdings have been developed for semi industrial uses.

Plate 10, Transport Business – Semi Natural LCA
Residential development largely surrounded by vegetation.

POSSIBLE SENSITIVE RECEIVERS

Plate 11, Farmstead and guesthouse close to the R34 to the north of the proposed development

Plate 12, Residential use close to the R34 on smallholding to the west of the proposed development

Plate 13, Homestead close to the N18 to the south west of the proposed development.

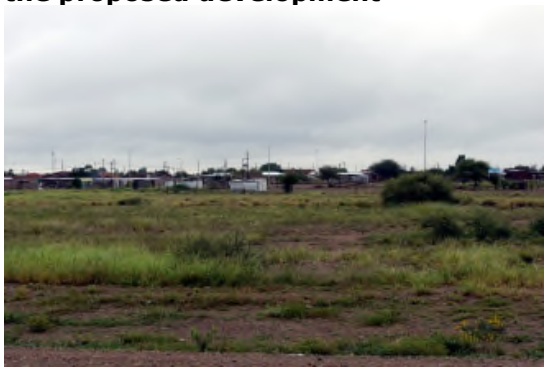
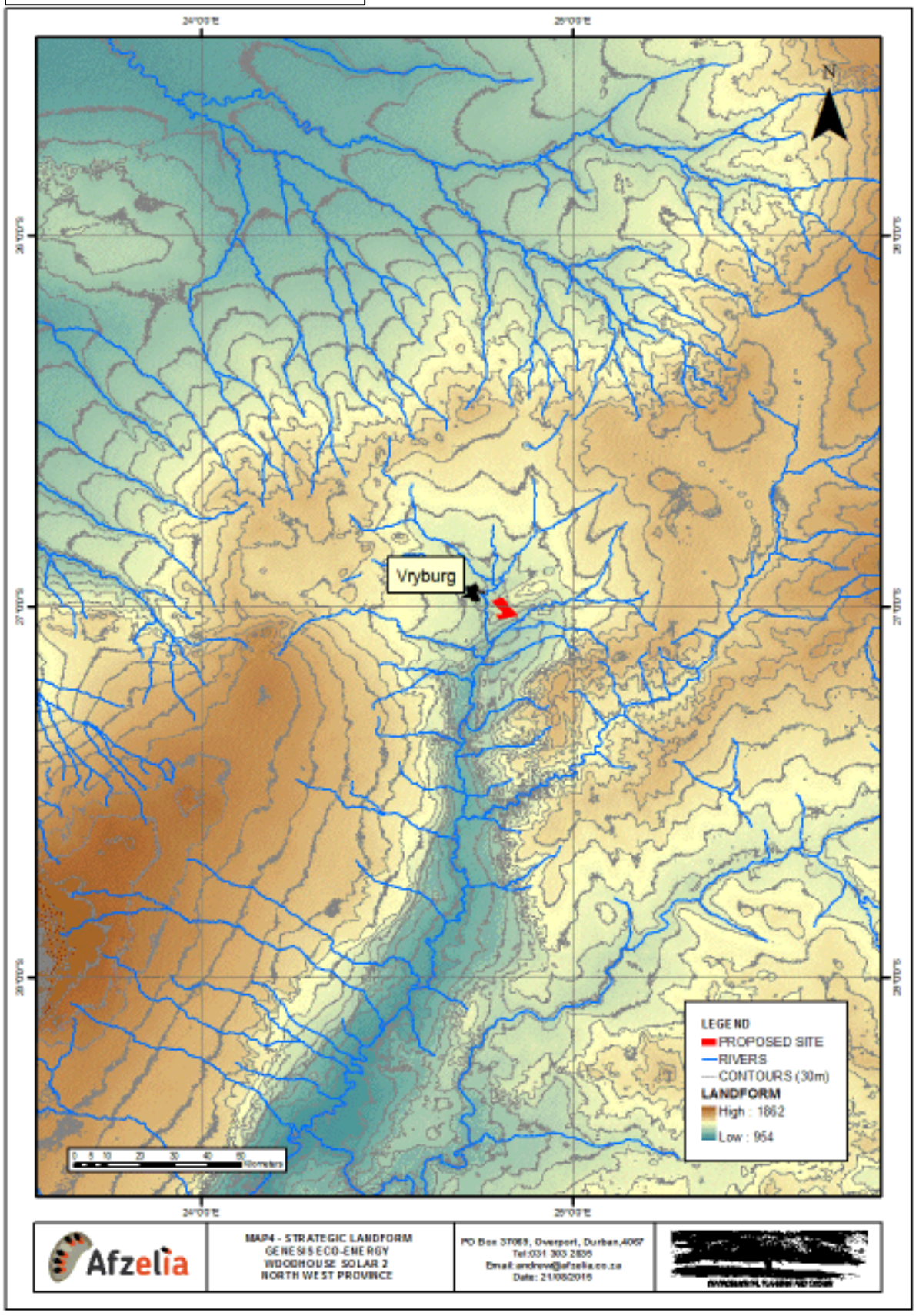


Plate 14, The Huhudi township to the north west o fthe proposed development.

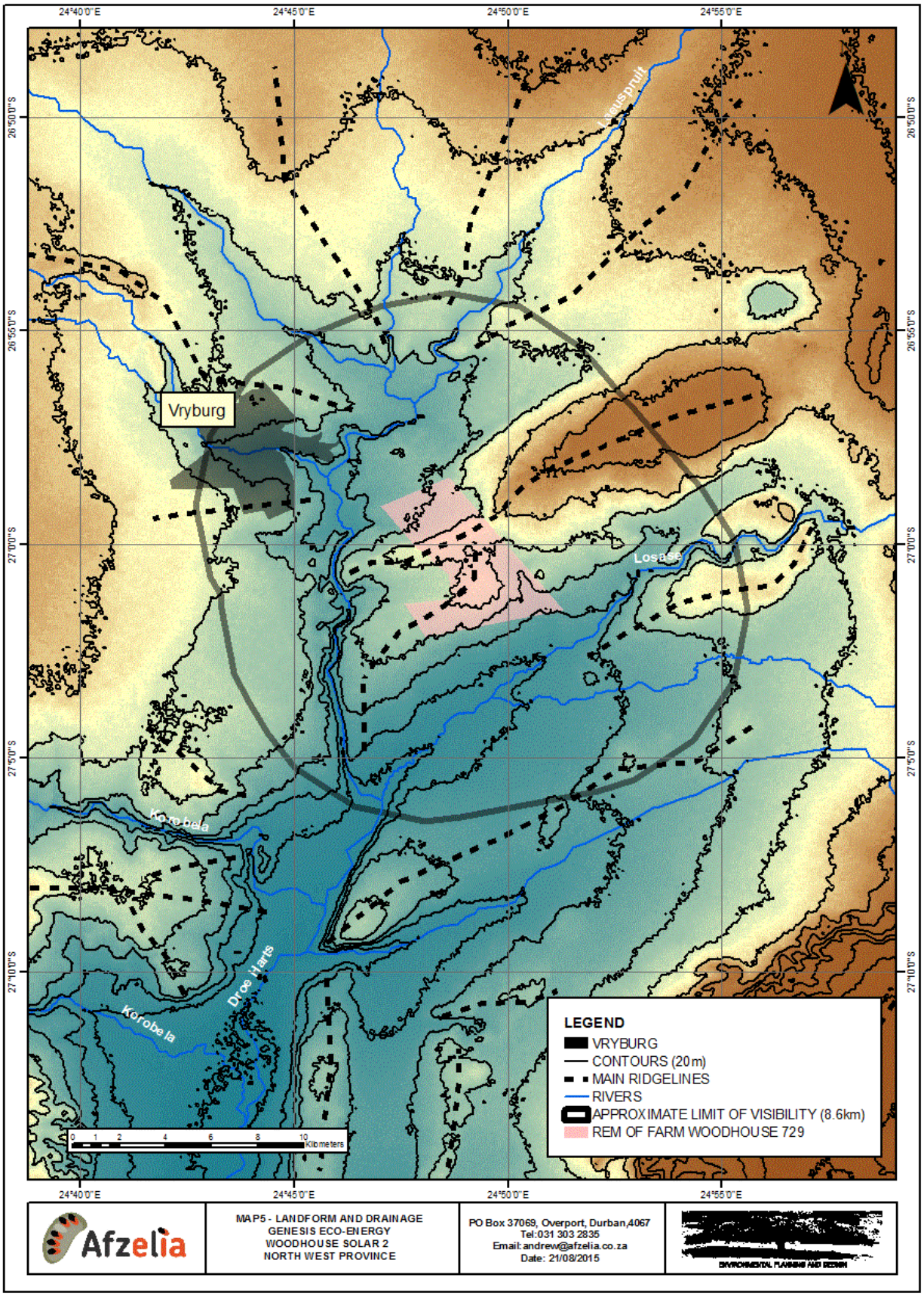
Plate 15, homestead on agricultural land to the south of the proposed development

Plate 16, Roads to the east and west of the proposed development including the N18, the R34 and the N14.

