Abengoa Solar Power South Africa (Pty) Ltd

PROPOSED PAULPUTS 200MW CONCENTRATED SOLAR POWER TOWER FACILITY, NEAR POFADDER NORTHERN CAPE

VISUAL IMPACT ASSESSMENT REPORT

APRIL 2016

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ACRONYMS

amsl	above mean sea level
CSP	Concentrating Solar Power
DEA	Department of Environmental Affairs
DoE	Department of Energy
DSG	Direct steam generation
EIA	Environmental Impact Assessment
GIS	Geographical Information System
LCAs	Landscape Character Areas
NEMA	National Environmental Management Act, Act No. 107 of 1998
REDZ7	Renewable Energy Development Zone 7
REIPPP	Renewable Energy Independent Power Producers Procurement Programme
USAA	US Aviation Authority
VAC	Visual Absorption Capacity
VIA	Visual Impact Assessment
ZTV	Zones of Theoretical Visibility

1 INTRODUCTION

1.1 GENERAL

This visual impact assessment (VIA) study forms part of the Scoping and Environmental Impact Assessment (EIA) that is being undertaken by Savannah Environmental (Pty) Ltd. on behalf Abengoa Solar Power South Africa (Pty) Ltd. for the proposed development of a concentrated solar power tower facility with a generating capacity of up to 200MW, as well as related infrastructure.

In terms of the EIA Regulations promulgated under the amended National Environmental Management Act (NEMA), Act No. 107 of 1998, the proposed development of the facility requires environmental authorisation from the National Department of Environmental Affairs (DEA). An impact to be assessed comprises the visual impact that the facility will have on surrounding areas.

This VIA report has been prepared for inclusion in the project EIA report following the approval of the Scoping report.

The site investigation was undertaken in April 2016. The key issue regarding the timing of the site investigation is that it is undertaken during clear weather. This enables key landscape features to be identified more easily over the greatest distance and for the assessor to consider the project under the worst case conditions in terms likely maximum impact.

1.2 PROJECT LOCATION AND EXTENT

Paulputs CSP RF (Pty) Ltd is proposing to develop a Concentrated Solar Power (CSP) Project and associated infrastructure on Portion 4 of the farm Scuitklip 92, in the Khai-Ma Local Municipality in the Northern Cape Province **(Map 1, Site location)**.

The development footprint for the Paulputs CSP Project (approximately 900 ha in extent) would be appropriately located within the remaining extent of the farm portion (approximately 1600ha in extent). The identified site is accessible via the R357 and MR73 existing access road, via the N14.

Detailed description of the farm Scuitklip 92

Province	**Northern Cape Province**
District Municipality	Namakwa District Municipality
Local Municipality	Khai-Ma Local Municipality
Ward number(s)	1
Nearest town(s)	Pofadder and Kakamas
Farm name(s) and number(s)	The Farm Scuitklip 92
Portion number(s)	Portion 4
SG 21 Digit Code (s)	C03600000000009200004
Landowner	Abengoa Solar South Africa Pty Ltd
Land use	Zoned Special Solar

The geographic coordinates of the approximate centre point of the site are:

LATITUDE (S):	28°	51'	42.19"
LONGITUDE (E):	19°	34'	39.17"

No site alternatives are under consideration.

1.3 PROJECT CONTEXT

Two CSP Parabolic Trough facilities, Kaxu Solar One and Xina Solar One are located in the southern portion of the site. The landowner, KaXu CSP South Africa (Pty) Ltd (another Abengoa company), have rezoned the entire farm parcel south of the R357 for Special Solar use, which is consistent with the current and intended land use.

1.4 BACKGROUND OF SPECIALIST

Jon Marshall (Pr. LArch, CMLI, EAPSA, Dip LA) qualified as a Landscape Architect in 1978 **(Appendix 1, Specialists brief CV)**. He is also a certified Environmental Impact Assessment Practitioner. 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 (zone of theoretical visibility) and three dimensional modelling to illustrate impact assessments. He has undertaken visual impact assessments for major buildings, mining, industrial development, mining and infrastructure projects and has been involved in the preparation of visual guidelines for large scale developments. Jon is responsible for report writing and visual impact assessment.

1.5 TERMS OF REFERENCE 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) (Oberholzer, 2005). This is the only local relevant guideline available in South Africa, setting various levels of assessment subject to the nature of the proposed development and surrounding landscape **(Appendix II)**; 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) (Landscape Institute and Institute of Environmental Assessment and Management, 2013).

Based on the predicted visual impacts described in the VIA Scoping Report, a Level 4 Assessment, in accordance with the Western Cape Guidelines, is required to be undertaken. A Level 4 Assessment requires;

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

1.6 ISSUES IDENTIFIED

Anticipated issues related to the potential visual impact of the proposed project identified at the scoping stage include the following:

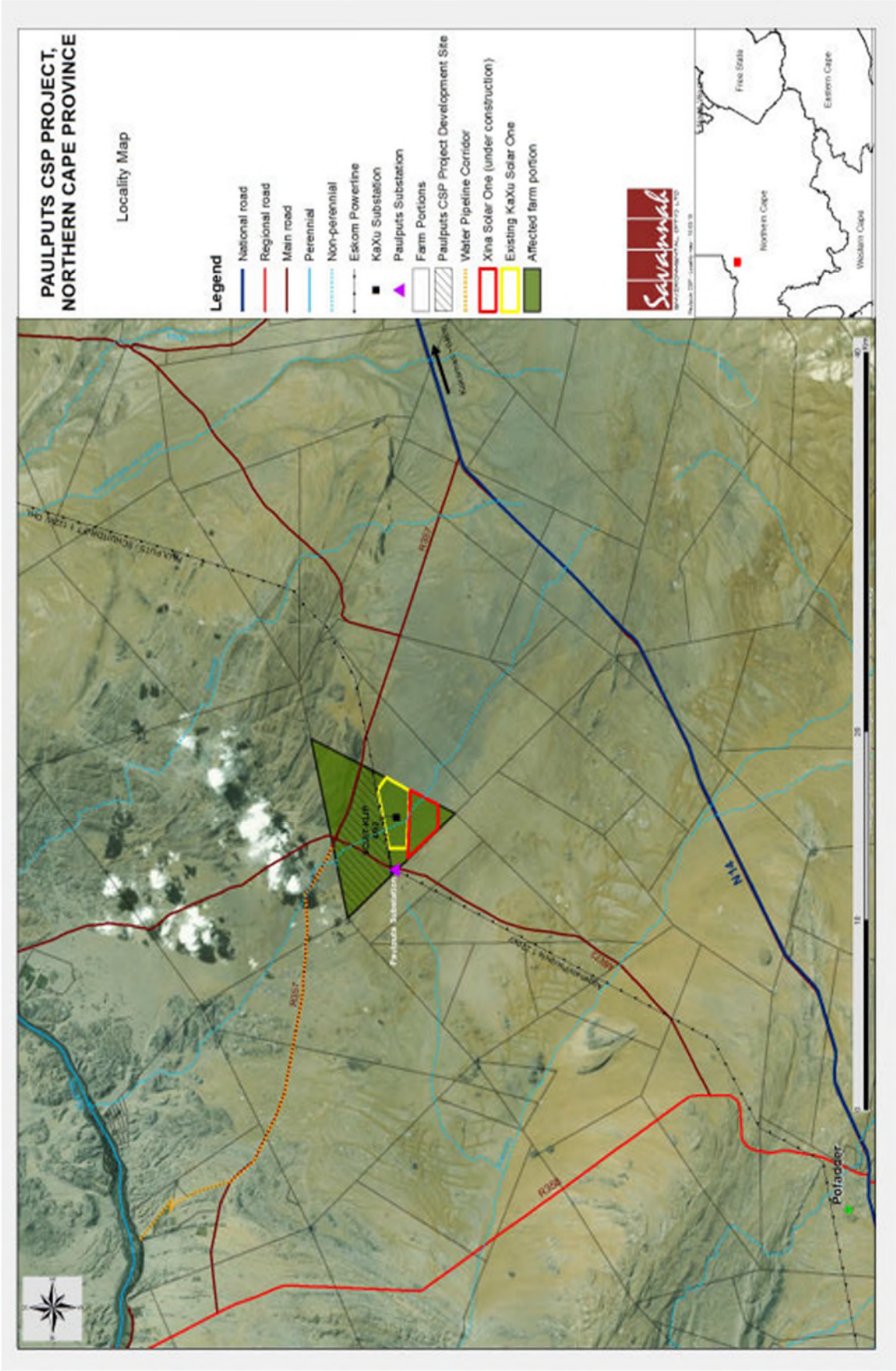
Issue	Nature of Impact	Extent of	No-go Areas
Potential visual intrusion on sense of place.*	The CSP facility could potentially transform the semi-arid wilderness and farmland locally into an industrial landscape.	Local	Rocky terrain on the north-east portion of the property.
Potential effect on landscape features and scenic re-sources.	The solar energy facilities would be located on an expansive plain with a number of prominent landscape features.	Local	Rock outcrop features and drain- age lines.
Potential effect on local inhabitants, visitors to the area and on tourism.	The proposed facilities, especially the tower, could be visible to a number of farmsteads, and to travelers on the N14 and R357.	Local	Visual buffer areas along routes.
Potential effect of related infrastruc-ture.	The water pipelines, water tanks and pump house, as well as related powerlines, particularly where these are above-ground, could have a negative visual effect on the surroundings.	Local	Visually prominent ridges or skylines.
Potential effect of lights at night.	Security and navigational lights at night could have an effect on the 'dark skies' characteristic of the area.	Local	n/a
Potential effect of construction and de-commissioning	The nature and scale of the project could have potential visual effects relating to the construction of access roads, haul roads, pipelines, batching plant, stockpiles and the use of cranes and other heavy construction	Local	Identified landscape features and areas outside the development

	machinery. Scarring of the landscape, dust from the site, and the noise of transportation vehicles to the site along public roads could be expected. At the end of the life of the project, many of the foundations and roads may remain visible in the arid landscape.		footprint.
Cumulative visual impacts.	Cumulative visual impacts would occur when the CSP project is seen in conjunction with existing and other proposed energy projects in	Local	n/a

These issues will be considered in the context of the Landscape Character Areas, visual effects identified and possible cumulative influence of other possible infrastructure projects that are planned in the vicinity.

Possible mitigation measures will also be identified.

MAP 1: SITE LOCATION



2. PROJECT DESCRIPTION

2.1 MOTIVATION

The overarching objective for the Paulputs CSP Project is to maximise electricity production through exposure to the solar resource, while minimising infrastructure, operational and maintenance costs, as well as social and environmental impacts. From a regional site selection perspective, this region is considered to be preferred for solar energy development by virtue of its annual solar irradiation values being comparable to the Atacama desert in Chile which has the highest solar resource in the world (refer to Figure 2.1). From a local perspective, the site has specifically been identified by Paulputs CSP RF (Pty) Ltd as being highly desirable for the development of a CSP Project due to its suitable topography (i.e. in terms of slope and local topography), site access (i.e. to facilitate the movement of machinery during the construction phase and operations staff in the long-term), land availability (i.e. the land is secured for the intended use), the extent of the site (i.e. the land parcel is able to accommodate the 900ha required for the facility), and enabling optimal placement of the infrastructure considering potential environmental sensitivities or technical constraints, as well as the consolidation of renewable projects within an already identified node (i.e. the only site presently in South Africa with two adjacent CSP facilities).

At a Provincial level, the Northern Cape has been identified as the area with highest potential for solar renewable energy generation, with high solar radiation levels and the availability of vast tracts of land. There are already a number of CSP projects (and solar PV facilities) constructed and planned in the region. The development of another CSP project in the study area will be in line with the objectives of the Khai-Ma Local Municipality Integrated Development Plan (IDP) (2012-2017) as well as the Namakwa District Municipality IDF (2012-2016), as the need for the development of the renewable sector has been identified in both Municipal plans.

2.2 PROJECT DESCRIPTION

CSP Power Tower facilities include one or more central towers and typically surrounded by a generally circular or semi-circular array of flat-plate reflectors called heliostats. The number of heliostats varies by facility, but can number in the thousands to hundreds of thousands.

The power tower heliostats reflect the sun to heat molten salt to boil water. The light is focused onto a receiver unit that holds the molten salt located close to the top of the central tower.

The heliostats track the sun during the course of the day to keep sunlight focused on the receiver.

Power tower facilities have a power block, cooling system, and other ancillary structures similar to those of the other CSP systems.

The system requires a steam turbine that is housed in a power house and a cooling system that might be in the form of cooling towers or steam condensers (Dry Cooling). Refer to **Figure 1** for a layout.

This project consists of a concentrated solar power tower facility using molten salt technology, with a generating capacity of up to 200MW, as well as related infrastructure. A substation for the solar plant will be required including a 132kV overhead powerline to Eskom's Paulputs Substation.

An abstraction point on the Gariep River along with a connecting 30km water pipeline is also required. Components of the proposed CSP are given in Table 1 below. (**See also Figures 2 and Plates 1 and 2**).

Detail regarding the various elements that will make up the project is indicated in the table below.

List of Proposed Facilities

Facility	**Area**	**Height**	**Comments**
Total site area	3 520 ha	n/a	
Total CSP development area	795 ha 3.2 km diam.	n/a	incl. associated infrastructure
CSP salt tower	6.8 ha 300	260m	Concrete construction painted white. Navigational lights to CAA
Heliostats	788 ha	6m	150m^2 mirror surface, each.
Plant substation	0.25 ha	varies	At the centre of the heliostat layout.
Connecting powerline	2.5 km	28m	132kV overhead line to the Eskom Paulputs
6 lined evaporation ponds	1 ha each	1.8 m deep	
Raw water storage dam	1 ha	1.8 m deep	
5000 cube service water tank			
3000 cube RO tank			
2000 cube demin tank			
Package waste treatment plant			
Auxillary wet-cooled tower / chiller plant			
Power island	6.5 ha	12 m	4 tanks x 60m diam.
Steam turbine generator, heat ex- changers, dry-cooled			250MVA / 200MW
Construction laydown area	10ha and 5ha	n/a	
Abstraction point on Gariep River	225 m^2	n/a	
Filter and booster station	500 m^2		

Facility	Area	Height	Comments
Water pipeline	30 km (300 mm diam.)	undergrou nd	Along R357 Onseepkrans road to
Staff accommodation site	2.45 ha		Critical staff
MR73 road	1.5 km	n/a	Existing road re-routed around CSP
Internal access roads	1.54 km	n/a	
Perimeter fencing, access control	to be		
Security lighting / area lighting	to be		

2.2 GRID CONNECTION

The following grid connection alternatives have been considered though prefeasibility assessments. The grid connection for the project will be finalised based on input from Eskom and the environmental assessment. Due to the proximity of the Paulputs Transmission Substation (less than 3km away), only one viable option is considered at this point of the assessment process: i.e., a direct connection to the proposed plant substation (50m x 50m in extent) and an up to 3km of 132kV overhead power line to Eskom's existing Paulputs Transmission Substation.

The Paulputs Transmission Substation currently has the capacity to take the power from the Paulputs CSP project. Therefore no connection alternative is required.

2.3 ELEMENTS OF THE PROJECT THAT ARE LIKELY TO HAVE VISUAL IMPLICATIONS

The elements that are likely to have significant visual implications past the site boundary include;

- The proposed power tower,
- Development around the base of the power tower which includes heliostats, buildings and the power block.
- The 132kV overhead power line connection to the existing Paulputs substation.
- Security Lighting

It is noted that a 30km water pipeline between the project and the Orange River is required. However, the alignment will follow an existing road and the pipeline will be buried. Whilst there may be short term construction implications that could have visual consequence, this element will be hidden from view.

The MR73 road is also to be relocated within the subject property. From the flat landscape surrounding the site however, this realignment will also have little visual consequence outside the site area.

Both the proposed water pipeline and the proposed road realignment are therefore only dealt with in terms of management measures that are necessary to minimize local visual

impacts during the construction phase.

