August 2022

VISUAL IMPACT ASSESSMENT

PROPOSED KIWANO SOLAR PV AND BESS FACILITY

Visual Impact Assessment for the Proposed Eskom Kiwano Solar PV and BESS facility

Report produced for

Report produced by

GeoNest
GIS and Environmental Advisory

Direct enquiries to:

Leo Quayle

leo@geonest.co.za

Cell: 082 669 9298

Specialist declaration

The author of this report is independent, having no vested interest (either business, financial, personal or other), in the undertaking of the proposed activity, other than remuneration for professional fees in respect of work performed in terms of the Environmental Impact Assessment Regulations, 2014.

Expertise of Specialist to carry out the Visual Impact Assessment

Specialist:	Leo Quayle		
Role in Project:	Visual Impact Assessment		
Physical Address:	2 Athlone Road, Athlone, Pietermaritzburg		
Postal Address:	2 Athlone Road, Athlone, Pietermaritzburg		
Postal code:	3201	**Fax:**	N/A
Telephone:	033- 3470247	**Cell:**	082 6699 298
Email:	leo@geonest.co.za		
Expertise to conduct a Visual Impact Assessment:	Leo has a master's degree in environmental management and is a SACNASP accredited professional natural scientist. He has worked as a project leader, GIS specialist and spatial environmental planner in a number of local and international environmental management roles and projects and has led the development of a number of GIS tools for various environmental planning projects. He has undertaken a number of visual impact related studies, including visual impact assessments, landscape characterisations and the identification and protection of special viewsheds. A more detailed CV is provided in Addendum 2. Projects include: 1. Protection of view corridors of St Paul's Cathedral in London (UK) 2. VIA for the Dairy Residential development (Hilton) 3. VIA for a 132Kw Powerline for the Automotive Supplier Park on the KZN South Coast 4. Landscape characterisation for 7 local municipalities: • Greater Kokstad • Impendle • uMngeni • Umtshezi • Okahlamba • Imbabazane • Mooi-Impofana 5. Visual assessment and landscape characterisation of the Watson North Functional Area Plan in eThekwini Metro		

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1.0 Introduction

GeoNest (Pty) Ltd. has been commissioned by Zitholele Consulting to carry out a visual impact assessment (VIA) of the proposed construction by Eskom of the 58 Mega Watt Kiwano Battery Energy Storage System (BESS) and photovoltaic (PV) facility (KBPF) near Upington in the Northern Cape province. This forms part of a Basic Environmental Assessment for the development commissioned by Eskom in accordance with the 2014 NEMA regulations. This report represents the outcomes of this assessment.

A VIA is a technical evaluation of the potential impacts of a development on the visual amenity value of a landscape or place. It has the potential to be subjective given that an appreciation of landscape views, sense of place and cultural and personal associations with landscapes and their features are all aspects that people will often view differently. For this reason, this Visual Impact Assessment aims to focus on a number of key metrics which aim to be as objective as possible. The approach is also therefore guided by a number of local and international best-practice resources:

1. *Guideline for involving visual and aesthetic specialists in EIA processes*[1]
2. *Best Management Practices for Reducing Visual Impacts of Renewable Energy Facilities on BLM-Administered Lands. First Edition - 2013*[2]
3. *Landscape Character Assessment Guidance for England and Scotland*[3]

A landscape is made of a wide variety of aspects comprising components associated essentially with the relationship between people and place (Swanwick, 2002). These components are all interlinked and combine to form a person's perception of a landscape (Figure 1).

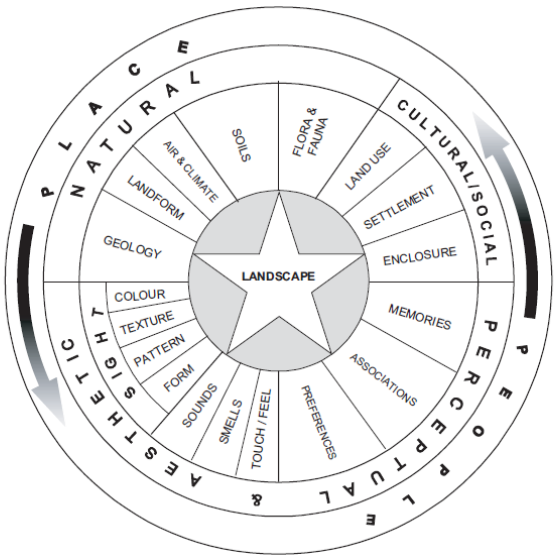

Figure 1: What is landscape - Taken from Swanwick 2002.

[1] Oberholzer, B. 2005. Guideline for involving visual & aesthetic specialists in EIA processes: Edition 1. CSIR Report No ENV-S-C 2005 053 F. Republic of South Africa, Provincial Government of the Western Cape, Department of Environmental Affairs & Development Planning, Cape Town.

[2] United States Department of the Interior. 2013. Best Management Practices for Reducing Visual Impacts of Renewable Energy Facilities on BLM-Administered Lands. Bureau of Land Management. Cheyenne, Wyoming. 342 pp, April.

[3] Swanwick, C. 2002. Landscape Character Assessment, guidance for England and Scotland. Prepared on behalf of The Countryside Agency and Scottish Natural Heritage.

Whilst all of these components could be considered in assessing impacts on the aesthetic value of a landscape, it is not possible to evaluate all of them within the scope of a project such as this one, particularly individual's perceptual components such as memories, preferences and associations. This assessment is therefore focused on the natural, cultural/social and aesthetic components of the landscape.