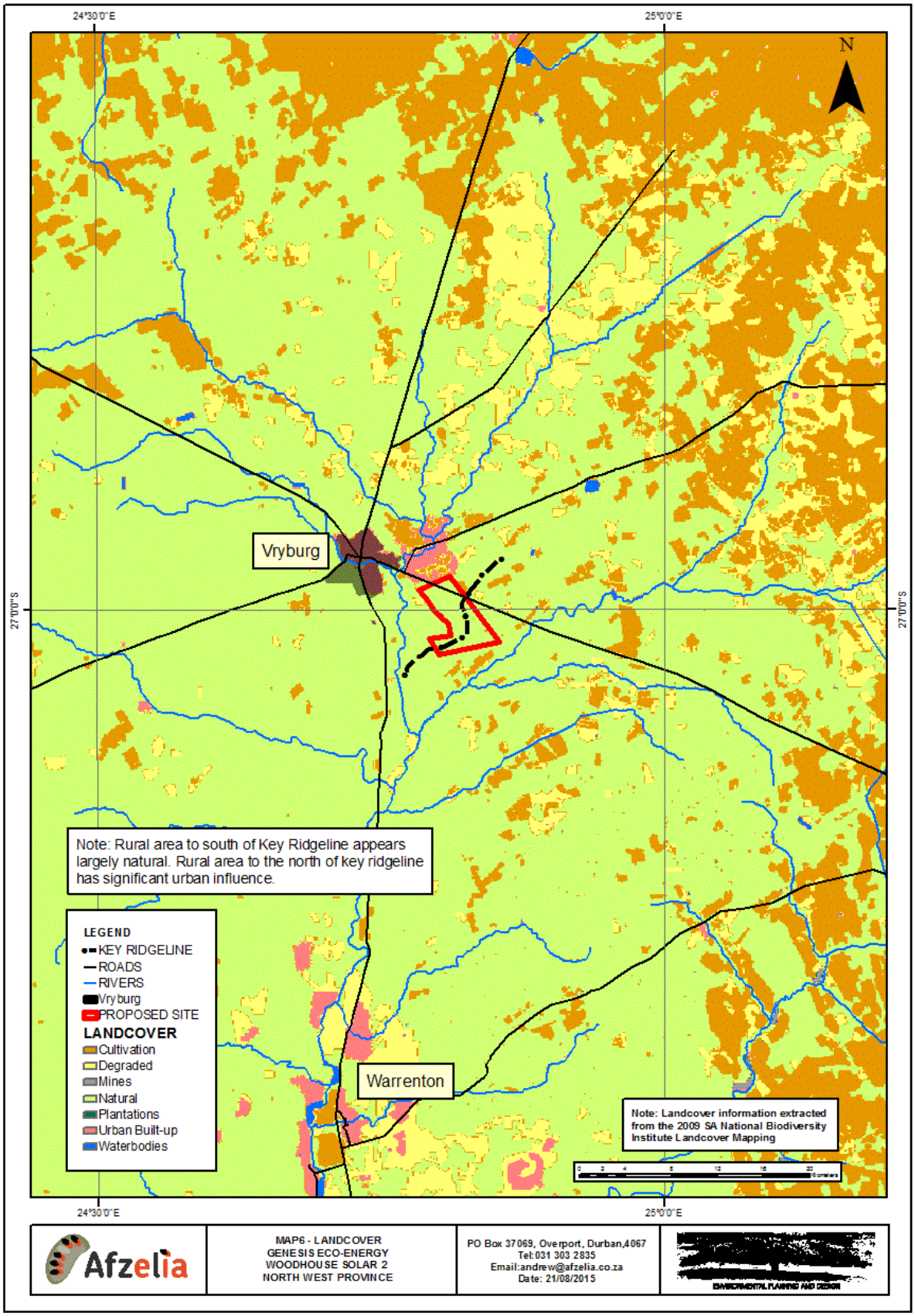
MAP 4, STRATEGIC LANDFORM



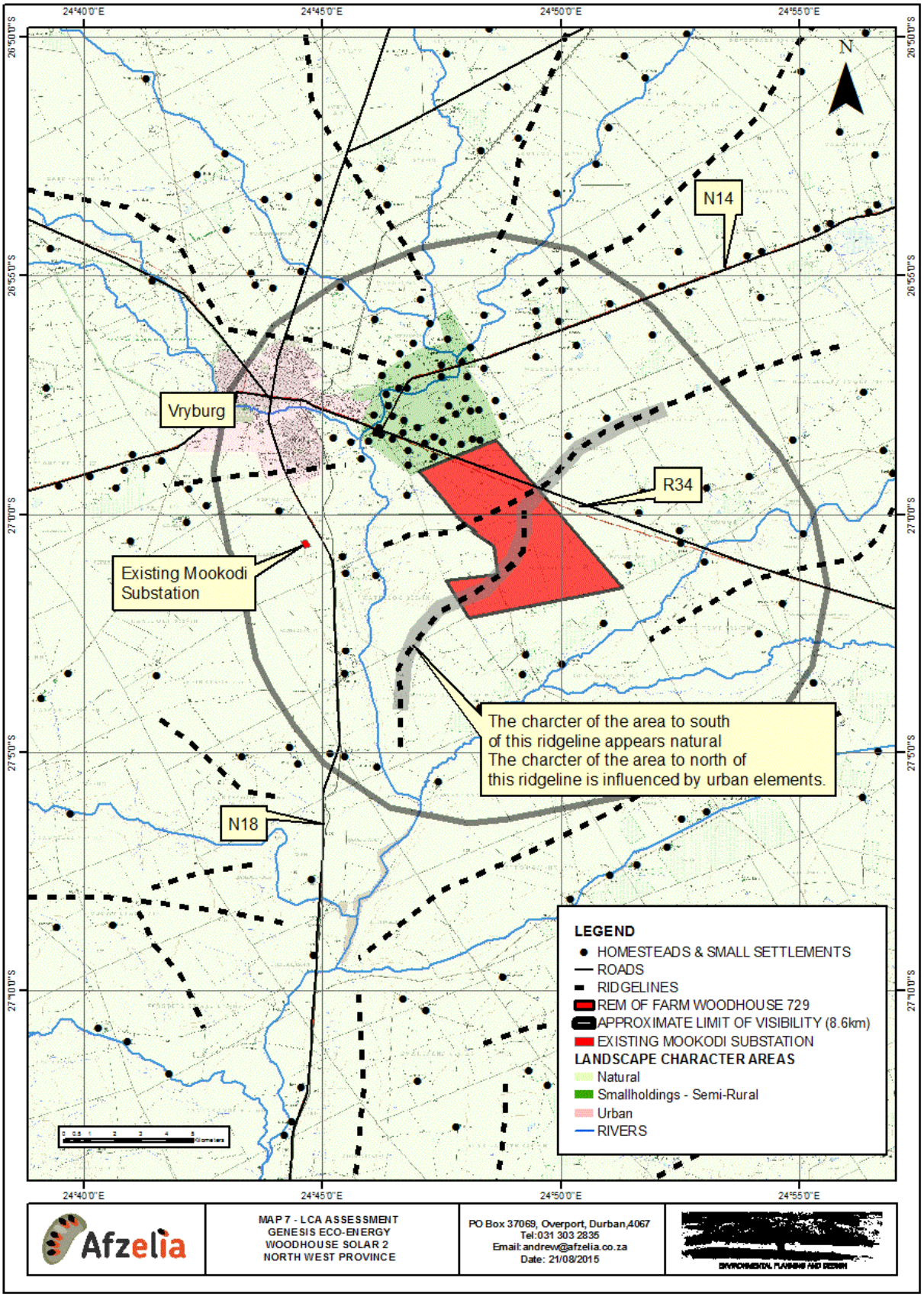
MAP 5, LANDFORM & DRAINAGE



MAP 6, LANDCOVER



MAP 7, LANDSCAPE CHARACTER AREAS



4 THE NATURE OF POTENTIAL VISUAL IMPACTS

4.1 GENERAL

Impacts could include general degradation of the relatively natural landscape in which the development is proposed 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 that are visible. 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.
b. Change in specific views for specific receptors for 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 has however been 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, 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 for receptors are expected to relate largely to intrusion.

4.2 THE NATURE OF LIKELY VIEWS OF THE DEVELOPMENT

During the construction phase, it is expected that traffic will be slightly higher than normal 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 development description included in Appendix I indicates that the land is relatively flat so only minor grading will 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 will occur within a laydown area within the overall site.

These activities are only likely to be visible from the immediate vicinity of the site and particularly from adjacent roads.

As the site is developed, concrete bases will be constructed, 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 overhead power line that will link the facility to the grid within the site boundary are also likely to appear in the landscape progressively. They will follow the same pattern as the PV array, with concrete bases being constructed first followed by assembly of structures and finally stringing of overhead lines.

The construction phase is programmed to take approximately 12 to 18 months.

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

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

The main visible elements therefore are likely to include;

1. 132kV Overhead power line between the PV1 and PV2 on-site substations, and
2. The solar array located within a fence line with associated on-site substation minor buildings and structures.

4.2.1 Overhead Power Lines

A new 132kV overhead power line will be constructed to link the PV 2 on-site substation to the national grid where the generated electricity will be evacuated to the National Grid.

Refer to **Plates 24 and 25** for detail of likely standard Eskom structures to be utilised.

4.2.2 The Solar Array

Two sites are under consideration for the PV 2 array;

a) Site alternative 1 (preferred) is located to the south of the property. The required area is indicated on Map 3.
b) Site alternative 2 is also indicated on Map 3. It is located to the north of the site. A total possible area of approximately 500ha has been identified for the

development. It should be noted however that only approximately 295ha of the identified area will be required for the development of the PV facility. Because of the size of the site alternative 2 and due to the need to highlight the most appropriate section for development from a visual perspective, the site alternative 2 is considered in two parts. The northern section of the site alternative 2 which is the area of the site from the ridgeline that bisects the site extending to the northern boundary. The southern section of the site alternative 2 is the area of the site from the ridgeline that bisects the site extending to the south to the southern boundary.

Both the site alternative 1 (preferred) and the site alternative 2 (alternative) are located on minor ridgelines, this means that they are likely to be visible from areas to the north and south of the ridgelines.

The site alternative 1 is also located close to the R34.

The PV panels will be mounted on continuous supports and orientated to face north towards the R34 and Vryburg.

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 and subject to the view angle, this can result in a PV array having a similar appearance as a large industrial structure when viewed from above.
- From the south, east and west the dark face of the PV units are 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, because of the contrast in colour with the surrounding landscape, the array is likely to be obvious 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.
- Mitigation or screening of views is often 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 view points, mitigation is likely to be less feasible as the height of any screen 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 not generally designed 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.

4.2.3 Security Lighting

The facility will 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.

Plate 17, PV array viewed from approximately the same ground level as the array. Note the array appears as a linear dark element in the landscape

Plate 18, PV array viewed from above. Note the array rows are read as one and have a similar impact as the roof of a large industrial building might.

Plate 19, PV array viewed from behind and the side. The dark face of the PV units are not obvious and subject to the colour of the undersides of the units, the supporting structures are likely to become more apparent. This might appear as a long industrial structure from close quarters. From a distance however, the shadow cast by the structure will be read and will probably appear similar in nature to the front view of the array.

Plate 20, PV array screened by low vegetation. It is possible to screen a PV array from close viewpoints at a similar level to ground level within the array.

5 VISIBILITY OF THE PROPOSED DEVELOPMENT

5.1 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".

ZVTs of the proposed development have been assessed using Arc Spatial Analyst GIS.

The assessment is based on terrain data that has been derived from satellite imagery. This data was originally prepared by NASSA 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 an online mapping programme.

Whilst the ZTV has been calculated from terrain data only, existing vegetation and development could have a significant modifying effect on the areas indicated.

5.2 ASSESSMENT LIMIT

The GIS based assessment of Zones of Theoretical Visibility does not take the curvature of the earth or reduction in scale due to distance into account. In order to provide an indication of the likely limit of visibility due to this effect a universally accepted navigational calculation (**Appendix IV**) has been used to calculate the likely distance that the proposed structures might be visible over. This indicates that in a flat landscape a structure 6m high could be visible at a distance of approximately 8.6 km.

Whilst the low ridgelines that surround the site could extend this range, due to the relatively flat nature of the topography, the 8.6 km buffer has been adopted as an indication of the approximate limit of visibility.

5.3 APPROACH TO THE ASSESSMENT

5.3.1 ZTV for Proposed Array

The detailed location of the proposed array has been provided by the developer (Map 2). In order to generate the ZTV for the proposed array, it has been assumed that entire area of the array will be set at a uniform maximum height of up to 5m. Points have been set at each change in direction of the array boundary plus an additional point at the centre of the array all with 6m offsets for generation of the ZTV using the Viewshed option in Arc Spatial Analyst.

5.3.2 ZTV for Overhead Power Line and On Site Sub Station

The proposed Eskom Bophorima Substation and new overhead power line link to the existing Mookodi Substation are Eskom proposals and so are not considered in detail in this assessment.

5.4 VISIBILITY

5.4.1 Zones of Theoretical Visibility (ZTV)

Maps 8, 9 and 10 indicate the ZTV for the proposed PV arrays associated with project alternatives , i.e. site alternative 1 and site alternative 2 (northern and southern portions, , substation and internal infrastructure.

Map 11 indicates the ZTV for the possibly required 132kV overhead power line.

The assessment indicates that;

i. The visibility of the proposed project is likely to be limited to areas to the north of the project and particularly to the area between Vryburg and the proposed development. This is an area where even in open agricultural areas, the character of the area is influenced by urban and urban fringe development.
ii. The development will be screened by a minor ridgeline from areas to the south of the proposed development where the landscape character is relatively natural and there is little influence of development on landscape character.
iii. The ZTV indicates that areas to the west of the proposed development around the Huhudi Township as well as the N18 immediately to the south could be impacted with a high degree of visual exposure. In reality however, existing vegetation and railway infrastructure will help to soften this impact.
iv. The proposed development will be visible to limited sections of the N14 close to its junction with the R34.
v. The possible 132kV power line connection to the Mookodi Substation will be visible to a similar area as the array

5.5 MODIFYING EFFECT DUE TO VAC OF THE LANDSCAPE AND THE NATURE OF THE DEVELOPMENT

The Visual Absorption Capacity (VAC) of the landscape is related to both vegetation and topography.

5.5.1 Views of the Array and on site infrastructure and buildings.

- Dense roadside vegetation and vegetation in valley lines to the south of Vryburg between the urban area and the proposed development is likely to soften views of the development from areas to the north.
- The low ridgeline immediately to the south of the proposed development area will screen the development from areas to the south.
- Railway infrastructure and associated vegetation as well as vegetation on the eastern edge of Huhudi will help to soften views of the development from the urban area and affected sections of the N8.
- Vegetation is likely to at least partially screen views of the development from the short sections of the R34 from which it is indicated as being visible.

The effects noted above and the nature of the proposed development will have the following influence on the way that the proposed development is seen from the surrounding area;

5.5.2 Views of the Grid Connection.

As part of the Woodhouse PV 2 project it will be necessary to construct a 132kV overhead power line connection between the PV 2 on-site substation in order that power generated by the PV 2 project can be evacuated to the National Grid.

Plate 10 indicates the existing 132kV overhead power line. The view is taken during a period of good visibility along the line of towers which have a spacing of +/- 250m. In total 9 towers are visible along the line before it connects to a line running at right angles. The last tower in the line which is a solid pole structure is just visible at +/- 2.5km.

From the photograph and considering the backdrop, it can be concluded that the visual mass of the overhead power line is unlikely to be obvious from distances greater than 2.5km.

The proposed new overhead power line will also be viewed in the context of existing power lines that are located on the northern edge of the site that are likely to be more noticeable particularly to areas from the north of the project (**Plate 2**).

Given the above, even though the ZTV model for the proposed power line indicates that it could be visible over an extensive area, site conditions and the makeup of the power line structures will result in the proposed power line not having any significant impact at a distance greater than 2.5km. From closer distances it will also be viewed in the context of an existing power line.

Plate 21, Existing Solar Arrays at Upington Airport as seen from the air

Plate 22, Existing array seen in a flat landscape from approximately 700m. The array is clearly visible.

Plate 23, 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 24, **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.

Plate 25, View of a 132kV overhead power line similar line to that proposed. Note pylons on the horizon (approx 2.5km distance) are just visible.