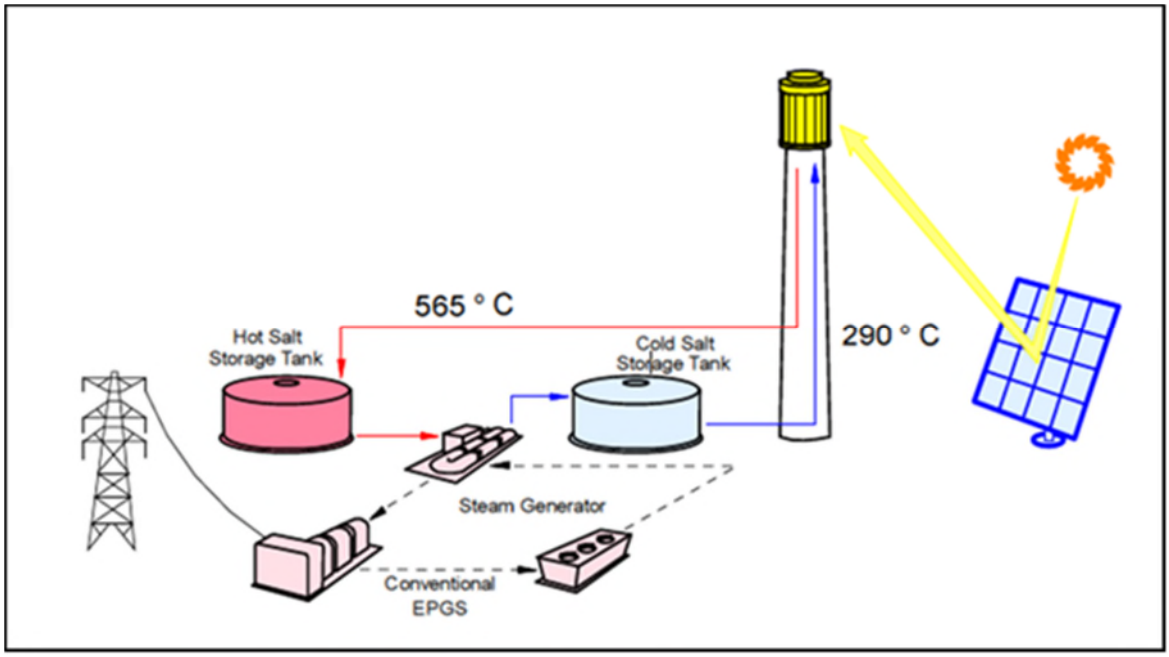


Figure 1, Layout of a Power Tower CSP courtesy of Abengoa SA

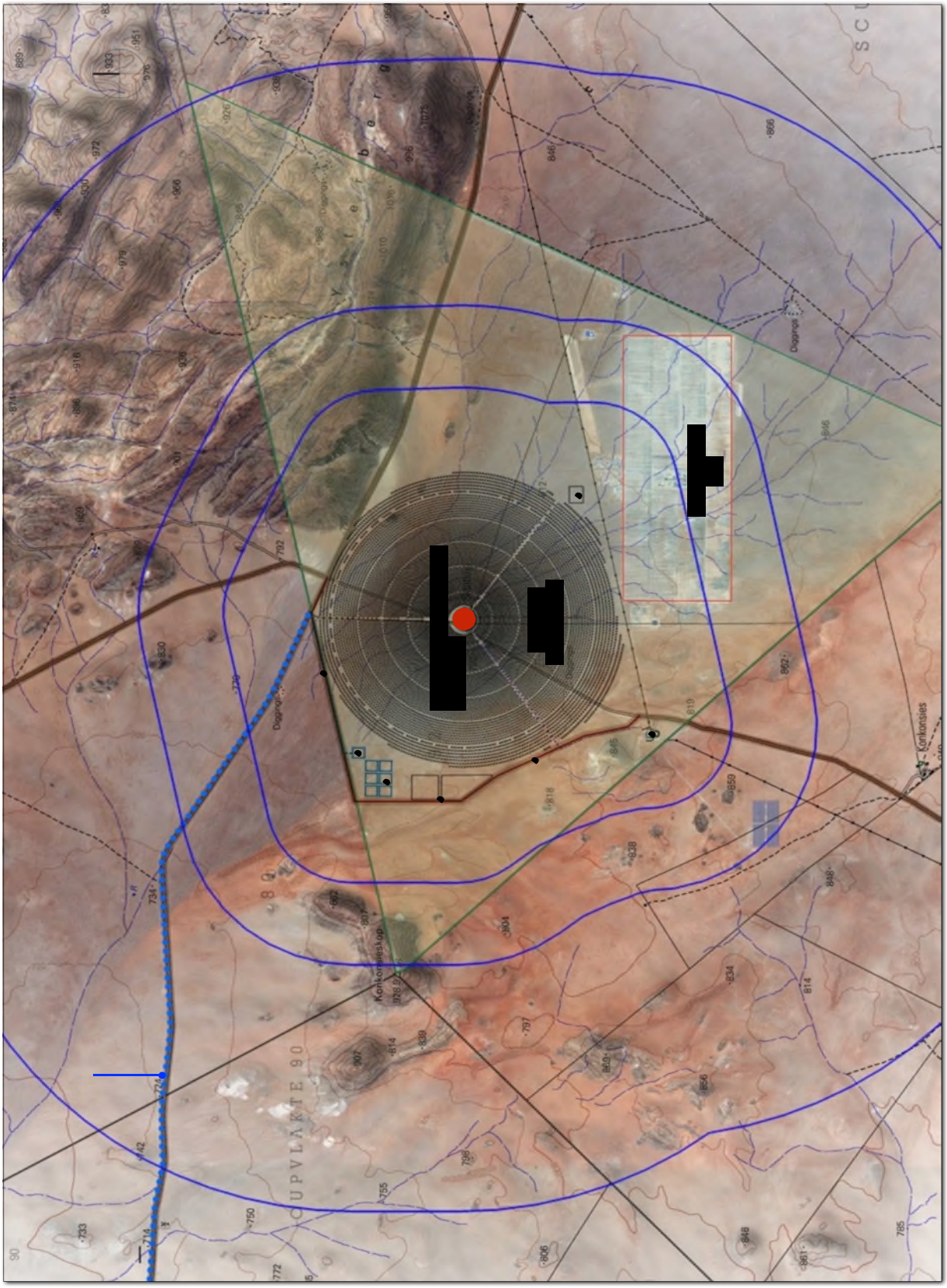


Figure 2, Site Layout

Plate 1, Existing Power Tower Projects in Sanlucar la Mayor, near Seville, Spain. (photograph extracted from Desertec - UK web site, http://www.trec-uk.org.uk)

Plate 2, Existing Power Tower project. (photograph extracted from CSP World Web Site, http://www.csp-world.com).

3 DESCRIPTION OF RECEIVING ENVIRONMENT AND POSSIBLE RECEPTORS

3.1 LANDSCAPE CHARACTER

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

The proposed site is located within the floor of a broad valley system that generally falls from the east to the west towards the Orange River. Beside the Orange River there is a near continuous range of rocky hills.

The landscape surrounding the site is arid, comprising relatively flat drainage plains with inselbergs or rocky outliers rising above the plains in the wider landscape.

Whilst the general area surrounding the proposed site appears relatively natural, with the exception of roads and scattered homesteads, there are a number of industrial elements that currently impact on the character of the site and its immediate surroundings, these include;

- A quarry that is located approximately 13.5km to the north east of the site,
- An existing 220kV overhead power line that bisects the property
- The existing Paulputs substation which is located on the property; and
- Two existing CSP Parabolic Trough projects.

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

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

3.1.1 Landform and Drainage

The site is located south of the Kalahari Basin. The landscape is sparsely vegetated and covered by pale red sands of aeolian sands of the Quaternary Gordonia Formation (Kalahari Group) (Almond).

The Orange River flows from north west to south east approximately 30km west of the proposed development site. The Orange River is a major regional river system that has its source in the mountains on the western edge of Lesotho, is joined by the Vaal and flows into the sea on the West Coast where it forms the border between South Africa and Namibia.

The site is located within a broad valley that drains towards the Orange River. The site is set at an elevation of 800 – 900m above mean sea level (amsl). To the north east and south west the landform rises to approximately 1000m amsl.

The valley floor surrounding the site is incised by a number of shallow water courses that drain towards the Orange River. These water courses are non-perennial and only run for short periods of time during and after Summer and Autumn rains.

Most of the study area comprises fairly flat-lying terrain between the Inselberge or isolated rocky steep mountains. These landforms are concentrated to the north, north east and west of the site where they are likely to provide screening from those

directions. There are also a number of isolated ridgelines to the south and south east that are likely to provide a degree of screening from those directions.

This landform is likely to have a number of implications for visibility of the proposed development;

- The small changes in elevation within the generally flat landscape could help provide screening of the proposed facility or could open up views over the proposed arrays.
- The scattered Inselberge are likely to provide screening for the proposed development.
- The way that the valley falls towards the Orange River is likely to open up long distance views from that direction.

Refer to Map 2 for analysis of the landform and drainage.

3.1.2 Nature of Development and Land Uses

Landcover within the study area is indicated on Map 3. This information has been extracted from the latest (2005) SANBI landcover survey. Landcover can be divided into the following types;

- **Natural Area**. The main landcover type surrounding the proposed development is natural area. This area is likely to be used largely for stock rearing and low intensity grazing. As this has not resulted in mass clearance of vegetation, the majority of the area retains a relatively natural appearance. Situated within this landcover are occasional homesteads that are scattered thinly throughout the area. The low density of development is no doubt a product of the low agricultural potential / carrying capacity of the area. Sheep farming is the main activity.
- **Urban development** in the small town of Pofadder, which includes housing, sports grounds and commercial uses. Particularly within the well-established areas of these settlements, streets are relatively broad and are lined with street trees. Gardens generally have mature woody ornamental plants. The density of development and the extent of vegetation is likely to serve to screen most external views from the urban area.
- **Cultivation** which generally occurs beside the Orange River and is comprised of irrigated land. Crops in some areas are covered with shade houses.
- **Degraded areas** are also evident. From reference to online aerial photography, these appear to be associated with mining.
- **Mine development** includes the adjacent quarry to the north east of the property.

Refer to Map 3 for Landcover.

3.1.3 Vegetation Patterns

The majority of the landscape is covered by low sparse grass and herbaceous vegetation. During much of the year this vegetation lies dormant and is brown due to lack of water. However during Summer and Autumn rains, the landscape rapidly becomes green and colourful as plants use this period to regenerate and reproduce.

Mucina, and Rutherford (Vegetation of South Africa, Lesotho and Swaziland, 2006) indicate that the vegetation types within the study area include;

- Bushmanland Arid Grassland which covers the area on which the site is located;

- Lower Gariep Broken Veld which covers the more rugged terrain particularly close to the Orange River;
- Eastern Gariep Plains Desert; and
- Bushmanland Sandy Grassland.

All natural vegetation types are highlighted as being associated with the farming of small stock particularly sheep and goats.

Whilst there are significant botanical differences between these vegetation types, in terms of visual impact, the main issue is that they are all very low and provide no screening ability.

In addition to the natural vegetation types highlighted above, taller woody vegetation occurs in limited areas including;

- The town of Pofadder where dense tree and shrub planting has occurred around houses and on the towns golf course; and
- Homesteads around which trees and tall woody vegetation has been allowed to develop. This vegetation often contrasts with the surrounding barren landscape making the location of homesteads obvious from a distance. It can also provide a degree of shelter and screening for the immediate area around buildings.
- Water points for livestock that are spotted around local farms. Water is generally provided by wind pumps to a surface structure for animals. The availability of water has allowed trees and tall woody vegetation to develop. This also has the benefit of providing shelter and shade for livestock. The contrast between this vegetation and surrounding areas makes the location of water points obvious from a distance.

The existence of a Quiver tree (*Aloe dichotoma*) Forest is also reported in the vicinity of the project. Whilst quiver trees can grow to eight metres in height, the term forest in can be misleading as a quiver tree forest is generally comprised of a group of relatively isolated specimens that provides little or no screening ability.

From observations on site the quiver tree forest occurs within an area of Eastern Gariep Plains Desert that is located approximately fourteen kilometres from the proposed tower**.**

The quiver tree is promoted as a natural feature that is symbolic of the region. The forest provides an area of interest that has potential to be used as an attraction particularly for visitors that are attracted to the region for its natural attributes. Currently however, there appears to be no mapping or tourism documentation confirming its location and it is only obvious to the casual visitor over approximately 2 – 3 km of the R357.

The quiver tree is a red data (vulnerable) listed species that generally occurs within the "Eastern Gariep Plains Desert" as defined by Mucina & Rutherford. The area has no formal or informal protection status.

Refer to Map 4 for Vegetation Types.

3.1.4 Landscape Character Areas and, Visual Absorption Capacity (VAC)

Landscape Character Areas (LCAs) are defined by the UK Guidelines 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 be broadly divided into the following LCAs that are largely defined by vegetation and landform.

- **Upper Plain with Isolated Inselberge.** This LCA is comprised of the flat landscape above the Orange River Corridor with isolated Inselberge and Bushmanland Arid Grasland vegetation. It covers the site as well as surrounding areas. It is characterised by low undulating topography with low grass / herbaceous vegetation, few taller trees and shrubs and is bisected by temporary drainage lines.

  Throughout this LCA, VAC of the landscape is only likely to be provided by landform which includes minor ridgelines and isolated inselberge. The inselberge are often located close to and across the alignment of the N14 which is forced to either cross or deflect around the landforms. This creates the feeling for the traveller along the road of passing through a series of discrete landscape areas with each one being enclosed by the tall rocky landforms.

  Within the discrete landscape areas indicated above, any structure that extends above the grass / herbaceous vegetation is likely to be obvious. The higher and bulkier a structure is then the more obvious it is likely to be in the landscape. Brightly colours are also likely to exacerbate visibility within a landscape that for much of the year is mono-tonal.

  The tall rocky inselberge that form the thresholds between the discrete landscape areas totally screen one area from the next.

  Within the discrete landscape areas there a small degree of VAC may be provided by subtle changes in the topography of the valley floor, but between them there will be significant screening.

- **Ridgelines and rugged topography** that is generally comprised of relatively continuous steep hills and the Lower Gariep / Eastern Gariep Broken Veld vegetation type.

  The VAC of this LCA is likely to be provided by both the terrain which is more rugged than the Upper Plain and the vegetation type which appears to include a larger proportion of woody shrubs and trees.

  Within this LCA is the area of Quiver Tree Forest that is located on a narrow area of relatively flat plain between areas of more rugged terrain.

- **The Orange River corridor,** which is generally comprised of open cultivated land that is surrounded by steep rocky valley sides. in areas tall woody vegetation exists

particularly on the river edges. . Both the topography and vegetation provide a degree of screening from within the LCA.

- **The urban area of Pofadder** that is comprised of dense settlement. Houses are relatively densely developed and garden and street vegetation is mature. This results in the majority views from within the settlement being internal views of houses and roads rather than the surrounding landscape. Even on the edges of the settled area, views over the surrounding landscape are largely screened by roadside planting.

- **The Industrial Landscape Character Area** that is comprised of existing CSP Trough development, a CSP Trough development being constructed, a small PV solar project and the Paulputs Substation. This in effect is an island of industry within the relatively natural surrounding landscape.

The current LCAs are indicated on **Map 5, Landscape Character Areas.**

3.2 LANDSCAPE QUALITY AND IMPORTANCE

3.2.1 General.

There are no protected landscapes within the study area.

The entire study area is located within the Riemvasmaak Community Conservancy (RCC). This conservancy is 74 000ha in extent and is overseen by local Nama and Xhosa tribes. The RCC is reported to have been one of post-Apartheid South Africa's first land restitution project. It belongs to the local Nama and Xhosa descendants of the people who were resettled from the Area in 1974.

The area is therefore highly important to local communities and for this reason it is important to ensure that future potential use of the land for agriculture and tourism is not compromised by development.

The area is also a corridor for tourism related traffic using the N14 for access from the south west into the Kalahari region.

3.2.1 Upper Plain with Inselberge.

This LCA is primarily important as a productive agricultural area.