1.1 Scope of work

The scope of work for the visual impact assessment is as follows:

1. Collection and review of existing project related information including:
    a. Project description information,
    b. Project plans and spatial information (including topographical data of the site and surroundings).
    c. The development plans and policies of Local and District Municipalities.
    d. The policies surrounding the Upington REDZ and the Strategic Powerline Corridor.
    e. Site contextual information including topography (best publicly available if not provided by the project), land use etc.
2. Develop a viewshed model of the two proposed development sites using the best available topographical data (if no better is provided by the project, the best available surveyor general contours or the 30m SRTM Digital Elevation Model will be used) and data supplied by the client regarding the dimensions of all planned features and any receptors identified through the broader project's stakeholder engagement process.
3. Identify the view catchment area and potentially sensitive viewpoints and landscapes associated with the development based on the viewshed. This includes the delineation of Landscape Character Units as per Swanwick (2002).
4. Undertake a site visit to the project site to:
    a. Verify the outputs of the viewshed model and the locations of sensitive views / receptors
    b. Characterise and photograph the project landscape character units affected by the development
    c. Identify any additional elements of particular aesthetic value and quality
    d. Assess in the field, the character and sensitivity of the visual receptors, viewpoints and landscapes identified.
    e. Photograph sensitive views and sensitive landscapes.
5. Evaluation of outputs of the process to determine the significance of visual impacts based on guidelines provided by Oberholzer (2005). This will include assessments of direct, indirect and cumulative impacts and will address:
    a. Visual exposure of the area
    b. Visual absorption capacity of the area
    c. Landscape integrity
    d. Viewing distance and visibility of the project
    e. Sensitivity of Viewers (visual receptors) and distribution of impacts.
6. Attend virtual integration workshops to align studies and compile findings.
7. Outputs and findings information will be compiled into a single Visual Impact Assessment Report. This will address all requirements of the environmental impact assessment regulations, 2014 and will include:
    a. A description of the receiving environment, existing impacts, character of the different landscape character units and elements of particular visual value and quality that may be affected by the development;
    b. A detailed methods section documenting methods, data, assumptions, and limitations.

c. an assessment of impacts (direct, indirect, and cumulative) on the visual environment and sense of place based on professional opinion and the prescribed impact rating methodology.
d. A reasoned opinion
e. Mitigation measures to avoid or minimise the impacts of the development will be provided.
f. Any relevant environmental management and monitoring measures for inclusion in the Environmental Management Programme and in the authorisation.

1.2 Assumptions and Limitations

The following assumptions and limitations apply:

1. The layout, drawings, height regulations etc. for the various layouts and sites are provided by the developer and are assumed to represent the proposed development's specifications accurately.
2. Where different options are listed but the final construction specifications are not yet finalised, the most visually intrusive option has been selected for modelling (worst case scenario)
3. The viewshed models produced in this report are generated using the best available topographic information to identify the areas from which the proposed development would be visible. The topographic information used is a close approximation of the earth's surface but is not a perfect representation and as such may not include minor topographic variations.
4. The viewshed models do not take into account man-made structures and vegetation which may obscure the development from view.
5. The nature of a visual impact assessment is mostly descriptive and qualitative not quantitative, being based on subjective attributes. Attempts have been made to limit subjectivity by using non-emotive metrics.
6. This document is a visual impact assessment and therefore confines itself to assessing visual impact issues.

2.0 Project Details

2.1 Location

The KBPF will be located at the Eskom owned Kiwano site, near Upington in the Dawid Kruiper Local Municipality and ZF Mgcawu District Municipality in the Northern Cape. Two alternative sites have been identified for the construction of the facility and these are labelled as Site A and Site B (Figure 2). These are located to the south west of Upington, to the west of the N14 and on either side of the D3276.

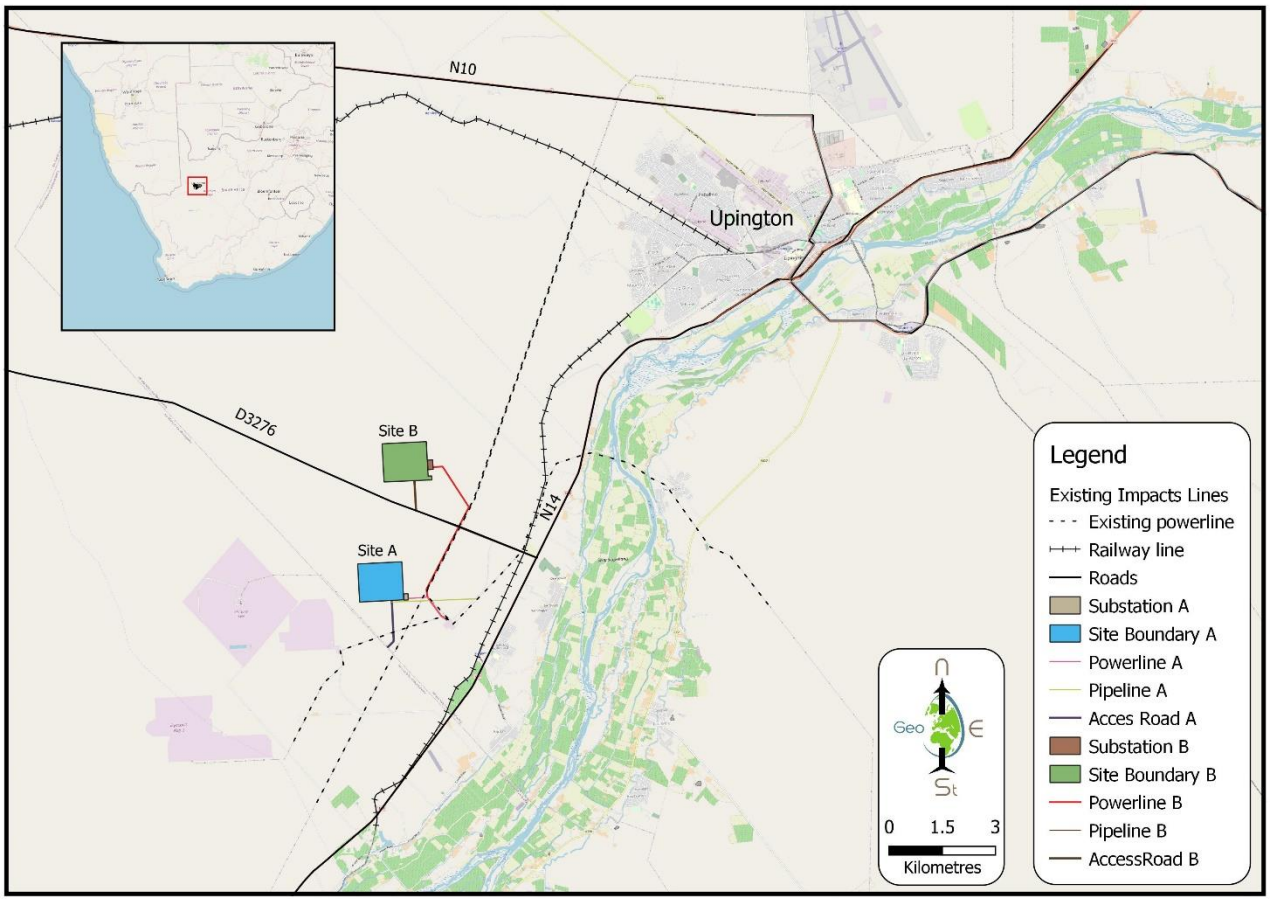

Figure 2: Location of the proposed alternative sites, south-west of Upington, Northern Cape Province