5.7 KEY VIEWPOINTS

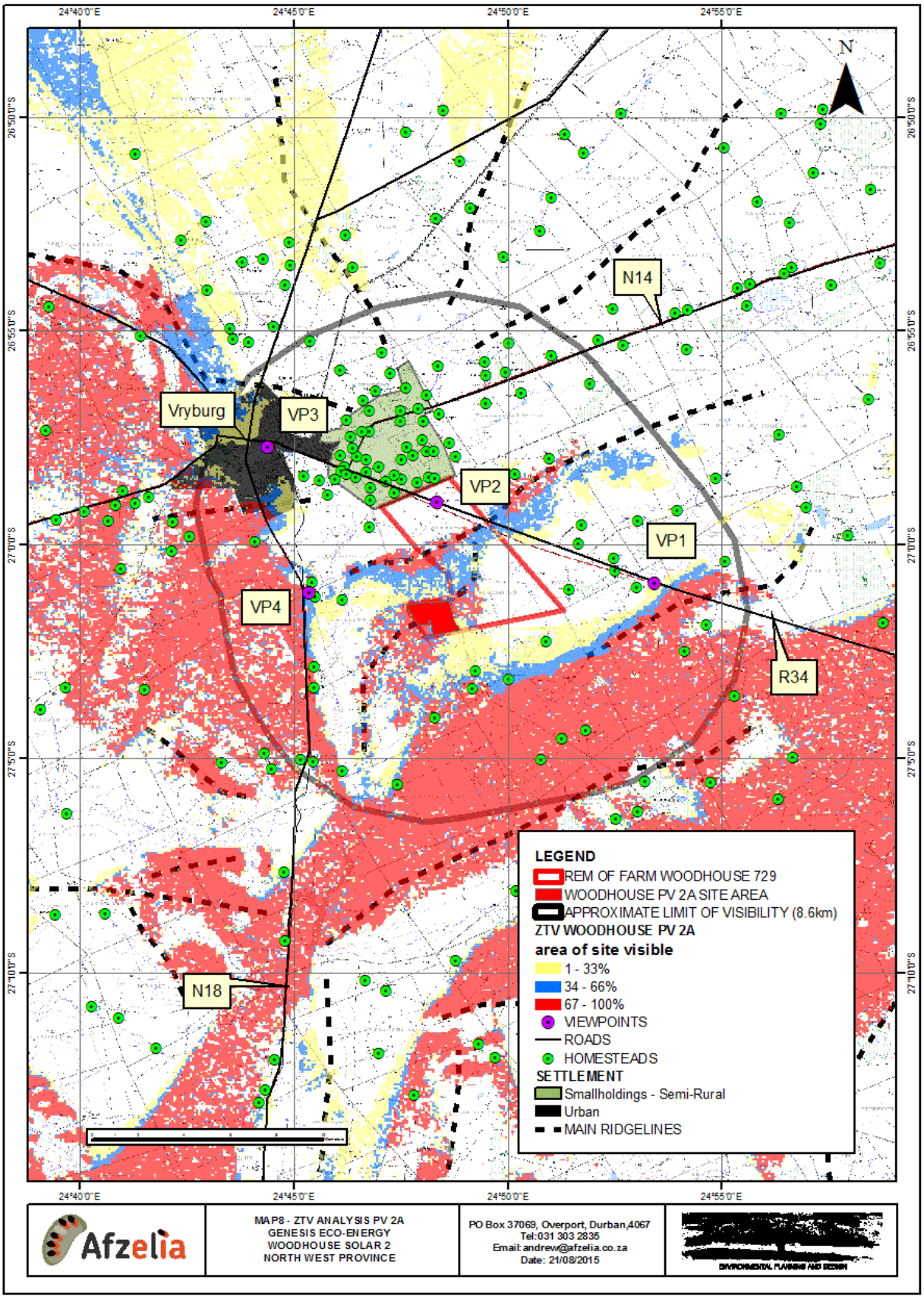
Key viewpoints that are adjudged to provide an indication of typical views towards the proposed development and are representative of views of the identified visual receptors / LCAs are located on **Maps 8, 9 and 10**. Photographs from these viewpoints on which the approximate extent of the proposed array have been marked are indicated in **Figures 1 to 4** inclusive.

Five viewpoints have been selected including;

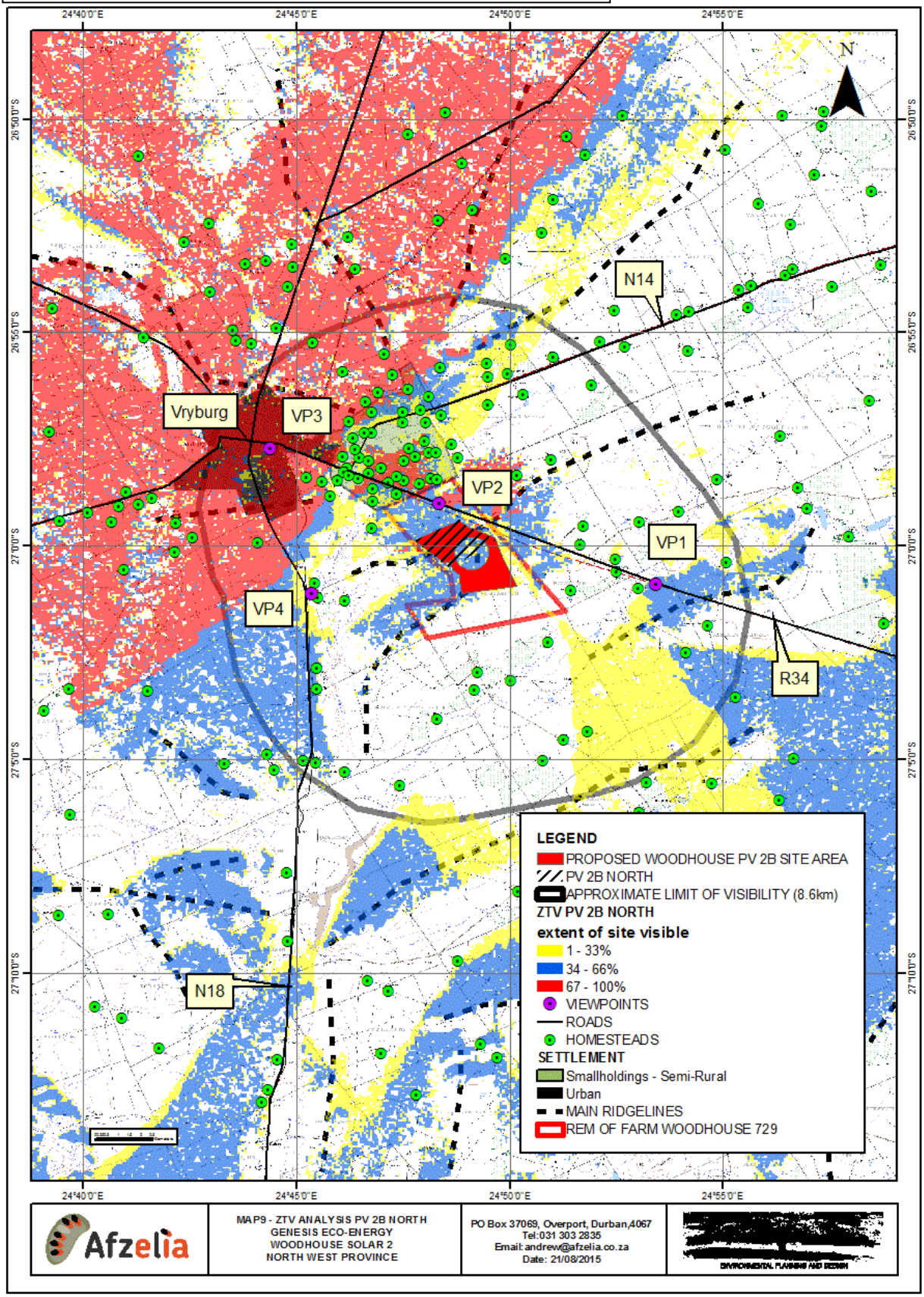
1. VP1 **(Figure 1)** is located approximately 5.6km to the south east of alternative PV 2B South on the R34. This viewpoint illustrates the likely impact of this alternative on the more natural rural landscape to the south of the project area.
2. VP2 **(Figure 2)** is located on the R34 approximately 1.5 km to the north west of the site. The array will be tilted on the hillside towards the viewer. Retention of a natural buffer area immediately beside the road will help to mitigate this impact.
3. VP3 **(Figure 3)** is located on the southern urban edge of Vryburg approximately 7.5 km to the north east of the site. Existing vegetation and the low level of the viewpoint will mean that the development is not visible from this area.
4. VP4 **(Figure 4)** is located close to the N18 approximately 3.6 km to the west of the site. This provides an indication of the worst possible view from the road. In reality however, the view from the majority of the road will be softened by the existing railway line and associated vegetation.

The extent of the proposed array as it would appear from the above viewpoints has been marked on the photographs. Each extent has been approximated by measuring on plan the angle of the view that development occupies given that each view was taken with a 28mm lens which has an approximate angle of vision of just over 74°. This has been cross referenced with known land marks.

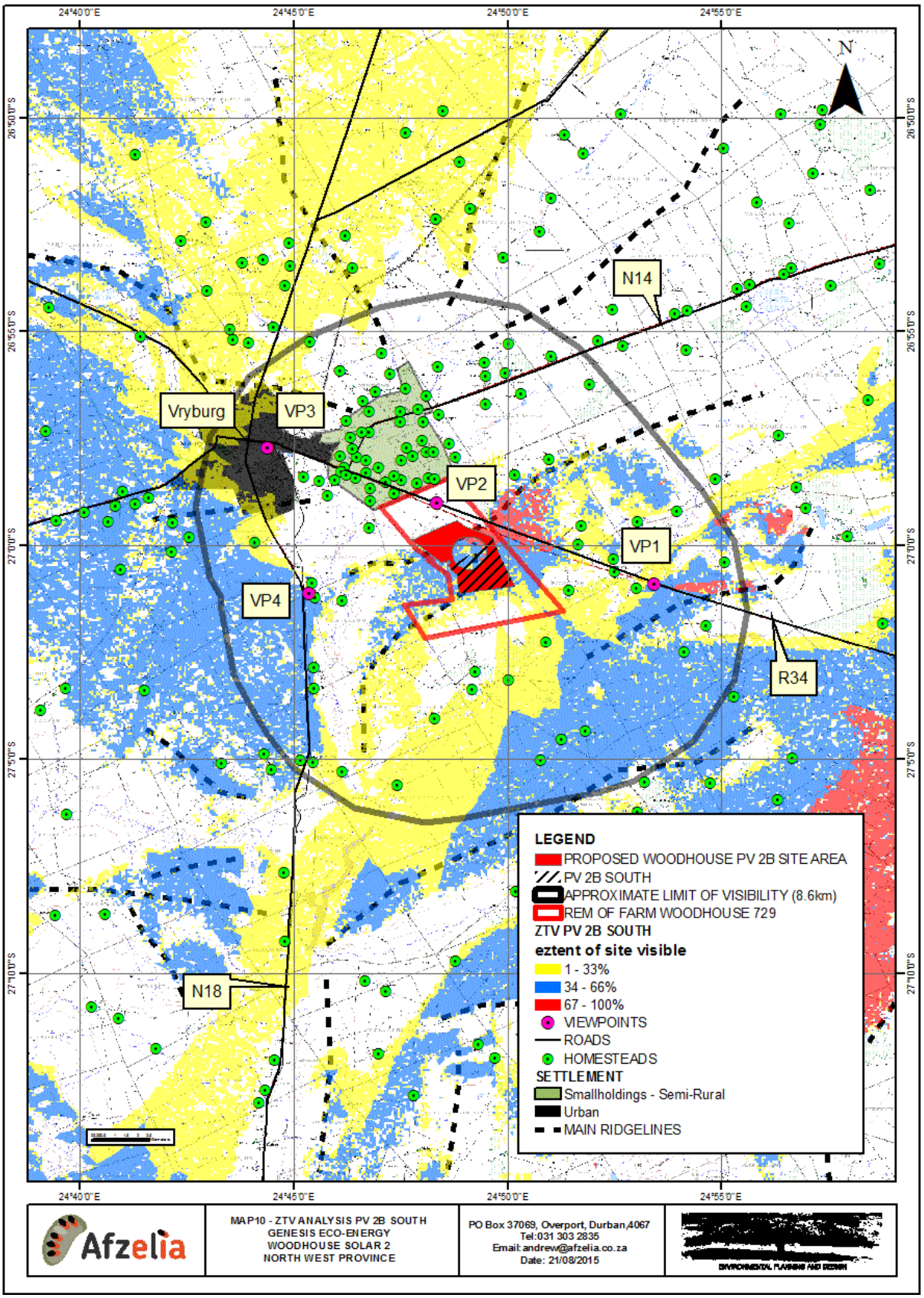
MAP 8, ZTV PROPOSED WOODHOUSE PV 2A ARRAY



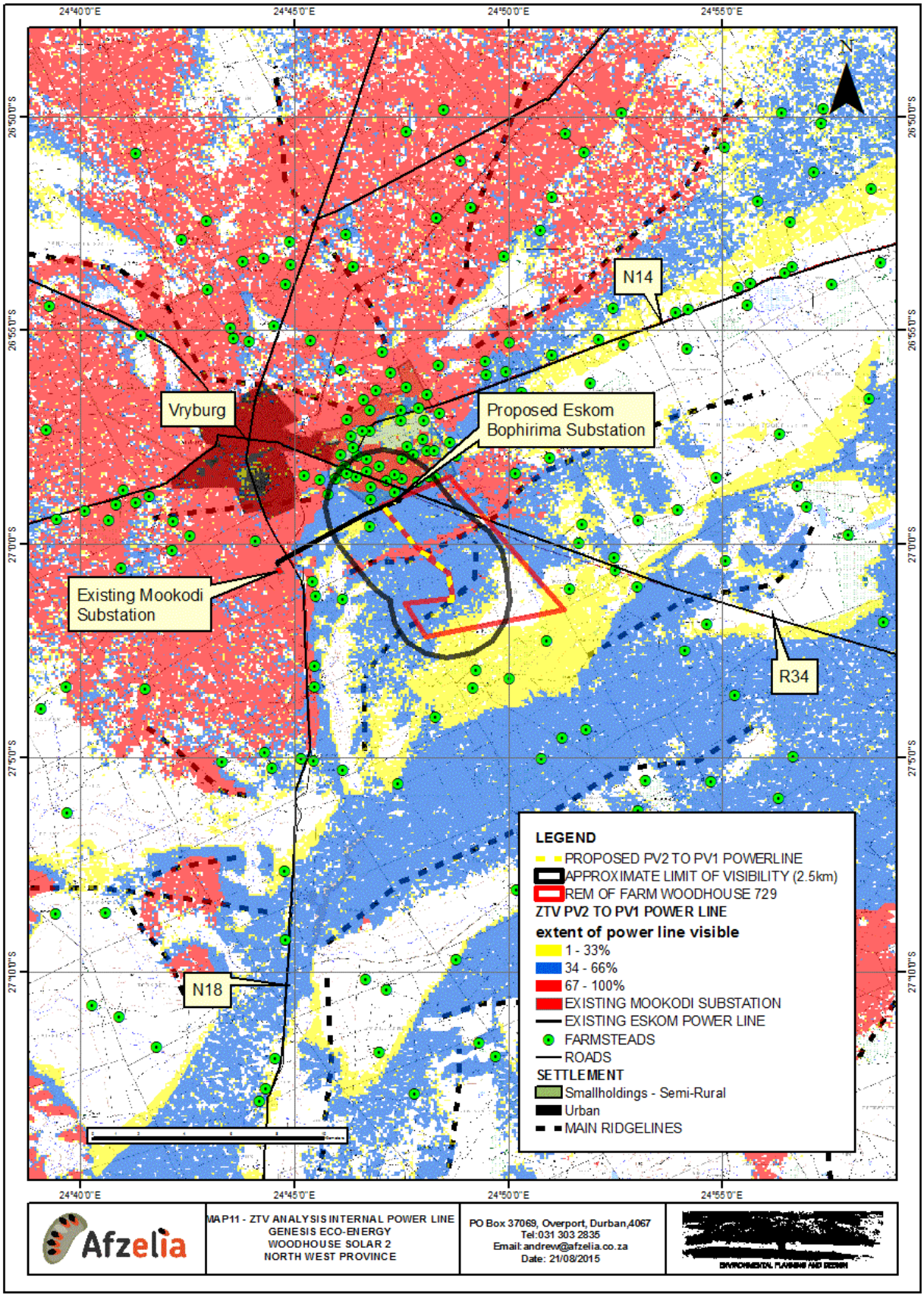
MAP 9, ZTV PROPOSED WOODHOUSE PV 2B NORTH ARRAY