The relatively low intensity grazing regimes that appear to be adopted has also resulted in a relatively natural outlook that is typical of the area. The low density of development combines with relatively pristine vegetation to provide an outlook that is perhaps close to wilderness. The only elements that perhaps currently detract from this natural appearance are the occasional farmsteads, wind pumps, roads, overhead power lines and sub stations. As the viewer moves away from existing infrastructure, the natural character of the area no doubt becomes stronger. This natural outlook no doubt helps to contribute to the general attraction of the area for local and regional tourism.

The inselberge provide structure and focal points within the landscape. When travelling through the landscape, they compartmentalise the plain, foreshortening views and screening adjacent areas.

It is the contrast between what appears to be a planar topograhy and dramatic steep land forms as well as this compartmentalisation provided by the inselberge that maintains the interest of the viewer in the dramatic and ever changing scene.

3.2.2 Orange River Corridor

This landscape is of prime importance for productive agriculture it also forms the border between South Africa and Namibia. The main concern of the majority of users of the corridor is therefore likely to be related to the productivity of the area rather than aesthetic concerns. The corridor is distinct due to the intensive agriculture that occurs within it and the steep valley sides that fall towards the river from the Upper Plain. The area is also a focus for local recreational use and of secondary tourism importance. Due to topography, views from within this LCA largely have an internal focus.

3.2.3 Ridgelines and Rugged Topography

The continuous series of ridgelines that form the southern edge of the Orange River Valley to the north of the study area provides a dramatic backdrop for the area. From a visual perspective these ridgelines provide visual continuity behind an ever changing foreground.

In addition to the provision of a general backdrop that helps to define the regional character, the quiver tree forest currently provides additional local interest and has potential for use as a regional tourist attraction.

3.2.4 Urban Landscape Character Area

This is comprised of the urban area of Pofadder which is a local town whose existence can be probably be attributed to its location on a strategic route (N14).

Pofadder is obvious in the landscape from a distance due to the extent of tree planting which contrasts with surrounding areas.

3.2.5 Industrial Landscape Character Area

This is comprised of the urban area of the existing industrial development within and adjacent to the subject site. This area is important for electricity generation. It should be noted that existing trough and substation infrastructure affect a limited area of the surrounding landscape due to, topography and the relatively low nature of the existing development.

3.3 VISUAL RECEPTORS

3.3.1 Definition

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

It is also 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.

3.3.2 Possible visual receptors and sensitivities

This section is intended to highlight possible visual receptors within the landscape which due to use could be sensitive to landscape change. They include;

Area Receptors

Within the vicinity of the project, the only potential area receptor is the urban area of Pofadder. Areas associated with this use are likely to be the most sensitive to possible changes in outlook associated with the proposed development.

Due to its potential as an attraction for tourism, the Quiver Tree Forest that is located approximately 13km to the west of the proposed tower may be considered to be an area receptor.

Linear Receptors

Linear receptors in the vicinity of the project include roads. The N14 is probably the most important road as it is a strategic national route that is likely to carry a high proportion of recreational and tourism related traffic.

There are also three local roads that provide access from the N14 to the Orange River and to a border crossing at Onseepkans. The R358 is an unsurfaced road that provides access from the N14 at Pofadder directly to Onseepkans. This road becomes the C10 after the border crossing in Namibia. The R357 which is surfaced between the N14 and the site provides access to the site and continues on to Onseepkans as an unsurfaced road. From close to the site a local road connects the R357 to the Orange River Corridor to the north west. There is a Guesthouse signposted along this road which indicates that these local roads are likely to have some tourism significance.

Point Receptors

Approximately 100 homesteads have been identified within the study area. These are likely to be used largely by local stock farmers. It is possible though that a limited number will have a secondary tourism use.

Visual receptors were ground truthed during the assessment phase. The main receptors that have been identified are indicated on **maps 6, 7, 8 and 9** indicating the Landscape Character Areas and the assessment of Zones of Theoretical Visibility (ZTV).

LANDSCAPE CHARACTER AREAS

Plate 3, Urban Landscape Character Area. Pofadder settlement.

Plate 4, Industrial Landscape Character Area. Existing CSP parabolic trough project.

Plate 5, Industrial Landscape Character Area. Paulputs Substation.

Plate 6, Ridgelines / Rugged Topography Landscape Character Area.

Plates 7, Orange River Corridor Landscape Character Area.

Plate 8, Upper Plain Landscape Character Area.

POSSIBLE SENSITIVE RECEPTORS

Plate 9, Homesteads in the surrounding plain.

Plate 10, Local unsurfaced roads.

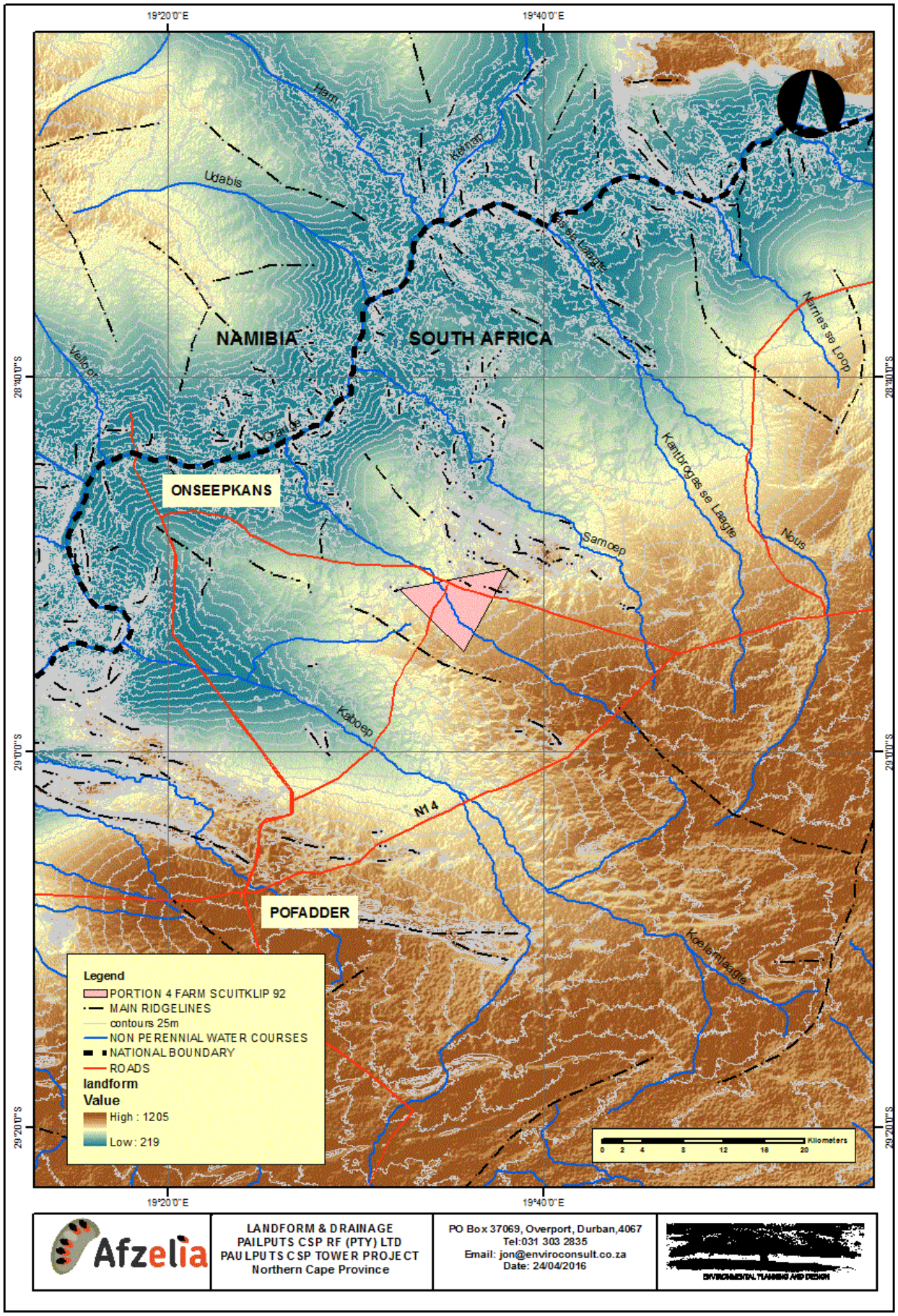
POSSIBLE SENSITIVE RECEPTORS

Plate 11, The N14 which is a major regional route with obvious tourism importance.

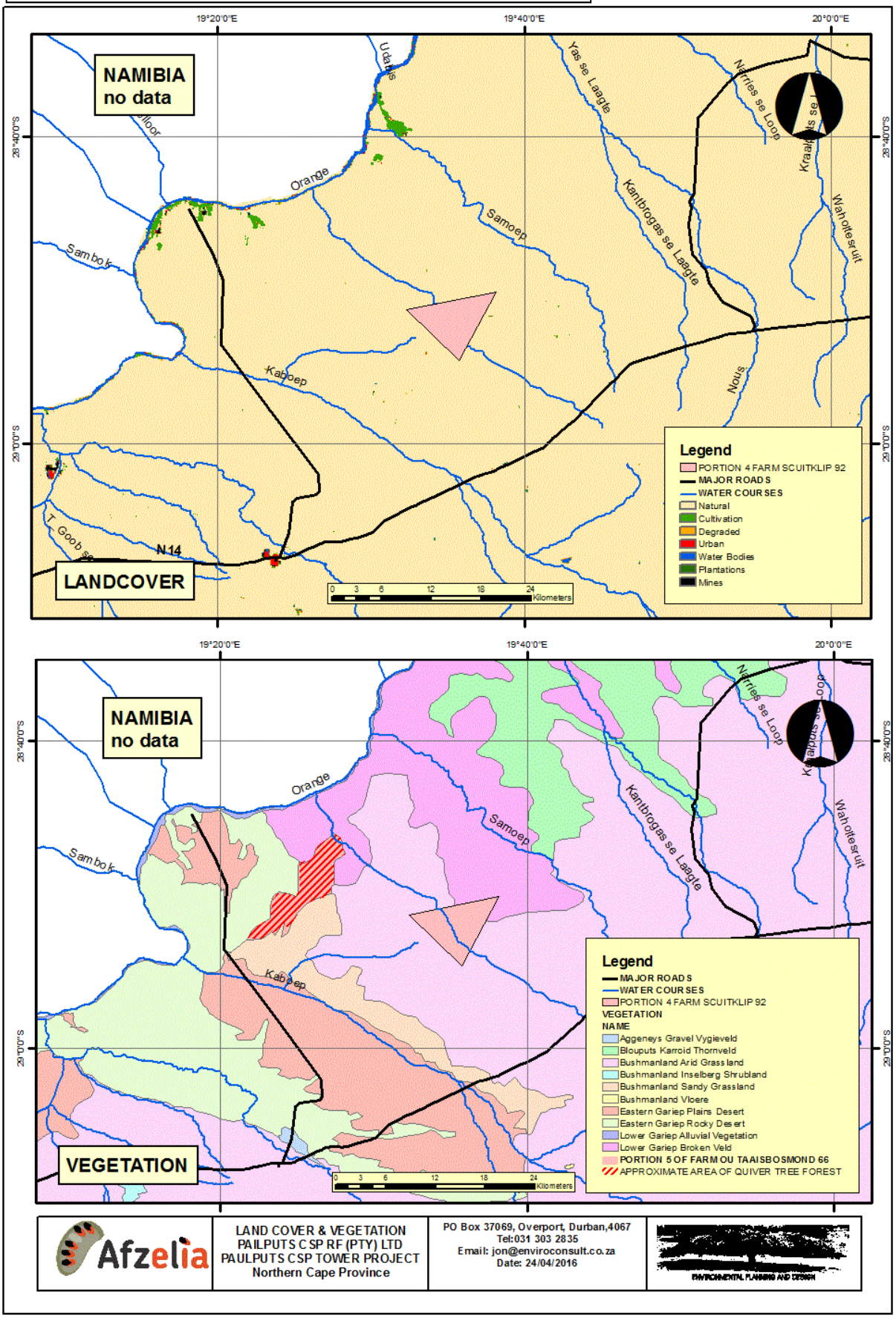
Plate 12, The urban area of Pofadder.

Plate 13, The Quiver Tree Forest. This area has potential as a future tourist attraction. Due to topography, direct views of the site are not possible, however it is likely that a section of teh proposed tower may be visible above teh horizon to the north of the area.

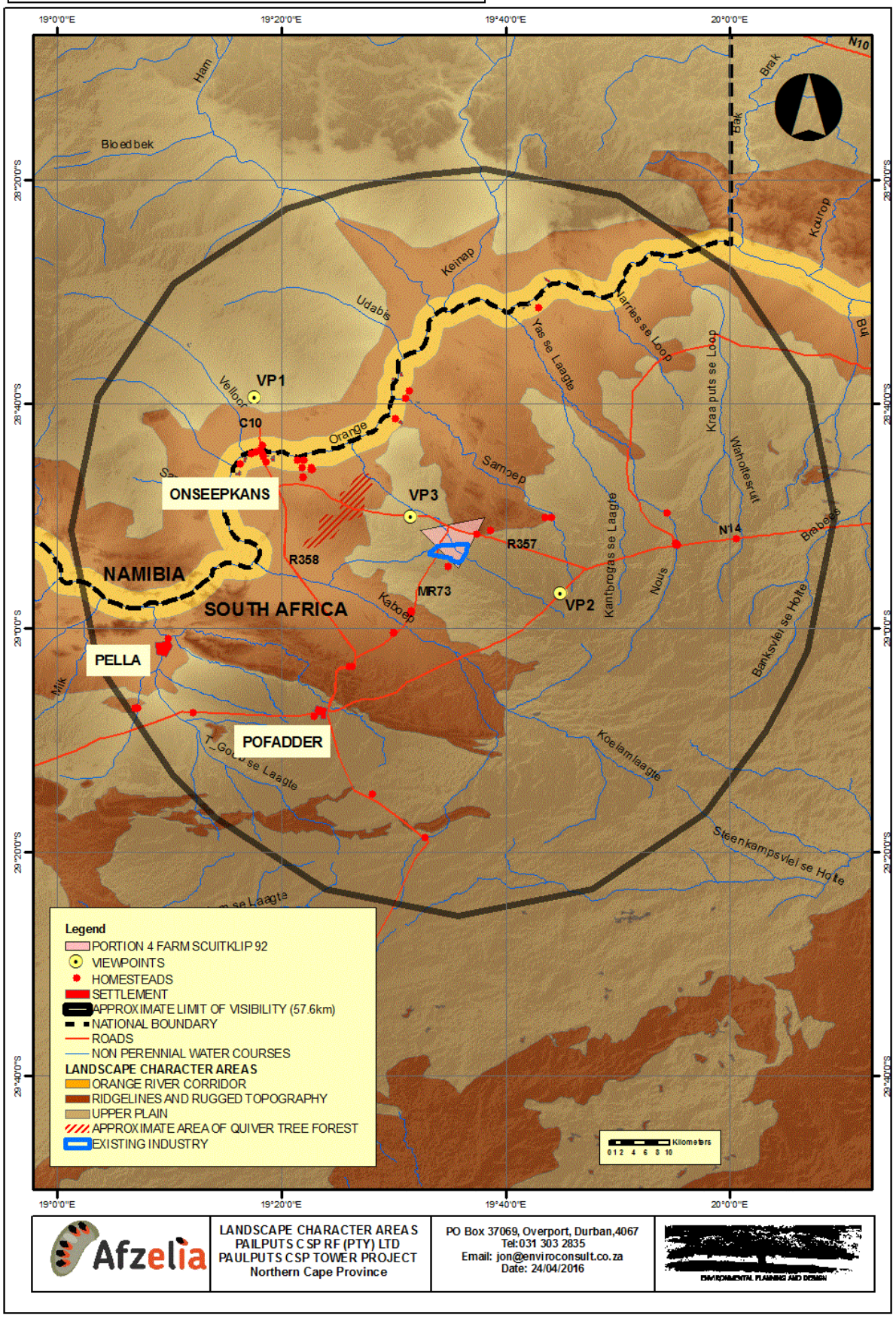
MAP 2: LANDFORM AND DRAINAGE



MAPS 3 & 4: LANDCOVER AND VEGETATION



MAP 5: LANDSCAPE CHARACTER AREAS



4 THE NATURE OF POTENTIAL VISUAL IMPACTS

4.1 GENERAL

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

a. Generally, landscape change or degradation is particularly important for protected areas where the landscape character might be deemed to be exceptional or rare. However, it can also be important in non-protected areas particularly where landscape character is critical to a specific broad scale use such as tourism areas or for general enjoyment of an area. This is generally assessed by the breaking down of a landscape into components that make up the overall character and understanding how proposed elements may change the balance of the various elements. The height, mass, form and colour of new elements all help to make new elements more or less obvious as does the structure of an existing landscape which can provide screening ability or texture that helps to assimilate new elements. This effect is known as visual absorption capacity; and
b. Change in specific views within the affected area from which the character of a view may be important for a specific use or enjoyment of the area.
    - Visual intrusion is a change in a view of a landscape that reduces the quality of the view. This can be a highly subjective judgement. Subjectivity 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; and
    - Visual obstruction is the blocking of views or foreshortening of views. This can generally be measured in terms of extent.