2.2 Project description

According to the Preliminary Technical Scope Report released by Eskom, the proposed KBPF will comprise of the following:

- PV installation with envisaged capacity of 58 MW,
- BESS installation with envisaged capacity of 40 MW / 200 MWh
- Kiwano 132 kV substation with 5 feeder bays
- Single Twin-Tern 132 kV overhead line on a double circuit support structure, connecting Kiwano substation to Upington substation.

The PV facility proposed for Kiwano will include the following associated infrastructure:

- Total site area for PV installation up to 1,150,000 m^2 (115 hectares) to allow for the construction of a PV facility with capacity of 58 MW.
- Solar PV modules, up to a total of 450,000 m^2, that convert solar radiation directly into electricity. The solar PV modules will be elevated above the ground and will be mounted on either fixed tilt systems or tracking systems (comprised of galvanised steel and aluminium). The Solar PV modules will be placed in rows in such a way that there is allowance for a perimeter road and security fencing along the site boundary, and access roads in between the PV module rows.
- Inverter stations, each occupying a footprint up to approximately 30 m^2, with up to 60 Inverter stations installed on the site. Each Inverter station will contain an inverter, step-up transformer, and switchgear. The Inverter stations will be distributed on the site, located

alongside its associated Solar PV module arrays. The Inverter station will perform conversion of DC (direct current) to AC (alternating current), and step-up the LV voltage of the inverter to 22 kV, to allow the electricity to be fed into the Kiwano substation. Inverter stations will connect several arrays of Solar PV modules and will be placed along the internal roads for easy accessibility and maintenance.

- Below ground electrical cables with trenching - connecting PV arrays, Inverter stations, O&M buildings, and 132kV Kiwano substation.
- Adequately designed foundations and mounting structures that will support the Solar PV modules and Inverter stations.
- Where possible, existing roads that provide access to the Kiwano site will be used, upgraded, and extended as necessary. For Site A, an access road, approximately 6 m wide and estimated up to 5 km long, will be required to provide access to the PV site. For Site B, a new access road from the existing D3276 road to the site will be required, approximately 6 m wide and estimated up to 1 km long. The existing D3276 road will require upgrading, approximately 6 m wide and estimated up to 4 km long (from N14 to site access road).
- A perimeter road around the site, approximately 5 m wide and 4.5 km in length.
- Internal roads for access to the Inverter stations, approximately 5 m wide and 18 km total length.
- Internal roads/paths between the Solar PV module rows, approximately 2-3 m wide, to allow access to the Solar PV modules for operations and maintenance activities.
- Infrastructure required for the operation and maintenance of the Kiwano PV Plant installation:
    - Meteorological Station
    - O&M Building – comprising control room, server room, security equipment room, offices, boardroom, kitchen, and ablution facilities (including sewage infrastructure)
    - Spares Warehouse and Workshop
    - Hazardous Chemical Store
    - Security Building
    - Parking areas and roads
- Small diameter water supply pipeline connecting existing municipality pipeline, approximately 5 km long.
- Stormwater channels
- Perimeter fencing of the Kiwano site, with access gates. Detailed requirements will be determined following the security risk assessment.
- Temporary laydown area, occupying a footprint up to 100,000 m^2 (10 hectares). The laydown area will be used during construction and rehabilitated thereafter. The laydown area will also accommodate water storage tanks or lined ponds (estimated 815 kl/month for the first 3 months and 408 kl/month for the remaining 21 months, until construction is completed).
- Temporary concrete batching plant, occupying a footprint up to 10,000 m^2 (1 hectare). The concrete batching plant area will be used during construction and rehabilitated thereafter.
- Temporary site construction office area, occupying a footprint up to 10,000 m^2 (1 hectare). This area will accommodate the offices for construction contractors during construction and rehabilitated thereafter.

3.0 Planning policy context

Any landscape and the vistas associated with it, are shaped by the use of land. In South Africa, the use of land and the developments that influence a landscape are guided by a framework of national, provincial and local level land use planning policy. This planning aims to make optimal use of available land resources, to provide for systematic and efficient development and to protect valuable land assets. These plans provide a guiding vision for the development of the areas to which they refer. As a broad starting point in the evaluation of this development, the Kiwano PV and BESS facility, and the impact this will have on the local sense of place should be evaluated against this planning. Various levels of planning documents have been briefly reviewed to provide an understanding of the vision for regional and local development, and to assess the level of alignment of the proposed development with these.

3.1 National Plans

Chapter five of the South African National Development Plan is devoted to describing a transition to a low-carbon economy. It describes a 2030 vision of South Africa well on its way to a low carbon, resilient economy with a low dependency on carbon. In support of this vision, the government has established a number of Renewable Energy Development Zones (REDZ). These were gazetted in February 2018 in terms of the National Environmental Management Act (107 of 1998). The two alternative sites proposed for the Kiwano BESS and PV facility both fall within REDZ 7 – UPINGTON (Figure 3) which is identified as a zone for large scale solar photovoltaic energy facilities.