MAP 10, ZTV PROPOSED WOODHOUSE PV 2B SOUTH



MAP 11, ZTV INTERNAL132KV POWER LINE



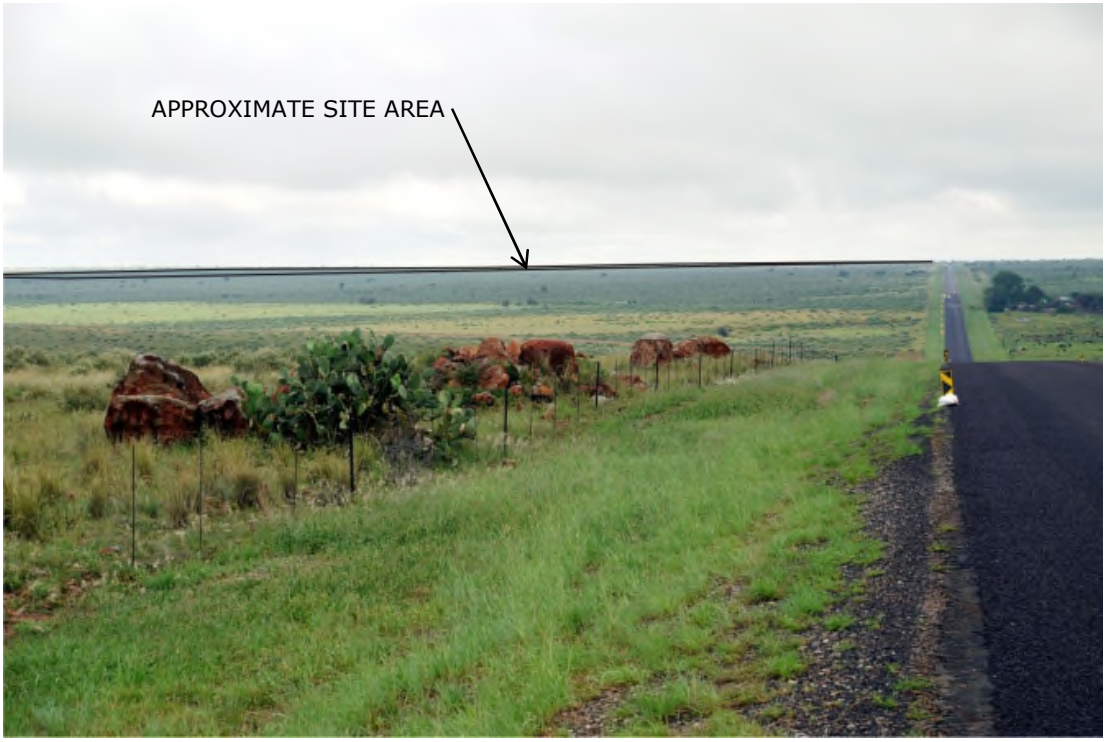


Figure 1, VP1 located approximately 5.6km to the south east of alternative PV 2B South on the R34. This viewpoint illustrates the likely impact of this alternative on the more natural rural landscape to the south of the project area.

Figure 2, VP2 located on the R34 approximately 1.5 km to the north west of the site. The array will be tilted on the hillside towards the viewer. Retention of a natural buffer area immediately beside the road will help to mitigate this impact.

Figure 3, VP3 located on the southern urban edge of Vryburg approximately 7.5 km to the north east of the site. Existing vegetation and the low level of the viewpoint will mean that the development is not visible from this area.

Figure 4, VP4 located close to the N18 approximately 3.6 km to the west of the site. This provides an indication of the worst possible view from the road. In reality however, the view from the majority of the road will be softened by the existing railway line and associated vegetation.

6 VISUAL IMPACT ASSESSMENT

6.1 ISSUES TO BE ADDRESSED

The following list of possible impacts were identified by the Scoping Report and need to be addressed in the assessment;

a) The proposed development could change the character of a relatively natural area.
b) The proposed development could be visible to and impact on an extensive area of small holdings to the north.
c) The proposed development could change the character of the landscape as seen from the urban edge of Vryburg.
d) The proposed project is likely to be visible to and impact on a short length (approximately 3km) of the N14.
e) The proposed project is likely to be visible intermittently to and impact on approximately 5-6km of the R34
f) The proposed project is likely to be visible to and impact on approximately 9km of the N18.
g) The project is likely to impact on agricultural homesteads however, homesteads within 5km of the proposed study area are less likely to be affected by the proposed project than homesteads at a greater distance.
h) Glare from the proposed project could cause nuisance on adjacent roads and for flightpaths associated with the Vryburg airport.
i) Lighting impacts.

6.2 ASSESSMENT METHODOLOGY

The previous section of the report identified specific areas where likely visual impacts may occur. This section will attempt to quantify these potential visual impacts in their respective geographical locations and in terms of the identified issues (see Section 1.5) related to the visual impact.

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).

6.2 VISUAL IMPACT ASSESSMENT

6.2.1 Impact of the Proposed Development on General Landscape Character

Nature of impact:

There is one possible areas of impact;

- The proposed solar project will introduce industrial elements into the rural landscape to the south of Vryburg.

The area south of Vryburg can be divided into to types of rural area;

a) The character of the area extending approximately 5 to 6 km to the south from the urban edge to the first major ridgeline that bisects the site is largely influenced by urban and urban fringe development.
b) The character of the area extending to the south of the ridgeline indicated above is relatively natural with only the road and very occasional homesteads being the only elements of development that are obvious in the landscape.

Both alternatives site alternative 1 and site alternative 2 (southern portion) will largely impact the relatively natural landscape.

The northern section of the site alternative 2 is likely to partly impact the relatively natural area but the main impact area will be the area immediately to the south of the urban area where the landscape character is affected by urban and urban fringe development.

The proposed internal power line will have a very local effect and is unlikely to be obvious from outside the general area of development.

This area is already highly influenced by urban development.

	Without mitigation	**With mitigation**
Extent	**Site alternative 1** Site and immediate surroundings, **(2)** **Site alternative 2** <u>Northern portion</u> Site and immediate surroundings, **(2)** <u>Southern portion</u> Site and immediate surroundings, **(2)**	**Site alternative 1** Site and immediate surroundings **(2)** **Site alternative 2** <u>Northern Portion</u> Site and immediate surroundings **(2)** <u>Southern portion</u> Site and immediate surroundings **(2)**
Duration	**Site alternative 1** Long term, **(4)** **Site alternative 2** <u>Northern portion</u> Long term, **(4)** <u>Southern portion</u> Long term, **(4)**	**Site alternative 1** Long term, **(4)** **Site alternative 2** <u>Northern portion</u> Long term, **(4)** <u>Southern portion</u> Long term **(4)**

Magnitude	**Site Alternative 1** Moderate, **(6)** **Site alternative 2** Northern portion Low, **(4)** Southern portion Moderate, **(6)**	**Site alternative 1** Low,(**4)** **Site alternative 2** Northern portion **(2)** Southern portion Low**, (4)**
Probability	**Site Alternative 1** Highly probable, **(4)** **Site Alternative 2** Northern Portion Probable, **(3)** Southern portion Highly probable, **(4)**	**Site Alternative 1** Highly probable, **(4)** **Site Alternative 2** Northern portion Probable, **(3)** Southern portion Highly probable, **(4)**
Significance	**Site Alternative 1** Medium, **(48)** **Site Alternative 2** Northern portion Low to medium, **(30)** Southern portion Medium, **(48)**	**Site Alternative 1** Medium, **(40)** **Site Alternaitve 2** Northern portion Low, **(24)** Southern portion Medium, **(40)**
Status	The loss of natural landscape areas is seen as a **negative impact**.	**negative**
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 possible that a proportion of stakeholders will view the loss of view as irreplaceable.	**No irreplaceable loss**
Can impacts be mitigated?	**Yes**	

Mitigation / Management:

Site Alternative 1 & Site Alternative 2 (northern and southern portions)

Colour treat back face and structure of PV panels in order to ensure that structure is not obvious and all elements receded visually.

Screen plant and maintain vegetation on most visible sides of the development, this is typically the northern edge but the site alternative 2 northern portion extends just up to the ridgeline would also benefit from screen planting on the eastern edge on the ridgeline.

Cumulative Impacts:

The proposed solar PV project will increase the influence of development over a relatively natural landscape area.

Site alternative 1 and site alternative 2 (southern portion) are likely to have the most major impacts.

See appendix IV.

Residual Risks:

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.

6.2.2 The proposed development could be visible to and impact on an extensive area of small holdings to the north.

Nature of impact:
The issue relates to the fact that the affected area is a mixed development area with some sites used for social uses such as a church, others used for light industrial and transport related activities and others have been developed as residential properties. It is the residential use that is likely to be most sensitive to possible industrialisation of the landscape that the properties overlook.

The ZTV analysis indicates that alternatives site alternative 1 and site alternative 2 (southern portion) are likely to have minimal impact on this area because they are located largely on the opposite side of a ridgeline from the affected area. The northern portion of site alternative 2 is however located on the same ridgeline but overlooks the affected area. This alternative therefore could impact the area.

In reality the majority of houses are set amongst trees which will help to screen them from the development. The properties to the north of the N14 are also set a level lower than the road which foreshortens views to the south from this area.

Properties close to the R34 on both the northern and southern sides of the roads are the only properties that are likely to be significantly impacted. This includes a property that has been developed as a guest house which is located close to the northern boundary of the proposed development as well as a number of private houses on the opposite side of the road to the development.

The proposed internal power line will have a very local effect and is unlikely to be obvious from outside the general area of development. Existing power lines to the north of the site are also likely to help mitigate views of the power line which will be viewed through the existing infrastructure.

	Without mitigation	**With mitigation**
Extent	**Site Alternative 1** Site and immediate surroundings, **(2)** **Site Alternative 2** <u>Northern portion</u> Site and immediate surroundings, **(2)** <u>Southern portion</u> Site and immediate surroundings, **(2)**	**Site Alternative 1** NA **Site Alternative 2** <u>Northern portion</u> NA <u>Southern portion</u> NA
Duration	**Site Alternative 1** Long term, **(4)** **Site Alternative 2** <u>Northern portion</u> Long term, **(4)** <u>Southern portion</u> Long term, **(4)**	**Site Alternative 1** NA **Site Alternative 2** <u>Northern portion</u> NA <u>Southern portion</u> NA
Magnitude	**Site Alternative 1** Small, **(0)** **Site alternative 2** <u>Northern portion</u> Low, **(4)** <u>Southern portion</u> Small, **(0)**	**Site Alternative 1** NA **Site Alternative 2** <u>Northern portion</u> NA <u>Southern portion</u> NA

Probability	**Site Alternative 1** Probable, **(3)** **Site Alternative 2** <u>Northern portion</u> Probable, **(3)** <u>Southern portion</u> Probable, **(3)**	**Site Alternative 1** NA **Site Alternative 2** <u>Northern portion</u> NA <u>Southern portion</u> NA
Significance	**Site Alternative 1** Low, **(18)** **Site Alternative 2** <u>Northern portion</u> Low to medium, **(30)** <u>Southern portion</u> Low, **(18)**	**Site Alternative 1** NA **Site Alternative 2** <u>Northern portion</u> NA <u>Southern portion</u> NA
Status	The character of the rural outlook from the closest properties will be modified. Overviews of site alternative 2 (northern portion) will be possible as it will be set out on a slope overlooking the affected area. The above factor will result in the project being seen as an obvious hard geometric form in the landscape. It is possible that a proportion of receptors, particularly those that may benefit from this or similar projects in the area, will view the development as a positive addition to the local landscape. For those people that are attracted to the area for its natural attributes, it is likely that development of natural areas will be seen as a **negative impact**.	NA
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 possible that a proportion of stakeholders will view the loss of view as irreplaceable.	NA
Can impacts be mitigated?	No. The proposed project will be located on a ridgeline. Site alternative 2 (northern portion) will overlook the affected area. As the land falls towards the affected area and there is a need to prevent shadow falling on the PV panels, screening will not be possible.	
Mitigation / Management: NA		
Cumulative Impacts: There are a number of proposed projects including the Woodhouse PV1 project that will impact on this area. Site alternative 2 (northern portion) will have the most significant cumulative effect. Site alternative 1 and site alternative 2 (southern portion) will have relatively small cumulative effects.		