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

4.2 POSSIBLE IMPLICATIONS FOR LANDSCAPE CHARACTER

Heliostats will be aligned radially around the power tower as indicated on Figure 2.

From views of an existing power tower installation to the west of Upington, unless reflection, glint and glare make them more obvious, it is unlikely that the heliostats will be obvious in the flat landscape from greater than 4 – 5km distance.

Reflection, glint and glare are however likely to make the heliostats more obvious in the landscape from the east, west and north at certain times of the day.

When heliostats are aligned facing a viewpoint, light reflecting off the mirrored surfaces is likely to make the structures more obvious. In general therefore it is likely to be most obvious to the east in the morning, to the west in the afternoon and to the north during the middle of the day.

The heliostats can also reflect the colour of the sky or the surrounding landscape subject to their inclination. The colour of the facility is therefore likely to change as the angle of the sun changes.

Until the viewer sees the back face of the structure when the colour of the finish on the reverse side of the mirror is seen reflections of the sky or surrounding landscape are seen. This side is also likely to be viewed in at least partial shadow.

Where the development is seen from an elevated viewpoint, it is likely that the structures will visually combine providing an impression of an extensive industrial development. Judging from the topography of within the approximate limit of visibility, it seems unlikely that this will occur, however views from upland areas to the east on the edge of the approximate limit of visibility could provide this impression.

The existing power tower development to the west of Upington is a dominant element in the landscape at 5km and at 30km the tower is obvious but not dominant.

Subject to time of day and weather conditions, it is likely that the structure will become less dominant at around 15-20km and not obvious at around 30-35km distance.

However, in addition to visual impacts from the tower structure, the sunlight focused on the tower's receiver by the heliostats during normal operations causes the surface of the receiver to appear to glow with sufficient intensity to be visible for long distances. It is likely therefore that this will make the tower more obvious to the south east, south and south west.

Refer to **Plates 12 to 18** inclusive which provide an indication of the likely impact of the proposed power tower on views from distances up to 35km. These images feature the existing power tower to the west of Upington.

4.3 POSSIBLE IMPLICATIONS FOR VISUAL RECEPTORS

Implications for visual receptors can be divided into;

1) Possible changes in views over the landscape that could affect sensitive users or general enjoyment of views; and
2) Glint and / or glare that could cause eye damage or nuisance to receivers. Power Tower projects are known to have the following effects[1];
   - Specular reflections[2] from the heliostats particularly from higher ground.
   - Diffuse[3] and specular reflections from the receiver.

4.4.1 Possible changes in views over the landscape that could affect sensitive users or general enjoyment of views

The proposed project will see the development of one up to 300m high tower. This structure is likely to be visible for a significant distance within the surrounding landscape. Even when the tower structure is not obvious, the glow of the receptor on the

[1] Journal of Solar Energy Engineering August 2011, Vol. 133. Clifford K. Ho of the Concentrating Solar Technologies Department, Sandia National Laboratories.

[2] Specular reflection is the mirror-like reflection of light (or of other kinds of wave) from a surface, in which light from a single incoming direction (a ray) is reflected into a single outgoing direction

[3] Diffuse *reflection* is the *reflection* of light from a surface such that an incident ray is reflected at many angles.

top of the tower is likely to make the development obvious. Review of possible sensitive receptors in the region highlighted the following:

The N14 national road. The N14 is located approximately17km to the east of the proposed site. Given the flatness of the landscape and the distance, it is unlikely that the heliostats will be visible. The power tower is likely to be obvious to extensive sections of these road however but inselberge between the development and the road as well as the rugged terrain immediately north of the site and on the eastern side of Pofadder will help to break views.

Local unsurfaced roads. These roads are located between 0km (R357) and 20km (R358) from the proposed site. They are likely to be used mainly by local people accessing rural areas, the Orange River Corridor and the border crossing into Namibia at Onseepkans. This means that in addition to local people, it is likely that the routes have some tourism and commercial importance.

With the exception of the R357 which passes through the site, it is likely that the heliostats will not be obvious from the majority of local roads. The power tower is likely to be the most obvious element. The further south the viewer is on the roads, the more likely that diffuse reflection from the receptor will make the tower more obvious.

Homesteads located in the landscape surrounding the proposed project. The majority of homesteads are located within the Orange River Corridor and are set at a lower level than the proposed site. This means that they could be screened from the project.

There are a small number of homesteads in the flat Upper Plain LCA that surrounds the project, the closest being approximately 3.3km to the south and 2.5km to the north east. The southern homestead is used for agricultural purposes whilst the homestead to the north east, at the time of the site visit, was being used by a transport company. Heliostats are likely to be visible to the NE homestead but a small ridgeline is likely to screen the heliostats from the farm buildings to the south.

4.4.2 Possible Glint and / or Glare

Glint is defined as a momentary flash of light, while glare is defined as a more continuous source of excessive brightness relative to the ambient lighting. Hazards from glint and glare from concentrating solar power plants include the potential for permanent eye injury (e.g., retinal burn) and temporary disability or distractions (e.g., flash blindness), which may impact people working nearby, pilots flying overhead, or motorists driving alongside the site[4].

Research indicates that glint and glare problems are most likely to occur from the heliostats, reflections from receptors at the top of power towers whilst they are obvious are generally more diffuse. From the NE homestead and the R357 in close proximity to the site are likely to be affected by glint and glare.

[4] Solar PACES, Berlin, September 15-18. 2009, conference paper by Clifford Ho, Cheryl Ghanbari, Richard Diver.

4.4.3 Possible Mitigation Measures

The US Bureau of Land Management highlights the following mitigation measures in their Best Practices Manual for Reducing Visual Impacts of Renewable Energy Facilities[5];

Vegetation Clearance

Often, vegetation beneath a solar field is completely stripped and the area may be levelled prior to construction; however, depending on the solar technology employed, these procedures may not be necessary. In some cases, grasses and some low shrubs can be left under the heliostat field, or shrubs can be trimmed to shorten them to an acceptable height. If vegetation can safely be left beneath the structures and does not interfere with facility construction, operation, or maintenance, strong colour contrasts associated with exposed or eroded soils can be reduced, as can texture contrasts caused by vegetation removal. The visual benefits of leaving vegetation underneath structures varies depending on the height and spacing between solar collectors; it is most effective at reducing visual impacts for more widely spaced and taller collector arrays because there is more space visible underneath and between the collectors. Leaving or replacing vegetation underneath the structures has non-visual benefits as well, such as reduced runoff and erosion, and reduced cost for revegetation at the time of decommissioning.

Colour

Colour-treated mirror backs and structural supports minimises reflection from these faces. Colour-treated mirror backs appear as a dark band. Untreated mirror backs appear blue. In this case, the colour treatment used has the added benefit of strengthening the mirrors, and it improves energy production efficiency during low-energy production conditions.

Depending on the component and treatment method, treatments could be subject to fading or flaking, and may require re-treatment to maintain proper coloration.

Fencing / Screening

Where significant offsite glare is unavoidable, fencing with privacy slats, earthen berms, or vegetative screening materials may be employed.

[5] Best Management Practices for Reducing Visual Impacts of Renewable Energy Facilities on BLM Administered Lands, United States Department of Interior, Bureau of Land Management (BLM), first edition, 2013.

VISUAL INFLUENCE OF POWER TOWER DEVELOPMENT

Plate 13, Existing Power Tower viewed from less than 5km.

Plate 14, Existing Power Tower viewed from approximately 15km.

Plate 15, Existing Power Tower viewed from approximately 20km.

Plate 16, Existing Power Tower viewed from approximately 25km.

Plate 16, Existing Power Tower viewed from approximately 30km.

Plate 17, Existing Power Tower viewed from approximately 35km.

Plate 18, Existing Power Tower visible over ridgeline.
Note, whilst only a small section of the upper tower is visible the diffuse reflection from the receptor makes the structure obvious. It is likely that similar views will be possible to the north of the Orange River Corridor.

5 VISIBILITY OF THE PROPOSED DEVELOPMENT

5.1 ZONES OF THEORETICAL VISIBILITY

Zones of Theoretical Visibility (ZTV) are defined by the UK Guidelines as "a map usually digitally produced showing areas of land within which a development is theoretically visible".

The ZTV analysis has been undertaken 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 NASA and is freely available on the CIAT-CCAFS website (http://www.cgiar-csi.org).

The Site Layout (Figure 2) locates the power tower and the heliostat field. Points have been placed and height attributes added to the points to represent the components of the proposed development and the viewshed facility in Arc Spatial Analyst has then been used to prepare each ZTV dataset.

5.2 ASSESSMENT LIMIT

The GIS based assessment of ZTV's 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 III**) has been used to calculate the likely distance that the proposed structures might be visible over.

This indicates that in a flat landscape the proposed structures may be visible for the following distance;

ELEMENT	APPROXIMATE LIMIT OF VISIBILITY
Proposed Power Tower 260m high.	57.6km
Heliostats and low structures 12m high	12.4km
Proposed internal overhead power line 28m high	18.9km

It is noted that the landscape within these distances from the proposed development is relatively flat and so this approximate limit of visibility is considered appropriate.

In reality visibility could be reduced by;

- Weather conditions that limit visibility. This would include hazy conditions during fine weather as well as mist and rain.
- Scale and colour of individual elements making it difficult to differentiate structures from background.
- Landform.

5.3 APPROACH TO THE ASSESSMENT

The project layout has been provided **(Figure 2)**. From this information, the location of the Power Tower and heliostats is obvious. In order to generate the ZTV for the proposed development, it has been assumed that the entire area of heliostat development as indicated will be set at a uniform maximum height of 12m. It is noted

that the heliostats are proposed at 6m high. The additional 6m makes allowance for buildings and the power block that also sit around the base of the tower.

Points have also been set to represent the Power Tower and the overhead 132kV power line that will link the power block to the existing Paulputs Substation.

Appropriate heights have been allocated to all the points and Viewshed option in Arc Spatial Analyst GIS used to generate the ZTV analysis.

5.4 VISIBILITY OF DEVELOPMENT AND THE MODIFYING EFFECT DUE TO VAC OF THE LANDSCAPE

Map 6 indicates the ZTV of the proposed up to 300m high Power Tower.

The ZTV clearly indicates that the visibility of the tower will be channelled by the ridgelines and rugged topography in a band that extends approximately east to west.

The tall ridgelines that are located immediately to the north of the proposed development will provide a high degree of screening from the north and the major ridgelines immediately to the north of Pofadder will provide screening for the town and the landscape to the south.

Due to the fall of the land a large area on the Namibia side of the border is likely to be affected, however, the Orange River Corridor is likely to be largely screened due to the steep and rugged nature of the valley sides.

From the ZTV it is also obvious that the inselberge between the development and the N14 will help to break views of the tower from large sections of the road.

Map 7 indicates the ZTV of the proposed lower development around the base of the Power Tower. This includes buildings, the power block and the heliostat field.

The analysis indicates that the visibility of these elements is also likely to be channelled in a roughly east to west running band. On the northern edge, the major ridgelines immediately to the north of the site again restrict visibility to the north. To the south however a relatively minor ridgeline that will have no effect in restricting visibility of the tower, will play a major role in restricting visibility of the lower development from areas to the south. It was noted on site that this ridgeline currently completely hides the existing CSP Parabolic Trough projects from areas to the south.

Given that the existing parabolic trough projects are of a similar scale to the lower development associated with the Power Tower, these projects are all likely to impact a similar area.

The main areas of impact will include the R357 approximately 6km to the east and west of the site as well as the two closest homesteads.

Map 8 indicates the ZTV of the required 132kV overhead power line between the power block and the existing Paulputs substation.

The ZTV analysis indicates that this section of the development will be visible to a similar area as the low development around the base of the tower. However, observations of existing overhead power lines indicates that visibility is likely to be more restricted.

Plate 10 indicates an 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 nine 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.

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 are likely to result in the proposed power line not having minimal impact at a distance greater than 2.5km. From closer distances it will also be viewed in the context of the existing Eskom 220kV overhead power line.

5.6 KEY VIEWPOINTS

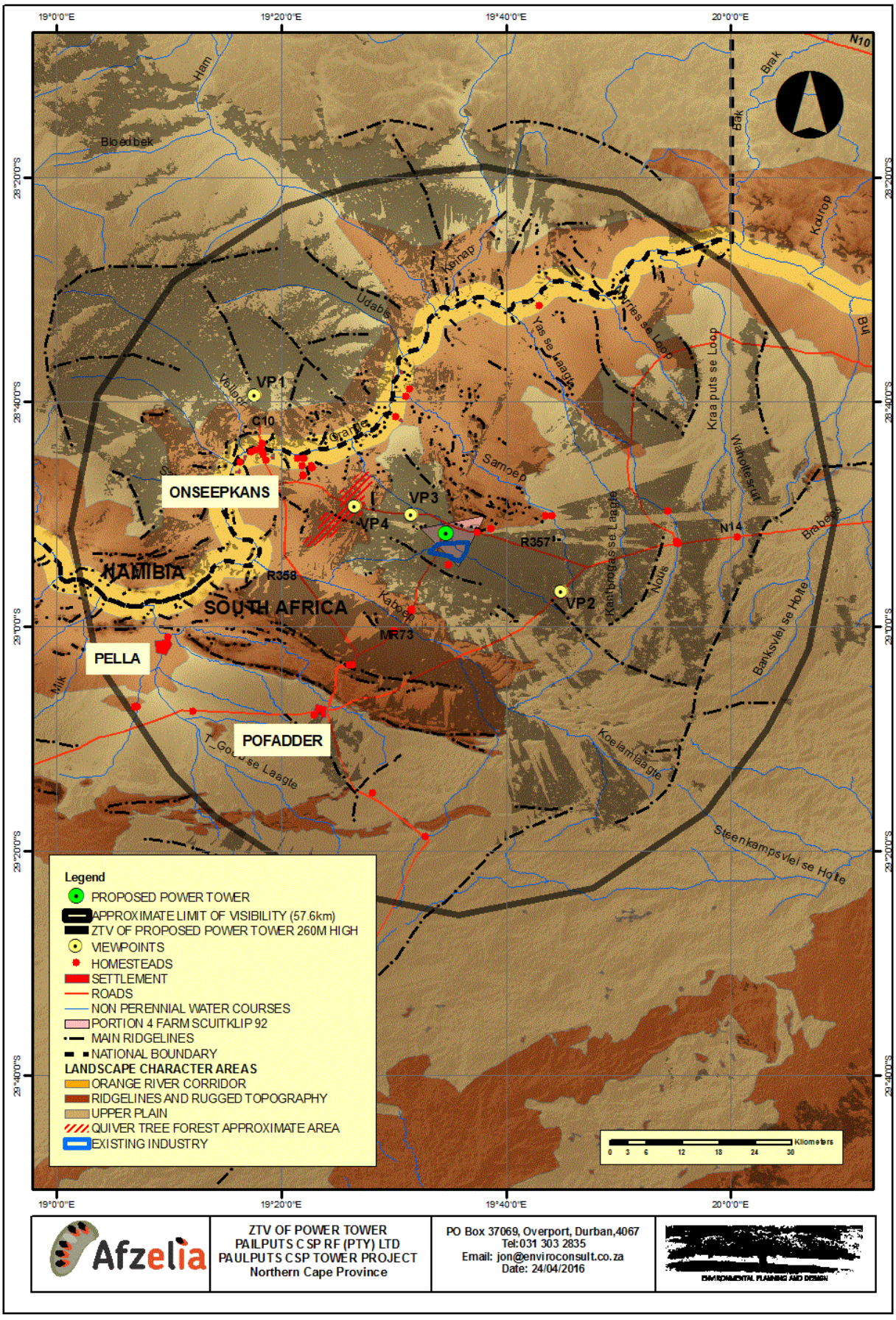
Key viewpoints that are adjudged to provide an indication of typical views towards the proposed development and are representative of views of the identified visual receptors / LCAs are located on **Maps 5, 6, 7 and 8**. Photographs from these viewpoints on which the proposed development has been montaged are indicated in **Figures 3 to 5** inclusive.