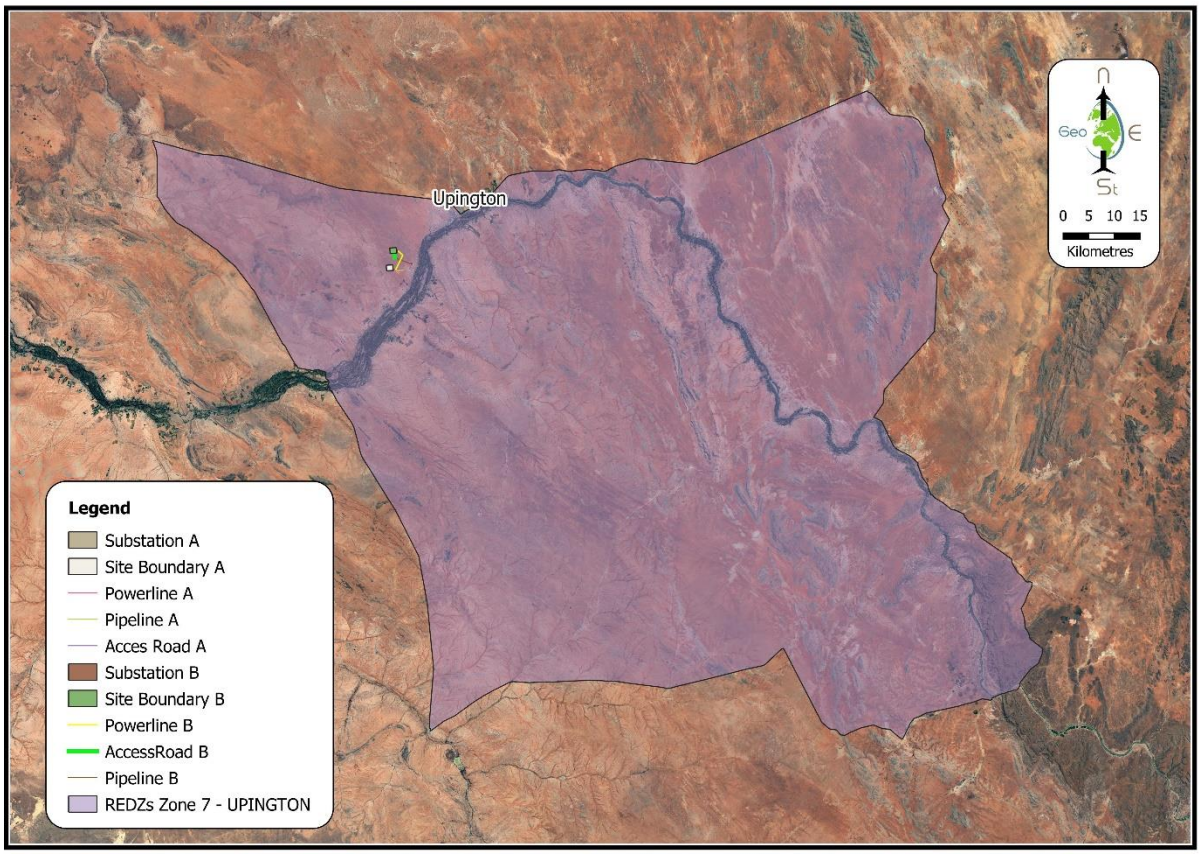

Figure 3: Extent of REDZ 7 - UPINGTON relative to the proposed alternative sites for the KBPF

3.2 Provincial plans

The Northern Cape Provincial Spatial Development Framework (NCPSDF) identifies a number of development corridors (Figure 4). Importantly in the context of this report, a solar corridor is identified passing through Upington, in which the proposed sites for the development of the KBPF are located.

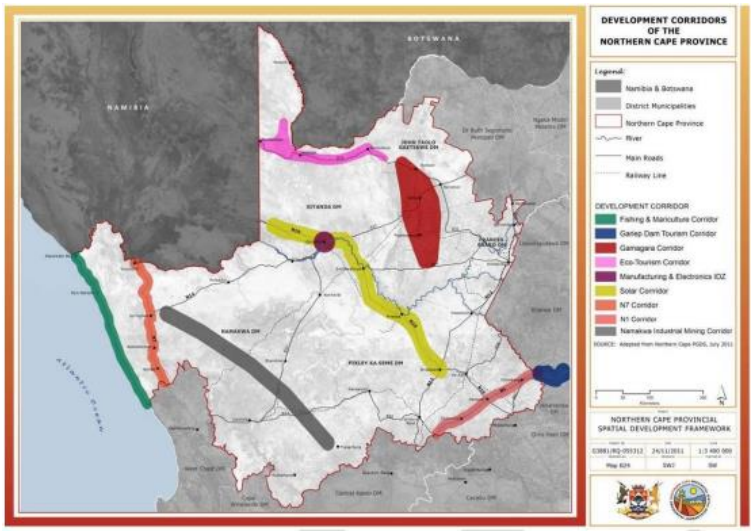

Figure 4: Development corridors of the Northern Cape (NCPSDF)

3.3 Local Municipal Plans

3.3.1 Integrated Development Plan

Renewable energy and Solar energy in particular are specifically mentioned in the Dawid Kruiper Local Municipality's Integrated Development Plan (IDP). This document identifies a number of key development projects amongst which is a 'Solar Special Economic Zone'. It states that "Upington in particular is positioning itself to provide businesses and investors with prime locations for renewable energy plants. Economic clusters of solar photovoltaic manufacturing are at the forefront of this activity".

3.3.2 Local Economic Development Strategy

The LED Strategy has identified the following economic sectors to be the drivers of economic development to realise the Dawid Kruiper Municipality's 2030 LED vision:

- Transport and logistics
- Agriculture and Agro-processing
- **Renewable energy**
- Tourism (events, hunting and business tourism)
- Services (banking, insurances, construction etc.)
- Manufacturing and Special Economic Zone (SEZ)

Whilst it is important that renewable energy is identified in this plan, it should also be noted that tourism is also identified as an important driver of economic activity in the municipality. Tourism is an activity which is potentially impacted by the loss of aesthetic value in a landscape.

3.3.3 Spatial Development Framework

The Dawid Kruiper Local Municipality Spatial Development Framework has itself identified renewable energy as a key economic driver in the area. It has identified a Renewable Energy Park termed 'The Upington Renewable Energy Park (REP)' to be developed on the Farm 1080 (Olyvenhoutsdrift

Settlement), Farm Klip Kraal No. 451 and a portion of Erf 1, Upington. The plant will include all equipment and other miscellaneous infrastructure associated with the generation, transmission and distribution of electricity.