Appendix IV.
Residual Risks: 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.

6.2.3 The proposed development could change the character of the landscape as seen from the urban edge of Vryburg.

Nature of impact:

This issue is associated with two areas;

- The southern edge of Vryburg is generally comprised of light industrial development and large scale retail. This area is unlikely to be sensitive to potential change in outlook. The area is also relatively low when compared with the site and there is a significant amount of tall vegetation on the urban edge that will almost certainly screen views of the proposed development.
- The housing area of Huhudi which is located approximately 3.5km to the west of the proposed development. This is a dense housing area so views towards the development will only be possible from the eastern edge of the settlement area. Mitigating effects include;
  - There is a substantial amount of vegetation on the urban edge that will help to soften views of the development.
  - The urban area is set at approximately the same level as the proposed development which means that extensive overviews of the array will not be seen.

Whilst residents may not appreciate views of the development, the nature of the settlement is such that change in outlook is unlikely to impact on property values.

The ZTV analysis indicates that site alternative 1 and site alternative 2 (southern portion) are likely to have minimal impact on this area because they are located largely on the opposite side of a ridgeline from the affected area. Site alternative 2 (northern portion) is however located on the same ridgeline but overlooks the affected area. This alternative therefore could impact the area.

A small number of properties on the south eastern edge of the Huhudi area are the only ones that are likely to be affected.

The proposed internal power line will have a very local effect and is unlikely to be obvious from outside the general area of development.

	Without mitigation	**With mitigation**
Extent	**Site Alternative 1** Site and immediate surroundings, **(2)** **Site Alternative 2** <u>Northern portion</u> Site and immediate surroundings, **(2)** <u>Southern portion</u> Site and immediate surroundings, **(2)**	**Site Alternative 1** NA **Site Alternative 2** <u>Northern portion</u> NA <u>Southern portion</u> NA
Duration	**Site Alternative 1** Long term, **(4)** **Site Alternative 2** <u>Northern portion</u> Long term, **(4)** <u>Southern portion</u> Long term, **(4)**	**Site Alternative 1** NA **Site Alternative 2** <u>Northern portion</u> NA <u>Southern portion</u> NA

Magnitude	**Site Alternative 1** Small, **(0)** **Site Alternative 2** <u>Northern portion</u> Minor, **(2)** <u>Southern portion</u> Small, **(0)**	**Site Alternative 1** NA **Site Alternative 2** <u>Northern portion</u> NA <u>Southern portion</u> NA
Probability	**Site Alternative 1** Probable, **(3)** **Site Alternative 2** <u>Northern portion</u> Probable, **(3)** <u>Southern portion</u> Probable, **(3)**	**Site Alternative 1** NA **Site Alternative 2** <u>Northern portion</u> NA <u>Southern portion</u> NA
Significance	**Site Alternative 1** Low, **(18)** **Site Alternative 2** <u>Northern portion</u> Low, **(24)** <u>Southern portion</u> Low, **(18)**	**Site Alternative 1** NA **Site Alternative 2** <u>Northern portion</u> NA <u>Southern portion</u> NA
Status	The character of the rural outlook from the closest properties will be modified. The project will be seen largely in elevation and from an acute angle overlooking the extent of the project. The above factors will result in the project being seen as an obvious hard geometric form which is likely to be seen by most people as development within a relatively natural setting. It is possible that a proportion of receptors, particularly those that may benefit from this or similar projects in the area, will view the development as a positive addition to the local landscape. For those people that are attracted to the area for its natural attributes, it is likely that development of natural areas will be seen as a **negative impact**.	NA
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 possible that a proportion of stakeholders will view the loss of view as irreplaceable.	
Can impacts be mitigated? No. The proposed project will be located on a ridgeline. Site Alternative 2 (northern portion) will overlook the affected area. As the land falls towards the affected area and there is a need to prevent shadow falling on the PV panels, screening will not be possible.		
Mitigation / Management:		

NA
Cumulative Impacts: There are a number of proposed projects including the Woodhouse PV1 project that will impact on this area. Site alternative 2 (northern portion) will have the most significant cumulative effect. Site alternative 1 and Site alternative 2 (southern portion) will have relatively small cumulative effects. **Appendix IV.**

6.2.4 The proposed project is likely to be visible to and impact on a short length of the N14.

Nature of impact:
The ZTV analysis indicates that the site alternative 2 (northern portion) project may be visible from a small section of the N14 however in reality, existing vegetation will screen most of these views.

Site alternative 1 and site alternative 2 (southern portion) are unlikely to be visible from this road.

The proposed internal power line will have a very local effect and is unlikely to be obvious from outside the general area of development.

	Without mitigation	**With mitigation**
Extent	**Site Alternative 1** Site and immediate surroundings, **(2)** **Site Alternative 2** Site and immediate surroundings, **(2)** **PV 2B South** Site and immediate surroundings, **(2)**	**Site Alternative 1** NA **Site Alternative 2** NA NA
Duration	**Site Alternative 1** Long term, **(4)** **Site Alternative 2** <u>Northern Portion</u> Long term, **(4)** <u>Southern portion</u> Long term, **(4)**	**Site Alternative 1** NA **Site Alternative 2** <u>Northern portion</u> NA <u>Southern portion</u> NA
Magnitude	**Site Alternative 1** Small, **(0)** **Site Alternative 2** <u>Northern portion</u> Minor, **(2)** <u>Southern portion</u> Small, **(0)**	**Site Alternative 1** NA **Site Alternative 2** <u>Northern portion</u> NA <u>Southern portion</u> NA
Probability	**Site Alternative 1** Very improbable, **(1)** **Site Alternative 2** <u>Northern portion</u> Probable, **(3)** <u>Southern portion</u> Very improbable, **(1)**	**Site Alternative 1** NA **Site Alternative 2** <u>Northern portion</u> NA <u>Southern portion</u> NA

Significance	**Site Alternative 1** Low, **(6)** **Site Alternative 2** <u>Northern portion</u> Low, **(24)** <u>Southern portion</u> Low, **(6)**	**Site Alternative 1** NA **Site Alternative 2** <u>Northern portion</u> NA <u>Southern portion</u> NA
Status	**Negative**	**Negative**
Irreplaceable loss	The proposed development can be dismantled. There will therefore be **no irreplaceable loss.** However, given the long term nature of the project, it is likely that a proportion of stakeholders will consider the loss of view as irreplaceable.	**No irreplaceable loss.**
Can impacts be mitigated	No	
Mitigation: No mitigation possible.		
Cumulative Impacts: Site alternative 2 (northern portion) is not likely to be obvious from the road the significance of cumulative impacts is likely to be low. Site alternative 1 and site alternative 2 (southern portion) will not be visible from the road and so there will be no cumulative impact. **See appendix IV.**		
Residual Risks: 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.		

6.2.5 The proposed project is likely to be visible intermittently to and impact on the R34.

Nature of impact:

The N34 runs along the northern site boundary. Views of the projects are likely to be visible to varying degrees;

- Site alternative 1 is located some 3.3km from the R34. Whilst the project is located on a ridgeline facing south east towards a section of the R34. The ZTV analysis indicates that this project is likely to affect approximately 3.0km of the road in an area where views from the road are over a relatively natural area. The distance will to a degree help to mitigate impacts.
- Site alternative 2 (northern portion) is located closer to the R34 also close to a ridgeline but will face north west. This project is located approximately 0.5km from the road and the ZTV analysis indicates that it is likely to affect approximately 7.3km of the road in an area where views from the road are over urban and urban fringe type development.
- Site alternative 2 (southern portion) is located some 0.5km from the R34. Whilst the project is located on a ridgeline facing south east towards a section of the R34. The ZTV analysis indicates that this project is likely to affect approximately 8.3km of the road in an area where views from the road are over a relatively natural area.

The proposed internal power line will have a very local effect and is unlikely to be obvious from outside the general area of development.

Whilst the R34 is an important regional route, it is not likely to carry as high a proportion of tourism related traffic as a national route.		
	Without mitigation	**With mitigation**
Extent	**Site Alternative 1** Site and immediate surroundings, **(2)** **Site Alternative 2** Northern portion Site and immediate surroundings, **(2)** Southern portion Site and immediate surroundings, **(2)**	**Site Alternative 1** Site and immediate surroundings, **(2)** **Site Alternative 2** Northern portion Site and immediate surroundings, **(2)** Southern portion Site and immediate surroundings, **(2)**
Duration	**Site Alternative 1** Long term, **(4)** **Site Alternative 2** Northern portion Long term, **(4)** Southern portion Moderate, **(4)**	**Site Alternative 1** Long term, **(4)** **Site Alternative 2** Northern portion Long term, **(4)** Southern portion Moderate, **(4)**
Magnitude	**Site Alternative 1** Low / Minor, **(3)** **Site Alternative 2** Northern portion Minor, **(2)** Southern portion Low, **(4)**	**Site Alternative 1** Low/Minor, **(3)** **Site Alternative 2** Northern portion Minor, **(2)** Southern portion Low, **(4)**
Probability	**Site Alternative 1** Highly probable, **(4)** **Site Alternative 2** Northern portion Highly probable, **(4)** Southern portion Highly probable, **(4)**	**Site Alternative 1** Probable, **(3)** **Site Alternative 2** Northern portion Probable, **(3)** Southern portion Probable, **(3)**
Significance	**Site Alternative 1** Medium, **(36)** **Site Alternative 2** Northern portion Medium, **(32)** Southern portion Medium, **(40)**	**Site Alternative 1** Low, **(28)** **Site Alternative 2** Northern portion Low, **(24)** Southern portion Medium, **(30)**
Status	**Negative**	**Negative**
Irreplaceable loss	The proposed development can be dismantled. There will therefore be **no irreplaceable loss.** However, given the long term nature of the project, it is likely that a proportion of stakeholders will	**No irreplaceable loss.**

	consider the loss of view as irreplaceable.	
Can impacts be mitigated	Yes	

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;
- Retain natural buffer areas adjacent to the R34.

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.
- Maintain natural buffer areas adjacent to the R34.

Decommissioning:

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

Cumulative Impacts:

As the proposed project is one of the closest projects to the road the significance of cumulative impacts are similar to above. **See appendix IV.**

Residual Risks:

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.

6.2.6 The proposed project is likely to be visible to and impact on the N18.

Nature of impact:

The N18 runs to the west of the proposed projects. Views of the projects are likely to be visible to varying degrees;

- Site alternative 1 is located some 4.0km from the N18. This project is located on a ridgeline facing south east towards a section of the N18. It is also the closest of the project alternatives to this road. The ZTV analysis indicates that this project is likely to affect approximately 10.1km of the road in an area where views from the road are over a relatively natural area. The distance will to a degree help to mitigate impacts.
- Site alternative 2 (northern portion) is also located a ridgeline but will face north west away from the N18. This project is located approximately 5.0km from the road and the ZTV analysis indicates that it is likely to affect approximately 11.4km of the road in an area where views from the road are over urban and urban fringe type development.
- Site alternative 2 (southern portion) is located some 6.2km from the N18. Whilst the project is located on a ridgeline facing south east towards a section of the N18. The ZTV analysis indicates that this project is likely to affect approximately 12.0km of the road in an area where views from the road are over a relatively natural area.

The proposed internal power line will have a very local effect and is unlikely to be obvious from outside the general area of development.

The N18 is an important regional route, it is likely to carry as high a proportion of tourism related traffic as a national route.		
	Without mitigation	**With mitigation**
Extent	**Site Alternative 1** Site and immediate surroundings, **(2)** **Site Alternative 2** <u>Northern portion</u> Site and immediate surroundings, **(2)** <u>Southern portion</u> Site and immediate surroundings, **(2)**	**Site Alternative 1** Site and immediate surroundings, **(2)** **Site Alternative 2** <u>Northern portion</u> Site and immediate surroundings, **(2)** <u>Southern portion</u> Site and immediate surroundings, **(2)**
Duration	**Site Alternative 1** Long term, **(4)** **Site Alternative 2** <u>Northern portion</u> Long term, **(4)** <u>Southern portion</u> Moderate, **(4)**	**Site Alternative 1** Long term, **(4)** **Site Alternative 2** <u>Northern portion</u> Long term, **(4)** <u>Southern portion</u> Moderate, **(4)**
Magnitude	**Site Alternative 1** Low, **(4)** **Site Alternative 2** <u>Northern portion</u> Minor, **(2)** <u>Southern portion</u> Minor, **(2)**	**Site Alternative 1** Low/Minor, **(3)** **Site Alternative 2** <u>Northern portion</u> Small/Minor, **(1)** <u>Southern portion</u> Small/Minor, **(1)**
Probability	**Site Alternative 1** Highly probable, **(4)** **Site Alternative 2** <u>Northern portion</u> Probable, **(3)** <u>Southern portion</u> Probable, **(3)**	**Site Alternative 1** Probable, **(3)** **Site Alternative 2** <u>Northern portion</u> Probable, **(3)** <u>Southern portion</u> Probable, **(3)**
Significance	**Site Alternative 1** Medium, **(40)** **Site Alternative 2** <u>Northern portion</u> Low, **(24)** <u>Southern portion</u> Low, **(24)**	**Site Alternative 1** Low, **(27)** **Site Alternative 2** <u>Northern portion</u> Low, **(21)** <u>Southern portion</u> Low, **(21)**
Status	**Negative**	**Negative**
Irreplaceable loss	The proposed development can be dismantled. There will therefore be **no irreplaceable loss.** However, given the long term nature of the project, it is likely that a proportion of stakeholders will consider the loss of view as irreplaceable.	**No irreplaceable loss.**

Can impacts be mitigated	Yes

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.