The following viewpoints have been selected;

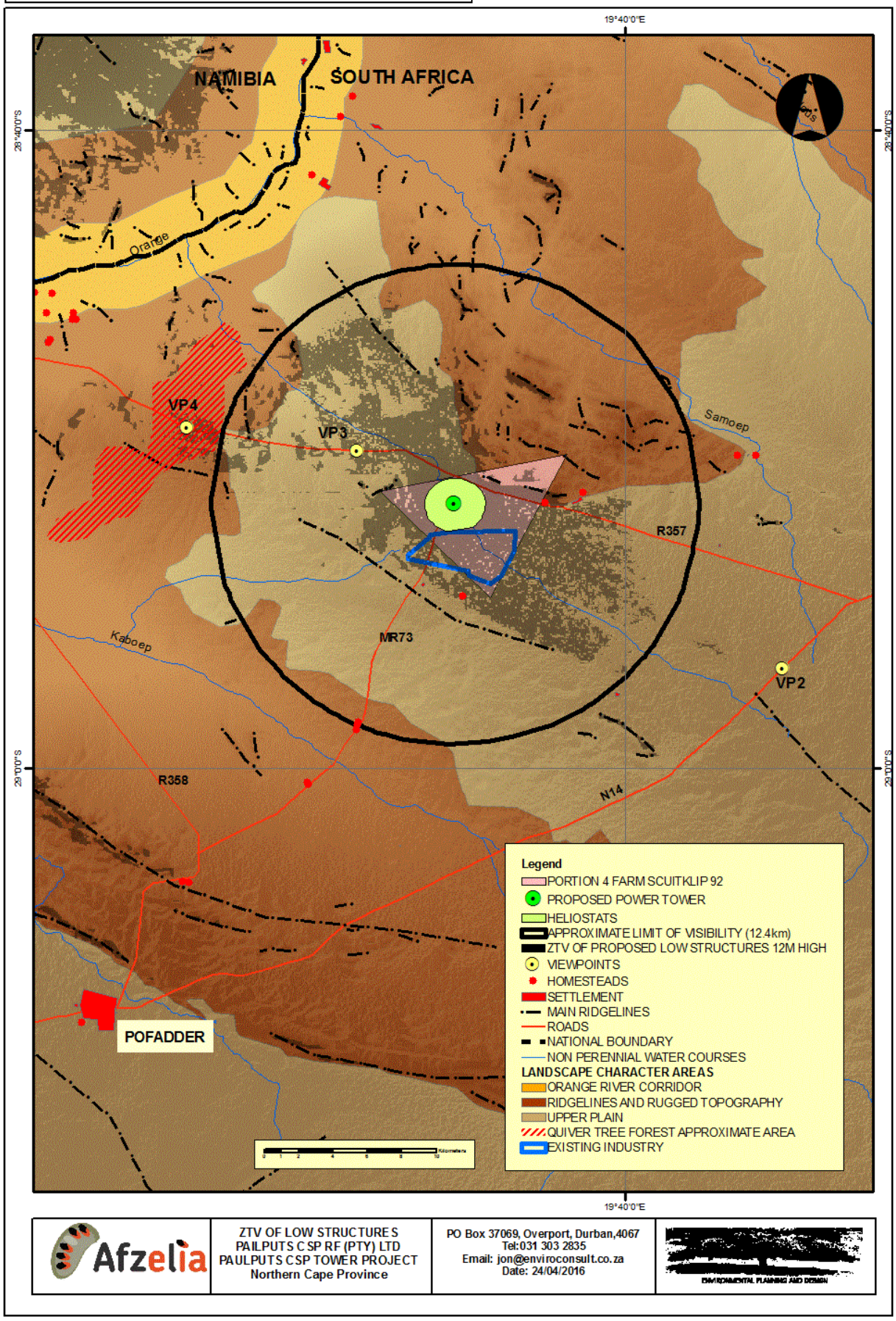
- **VP1** is located approximately 35km to the north west of the proposed power tower on the C1 road in Namibia. In addition to indicating the international impact, this viewpoint is likely to be typical of distance views from ridgeline overlooking Pofadder to the south as well as flat areas to the east. This viewpoint indicates the likely level of impact with the defuse reflection on the receptor being obvious.
- **VP2** is located on the N14 at its closest point (19km) to the proposed Power Tower. This will therefore illustrate the worst case view from the N14. This view is also representative of views from other roads and homesteads at a similar distance from the proposed development.
- **VP3** is a relatively close range view (6km) form the R357. In addition to illustrating a relatively close view of the development, it also illustrates the relative scale of the landform to the north that provides screening from that direction and the influence of other smaller local landforms in limiting visual impacts.

Plate 19, View of a 132kV overhead power line similar line to that proposed. Note pylons on the horizon (approx 2.5km distance) are just visible.

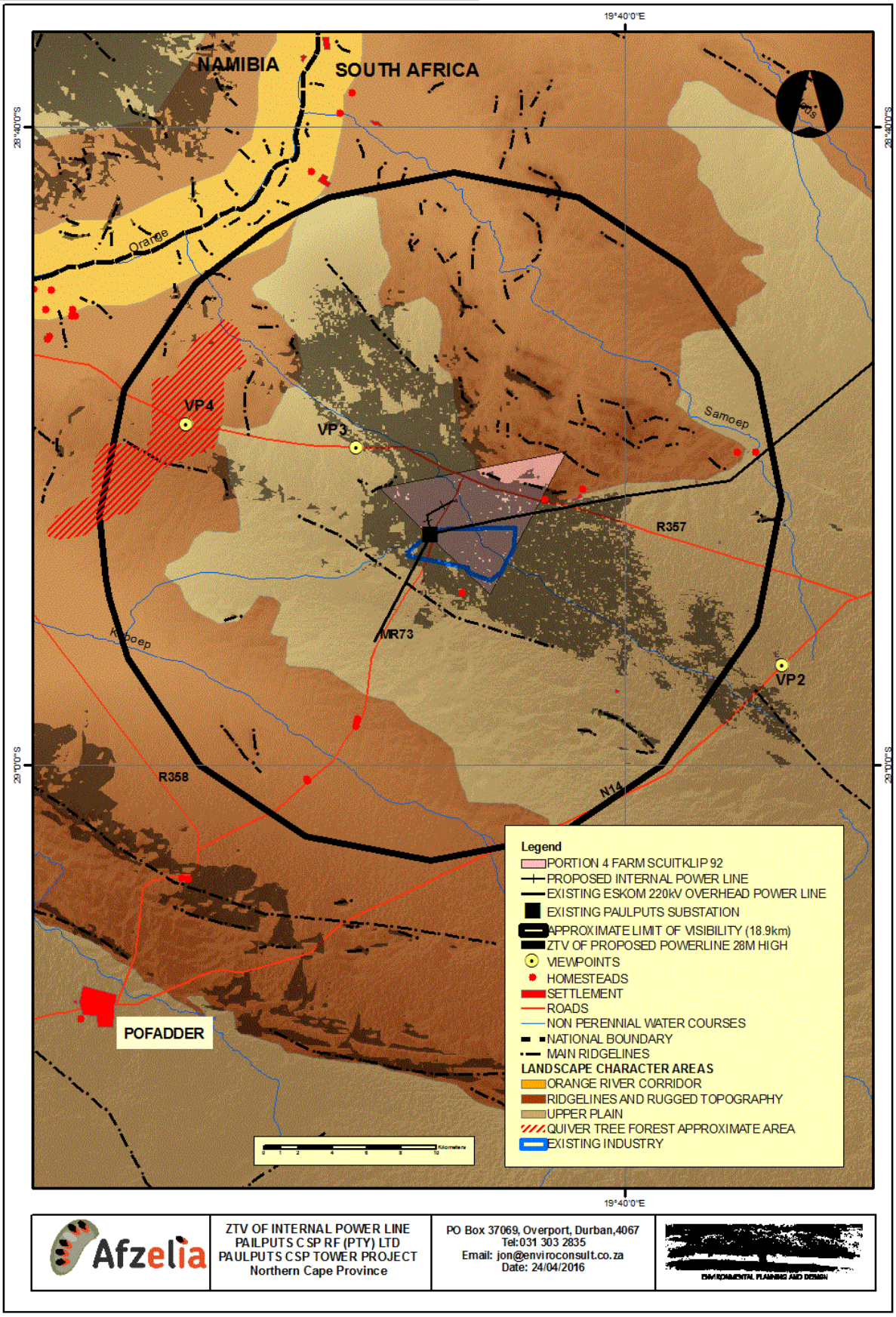
MAP 6: ZTV OF POWER TOWER



MAP 7: ZTV OF LOW STRUCTURES



MAP 8: ZTV OF INTERNAL POWER LINE



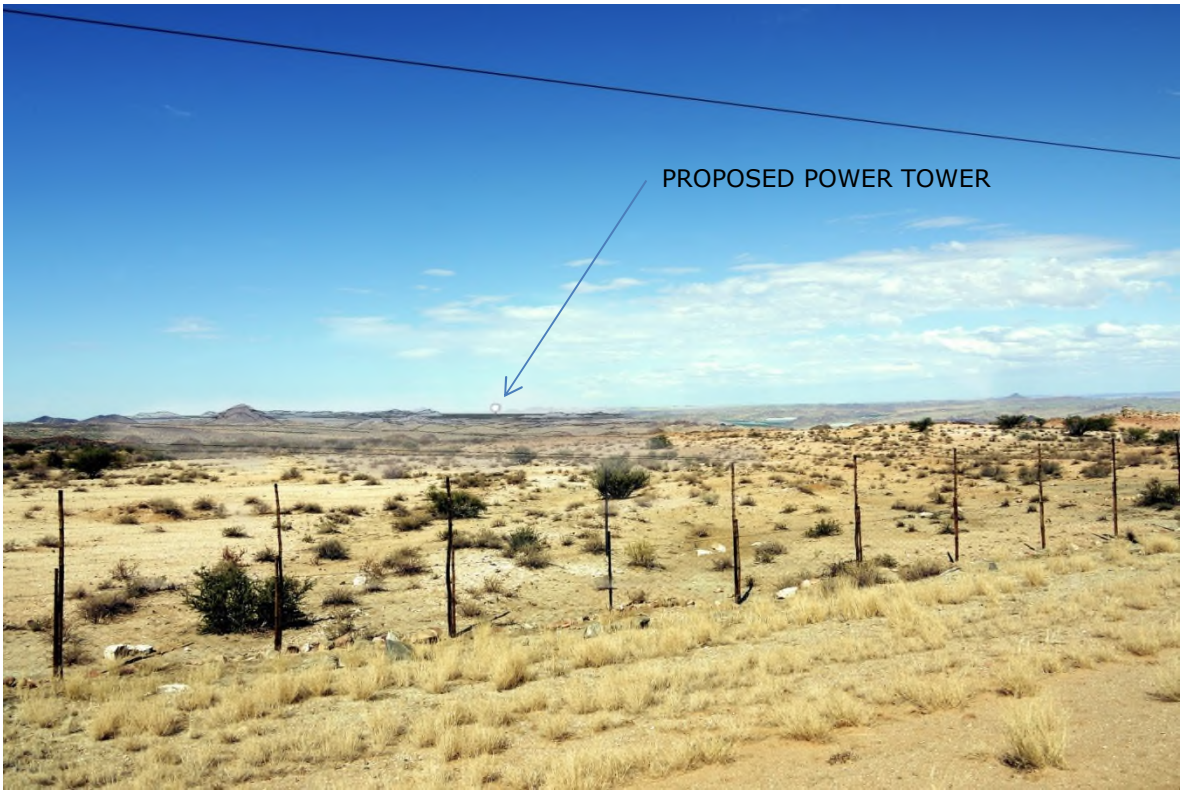


Figure 3, VP1. View from the C1, a local road across the border in Namibia approximately 35km from the development. The power tower is likely to be visible however, the structure will only be obvious due to the glow of the receptor plate.

Figure 4, VP2. View from the N14 approximately 19km to the south east of the development. The power tower is likely to be visible however at this distance the structure is not likely to be a

dominant feature. The structure will be obvious due to the glow of the receptor plate.

Figure 5, VP3. View from the R357 approximately 6km to the west of the development. The power tower is likely to a dominant element within the landscape that is made more obvious due to the glow of the receptor plate. The ridgelines that surround it will help to screen views particularly from the north and north east. Even at this distance the lower elements around the base of the tower will be hidden by the landform.

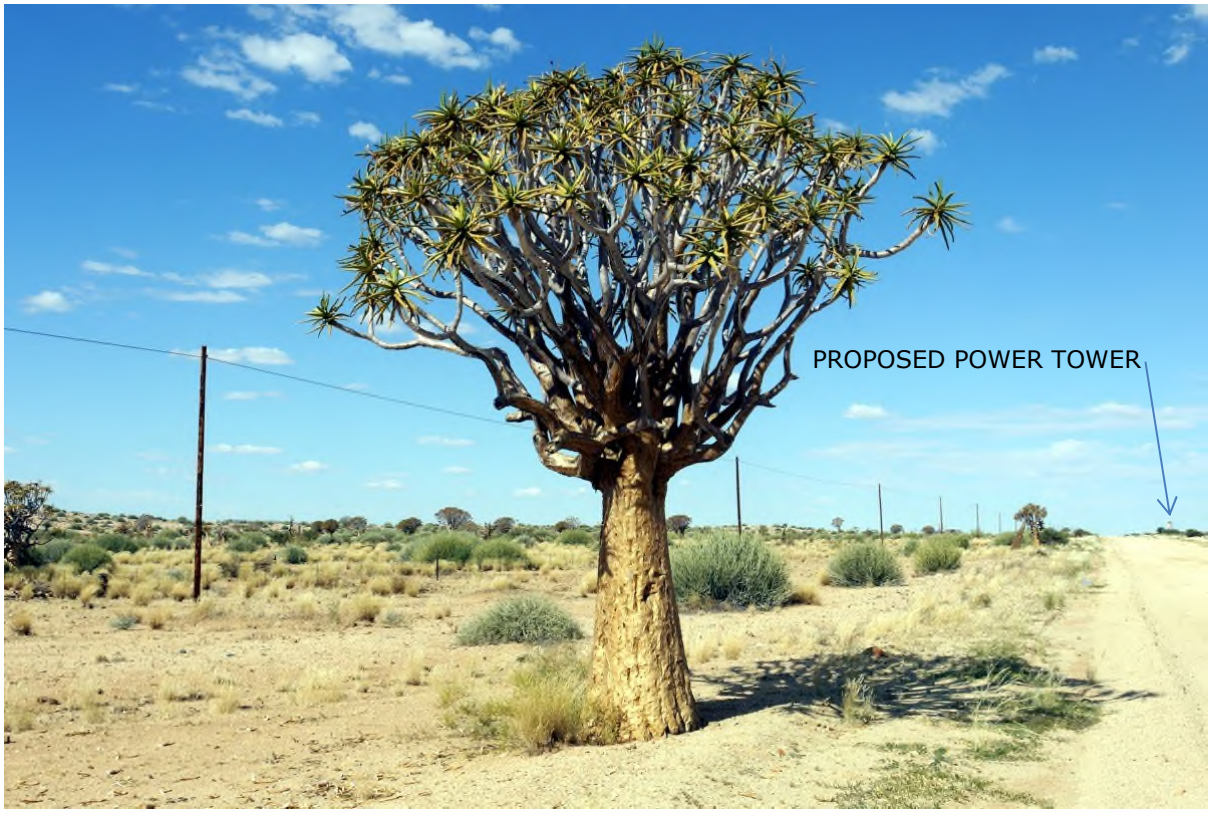


Figure 6, VP4. View from the R357 approximately 14.5km to the west of the development within the Quiver Tree Forest. The top of the power tower is likely to be visible but not obvious. Because the forest is located in an area that is lower than the development and enclosed by minor ridgelines only part of the power tower is likely to be visible from the majority of the area. As indicated above, existing low vegetation is also likely to help partially screen the tower.