3.4 Planning policy summary

This brief review of planning policy indicates that there is a clear vision for the area around Upington, from national to local planning level, to promote the development of renewable energy infrastructure. From a visual impact assessment perspective, this is taken to provide an indication of government's vision for the development of this landscape. The development of the KBPF is in keeping with this vision.

4.0 Visual Assessment - Approach and methods

4.1 Construction of a viewshed model

Viewshed models were constructed for each of the components (for both alternative sites) of the proposed development. This was done using visibility analysis in a Geographic Information System (GIS) using a 30m Shuttle Radar Topography Mission (SRTM) Digital Elevation Model (DEM) as input data. The outputs of this provided an indication of sites from where the different components of the proposed development will be visible and to what extent they would be visible. These models are based on the following specifications:

1. Solar panels
    a. Height used was 6 metres as provided for tracking PV panels in the preliminary technical scoping document
    b. It was assumed that panels would cover the extent of the area shown in the project preliminary technical scoping report. This was modelled using a grid of points, the distribution of which were calculated to reflect the spatial distribution of the solar panel rows.
2. Powerlines
    a. Height used was 30 metres
    b. Pylon alignment was assumed to be represented by the digital spatial data provided.
3. Access road
    a. Height used was zero metres

Notes on the viewshed model and distance: The viewshed model does not take distance into account in representing feature visibility and the reducing impact of a feature viewed from increasing distance is thus not reflected in the output maps. It also does not take the volume / size of the feature into account (i.e., a single pole of 30cm diameter is treated the same as a large building in terms of line of sight, whilst in real life, the pole would become invisible relatively quickly with increasing distance. As such the map outputs which follow should be viewed with caution and interpreted as simply reflecting where an object could potentially be seen from. The actual visibility of a feature in the field and its impact on sensitive views are discussed in more detail in other sections. In order then to assess visual impact appropriately, it is therefore important to consider the mitigating effect of distance on visual impacts at a landscape level. Hull and Bishop (1988) identified an inverse exponential relationship between distance and visibility (Figure 5). Thus, the visual impact at 1000 metres would be approximately a quarter of the impact as viewed from 500 metres. The view of the project components would appear so small from a distance of 2500 metres or more that the visual impact at this distance is insignificant. On the other hand, the visual impact of the project components from a distance of 500 metres or less would be at its maximum. These values relate to the assessment carried out for this report and are reflected in where in some areas,

although the majority of panels / powerline or other infrastructure are theoretically visible (areas marked in shades of red in viewshed models), the impact from distances greater than 2.5 km is very low to negligible.

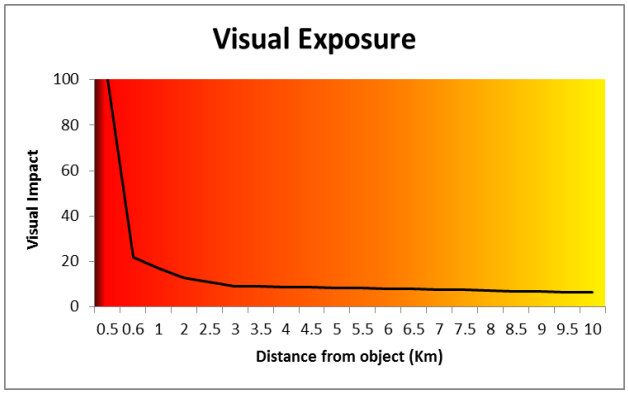

Figure 5: The relationship between distance and visual impact (after Hull and Bishop 1988).

4.2 Delineation of Landscape Character Units

Landscape Character Units (LCUs) were delineated from high-resolution aerial imagery based on obvious divisions in landscape character, though predominantly land use. This was done loosely following the method provided by Swanwick (2002). These delineations were confirmed later in the field.

4.3 Site visit and in-field characterisation and evaluation of the landscape and potentially sensitive views.

A site visit was conducted on the 22nd and 23rd of March 2022. All LCUs were visited and assessed with respect to the topographic features, land uses, level of noise and activity, colours and levels of contrast in the landscape. All areas with views of either of the sites that were identified in the viewshed model were also visited, assessed and photographed. Photographs were all taken using a Canon 70D camera fitted with a 35-50mm lens. This combination provides a photo output that is very similar in magnification to what the human eye would perceive.

4.4 Identification of potentially sensitive views and receptors

Potentially sensitive views and receptors were identified based on the viewshed analysis undertaken earlier in the study and on the findings of the site visit. The area within 5 km of the alternative sites was also searched in detail for any potential receptors not accommodated within the LCUs and their characterisation.

4.5 Assessment of visual sensitivity and potential impacts

The landscape was evaluated with respect to its level of visual exposure, its visual impact absorption capacity and any existing impacts that would mitigate project associated impacts.

4.6 Impact Assessment

The assessment of visual impact was undertaken using the template supplied by Zitholele Consulting. This included assessment of impacts associated with design, construction, operation and decommissioning phases.

5.0 Visual Assessment - Results

5.1 Landscape character

Landscape character is a function of a variety of tangible aspects including topography, geology, vegetation, land use, level of development and infrastructure and intangible aspects including sense of place, cultural associations and societal perceptions. These are evaluated in this section.

5.1.1 Site landscape topography

The topography of the site is characterised by a dramatic lack of relief (Figure 6, Figure 7). It is a very flat landscape with very slight undulations manifesting over vast distances with a general sloping from elevated ground in the north-west, towards the lower lying Orange River. Distant isolated relief features are visible on the horizon towards the north-east and to the west of the proposed sites. This landscape form represents a potentially vulnerable area from a visual impact perspective.