Cumulative Impacts:

The proposed project will also extend the general influence of solar projects on the character of the landscape surrounding Vryburg. However there are other proposed projects in closer proximity to the N18. These alternatives therefore will add a small amount to the likely cumulative effects of solar projects on the N18. **See appendix IV.**

Residual Risks:

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.

6.2.7 The project is likely to impact on agricultural homesteads however, homesteads within 5km of the proposed study area are less likely to be affected by the proposed project than homesteads at a greater distance.

Nature of impact:

The ZTV indicates that;

- Site alternative 1 will affect four homesteads at a distance of approximately 4km and eight homesteads at a distance of five to seven kilometres. The ZTV also indicates that the closest homesteads are only likely to have partial views over the development whereas three of the more distant homesteads are likely to have a complete overview of the proposed development.
- Site alternative 2 (northern portion) is likely to affect four homesteads within 4km of the development all of which could have partial views over the development and five homesteads at a distance of between 5 and 7km all of which are likely to have partial views of the development.
- Site alternative 2 (southern portion) is likely to affect one homestead within 4km and up to nine homesteads at a distance between 5km and 8km from the proposed development. All views are likely to be over part of the proposed development only.

The proposed internal power line will have a very local effect and is unlikely to be obvious from outside the general area of development.

Most homesteads in the area appear to be associated with agricultural use of the land. There do not appear to be any with secondary tourism uses.

Most homesteads also appear to have trees planted around them which will help to screen views of the proposed development.

	Without mitigation	**With mitigation**
Extent	**Site Alternative 1** Site and immediate surroundings, **(2)** **Site Alternative 2** Northern portion Site and immediate surroundings, **(2)** Southern portion Site and immediate surroundings, **(2)**	**Site Alternative 1** Site and immediate surroundings, **(2)** **Site Alternative 2** Northern portion Site and immediate surroundings, **(2)** Southern portion Site and immediate surroundings, **(2)**
Duration	**Site Alternative 1** Long term, **(4)** **Site Alternative 2** Northern portion Long term, **(4)** Southern portion Moderate, **(4)**	**Site Alternative 1** Long term, **(4)** **Site Alternative 2** Northern portion Long term, **(4)** Southern portion Moderate, **(4)**
Magnitude	**Site Alternative 1** Low, **(4)** **Site Alternative 2** Northern portion Low, **(4)** Southern portion Low, **(4)**	**Site Alternative 1** Low/Minor, **(3)** **Site Alternative 2** Northern portion Low/Minor, **(3)** Southern portion Low/Minor, **(3)**
Probability	**Site Alternative 1** Probable, **(3)** **Site Alternative 2** Northern portion Probable, **(3)** Southern portion Probable, **(3)**	**Site Alternative 1** Probable, **(3)** **Site Alternative 2** Northern portion Probable, **(3)** Southern portion Probable, **(3)**
Significance	**Site Alternative 1** Low to medium, **(30)** **Site Alternative 2** Northern portion Low to medium, **(30)** Southern portion Low to medium, **(30)**	**Site Alternative 1** Low, **(27)** **Site Alternative 2** Northern portion Low, **(27)** Southern portion Low, **(27)**
Status	**Negative**	**Negative**
Irreplaceable loss	The proposed development can be dismantled and removed at the end of the operational phase.	**No irreplaceable loss.**

	There will therefore be **no irreplaceable loss**. However, given the likely long term nature of the project, it is possible that a proportion of stakeholders will view the loss of view as irreplaceable.	
Can impacts be mitigated?	Yes	

Mitigation / Management:

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;

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 areas to their natural state;
- Rehabilitated and monitor areas post-decommissioning and implement remedial actions.

Cumulative Impacts:

The proposed solar PV project will increase the influence of urban development but this increase will be limited due to the existing ridgeline to the south of the project which will screen the development from more natural landscape areas.

The proposed project will also extend the general influence of solar projects on the character of the landscape surrounding Vryburg. **See appendix IV.**

Residual Risks:

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.

6.2.8 Glare from the proposed project could cause nuisance on adjacent roads and for flightpaths associated with the Vryburg airport.

Nature of impact:

Research indicates that glint and glare problems are most likely to occur to the west and north-west of a facility in the morning, to the east and north-east in the afternoon and evening.

Whilst PV panels are designed to absorb light energy, light is often reflected when the angle of incidence is acute as happens when the sun is bright and low in the sky.

At the scoping stage it was indicated that the glint and glare assessment tools on the Sandia National Laboratories web site would be used to assess this issue. These tools have become the standard for such an assessment and are a requirement of the US FAA for solar developments in the vicinity of airports. Unfortunately these tools are no longer available. Discussion has been undertaken with the developer who has

confirmed that they are being transformed into a commercial operation. In the absence of these tools comment is provided on the basis of the likelihood of reflected light affecting sensitive receivers.
Given the fact that the N34 to the east of the site is higher than the site, it is possible that sections of this road will be affected.
It is also possible that the flightpath into the airstrip to the west could be affected. This air strip however, is not operated commercially nor is it lit so it is relatively unlikely that planes travelling to Vryburg will land in the early morning or late afternoon. It is possible however, that local private pilots could use the airstrip during these periods. The distance is such that if this does occur it is likely to be a nuisance issue that may result in momentary persistence of vision.
It needs to be understood that if these impacts do occur, they will be dependent on appropriate conditions that are likely to occur during specific months of the year and time of day. The impacts are therefore likely to be intermittent and not ongoing.
Site alternative 2 (northern portion) is closer to the R34 and therefore is likely to pose the greatest risk of glint and glare impacts.

	Without mitigation	**With mitigation**
Extent	**Site Alternative 1** Site and immediate surroundings, **(2)** **Site Alternative 2** <u>Northern portion</u> Site and immediate surroundings, **(2)** <u>Southern portion</u> Site and immediate surroundings, **(2)**	**Site Alternative 1** Site and immediate surroundings, **(2)** **Site Alternative 2** <u>Northern portion</u> Site and immediate surroundings, **(2)** <u>Southern portion</u> Site and immediate surroundings, **(2)**
Duration	**Site Alternative 1** Long term, **(4)** **Site Alternative 2** <u>Northern portion</u> Long term, **(4)** <u>Southern portion</u> Moderate, **(4)**	**Site Alternative 1** Long term, **(4)** **Site Alternative 2** <u>Northern portion</u> Long term, **(4)** <u>Southern portion</u> Moderate, **(4)**
Magnitude	**Site Alternative 1** Minor, **(2)** **Site Alternative 2** <u>Northern portion</u> Low to minor, **(3)** <u>Southern portion</u> Minor, **(2)**	**Site Alternative 1** Minor/Small, **(1)** **Site Alternative 2** <u>Northern portion</u> Low, **(2)** <u>Southern portion</u> Minor/Small, **(1)**
Probability	**Site Alternative 1** Probable, **(3)** **Site Alternative 2** <u>Northern portion</u> Probable, **(3)** <u>Southern portion</u> Probable, **(3)**	**Site Alternative 1** Probable, **(3)** **Site Alternative 2** <u>Northern portion</u> Probable, **(3)** <u>Southern portion</u> Probable, **(3)**
Significance	**Site Alternative 1** Low, **(24)** **Site Alternative 2**	**Site Alternative 1** Low, **(21)** **Site Alternative 2**

	Northern portion Low, **(28)** Southern portion Low, **(24)**	Northern portion Low, **(24)** Southern portion Low, **(21)**
Status	**Negative**	**Negative**
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 possible that a proportion of stakeholders will view the loss of view as irreplaceable.	**No irreplaceable loss.**
Can impacts be mitigated?	Yes.	
Mitigation: • The use of non-reflective finishes and coatings to the surface of PV panels. • The use of a natural buffer area between the R34 and the facility. • Should problems occur on the R34, the use of screen fencing. • Should problems occur on the flightpath into the airstrip, the issuing of a general notice to pilots using the airstrip.		
Cumulative Impact: Other PV projects proposed in the area could also create similar impacts. It is possible that this project could add to glint and glare issues experienced in the area. **See appendix IV.**		
Residual Risks: No residual risk has been identified.		

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

Nature of impact:
No specific detail has been provided other than confirmation of the need for lighting at sufficient level to enable security cameras to be used at night.
The area to the north west of the site is currently affected by lighting from the adjacent urban area, street lighting on the busy R34/N14 section of the road north of the N14 junction and lighting associated with transport operations and homesteads to the south of Vryburg. It is not therefore a dark area at night.
The further away from the urban area that the development occurs however, the greater the impact is likely to be on currently relatively dark areas. This means that site alternative 2 (northern portion) is likely to have the least impact and site alternative 1 and site alternative 2 (soutthern portion) are likely to have the greatest level of impact. The difference between the levels of impact are likely to be small however.

	Without mitigation	**With mitigation**
Extent	**Site Alternative 1** Site and immediate surroundings, **(2)** **Site Alternative 2** Northern portion Site and immediate surroundings, **(2)** Southern portion Site and immediate surroundings, **(2)**	**Site Alternative 1** Site and immediate surroundings, **(2)** **Site Alternative 2** Northern portion Site and immediate surroundings, **(2)**

		Southern portion Site and immediate surroundings, **(2)**
Duration	**Site Alternative 1** Long term, **(4)** **Site Alternative 2** Northern portion Long term, **(4)** Southern portion Moderate, **(4)**	**Site Alternative 1** Long term, **(4)** **Site Alternative 2** Northern portion Long term, **(4)** Southern portion Moderate, **(4)**
Magnitude	**Site Alternative 1** Low, **(4)** **Site Alternative 2** Northern portion Low to minor, **(3)** Southern portion Low, **(4)**	**Site Alternative 1** Minor, **(2)** **Site Alternative 2** Northern portion Minor to small, **(1)** Southern portion Minor, **(2)**
Probability	**Site Alternative 1** Probable, **(3)** **Site Alternative 2** Northern portion Probable, **(3)** Southern portion Probable, **(3)**	**Site Alternative 1** Improbable, **(2)** **Site Alternative 2** Northern portion Improbable, **(2)** Southern portion Improbable, **(2)**
Significance	**Site Alternative 1** Medium to Low, **(30)** **Site Alternative 2** Northern portion Low, **(27)** Southern portion Medium to Low, **(30)**	**Site Alternative 1** Low, **(16)** **Site Alternative 2** Northern portion Low, **(14)** Southern portion Low, **(16)**
Status	The appearance of a large lit area may be accepted by most people because it is so close to a well-lit urban environment. It is likely however that adjacent residents will see a new brightly lit area close to their property as a **negative** factor. This is particularly likely for the guest house on the northern boundary and residential properties on the opposite side of the R34 to the site.	If the lights are generally not visible then the occasional light is unlikely to be seen as negative.
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
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; and		

• Keep lighting low, no tall mast lighting should be used.
Cumulative Impact: **See appendix IV.**
Residual Risks: No residual risk has been identified.

7 IMPACT STATEMENT

7.1 VISIBILITY

Development of the Woodhouse site alternative 1 is likely to be visible largely to the N18 and the relatively natural rural area to the south. However, the distance from the N18 is far enough so that the impact will not be significant.

Development of the Woodhouse site alternative 2 (northern portion) is likely to be visible largely to the R34, to the urban edge, particularly Huhudi and to a limited number of homesteads particularly within the area of smallholdings to the north. It will also be visible to the R34. The main areas from which it will be visible from however are all within the area that is influenced by urban and urban fringe development. Subject to the extent of the site that is needed for development, there is potential for development to influence the character of the natural rural area to the south.

Development of the Woodhouse alternative site 2 (southern portion) is likely to be visible largely to the N18 and the R34 and to the relatively natural rural area to the south.

7.2 LANDSCAPE CHARACTER AREAS AND VISUAL ABSORPTION CAPACITY

The landscape character of the study area can be divided into three distinct Landscape Character Areas (LCAs);

- **Rural areas surrounding Vryburg**. These are likely to be used for cattle grazing and appear relatively natural. The flatness of the landscape combined with scattered shrubs and small trees are likely to help provide screening for low elements within the landscape. With relatively low vegetation and a shallow undulating topography, the height of the PV units is likely to be critical in maximising the little absorption capacity that exists. Vegetation is unlikely to provide significant screening for views over development from adjacent low ridgelines. This LCA can be further sub divided by the area of urban influence that occurs to the north of the ridgeline that bisects the southern section of the subject property and the rural area that is relatively free of urban influence to the south of the same ridgeline.
- **The urban area of Vryburg**. This area is generally inward looking drawing little character influence from external areas. It is unlikely that the proposed development will have much influence on these areas other than perhaps at the edges of the urban area that face onto the proposed development area.
- **The semi-rural area** that is comprised of the smallholdings to the east of Vryburg. This is a relatively open developed area from which views into the surrounding rural landscape are likely to be possible. VAC is generally therefore likely to be limited but will depend on localised features such as ornamental vegetation particularly around residential properties that could provide significant VAC for small areas.

7.3 VISUAL IMPACT

Visual impacts are likely to include;

In terms of general change in character of the landscape due to the proposed development, both site alternatives 1 and 2 (southern section) will largely impact the relatively natural landscape to the south. Site alternative 2 (northern portion) is likely to partly impact the relatively natural area but the main impact area will be the area immediately to the south of the urban area to the north where the landscape character is affected by urban and urban fringe development.

In terms of likely visual impact on the area of smallholdings to the north, The ZTV analysis indicates that site alternatives 1 and 2 (southern portion) are likely to have minimal impact on this area because they are located largely on the opposite side of a ridgeline to the affected area. Site alternative 2 (northern portion) however is located on the same ridgeline but overlooks the affected area. This alternative therefore could impact the area. In reality the majority of houses are set amongst trees which will help to screen them from the development. The properties to the north of the N14 are also set a level lower than the road which foreshortens views to the south from this area.