6 VISUAL IMPACT ASSESSMENT

6.1 ASSESSMENT METHODOLOGY

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

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 ASSESSMENT

The following assessment focuses on the issues identified during the scoping process which include:

1) Potential visual intrusion on sense of place;
2) Potential effect on landscape features and scenic re-sources;
3) Potential effect on local inhabitants, visitors to the area and on tourism;
4) Potential effect of related infrastructure;
5) Potential effect of lights at night; and

Potential effect of construction and de-commissioning. In addition the existence of a Quiver Tree Forest was noted following the site visit. This area has eco-tourism potential Impacts on this area are considered in 6.2.2.

Cumulative visual impacts were also noted as being of concern. These are dealt with as part of each section of the assessment and are assessed separately in Appendix IV.

Subsequent to the scoping phase, the issue of glint and glare has been identified. This issue is therefore also assessed.

6.2.1 Potential visual intrusion on sense of place

Nature of impact:

The CSP facility could potentially transform the semi-arid wilderness and farmland locally into an industrial landscape.

The various components of the project will influence the landscape character of the area in different ways and to different degrees.

The proposed water pipeline and relocation of the MR73 are likely to have greatest impact while under construction and then the influence will be very local. Once completed and as long as rehabilitation is undertaken appropriately there will be no long term influence on landscape character.

The 132kV overhead power line is likely to influence character of the landscape over a maximum distance of approximately 2.5km. It will be seen within an area that already has an industrial character due to existing CSP plants and the Paulputs substation. It could be argued that it will slightly intensify this existing character but its influence is likely to be minimal.

The heliostats and the buildings and facilities at the base of the tower are of a similar scale to the existing two CSP projects within the property and they are likely to be visible over a similar area. This development will intensify the industrial character within the area immediately surrounding the site. Whilst the ZTV indicates that the development might be visible up to 6km away, because the majority of elements are relatively low and because the tower will be a much more dominant feature, this intensification is likely to be limited to areas immediately surrounding the site.

The proposed tower at 260m high will form a major new feature in the landscape. It is likely to be a dominant feature up to 15 to 20 km away. It is also likely to be obvious in the landscape up to 30km away. Outside the area of influence of the heliostats and the development at its base however it will be seen as a relatively simple vertical structure that is surrounded by natural landscape. The degree to which this detracts from the character of the landscape within which it is viewed is a subjective judgement, purists are likely to see it as a major detractor whereas others might view it as one would a lighthouse in a coastal landscape. It will however influence the character of the landscape over a broad area. It also has to be considered that the landscape within which it is set is not a wilderness landscape but rather a natural rural landscape. From the east, the N14 has a major influence on the character of the area and from the west, development along the river particularly in the form of shade houses introduce large scale development into the rugged landscape.

The impact of the tower is mitigated to a degree by landform in that;

- It will largely be viewed against and within a rock formation that is taller and has substantially greater visual mass than the tower, it will therefore be in scale with its surroundings and seen against a landform backdrop from many viewpoints.
- The landform to the north will provide a large degree of screening from that direction.
- The compartmentalized nature of the landscape will mean that the impact will be limited.
- the steep slopes of the Orange River Valley will screen views of the tower from that area.
- Inselberge will help to further reduce the impact from key viewpoints such as the N14.

	Without mitigation	**With mitigation**
Extent	Regional, **(3)**	Regional, **(3)**
Duration	Long term, **(4)**	Long term, **(4)**
Magnitude	Moderate to high, **(7)**	Moderate, **(6)**
Probability	Highly probable **(4)**	Highly probable **(4)**
Significance	Medium, **(56)**	Medium, **(52)**
Status	The character of the rural landscape will be modified.	**Negative**

	For those people that are attracted to the area for its natural attributes and those travelling through the area for recreational and tourism reasons, it is likely that development of natural areas will be seen as a **negative impact**.	
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** to a small degree the impact of the pipe line, the road realignment and lower structures around the base of the tower may be mitigated.	

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 and within the development;

Operations:

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

Decommissioning:

- Remove infrastructure not required for the post-decommissioning use of the site;
- Return all affected areas to productive agricultural use;
- Monitor rehabilitated areas post-decommissioning and implement remedial actions.

Cumulative Impacts:

The lower sections of the proposed project will intensify industrial character within an area that is already industrial in nature.

The tower will add a significant area that will be affected by development. However this impact will be of a different nature and scale than existing industrial development.

Existing industrial development creates a relatively intense impact over a small area whereas the proposed tower will create a single element that will be visible over a very wide area. These two impacts are not comparable.

The tower therefore will create a new type of impact rather than create an extension to existing or planned impact in the area.

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 existing vegetation is maintained and protected and that effective rehabilitation is undertaken during and after construction as well as on closure of the plant.

6.2.2 Potential effect on landscape features and scenic resources.

Nature of impact:

The solar energy facilities will be located on an expansive plain with a number of prominent landscape features.

The proposed tower will be the main concern as the lower elements will affect an area that is already industrialised and the water pipe and road realignment should have temporary impacts only.

The landscape in which the proposed tower will be set is dramatic and memorable. This is largely due to the contrasting elements and particularly the near vertical landforms, comprised of the inselberge and ridgelines, rising from a near planar surface. The simplicity and natural character of the vegetation also add to this scene.

Approximately 13km to the west of the proposed development area is a Quiver Tree Forest. This area is important due to the extent of the forest and the fact that the quiver tree is a red data listed species. In addition the density of quiver trees does distinguish this area from its surroundings and provides the possibility of the area being used for eco-tourism. The ZTV indicates that a section of the proposed tower is likely to be visible from the majority of the forest area. The tower will be seen at a distance of 13 – 20km. It is likely to be visible but may not be obvious over the entire forest area.

The proposed development will add a major new and obviously man made feature into this landscape which will undoubtedly detract from the naturalness of the scene.

It is possible that some may see the inclusion of an obvious focal point within the landscape as a positive addition. It is also likely that those who cherish the natural environment will see the addition as an imposition.

The impact is to a degree mitigated by the compartmentalised landscape meaning that it will only be seen within a limited section of the landscape. Even within the compartment that it impacts the rugged landform provides screening form many receptors and for others the tower will be seen against a landform backdrop.

The Orange River Corridor is likely to be largely unaffected.

	Without mitigation	With mitigation
Extent	Regional, **(3)**	Regional, **(3)**
Duration	Long term, **(4)**	Long term, **(4)**
Magnitude	Moderate to high, **(7)**	Moderate, **(6)**
Probability	Highly probable **(4)**	Highly probable **(4)**
Significance	Medium, **(56)**	Medium, **(52)**
Status	For those people that are attracted to the area for its natural attributes and those travelling through the area for recreational and tourism reasons, it is likely that development of natural areas will be 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** to a small degree the impact of the pipe line, the road realignment and lower structures around the base of the tower may be mitigated.	

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 and within the development;

Operations:

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

Decommissioning:

- Remove infrastructure not required for the post-decommissioning use of the site;

- Return all affected areas to productive agricultural use;
- Monitor rehabilitated areas post-decommissioning and implement remedial actions.

Cumulative Impacts:

The lower sections of the proposed project will intensify industrial character within an area that is already industrial in nature.

The tower will add a significant area that will be affected by development. However this impact will be of a different nature and scale than existing industrial development.

Existing industrial development creates a relatively intense impact over a small area whereas the proposed tower will create a single element that will be visible over a very wide area. These two impacts are not comparable.

The tower therefore will create a new type of impact rather than create an extension to existing or planned impact in the area.

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 Potential effect on local inhabitants, visitors to the area and on tourism

Nature of impact:

The proposed development will not be visible from the settlement of Pofadder.

The proposed facilities will be visible to a number of homesteads and to travellers on the N14 and on local roads.

The lower section of the development will be visible to two homesteads one of which is currently being used by a transport company and the other is focused on agriculture. Both of which currently have views over the industrialised area. It is unlikely that residents of these homesteads will be concerned regarding the extension of similar scale development.

Residents within the broader area will have views of the proposed tower. However their focus is likely to be on agricultural productivity of the area which will be unaffected.

Tourism related facilities (existing guesthouse and river rafting) are focused on the Orange River Corridor. There will be minimal impact on this area.

The N14 will carry a proportion of tourism related travellers most of whom will be travelling through the area to the main centres including Springbok and Upington and on to the Kalahari and Namibia. This group are likely to have a passing interest in the surrounding landscape.

A small number of people are likely to be travelling to the area for tourism purposes

including staying at the existing guest house in the Orange River Corridor or for river rafting which is advertised in the area. This group of people will travel past the existing industrial development (CSP projects) and if approval is granted, the proposed tower and associated development. Whilst these existing and proposed facilities will be highly obvious on the drive through the area, they will not be obvious from their destination.

	Without mitigation	**With mitigation**
Extent	Regional, **(3)**	Regional, **(3)**
Duration	Long term, **(4)**	Long term, **(4)**
Magnitude	Low, **(4)**	Low to minor, **(3)**
Probability	Probable **(3)**	Probable **(3)**
Significance	Medium, **(33)**	Medium to Low, **(30)**
Status	For those people that are attracted to the area for its natural attributes and those travelling through the area for recreational and tourism reasons, it is likely that development of natural areas will be 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** to a small degree the impact of the pipe line, the road realignment and lower structures around the base of the tower may be mitigated.	

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 and within the development;

Operations:

- Reinstate any areas of vegetation that have been disturbed during construction;
- Remove all temporary works;
- Monitor rehabilitated areas post-decommissioning and implement remedial

actions;
- Minimise disturbance and maintain existing vegetation as far as is possible both within and surrounding the development area;
- Colouring of mirror backs;

Decommissioning:

- Remove infrastructure not required for the post-decommissioning use of the site;
- Return all affected areas to productive agricultural use;
- Monitor rehabilitated areas post-decommissioning and implement remedial actions.

Cumulative Impacts:

The lower sections of the proposed project will intensify industrial character within an area that is already industrial in nature.

The tower will add a significant area that will be affected by development. However this impact will be of a different nature and scale than existing industrial development.

Existing industrial development creates a relatively intense impact over a small area whereas the proposed tower will create a single element that will be visible over a very wide area. These two impacts are not comparable.

The tower therefore will create a new type of impact rather than create an extension to existing or planned impact in the area.

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.

6.2.4 Potential effect of related infrastructure

Nature of impact:

The water pipelines, water tanks and pump house, as well as related powerlines, particularly where these are above-ground, could have a negative visual effect on the surroundings.

The impact of the water pipe line and road realignment will be subject to appropriate rehabilitation which if undertaken properly will mitigate all impacts.

No information has been provided regarding the pump house facility. It is assumed that this will be a small structure with an off take in the river close to the border crossing. This area is relatively well developed (Plate 7). The development of an additional small riverside structure is unlikely to appear out of place. The minimisation of disturbance of the river bank and successful rehabilitation are key to mitigating the potential impact.

The lower structures around the base of the tower including the overhead power line will impact on the current area that is impacted by industrial development. This will

intensify the industrial character but will not extend the area of impact.

	Without mitigation	**With mitigation**
Extent	Regional **(3)**	Regional **(3)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Low **(4)**	Minor **(2)**
Probability	Probable **(3)**	Improbable **(2)**
Significance	**Medium (33)**	**Low (18)**
Status	**Negative**	**Negative**
Irreplaceable loss	No irreplaceable loss.	No irreplaceable loss.
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 and within the development;

Operations:

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

Decommissioning:

- Remove infrastructure not required for the post-decommissioning use of the site;
- Return all affected areas to productive agricultural use;
- Monitor rehabilitated areas post-decommissioning and implement remedial actions.

Cumulative Impacts:

The lower sections of the proposed project will intensify industrial character within an area that is already industrial in nature.

The water pipe has the potential to expand the area of disturbance significantly. However if disturbance is minimised and rehabilitation undertaken the cumulative impact of this is likely to be non-existent.

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 Potential effect of lights at night

Nature of impact:

Industrialisation of a natural landscape as seen at night.

Aviation warning lights are likely to be required on the top of the power tower. Given that the proposed power tower is just taller than an adjacent unlit landform, it may be possible to motivate for aviation warning lights not to be used.

Aviation warning lights are likely to be red and they are likely to be visible for a significant distance. In areas where there is no regular air traffic it may be possible to utilise pilot activated lighting which means that they are only activated when there is an aircraft in the vicinity. If this is used then aviation warning lights will have negligible impact.

It is also likely that operational lighting will be required at buildings and security lighting may be required within the heliostat field.

Lighting associated with the proposed project will be seen in the context of lighting that will occur due to the current two CSP projects on the property. It is unlikely to extend this impact significantly. The additional impact is therefore likely to be low.

It must be understood that existing projects are extensive and pose a similar risk to the transformation of the night time landscape as the proposed project.

If flood lighting is deemed necessary throughout the hours of darkness then general impact is likely to be significant. However if low level operational lighting is required at buildings then it is likely that the plant will not appear significantly different than the farmsteads that are scattered through the landscape.

If the former approach is adopted then floodlighting of the site will be noticeable. If however only low level lighting around buildings is required then the proposed project is likely to have negligible impact on the night time landscape.

	Without mitigation	**With mitigation**
Extent	Region **(3)**	Local, **(1)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Low to moderate **(5)**	Small, **(0)**

Probability	Probable **(3)**	Improbable **(2)**
Significance	Medium **(36)**	**Low (10)**
Status	The appearance of a large lit area in an otherwise dark, natural landscape is likely to be seen as a **negative** factor particularly by people wanting to experience the natural landscape.	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:

Planning:

- Use pilot activated aviation warning lights.
- Plan to utilise infra-red security systems or motion sensor triggered 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.

Residual Risks:

No residual risk has been identified.

Cumulative Impact:

Should The lighting approach require a well-lit development then the project will significantly add to lighting impacts in the area. Should a low key approach be adopted and other (infra-red) technology utilised for security, then the cumulative impact is likely to be negligible.

6.2.6 Visual impacts associated with construction of the proposed project.

Nature of impact:

Construction will be comprised of:

- Clearance of site;
- Construction of associated infrastructure;
- laying of concrete bases for the tower, heliostats and power plant;
- Erection and fixing of structures; and
- Laying of cable / pipe runs and connections.

This work is likely to be completed in twenty four to thirty six months.

As the site and surrounding area is relatively flat, an overview of the construction work is unlikely. Activity on site is likely to be obvious from vehicles and plant. Once ground work and concrete bases are complete, the structures are likely to progress rapidly.

Interim impacts are likely to include dust from site operations once the site has been cleared, storage areas which may be as high as the heliostat development and delivery trucks using local roads.

It is also possible that waste-blow could be problematic.

It is obvious that the site and ground level development is unlikely to be obvious except from the R357. Waste blow, delivery vehicles on local roads and dust could make the development obvious during construction.

In terms of addressing the local impact associated with construction, the minimising of disturbance and good rehabilitation are key.

	Without mitigation	**With mitigation**
Extent	Site and surroundings, **(2)**	Site and surroundings, **(2)**
Duration	Very short duration, **(1)**	Very short duration, **(1)**
Magnitude	Minor, **(2)**	Small, **(0)**
Probability	Probable, **(3)**	Possible, **(2)**
Significance	Low, **(15)**	Low, **(4)**
Status	Negative	Negative
Irreplaceable loss	There will be no irreplaceable loss.	There will be no irreplaceable loss.
Can impacts be mitigated?	Yes	

Mitigation:

- Minimise clearance of vegetation;
- undertake dust prevention measures;
- Maintain stockpiles to less than 3 m high; and
- Manage waste effectively and prevent waste blowing around and off site.