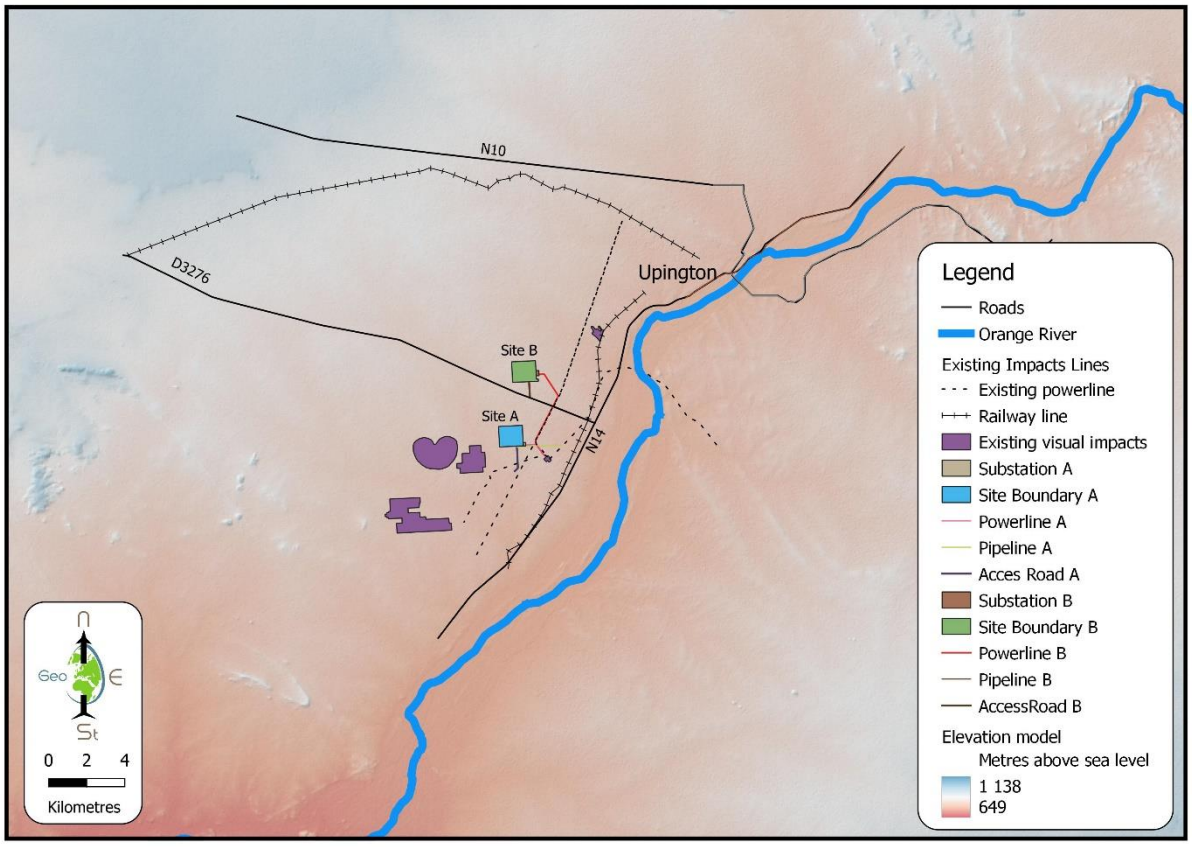

Figure 6: Topographical map of the study area

Figure 7: Selection of photos from the site demonstrating lack of relief

An almost imperceptible ridge / watershed runs in a north-east to south-west direction immediately to the east of the two proposed sites. The existing powerlines run along this ridge and serve as a landmark for this feature in the landscape. This ridge is actually one of the most important land forms

with respect to mitigating the visual impacts associated with this development and is discussed in more detail later in this report.

5.1.2 Land cover, vegetation and land use

The local landscape into which the proposed development will be placed is undeveloped and vegetation of the site is characterised by low grassland interspersed with shrubs (Figure 7). This has historically been used predominantly for livestock farming. Along the N14 road and down onto the banks of the Orange River, the cultivation of grapes and other crops dominates the land use (Figure 8). This area is a far busier landscape than the grassland to the north and west with settlements, various buildings and other farming related infrastructure present and generating a sense of rural business.

In addition to this, a number of linear features fragment the landscape including fences, roads (N4 and D3276), powerlines and railway lines. Importantly, to the south-west of the sites, there are a number of renewable energy facilities including two PV farms and the Khi Solar One Concentrating Solar Power (CSP) facility. Between Site B and Upington is a landfill site which itself is not visible from the N14.

Figure 8: Bright green vineyards characterise the Orange River valley while tall trees and buildings add visual contrast.

Figure 9: The area along the N14 is characterised by a variety of agricultural related activities including livestock farming

Figure 10: A number of small settlements are located between the N14 and the River e.g., Kalksloot

Figure 11: The Khi Solar One CSP facility is an imposing feature in the landscape and can be viewed from vast distances around.

Figure 12: The Upington Landfill site is located north of the N14. This feature is located behind a series of dunes.

5.1.3 Landscape character units

Given the lack of relief, there are few natural divisions in the landscape. Land use has however dramatically divided the landscape into a number of distinct character areas (landscape character units - LCUs). These have been mapped and are reflected in Figure 13.