The Huhudi area is the only section of the urban area of Vryburg that is likely to be affected. The ZTV analysis indicates that site alternatives 1 and 2 (southern portion) are likely to have minimal impact on this area because they are located largely on the opposite side of a ridgeline from the affected area. Site alternative 2 (northern portion) however is located on the same ridgeline but overlooks the affected area. This alternative therefore could impact the area. Impacts will however be mitigated to a low level

Site alternative 2 (northern portion) may be visible to the N14 while site alternatives 1 and 2 (southern portion) are unlikely to be visible from this road. Existing vegetation and distance will mitigate this impact to a low level.

Site alternative 1 is located some 3.3km from the R34. Whilst the project is located on a ridgeline facing south east towards a section of the R34. The ZTV analysis indicates that this project is likely to affect approximately 3.0km of the road in an area where views from the road are over a relatively natural area. The distance will to a degree help to mitigate impacts.

Site alternative 2 9northern portion) is located closer to the R34 also close to a ridgeline but will face north west. This project is located approximately 0.5km from the road and the ZTV analysis indicates that it is likely to affect approximately 7.3km of the road in an area where views from the road are over urban and urban fringe type development.

Site alternative 2 (southern portion) is located some 0.5km from the R34. Whilst the project is located on a ridgeline facing south east towards a section of the R34. The ZTV analysis indicates that this project is likely to affect approximately 8.3km of the road in an area where views from the road are over a relatively natural area.

Impacts on the N18 will be mitigated to a degree by the existing rail line which in areas is elevated above road level and with associated vegetation this will help to soften views over the development area. due to proximity and a higher intensity of impact, site alternative 1 is likely to have a higher impact on this area than the other two alternatives.

All project alternatives are likely to have a low to medium level of impact on local homesteads. However, most homesteads in the area appear to be associated with agricultural use of the land. There do not appear to be any with secondary tourism uses. Most homesteads also appear to have trees planted around them which will help to mitigate impacts.

There is a low risk of glint and glare affecting local roads, particularly the N34. Should this occur it may be mitigated.

Lighting associated with site alternatives 1 and 2 (southern portion) is likely to affect relatively dark, natural areas to the south whereas, lighting associated with site alternative 2 (northern portion) is likely to largely impact on the rural landscape immediately to the south of Vryburg which is largely impacted already by lighting associated with the urban area. Lighting impacts can be largely mitigated however.

7.4 CONCLUSION

The landscape quality of affected areas is not such that any of the alternatives considered can be discounted. However, if possible impact on the relatively undisturbed rural area to the south of the study area should be avoided. Site alternative 2 (southern portion) South is likely to have the greatest impact on this area.

Because identified impacts can be relatively easily mitigated and because site alternative 2 (northern portion) will mainly impact visually on an area where there already is a strong visual influence from urban and urban fringe development, this alternative is favoured from a visual impact perspective.

Whilst site alternative 1 does impact the more natural areas to the south, the distance of the site from the main viewpoints on the R34 are significantly greater than site alternative 2 (souothern portion) meaning that it is likely to be less obvious and impacts more easily mitigated. Because of this site alternative 1 is also acceptable from a visual impact perspective.

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

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		-	Writing	- Excellent

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Key Experience

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

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

He has worked in the United Kingdom (1990 - 1995) for a major supermarket chain and prepared CAD based visual impact assessments for public enquiries for new green field store development. He also prepared the VIA input to the environmental statement for the Cardiff Bay Barrage for consideration by the UK Parliament in the passing of the Barrage Bill.

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

VIA work undertaken during the last eighteen months includes assessments for proposed new mine developments in Ghana and Guinea, numerous solar plant projects for Eskom and private clients, proposed wind farm development and a proposed tourism development within the Isimangaliso Wetland Park World Heritage Site.

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

Relevant Visual Impact Assessment Projects

1. **Isundu Sub- Station Development -** Visual impact assessment for a new major sub – station in KwaZulu-Natal for Eskom.
2. **Bhangazi Lake Tourism Development** – Visual impact assessment for a proposed lodge development within the Isimangaliso Wetland Park World Heritage Site. This work is ongoing.
3. **Quarry Development for the Upgrade of Sani Pass –** Visual Impact Assessments for two proposed quarry developments on the edge of the uKhalamba-Drakensburg World Heritage Site.
4. **Mtubatuba to St Lucia Overhead Power Line** – Visual Impact Assessment for a proposed power line bordering on the Isimangaliiso Wetland Park World Heritage Site for Eskom.
5. **St Faiths 400/132 kV Sub-Station and Associated Power Lines** - Visual Impact Assessment for a proposed new major sub-station and approximately 15 km of overhead power line for Eskom.
6. **Clocolan to Ficksburg Overhead Power Line** – Visual Impact Assessment for a proposed power line for Eskom.
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ENVIRONMENTAL PLANNING AND DESIGN

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Nationality	British
Year of Birth	1956
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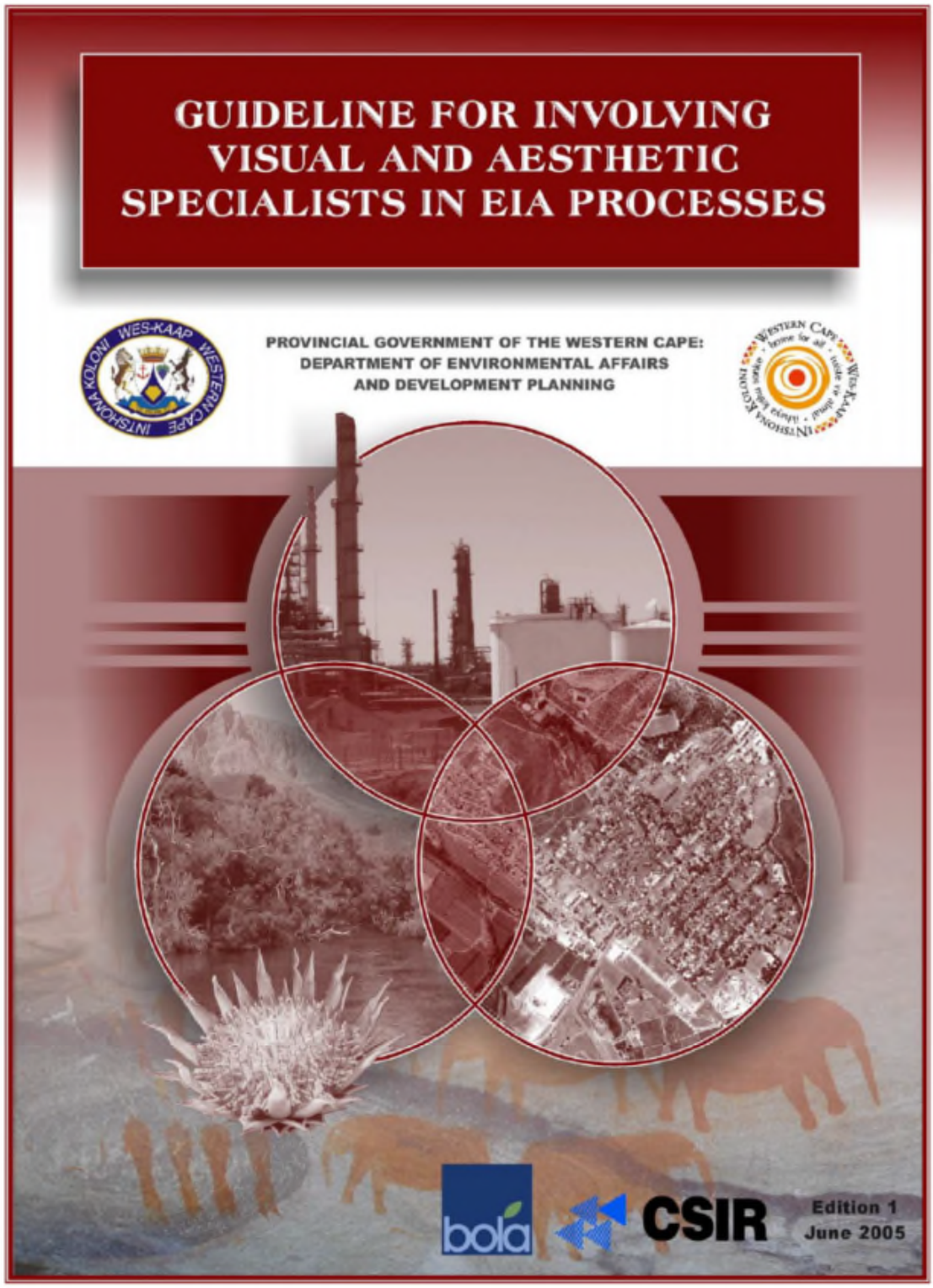
APPENDIX II

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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GUIDELINE FOR INVOLVING VISUAL AND AESTHETIC SPECIALISTS IN EIA PROCESSES

Edition 1

Issued by:

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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*.

CONTENTS

Acknowledgements i
Preface ii
Summary v

PART A : BACKGROUND 1

1. INTRODUCTION 1
2. PRINCIPLES AND CONCEPTS UNDERPINNING VISUAL SPECIALIST INVOLVEMENT IN EIA PROCESSES 2
3. CONTEXTUALISING SPECIALIST INPUT 4
3.1 Legal, policy and planning context for involving a visual specialist 5
3.2 Environmental context for specialist input 6
4. THE ROLE AND TIMING OF SPECIALIST INPUT WITHIN THE EIA PROCESS 6

PART B: TRIGGERS AND KEY ISSUES POTENTIALLY REQUIRING SPECIALIST INPUT 9

5. TRIGGERS FOR SPECIALIST INPUT 9
6. KEY ISSUES REQUIRING SPECIALIST INPUT 10

PART C: PLANNING AND COORDINATION OF SPECIALIST INPUTS (DRAWING UP THE TERMS OF REFERENCE) 13

7. QUALIFICATIONS, SKILLS AND EXPERIENCE REQUIRED 13
8. DETERMINING THE SCOPE OF SPECIALIST INPUTS 14
8.1 Identifying and responding to issues 15
8.2 Establishing appropriate time and space boundaries 16
8.3 Clarifying appropriate development alternatives 16
8.4 Establishing environmental and operating scenarios 17
8.5 Addressing direct, indirect and cumulative effects 17
8.6 Selecting the appropriate approach 18
8.7 Clarifying the timing, sequence and integration of specialist input 20
8.8 Ensuring appropriate stakeholder engagement 20
8.9 Clarifying confidentiality requirements 21

PART D: PROVIDING SPECIALIST INPUT 22

9. INFORMATION REQUIRED TO PROVIDE SPECIALIST INPUT 22
9.1 Relevant project information 22
9.2 Information describing the affected environment 23
9.3 Legal, policy and planning context 24
9.4 Information generated by other specialists in the EIA process 24
10. SPECIALIST INPUT TO IMPACT ASSESSMENT AND RECOMMENDING MANAGEMENT ACTIONS 25
10.1 Predicting potential impacts 25
10.2 Interpreting impact assessment criteria 26
10.3 Establishing thresholds of significance 29
10.4 Describing the distribution of impacts – beneficiaries and losers 30
10.5 Identifying key uncertainties and risks 30
10.6 Justifying underlying assumptions 31
10.7 Defining confidence levels and constraints to input 31
10.8 Recommending management actions 31
10.9 Identifying the best practicable environmental option 32
10.10 Communicating the findings of the specialist input 32
11. SPECIALIST INPUT TO MONITORING PROGRAMMES 33

PART E: REVIEW OF THE SPECIALIST INPUT 36

12. SPECIFIC EVALUATION CRITERIA 36

PART F: REFERENCES 37

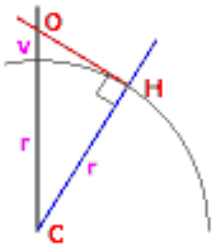
APPENDIX III

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

1 Landscape Change

Nature:
The proposed solar PV project will increase the influence of urban development but this increase will be limited due to the existing ridgeline to the south of the project which will screen the development from more natural landscape areas.

The proposed project will also extend the general influence of solar projects on the character of the landscape surrounding Vryburg.

Both PV2A and PV 2B South extend into a relatively undisturbed rural area to the south they are likely to have greater cumulative impact than PV2 North

	Without mitigation	**With mitigation**
Extent	**PV 2A** Site and immediate surroundings, **(2)** **PV 2B North** Site and immediate surroundings, **(2)** **PV 2B South** Site and immediate surroundings, **(2)**	**(2)** **(2)** **(2)**
Duration	**PV 2A** Long term, **(4)** **PV 2B North** Long term, **(4)** **PV 2B South** Long term, **(4)**	**(4)** **(4)** **(4)**
Magnitude	**PV 2A** Moderate, **(6)** **PV 2B North** Low, **(4)** **PV 2B South** Moderate, **(6)**	**(4)** **(2)** **(4)**
Probability	**PV 2A** Highly probable, **(4)** **PV 2B North** Probable, **(3)** **PV 2B South** Highly probable, **(4)**	**(4)** **(3)** **(4)**
Significance	**PV 2A** Medium, **(48)** **PV 2B North** Low to medium, **(30)** **PV 2B South** Medium, **(48)**	Medium, **(40)** Low, **(24)** Medium, **(40)**

Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	NA

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;
- Retain natural buffer areas adjacent to the R34 and on the northern boundary

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.
- Maintain natural buffer areas adjacent to the R34 and on the southern boundary.