Cumulative Impact:

Construction impacts associated with the two existing CSP projects on the property appear to have been addressed. Therefore, this project will present a new risk of impact.

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 Possible impact of glint and glare.

Nature of impact:

All large scale solar facilities are capable of causing offsite glare that may cause annoyance and visual discomfort.

Typically the main risk of glint and glare associated with Power Tower developments include;

1. Viewed from certain angles, specular reflection from heliostats might result in glint or glare from these surfaces, particularly from elevated viewpoints. Power tower facilities usually have the heliostats arrayed in a circle around the central tower. Where this heliostat configuration is used, some portion of the heliostat field would face viewers regardless of their direction of view, which could increase the potential for glinting and glare from the heliostats.
2. Observations of reflections from power tower receivers have shown the sunlight focused on the tower's receiver by the heliostats during normal operations causes the surface of the receiver to appear to glow with sufficient intensity to be visible for long distances; however, the apparent glow is actually diffuse reflected sunlight. The tower receivers can appear brilliantly white at close distances, and the light from relatively small-scale existing facilities has been observed at distances of 25 miles (40km)[6]. Whilst visible over a long distance, this effect is likely to be less intense than glare observed from other CSP facilities such as parabolic troughs.

In order for there to be a problem it is necessary for the facility to be visible to receivers. From the review of visibility undertaken in assessment of other impacts, it is obvious that the only identified receivers that have the potential to be impacted are;

- Local homesteads particularly the homestead to the north that currently appears to be being used by a transport company.
- Roads from which the heliostats may be visible from and particularly the R357 to the north of the development.

It is possible that glint and glare could be problematic to the areas indicated above, However given the relative levels and the small areas involved, if problems should occur, screening should be feasible.

	Without mitigation	**With mitigation**
Extent	Site and immediate surroundings**,**	Local, **(1)**

[6] Best Management Practices for Reducing Visual Impacts of Renewable Energy Facilities on BLM Administered Lands, United States Department of Interior, Bureau of Land Management (BLM), first edition, 2013.

	(2)	
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Minor **(2)**	Small **(0)**
Probability	Improbable **(2)**	Very improbable **(1)**
Significance	Low **(16)**	Low **(5)**
Status	Negative	Negative
Irreplaceable loss	There will be no irreplaceable loss.	There will be no irreplaceable loss.
Can impacts be mitigated?	Yes.	

Mitigation:

- Screening with opaque fencing / earth berms; and / or
- Careful siting and operation of solar collectors turning mirrors away from the sun during time periods when glare impacts are significantly adverse may substantially reduce or avoid visual impacts from offsite glare.

Cumulative Impact:

It is possible that there could be glint and glare impacts associated with the existing CSP projects on the property. However, if impacts should occur due to this project and appropriate mitigation is undertaken as indicated then there will be no cumulative impact.

Residual Risks:

No residual risk has been identified.

The detailed Cumulative Impact Assessment is attached as **Appendix IV**.

7 IMPACT STATEMENT

7.1 GENERAL

The assessment indicates that the development is likely to have two main areas of visual impact;

1) It will intensify the current industrial character of the area immediately surrounding the proposed development area.
2) The proposed tower at 260m high will form a major new feature in the landscape. It is likely to be a dominant feature up to 15 to 20 km away. It is also likely to be obvious in the landscape up to 30km away.

7.2 LANDSCAPE CHARACTER AND IMPORTANCE

The affected area can be divided into the following character areas;

The upper plain with inselberge is the area within which the development will be viewed. The low density of development combines with relatively pristine vegetation to provide an outlook that is perhaps close to wilderness.

The inselberge provide structure and focal points within the landscape. When travelling through the landscape, they compartmentalise the plain, foreshortening views and screening adjacent areas.

It is the contrast between what appears to be a planar topograhy and dramatic steep land forms as well as this compartmentalisation provided by the inselberge that maintains the interest of the viewer in the dramatic and ever changing scene.

The Orange River corridor's prime importance is for productive agriculture it also forms the border between South Africa and Namibia. The main concern of the majority of users of the corridor is therefore likely to be related to the productivity of the area. The corridor is distinct due to the intensive agriculture that occurs within it and the steep valley sides that fall towards the river from the Upper Plain. The area is also a focus for local recreational use and of secondary tourism importance. Due to topography, views from within this LCA largely have an internal focus.

The rugged topography and continuous series of ridgelines that form the southern edge of the Orange River Valley to the north of the study area which provides a dramatic backdrop for the area. From a visual perspective these ridgelines provide visual continuity behind an ever changing foreground.

7.3 AREAS AND NATURE OF VISUAL IMPACT

Possible visual receptors that have been identified include:

- A large number of homesteads that occur within the approximate limit of visibility of the proposed tower;
- The N14 national road and the R357, R358, MR73 local roads in South Africa as well as the C10 local road in Namibia that occur within the approximate limit of visibility of the proposed tower;
- Small sections of the MR73 and R357 that lie within the approximate limit of visibility of the low level development that is required around the base of the tower including the heliostat field, minor buildings and the power block;

- Two homesteads that lie within the approximate limit of visibility of the low level development that is required around the base of the tower;
- A quiver tree forest area approximately 13km to the west of the proposed development.

The assessment indicates that the low level development will largely be screened from the south and south west by a minor ridgeline. It will however be visible to the north and north west but visibility will be limited by the large landforms that surround it and due to its height. As two existing CSP parabolic trough projects lie immediately to the east the proposed development which are of a similar scale, the proposed project will affect a very similar area.

It is possible that glint and glare associated with the heliostats could impact on the R357 to the north of the development. If this does occur it is likely to impact on a relatively short section of road and due to levels should be mitigatable through simple screen fencing.

The proposed tower at 260m high will form a major new feature in the landscape. It is likely to be a dominant feature up to 15 to 20 km away. It is also likely to be obvious in the landscape up to 30km away. Outside the limited area of influence of the heliostats and the development at its base, it will be seen as a relatively simple vertical structure that is surrounded by natural landscape. The degree to which this detracts from the character of the landscape within which it is viewed is a subjective judgement, purists are likely to see it as a major detractor whereas others might view it as one would a lighthouse in a coastal landscape. It will however influence the character of the landscape over a broad area. It also has to be considered that the landscape within which it is set is not a true wilderness landscape but rather a natural rural landscape. From the east, the N14 has a major influence on the character of the area and from the west, development along the river particularly in the form of agricultural shade houses introduce large scale development into the landscape.

The majority of tourism operations seem to utilise the Orange River Corridor. However, there is a quiver tree forest approximately 13km to the west of the proposed project. From on-line research and the site visit, this area does not appear to be being used as a tourism attraction. It is possible however, that local guides could be using the area as part of guided tours. Irrespective of this, the area does have tourism potential. The proposed tower is likely to be visible to varying degrees over the entire forest area. The lower sections of the proposed development including heliostats, buildings and services are unlikely to be visible.

The impact of the tower is mitigated to a degree by landform in that;

- It will largely be viewed against and within a rock formation that is taller and has substantially greater visual mass than the tower, it will therefore be in scale with its surroundings and seen against a landform backdrop from many viewpoints.
- The landform to the north will provide a large degree of screening from that direction.
- The compartmentalised nature of the landscape will mean that the impact will be limited.

- The steep slopes of the Orange River Valley will screen views of the tower from that area.
- Inselberge will help to further reduce the impact from key viewpoints such as the N14.
- Both landform and vegetation will help to reduce the impact of the proposed tower as seen from the Quiver Tree Forest. In areas this will mean that the tower is not obvious, in other areas, the majority of the tower is likely to be visible. Refer to Figure 6 and Plate 14 for an indication of the likely lowest and highest impact respectively that is likely to be experienced within this area.

7.4 CUMULATIVE IMPACT

Identified cumulative impacts only relate to the low development and associated infrastructure associated with the proposed power tower. The impacts associated with these elements will be similar to and will largely impact the same area as the two existing CSP parabolic trough projects and the Paulputs substation which are located adjacent to which the proposed development. The proposed project will therefore not extend but will intensify the industrial character within a limited impact area.

There is nothing of a similar scale or nature in the affected landscape as the proposed power tower. On a basic level it might be argued that it extends the influence of development over a significant area. Whilst this is the case it provides too simplistic a view. It cannot really be considered that this will result in a significant increase of urbanisation or industrial influence as the setting will still be the existing, extensive semi-natural rural landscape. Because of this it may also be argued that it will not detract from the rural setting.

The introduction of a major and obviously man made, single focal point will however change the nature of the view over a wide area. This is a new type of impact within the affected landscape that in the absence of anything that is likely to have a similar affect can only be considered on an individual rather than a collective basis.

7.5 MITIGATION POTENTIAL

The affected landscape has a degree of visual absorption capacity due to minor ridgelines that bisect the plain, This will help to mitigate visibility of the lower levels of the development, including the heliostat field, from the closest receptors.

Visual absorption capacity is also provided by the inselberge within the plain surrounding the development, by the steep valley slopes of the Orange River Corridor and by the rugged topography immediately to the north of the development and to the north of Pofadder. This will help to screen and limit views of the power tower.

Where visible, the lower elements associated with the development will almost always be viewed from a similar level as the development meaning that they will largely be seen in elevation. This will mean that overviews of the full extent of development will not be possible from most public access areas. Mitigation should therefore be focused on minimising the affected area, maintaining natural vegetation which will minimise the area of influence and ensuring that development levels are not elevated above the natural landform.

It will not be possible to mitigate visual impact associated with the power tower.

7.7 CONCLUSION

The proposed lower elements of the project are likely to be in keeping with their surroundings and are unlikely to significantly extend the influence of industrial development within the landscape.

The proposed power tower however, will have significant visual influence that may extend beyond 30km. The impact on views will be mitigated to a degree by distance and by existing landform.

For some its appearance may spoil enjoyment of the natural landscape, however, it is unlikely to be obvious from the main area associated with recreation and tourism that generally occur in the Orange River Valley. It will however be obvious to passing tourist traffic on the N14 and on local roads and to a quiver tree forest area that does have potential for tourism use.

To a proportion of passing traffic it is also likely to be seen in a positive light as a landmark within the rugged landscape.

The proposed development will not affect protected areas and whilst the landscape in which it is set is dramatic and memorable landform serves to compartmentalise views in a progressive way for travellers through the area. This compartmentalisation of the landscape serves to help limit impacts.

Because the proposed project is unlikely to compromise existing land uses that depend on their landscape setting and because it will not permanently change the landscape character of the area permanently compromising future uses, there is no reason on visual grounds that the proposed project should not be authorised.

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APPENDIX I

SPECIALIST'S BRIEF CV

Name	JONATHAN MARSHALL
Nationality	British
Year of Birth	1956
Specialisation	Landscape Architecture / Landscape & Visual Impact Assessment / Environmental Planning / Environmental Impact Assessment.

Qualifications

Education	Diploma in Landscape Architecture, Gloucestershire College of Art and Design, UK (1979) Environmental Law, University of KZN (1997)
Professional	Registered Professional Landscape Architect (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

Languages	English	- Speaking	-	Excellent
		- Reading	-	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.
7. **Solar Plant Projects including Photovoltaic and Concentrating Solar Power Plants** – Numerous projects for Eskom and private clients in the Northern Cape, Limpopo, Mpumalanga and the Free State.
8. **Moorreesburg Wind Farm.** Visual impact assessment for a proposed new wind farm in the Western Cape.
9. **AngloGold Ashanti, Dokyiwa (Ghana)** – Visual Impact Assessment for proposed new Tailings Storage Facility at a mine site working with SGS as part of their EIA team.
10. **Camperdown Industrial Development** - Visual Impact Assessment for proposed new light industrial area to the north o Camperdown for a private client.
11. **Wild Coast N2 Toll Highway** – Peer review of VIA undertaken by another consultant.
12. **Gamma to Grass Ridge 765kv transmission line** – Peer review of VIA undertaken by another consultant.
13. **Gateway Shopping Centre Extension (Durban)** – Visual Impact Assessment for a proposed shopping centre extension in Umhlanga, Durban.
14. **Kouroussa Gold Mine (Guinea)** – Visual impact assessment for a proposed new mine in Guinea working with SGS as part of their EIA team.
15. **Mampon Gold Mine (Ghana)** - Visual impact assessment for a proposed new mine in Ghana working with SGS as part of their EIA team.
16. **Telkom Towers** – Visual impact assessments for numerous Telkom masts in KwaZulu-Natal
17. **Dube Trade Port, Durban International Airport** – Visual Impact Assessment for a new international airport.
18. **Sibaya Precinct Plan** – Visual Impact Assessment as part of Environmental Impact Assessment for a major new development area to the north of Durban.

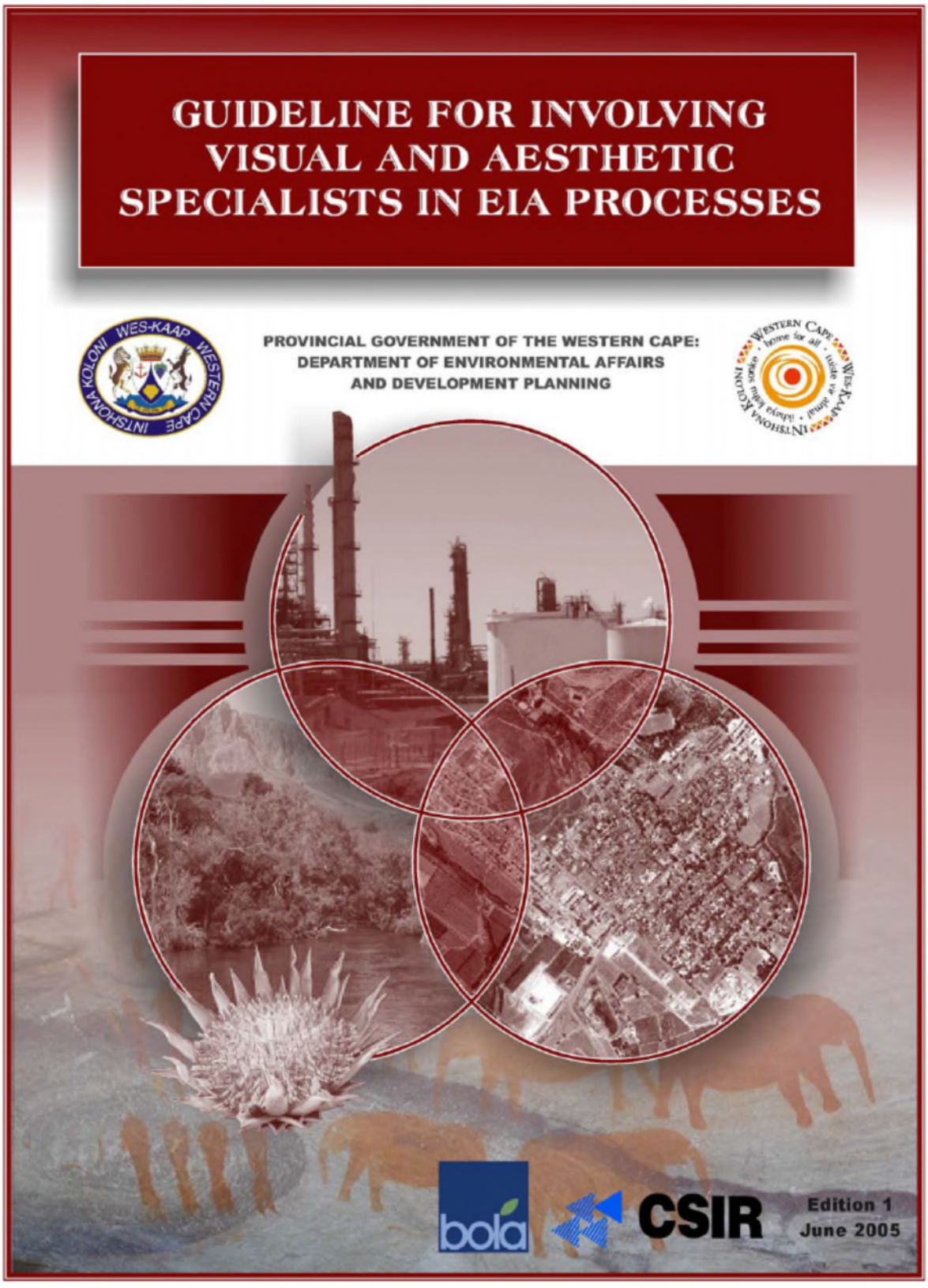
19. **Umdloti Housing** – Visual Impact Assessment as part of Environmental Impact Assessment for a residential development beside the Umdloti Lagoon to the north of Durban.
20. **Tata Steel Ferrochrome Smelter** - Visual impact assessment of proposed new Ferrochrome Smelter in Richards Bay as part of EIA undertaken by the CSIR.
21. **Diamond Mine at Rooipoort Nature Reserve near Kimberley** – Visual impact assessment for a proposed diamond mine within an existing nature reserve for De Beers.
22. **Durban Solid Waste Large Landfill Sites –** Visual Impact Assessment of proposed development sites to the North and South of the Durban Metropolitan Area. The project utilised 3d computer visualisation techniques.
23. **Hillside Aluminium Smelter, Richards Bay -** Visual Impact Assessment of proposed extension of the existing smelter. The project utilised 3d computer visualisation techniques.
24. **Estuaries of KwaZulu Natal Phase 1 and Phase 2 –** Visual character assessment and GIS mapping as part of a review of the condition and development capacity of eight estuary landscapes for the Town and Regional Planning Commission. The project was extended to include all estuaries in KwaZulu Natal.
25. **Signage Assessments** – Numerous impact assessments for proposed signage developments for Blast Media.
26. **Signage Strategy** – Preparation of an environmental strategy report for a national advertising campaign on National Roads for Visual Image Placements.
27. **Zeekoegatt, Durban** - Computer aided visual impact assessment. Acted as advisor to the Province of KwaZulu Natal in an appeal brought about by a developer to extend a light industrial development within a 60 metre building line from the National N3 Highway.
28. **La Lucia Mall Extension** - Visual impact assessment using three dimensional computer modelling / photo realistic rendering and montage techniques for proposed extension to shopping mall for public consultation exercise.
29. **Redhill Industrial Development** - Visual impact assessment using three dimensional computer modelling / photo realistic rendering and montage techniques for proposed new industrial area for public consultation exercise.
30. **Avondale Reservoir** - Visual impact assessment using three dimensional computer modelling / photo realistic rendering and montage techniques for proposed hilltop reservoir as part of Environmental Impact Assessment for Umgeni Water.
31. **Hammersdale Reservoir** - Visual impact assessment using three dimensional computer modelling / photo realistic rendering and montage techniques for proposed hilltop reservoir as part of Environmental Impact Assessment for Umgeni Water.
32. **Southgate Industrial Park, Durban** - Computer Aided Visual Impact Assessment and Landscape Design for AECI.
33. **Sainsbury's Bryn Rhos (UK)** - Computer Aided Visual Impact Assessment/ Planning Application for the development of a new store within the Green Wedge North of Swansea.
34. **Ynyston Farm Access (UK)** - Computer Aided Impact Assessment of visual intrusion of access road to proposed development in Cardiff for the Land Authority for Wales.