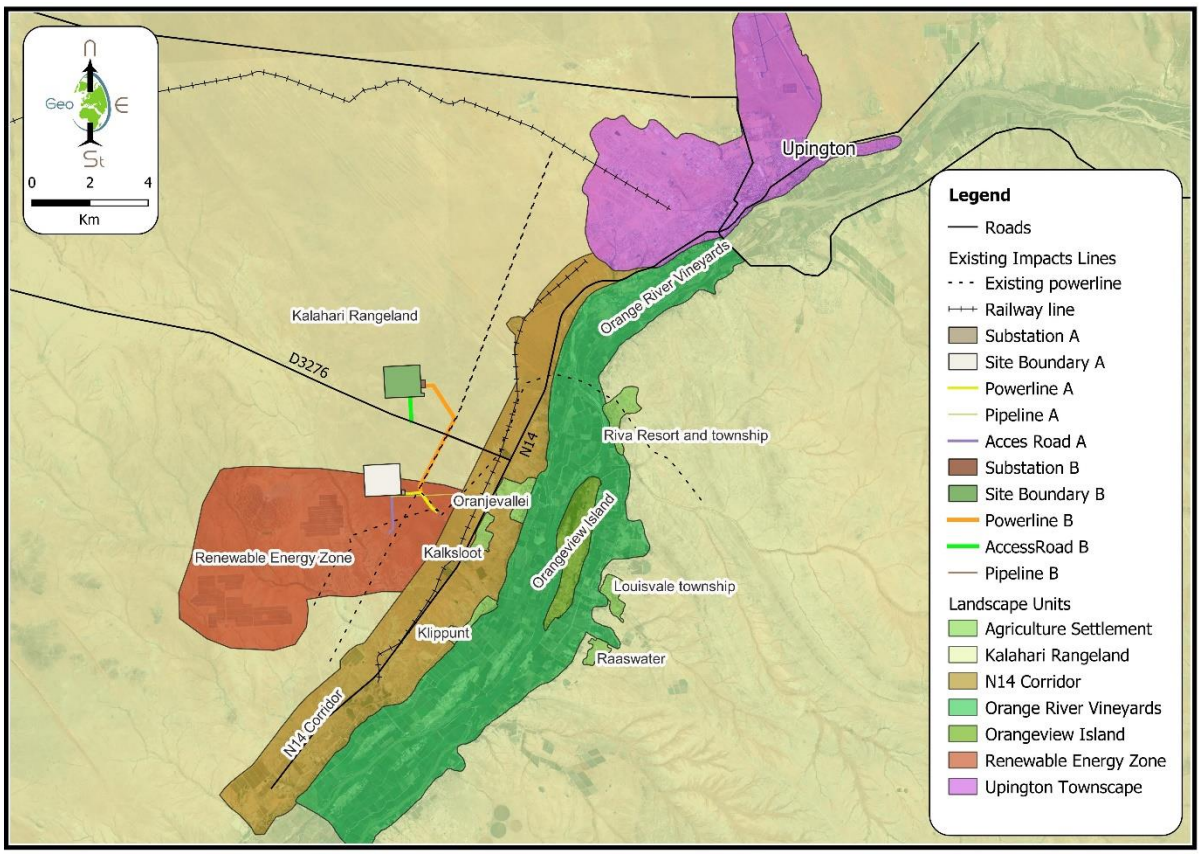

Figure 13: Landscape Character Units delineated for the study area

1.0 **The Upington Townscape:** A busy urban environment with residential, commercial and industrial buildings and activity. Busy roads and railways add to the noise and movement and sense of business.

2.0 **The Orange River Vineyards:** A restful agricultural scene dominated by deep to light green patchwork of irrigated grape vineyards of a largely single texture providing a stark colour contrast to the dry grassland areas lying outside of the flood plain.

3.0 **The N14 Corridor:** A busy rural, agricultural and peri-urban mix of activities dominated by the busy N14 road. It is flanked by railway and power lines and includes the Upington landfill site. The landscape is punctuated by small agricultural townships such as Oranjevallei and Kalksloot. Whilst these have been delineated separately to assist with identifying vulnerable receptors, because of their scale, and because of the number of activities and buildings in the N14 mixed activity unit, they should be considered together with the N14 as a single LCU. This mix provides a high level of contrast in both form, colour and level of activity.

4.0 **The Renewable Energy Zone:** Set in the flat and exposed Kalahari rangelands, a cluster of existing renewable energy infrastructure defines a small area of unique character. This includes the imposing Khi Solar One CSP, two photovoltaic facilities and a large substation. It also includes the access routes to these facilities which are clearly signposted on the N14.

5.0 **The Kalahari Rangelands:** The vast, flat and monotonously coloured Kalahari Rangelands surround all other units. The distinct lack of contrast and relief give the impression of expansive skies and very distant horizons. The lack of movement and sound ensures the observer experiences a sense of quiet and lonely wilderness. This sense is lessened somewhat as the observer approaches the N14 Corridor.

5.2 Sensitive Views and Receptors

A number of potentially sensitive views and view receptors have been identified. These are largely grouped per LCU.

5.2.1 Local residents and businesses

Residential areas are predominantly located in the Upington Townscape, in the N14 Corridor (mainly scattered farmsteads) and in the Agri-settlements. The majority of these areas are relatively isolated from the Kalahari Rangelands and their views are mostly focused inwards, either within the urban area, or onto the Orange River.

Businesses are likewise located in the urbanised areas of Upington and the agri-settlements, with some agriculturally focused businesses located along the N14 Corridor. The focus of this activity is also largely towards the Orange River Vineyards and the Orange River itself and views to the north of the Kalahari Rangelands are generally of little importance to these activities.

5.2.2 Road users on the N14

Motorists on the N14 pass through the Kalahari Rangelands and are exposed to its distant horizons and grassland vistas. The road is a busy national route and road users include people associated with farms and businesses in the N14 Corridor and tourists moving between Upington and tourist attractions along the Orange River such as those related to the wine and grape industries and ecotourism attractions such as Augrabies Falls. Views of the two alternative sites from this point are largely obscured by an area of high lying land.

Figure 14: View from the N14 towards the alternative sites. Note the higher lying area between the road and the site which obscures a road user's view of both of the alternative sites. The top of the Khi Solar One tower is visible on the horizon.

5.2.3 Road users on the D3276

The D3276 (Figure 15) is a gravel road traveling between the two alternative sites in a north-westerly direction from the N14. It is a quiet road which sees little traffic. Road users are likely to be mostly related to farming or mining or are using this road to access the existing Eskom substation adjacent to Site A.

Figure 15: The D3276 is a seldom used gravel road extending into the north-western portion of the study area.

The few users of the D3276 are the receptors most likely to be impacted visually by the proposed developments as this road climbs into a slightly elevated position relative to the proposed sites and the road passes relatively close to both alternative sites (Figure 16 and Figure 17).

Figure 16: View towards Site A from the D3276. Note existing PV installation in distant right. Note also rising ground in the foreground which largely obscures Site A.

Figure 17: View across site B from the D3276 towards Upington.

5.2.4 Residents and businesses on the south bank of the river

There are a number of agri-settlements and resorts such as the Riva Resort located on the south bank of the Orange River and on the islands in the middle. Many of these look northwards across the river and are potentially exposed to visual impacts occurring on the northern bank and beyond it.

The distance from which the development would be observed (Figure 18 and Figure 19) is however great, and this, together with the high level of visual contrast present on the north bank of the river (Figure 18, Figure 19, Figure 20), will mitigate any visual impact.