Decommissioning:

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

2 Impact on Smallholdings

Nature:
As other solar PV projects are unlikely to be obvious to the affected properties, the cumulative impact will equate to the impact imposed by this project.

	Without mitigation	**With mitigation**
Extent	**PV 2A** Site and immediate surroundings, **(2)** **PV 2B North** Site and immediate surroundings, **(2)** **PV 2B South**	NA NA NA

	Site and immediate surroundings, **(2)**	
Duration	**PV 2A** Long term, **(4)** **PV 2B North** Long term, **(4)** **PV 2B South** Long term, **(4)**	NA NA (NA
Magnitude	**PV 2A** Small, **(0)** **PV 2B North** Low, **(4)** **PV 2B South** Small, **(0)**	NA NA NA
Probability	**PV 2A** Probable, **(3)** **PV 2B North** Probable, **(3)** **PV 2B South** Probable, **(3)**	NA NA NA
Significance	**PV 2A** Low, **(18)** **PV 2B North** Low to medium, **(30)** **PV 2B South** Low, **(18)**	NA NA NA
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

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;
- Retain natural buffer areas adjacent to the R34 and on the northern boundary

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.
- Maintain natural buffer areas adjacent to the R34 and on the southern boundary.

Decommissioning:

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

3 The visual impact on the urban edge of Vryburg

Nature:
The proposed development is likely to increase the extent of solar projects visible from the urban edge. However, the only section of the urban edge likely to be affected is the eastern edge of Huhudi. It should be noted that there is a solar project planned for the area between the proposed project and Huhudi. It is likely therefore that proposed alternative PV 2B North will marginally increase cumulative impacts on the urban area.
The cumulative impact of alternatives PV 2A and PV 2B South is likely to be negligible.

	Without mitigation	**With mitigation**
Extent	**PV 2A** Site and immediate surroundings, **(2)** **PV 2B North** Site and immediate surroundings, **(2)** **PV 2B South** Site and immediate surroundings, **(2)**	NA NA NA
Duration	**PV 2A** Long term, **(4)** **PV 2B North** Long term, **(4)** **PV 2B South** Long term, **(4)**	NA NA (NA
Magnitude	**PV 2A** Small, **(0)**	NA

	PV 2B North Minor, **(2)** **PV 2B South** Small, **(0)**	NA NA
Probability	**PV 2A** Probable, **(3)** **PV 2B North** Probable, **(3)** **PV 2B South** Probable, **(3)**	NA NA NA
Significance	**PV 2A** Low, **(18)** **PV 2B North** Low, **(24)** **PV 2B South** Low, **(18)**	NA NA NA
Status (positive or negative)	Negative	NA
Reversibility	High	NA
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No. The proposed project will be located on a ridgeline. PV 2B north will overlook the affected area. As the land falls towards the affected area and there is a need to prevent shadow falling on the PV panels, screening will not be possible.	
Mitigation: NA		

4 Cumulative impact on the N14

Nature: Pv2A and PV2B South will not be visible from the N14 and PV2B North is not likely to be obvious. The significance of cumulative impacts is therefore likely to be low.		
	Without mitigation	**With mitigation**
Extent	**PV 2A** Site and immediate surroundings, **(2)** **PV 2B North** Site and immediate surroundings, **(2)** **PV 2B South** Site and immediate surroundings, **(2)**	NA NA NA
Duration	**PV 2A**	

	Long term, **(4)** **PV 2B North** Long term, **(4)** **PV 2B South** Long term, **(4)**	NA NA (NA
Magnitude	**PV 2A** Small, **(0)** **PV 2B North** Minor, **(2)** **PV 2B South** Small, **(0)**	NA NA NA
Probability	**PV 2A** Very improbable, **(1)** **PV 2B North** Probable, **(3)** **PV 2B South** Very improbable, **(1)**	NA NA NA
Significance	**PV 2A** Low, **(6)** **PV 2B North** Low, **(24)** **PV 2B South** Low, **(6)**	NA NA NA
Status (positive or negative)	**Negative**	NA
Reversibility	High	NA
Irreplaceable loss of resources?	No irreplaceable loss	NA
Can impacts be mitigated?	**No**	
Mitigation: NA		

5 Cumulative impact on the R34

Nature: As alternatives PV2B North and South are close to the road the significance of cumulative impacts are likely to be high relative to PV 2A. However PV2A affects a section of the road where views are over relatively natural landscape. This elevates the magnitude of the impact. Views from the section of road affected by PV 2B North are over an area that is already affected by urban and urban fringe development. This reduces the magnitude.		
Extent	**PV 2A** Site and immediate	Site and immediate

	surroundings, **(2)** **PV 2B North** Site and immediate surroundings, **(2)** **PV 2B South** Site and immediate surroundings, **(2)**	surroundings, **(2)** Site and immediate surroundings, **(2)** Site and immediate surroundings, **(2)**
Duration	**PV 2A** Long term, **(4)** **PV 2B North** Long term, **(4)** **PV 2B South** Moderate, **(4)**	Long term, **(4)** Long term, **(4)** Moderate, **(4)**
Magnitude	**PV 2A** Low / Minor, **(4)** **PV 2B North** Minor, **(2)** **PV 2B South** Low, **(4)**	Low/Minor, **(3)** Minor, **(2)** Low/Minor, **(3)**
Probability	**PV 2A** Highly probable, **(4)** **PV 2B North** Highly probable, **(4)** **PV 2B South** Highly probable, **(4)**	Probable, **(3)** Probable, **(3)** Probable, **(3)**
Significance	**PV 2A** Medium, **(36)** **PV 2B North** Medium, **(32)** **PV 2B South** Medium, **(40)**	**PV 2A** Low to medium, **(28)** **PV 2B North** Low, **(24)** **PV 2B South** Low to medium, **(28)**
Extent	**PV 2A** Site and immediate surroundings, **(2)** **PV 2B North** Site and immediate surroundings, **(2)** **PV 2B South** Site and immediate surroundings, **(2)**	Site and immediate surroundings, **(2)** Site and immediate surroundings, **(2)** Site and immediate surroundings, **(2)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of	There will be no	There will be no

resources?	irreplaceable loss.	irreplaceable loss.
Can impacts be mitigated?	Yes	

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;
- Retain natural buffer areas adjacent to the R34 and on the northern boundary

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.
- Maintain natural buffer areas adjacent to the R34 and on the northern boundary.

Decommissioning:

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

6 Cumulative impact on the N18

Nature:
The proposed project will extend the general influence of solar projects on the character of the landscape surrounding Vryburg. However there are other proposed projects in closer proximity to the N18. These alternatives therefore will add a small amount to the likely cumulative effects of solar projects on the N18.

Extent	**PV 2A** Site and immediate surroundings, **(2)** **PV 2B North** Site and immediate surroundings, **(2)** **PV 2B South** Site and immediate surroundings, **(2)**	Site and immediate surroundings, **(2)** Site and immediate surroundings, **(2)** Site and immediate surroundings, **(2)**

Duration	**PV 2A** Long term, **(4)** **PV 2B North** Long term, **(4)** **PV 2B South** Moderate, **(4)**	 Long term, **(4)** Long term, **(4)** Moderate, **(4)**
Magnitude	**PV 2A** Low, **(4)** **PV 2B North** Minor, **(2)** **PV 2B South** Minor, **(2)**	 Low/Minor, **(3)** Small/Minor, **(1)** Small/Minor, **(1)**
Probability	**PV 2A** Highly probable, **(4)** **PV 2B North** Probable, **(3)** **PV 2B South** Probable, **(3)**	 Probable, **(3)** Probable, **(3)** Probable, **(3)**
Significance	**PV 2A** Medium, **(40)** **PV 2B North** Low, **(24)** **PV 2B South** Low, **(24)**	**PV 2A** Low, **(27)** **PV 2B North** Low, **(21)** **PV 2B South** Low, **(21)**
Status	**negative**	**negative**
Reversibility	High	High
Irreplaceable loss of resources?	There will be no irreplaceable loss.	There will be no irreplaceable loss.
Can impacts be mitigated?	Yes	

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.

7 Cumulative impact on Homesteads

Nature: The proposed project will extend the general influence of solar projects on the character of the landscape surrounding Vryburg. It will however only impact on a small number of homesteads and these are likely to be impacted on more severely by other planned solar projects. The cumulative significance is therefore likely to be low.		
Extent	**PV 2A** Site and immediate surroundings, **(2)** **PV 2B North** Site and immediate surroundings, **(2)** **PV 2B South** Site and immediate surroundings, **(2)**	Site and immediate surroundings, **(2)** Site and immediate surroundings, **(2)** Site and immediate surroundings, **(2)**
Duration	**PV 2A** Long term, **(4)** **PV 2B North** Long term, **(4)** **PV 2B South** Moderate, **(4)**	Long term, **(4)** Long term, **(4)** Moderate, **(4)**
Magnitude	**PV 2A** Minor, **(3)** **PV 2B North** Minor, **(3)** **PV 2B South** Minor, **(3)**	Small/Minor, **(2)** Small/Minor, **(2)** Small/Minor, **(2)**
Probability	**PV 2A** Probable, **(3)** **PV 2B North** Probable, **(3)** **PV 2B South**	Probable, **(3)** Probable, **(3)**

	Probable, **(3)**	Probable, **(3)**
Significance	**PV 2A** Low, **(27)** **PV 2B North** Low, **(27)** **PV 2B South** Low, **(27)**	**PV 2A** Low, **(24)** **PV 2B North** Low, **(24)** **PV 2B South** Low, **(24)**
Status	**negative**	**negative**
Reversibility	High	High
Irreplaceable loss of resources?	There will be no irreplaceable loss.	There will be no irreplaceable loss.
Can impacts be mitigated?	Yes to a small degree	

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;

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 areas to their natural state;
- Rehabilitated and monitor areas post-decommissioning and implement remedial actions.

8 Possible impact of glint and glare.

Nature:

Other PV projects proposed in the area could also create similar impacts. It is

possible that this project could add to glint and glare issues experienced in the area. It is likely however that the proposed project will have a low impact therefore the contribution to cumulative impacts is also likely to be low.		
	Without mitigation	**With mitigation**
Extent	**PV 2A** Site and immediate surroundings, **(2)** **PV 2B North** Site and immediate surroundings, **(2)** **PV 2B South** Site and immediate surroundings, **(2)**	Site and immediate surroundings, **(2)** Site and immediate surroundings, **(2)** Site and immediate surroundings, **(2)**
Duration	**PV 2A** Long term, **(4)** **PV 2B North** Long term, **(4)** **PV 2B South** Moderate, **(4)**	Long term, **(4)** Long term, **(4)** Moderate, **(4)**
Magnitude	**PV 2A** Minor, **(2)** **PV 2B North** Low to minor, **(3)** **PV 2B South** Minor, **(2)**	Minor/Small, **(1)** Low, **(2)** Minor/Small, **(1)**
Probability	**PV 2A** Probable, **(3)** **PV 2B North** Probable, **(3)** **PV 2B South** Probable, **(3)**	Probable, **(3)** Probable, **(3)** Probable, **(3)**
Significance	**PV 2A** Low, **(24)** **PV 2B North** Low, **(28)** **PV 2B South** Low, **(24)**	**PV 2A** Low, **(21)** **PV 2B North** Low, **(24)** **PV 2B South** Low, **(21)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	There will be no irreplaceable loss.	There will be no irreplaceable loss.
Can impacts be mitigated?	Yes	
Mitigation:		

- The use of non-reflective finishes and coatings to the surface of PV panels.
- The use of a natural buffer area between the R34 and the facility.
- Should problems occur on the R34, the use of screen fencing.
- Should problems occur on the flightpath into the airstrip, the issuing of a general notice to pilots using the airstrip.

9 Night Time Lighting Impacts

Nature:
The cumulative impact of the lighting associated with other solar energy projects in the area.

Currently lighting in the area is comprised of urban lighting and this generally affects the most northern section of the study area which is not as likely to be sensitive to lighting impacts as areas to the south.

There is potential for security lighting and operational lighting associated with solar energy projects to further impact on the area but this is likely to be of low significance. Alternatives PV 2A and PV 2B South are likely to have the largest cumulative impact as they could impact on areas to the south of the study area.

	Without mitigation	**With mitigation**
Extent	**PV 2A** Site and immediate surroundings, **(2)** **PV 2B North** Site and immediate surroundings, **(2)** **PV 2B South** Site and immediate surroundings, **(2)**	Site and immediate surroundings, **(2)** Site and immediate surroundings, **(2)** Site and immediate surroundings, **(2)**
Duration	**PV 2A** Long term, **(4)** **PV 2B North** Long term, **(4)** **PV 2B South** Moderate, **(4)**	Long term, **(4)** Long term, **(4)** Moderate, **(4)**
Magnitude	**PV 2A** Low, **(4)** **PV 2B North** Low to minor, **(3)** **PV 2B South** Low, **(4)**	Minor, **(2)** Minor to small, **(1)** Minor, **(2)**
Probability	**PV 2A** Probable, **(3)** **PV 2B North** Probable, **(3)**	Improbable, **(2)** Improbable, **(2)**

	PV 2B South Probable, **(3)**	Improbable, **(2)**
Significance	**PV 2A** Medium to Low, **(30)** **PV 2B North** Low, **(27)** **PV 2B South** Medium to Low, **(30)**	**PV 2A** Low, **(16)** **PV 2B North** Low, **(14)** **PV 2B South** Low, **(16)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: 1) Use low key lighting around buildings and operational areas that is triggered only when people are present. 2) Plan to utilise infra-red security systems or motion sensor triggered security lighting; 3) Ensure that lighting is focused on the development with no light spillage outside the site; and 4) Keep lighting low, no tall mast lighting should be used.		