35. **Cardiff Bay Barrage (UK)** - Concept Design, Detail Design, Documentation, and Visual Input to Environmental Statement for consideration by Parliament in the debate prior to the passing of the Cardiff Bay Barrage Bill. The work was undertaken for Cardiff Bay Development Corporation.
36. **A470, Cefn Coed to Pentrebach (UK)** - Preparation of frameworks for the assessment of the impact of the proposed alignment on the landscape for The Welsh Office.
37. **Sparkford to Illchester Bye Pass (UK)** - The preparation of the landscape framework and the draft landscape plan for the Department of Transport.
38. **Green Island Reclamation Study (Hong Kong)** - Visual Impact Assessment of building massing, Urban Design Guidelines and Masterplanning for a New Town extension to Hong Kong Island.
39. **Route 3 (Hong Kong)** - Visual Impact Assessment for alternative road alignments between Hong Kong Island and the Chinese Border.
40. **China Border Link (Hong Kong)** - Visual Impact Assessment and initial Landscape Design for a new border crossing at Lok Ma Chau.
41. **Route 81, Aberdeen Tunnel to Stanley (Hong Kong)** - Visual Impact Assessment for alternative highway alignments on the South side of Hong Kong Island.

APPENDIX II

GUIDELINES FOR INVOLVING VISUAL AND AESTHETIC SPECIALISTS IN EIA PROCESSES

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


GUIDELINE FOR INVOLVING VISUAL AND AESTHETIC SPECIALISTS IN EIA PROCESSES
PROVINCIAL GOVERNMENT OF THE WESTERN CAPE:
DEPARTMENT OF ENVIRONMENTAL AFFAIRS
AND DEVELOPMENT PLANNING
bola
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GUIDELINE FOR INVOLVING VISUAL AND AESTHETIC SPECIALISTS IN EIA PROCESSES

Edition 1

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Stakeholders engaged in the guideline development process:

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

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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

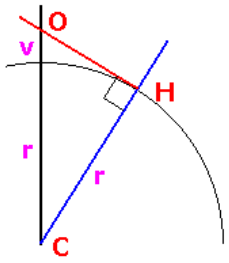
APPENDIX II1

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 Potential visual intrusion on sense of place

Nature:
Adding to the industrialisation of the area.

The assessment has shown that the lower sections of the proposed project will intensify industrial character within an area that is already industrial in nature.

The tower will add a significant area that will be affected by development. However this impact will be of a different nature and scale than existing industrial development. It will therefore be a new impact.

Existing industrial development creates a relatively intense impact over a small area whereas the proposed tower will create a single element that will be visible over a very wide area. These two impacts are not comparable.

The tower therefore will create a new type of impact rather than create an extension to existing or planned impact in the area. It therefore will not add to existing similar impacts.

	Overall impact of the proposed project considered in isolation	**Cumulative Impact of the project and other projects in the area**
Extent	Regional, **(3)**	Site and surroundings, (2)
Duration	Long term, **(4)**	Long term (4)
Magnitude	Moderate to high, **(7)**	Small (0)
Probability	Highly probable **(4)**	Probable (3)
Significance	**Medium, (56)**	**Low, (18)**
Status (positive or negative)	**Negative**	Negative
Reversibility	High	High
Loss of Resources?	No	No
Can impacts be mitigated?	Yes	NA
Confidence in findings:	High	

Mitigation:
Low level impacts associated with the heliostat field can be mitigated.

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-decommissioning and implement remedial actions;
- Minimise disturbance and maintain existing vegetation as far as is possible both within and surrounding the development area;

- Colouring of mirror backs;

Decommissioning:

- Remove infrastructure not required for the post-decommissioning use of the site;
- Return all affected areas to productive agricultural use;
- Monitor rehabilitated areas post-decommissioning and implement remedial actions.

2 Potential effect on landscape features and scenic resources

Nature:

The lower sections of the proposed project will intensify industrial character within an area that is already industrial in nature.

The tower will add a significant area that will be affected by development. However this impact will be of a different nature and scale than existing industrial development.

Existing industrial development creates a relatively intense impact over a small area whereas the proposed tower will create a single element that will be visible over a very wide area. These two impacts are not comparable.

The tower therefore will create a new type of impact rather than create an extension to existing or planned impact in the area.

	Overall impact of the proposed project considered in isolation	**Cumulative Impact of the project and other projects in the area**
Extent	Regional, **(3)**	Local, **(1)**
Duration	Long term, **(4)**	Long term, **(4)**
Magnitude	Moderate to high, **(7)**	Small to minor, **(1)**
Probability	Highly probable **(4)**	Very improbable, **(1)**
Significance	Medium, **(56)**	**Low, (6)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Loss of Resources?	No	No
Can impacts be mitigated?	Yes	Yes
Confidence in findings:	High	

Mitigation:

Low level impacts associated with the heliostat field and development around the tower can be mitigated.

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-decommissioning and implement remedial actions;
- Minimise disturbance and maintain existing vegetation as far as is possible both within and surrounding the development area;
- Colouring of mirror backs;

Decommissioning:

- Remove infrastructure not required for the post-decommissioning use of the site;
- Return all affected areas to productive agricultural use;
- Monitor rehabilitated areas post-decommissioning and implement remedial actions.

3 Potential effect on local inhabitants, visitors to the area and on tourism

Nature:
The lower sections of the proposed project will intensify industrial character within an area that is already industrial in nature.

The tower will add a significant area that will be affected by development. However this impact will be of a different nature and scale than existing industrial development.

Existing industrial development creates a relatively intense impact over a small area whereas the proposed tower will create a single element that will be visible over a very wide area. These two impacts are not comparable.

The tower therefore will create a new type of impact rather than create an extension to existing or planned impact in the area.

	Overall impact of the proposed project considered in isolation	**Cumulative Impact of the project and other projects in the area**
Extent	Regional, **(3)**	Local, **(1)**
Duration	Long term, **(4)**	Long term, **(4)**
Magnitude	Low, **(4)**	Small to minor, **(1)**
Probability	Probable, **(3)**	Improbable **(2)**
Significance	**Medium**, **(33)**	**Low, (12)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Loss of resources?	No	No
Can impacts be mitigated?	Yes	Yes
Confidence in findings:	High	
Mitigation:		

Low level impacts associated with the heliostat field and other low level development can be mitigated.

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-decommissioning and implement remedial actions;
- Minimise disturbance and maintain existing vegetation as far as is possible both within and surrounding the development area;
- Colouring of mirror backs;

Decommissioning:

- Remove infrastructure not required for the post-decommissioning use of the site;
- Return all affected areas to productive agricultural use;
- Monitor rehabilitated areas post-decommissioning and implement remedial actions.

4 Potential effect of related infrastructure

Nature:
The lower sections of the proposed project will intensify industrial character within an area that is already industrial in nature.

The water pipe has the potential to expand the area of disturbance significantly. However if disturbance is minimised and rehabilitation undertaken the cumulative impact of this is likely to be negligible.

	Overall impact of the proposed project considered in isolation	**Cumulative Impact of the project and other projects in the area**
Extent	Regional **(3)**	Regional **(3)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Minor **(2)**	Minor **(2)**
Probability	Probable **(3)**	Probable **(3)**
Significance	**Low (27)**	**Low (27)**
Status (positive or negative)	**Negative**	**Negative**
Reversibility	High	High
Loss of resources?	No irreplaceable loss	No irreplaceable loss
Can impacts be mitigated?	Yes	Yes

Confidence in findings:	High

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-decommissioning and implement remedial actions;
- Minimise disturbance and maintain existing vegetation as far as is possible both within and surrounding the development area;
- Colouring of mirror backs;

Decommissioning:

- Remove infrastructure not required for the post-decommissioning use of the site;
- Return all affected areas to productive agricultural use;
- Monitor rehabilitated areas post-decommissioning and implement remedial actions.

5 Potential effect of lights at night

Nature:

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

Currently lighting in the area is comprised of occasional low level lights associated with isolated homesteads. The project is therefore seen in a relatively dark area during night time hours.

There is potential for security lighting and operational lighting associated with solar energy projects to transform the night time landscape in the area.

The extent of lighting associated with solar projects in the area is not known. The assessment found that;

- If full security floodlighting of facilities is undertaken for existing facilities, then the proposed development could add slightly to impacts associated with these existing projects;
- If full security floodlighting is not required and only low level lighting of operational areas (buildings), then the proposed project will add negligible additional impact to the current CSP projects.

In the former case, the proposed extension will add slightly to cumulative impacts.

In the latter case, the proposed extension will not add to cumulative impacts.

	Overall impact of the proposed	**Cumulative Impact of the project and other**

	project considered in isolation	**projects in the area**
Extent	Region **(3)**	Site and immediate surroundings **(2)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Low to moderate **(5)**	Minor **(2)**
Probability	Probable **(3)**	Probable **(3)**
Significance	Medium **(36)**	**Low (24)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Loss of resources?	No	No
Can impacts be mitigated?	Yes	Yes
Confidence in findings:	High	
Mitigation: 1) Use of motion sensors to turn on security lights when needed. 2) Use of infrared security systems. 3) Preventing light spill through careful design.		

6 Visual impacts associated with construction of the proposed project.

Nature:
Construction impacts associated with the two existing CSP projects on the property appear to have been addressed. Therefore, this project will present a new area of impact rather than adding to existing impacts. The cumulative effect is therefore expected to be minimal.

	Overall impact of the proposed project considered in isolation	**Cumulative Impact of the project and other projects in the area**
Extent	Site and surroundings, **(2)**	Local, **(1)**
Duration	Very short duration, **(1)**	Very short duration, **(1)**
Magnitude	Minor, **(2)**	Small **(0)**
Probability	Probable, **(3)**	Very improbable, **(1)**
Significance	Low, **(15)**	Low, **(2)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Loss of resources?	There will be no irreplaceable loss.	There will be no irreplaceable loss.
Can impacts be mitigated?	Yes	Yes
Confidence in findings:	High	
Mitigation: • Minimise clearance of vegetation; • undertake dust prevention measures; and • Manage waste effectively and prevent waste blowing around and off site.		

7 Possible impact of glint and glare.

Nature:
The cumulative impact of the project on glint and glare associated with solar projects in the area.

The assessment indicates that it is possible that there could be glint and glare impacts associated with the existing CSP projects on the property. However, if impacts should occur due to this project and appropriate mitigation is undertaken as indicated then there will be no cumulative impact.

	Overall impact of the proposed project considered in isolation	**Cumulative Impact of the project and other projects in the area**
Extent	Site and immediate surroundings**, (2)**	Local **(1)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Minor **(2)**	Minor **(2)**
Probability	Improbable **(2)**	Improbable **(2)**
Significance	Low **(16)**	**Low (14)**
Status (positive or negative)	Negative	Negligible
Reversibility	High	High
Loss of resources?	No	No
Can impacts be mitigated?	Yes	Yes
Confidence in findings:	Medium	

Mitigation:
If impacts should occur the following measures can be used;

- Screening with opaque fencing / earth berms; and / or
- Careful siting and operation of solar collectors turning mirrors away from the sun during time periods when glare impacts are significantly adverse may substantially reduce or avoid visual impacts from offsite glare.

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25th June 2016

Afzelia Reference:
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Dear Michelle

PAULPUTS CSP PROJECT - VISUAL IMPLICATIONS OF AMENDMENT TO LAYOUT OF INFRASTRUCTURE

Further to our recent discussion and your email message of the 23rd June 2016 with the amended project layout attached, I confirm that I have reviewed the proposed layout changes and can confirm the following;

1. The main elements that are likely to create visual impact including the tower and heliostat field are as presented and assessed in the current VIA document have not changed.

2. The main changes relate to lower level infrastructure that has generally been relocated from the western side of the heliostat field to the eastern side of the heliostat field.

3. The overhead power line is generally located in the same area as originally proposed. The revised layout does however see it aligned slightly further west than originally proposed.

4. From reference to the ZTV analysis undertaken in the VIA, it should be noted that the extent of visibility of the lower sections of the proposed development are generally limited to a localised area by landform features. The small changes noted above therefore will not result in a significant change in affected area.

5. It is noted that the infrastructure elements that have been relocated have been moved from the MR73 road frontage and are slightly closer to the R357 than they were in the assessed layout. This is likely to result in simplification of low level elements viewed from the MR73 and adding to low level visual clutter seen from the R357. However these will be very localised effects and the relocated elements that may be visible to the R357 will be seen against the backdrop of the proposed heliostat field and the parabolic trough field and power plant of the neighbouring CSP project.

It can therefore be concluded that the proposed amendment to the layout will have negligible visual influence over and above that indicated in the VIA. The levels of impact indicated in the VIA will therefore not change.

I attach a screenshot of the revised layout plan that was attached to your email message of the 23rd of June for record purposes.

Should you have any further queries please contact the undersigned.

Yours faithfully

Jon Marshall
VISUAL IMPACT ASSESSOR
AFZELIA ENVIRONMENTAL CONSULTANTS (PTY) LTD

LAYOUT ATTACHED TO EMAIL MESSAGE OF TEH 23RD JUNE 2016