Figure 18: View from the south bank near Riva Resort looking towards site B noting high levels of visual contrast in the Orange River Valley. Smoke from a fire at the Upington landfill site is visible at right

Figure 19: View from the R359 on the South bank looking towards the two alternative sites which would be located on the distant ground on either side of the central koppie. Note Khi Solar One CSP visible at left horizon

Figure 20: View from the Oranjeview Island looking towards the two alternative sites (Site A centre left and Site B centre right). Note high level of visual contrast in the Orange River valley and the elevated ground forming the distant horizon screening views of the sites from this point

5.2.5 Value of landscape views in the region

5.2.5.1 Cultural values and perceptions

There are presently no known cultural associations with the landscapes within a 5km buffer of the proposed sites. Whilst some features of low to moderate historical significance have been recovered on site (see the cultural heritage specialist report), these are relatively commonly encountered, and there are no living population groups associated with these features. Cultural values and perceptions of these landscapes are thus considered of low significance.

5.2.5.2 Tourism

Tourism is an important part of the local economy. Tourism in Upington and surrounds is focused primarily on the wine estates and other related agricultural activity located in the Orange River Vineyards, Agricultural Townships and the N14 Corridor. The Orange River itself is also an important tourist attraction with several resorts located on the banks of the river. This form of tourism is largely focused inward towards the river and its viticultural landscape and has little association with the LCUs lying outside of the immediate Orange River valley.

The area is also an important route for tourists passing through to Augrabies Falls and other tourist destinations along the Orange River (along the N14) and the Kalaghadi Transfrontier Park (along the N10). This group of tourists are likely to be more outward looking, with a greater appreciation for the expansive Kalahari landscapes.

5.3 Visual Exposure

5.3.1 Viewshed (Line of site) model

A viewshed model has been generated for each of the visually significant components of the proposed development and for both alternative sites. These are provided in the sections that follow together with relevant observations.

5.3.1.1 Site A

Site A is located on the eastern side of a very shallow valley and thus is situated on a slope with a very slight west facing aspect. As such, the flat and relatively low panels are visible only from the opposite side of this valley to the west where the existing Khi Solar One CSP is located, and from higher up the valley to the north-west intersecting with the D3276 (Figure 21). The slightly higher lying ground of the eastern edge of the shallow valley shields views of the panels from the east including from the potentially sensitive N12 Corridor and its nested settlements and from the Orange River Vineyards.

The higher powerline feature is visible from a much wider range of positions (Figure 22). These include potentially sensitive areas in the N14 corridor and the Orange River Vineyards. The powerline will be visible from a large portion of the D3276

The access road is constructed flush with the ground and is visible only from immediately adjacent to the road as well as from a few isolated locations on the western side of the valley (Figure 23.

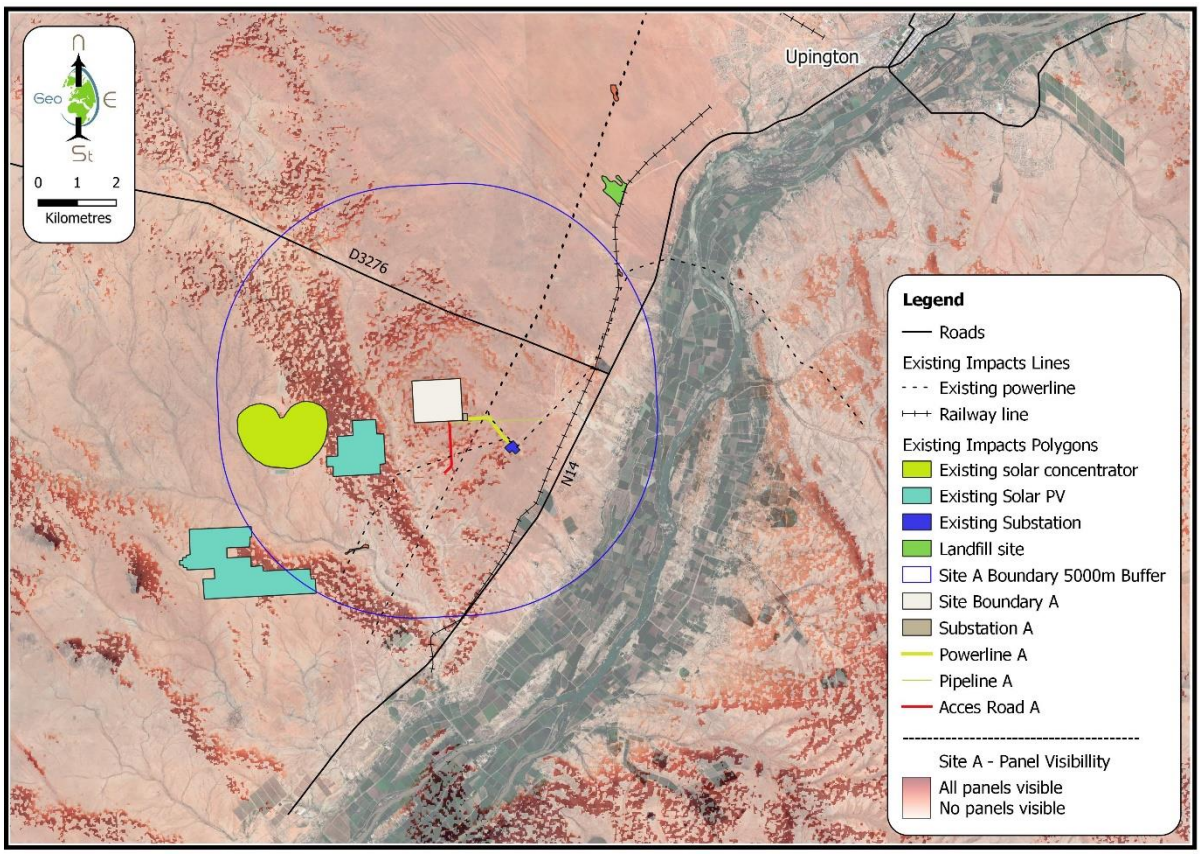

Figure 21: Viewshed model for the PV panels of Site A

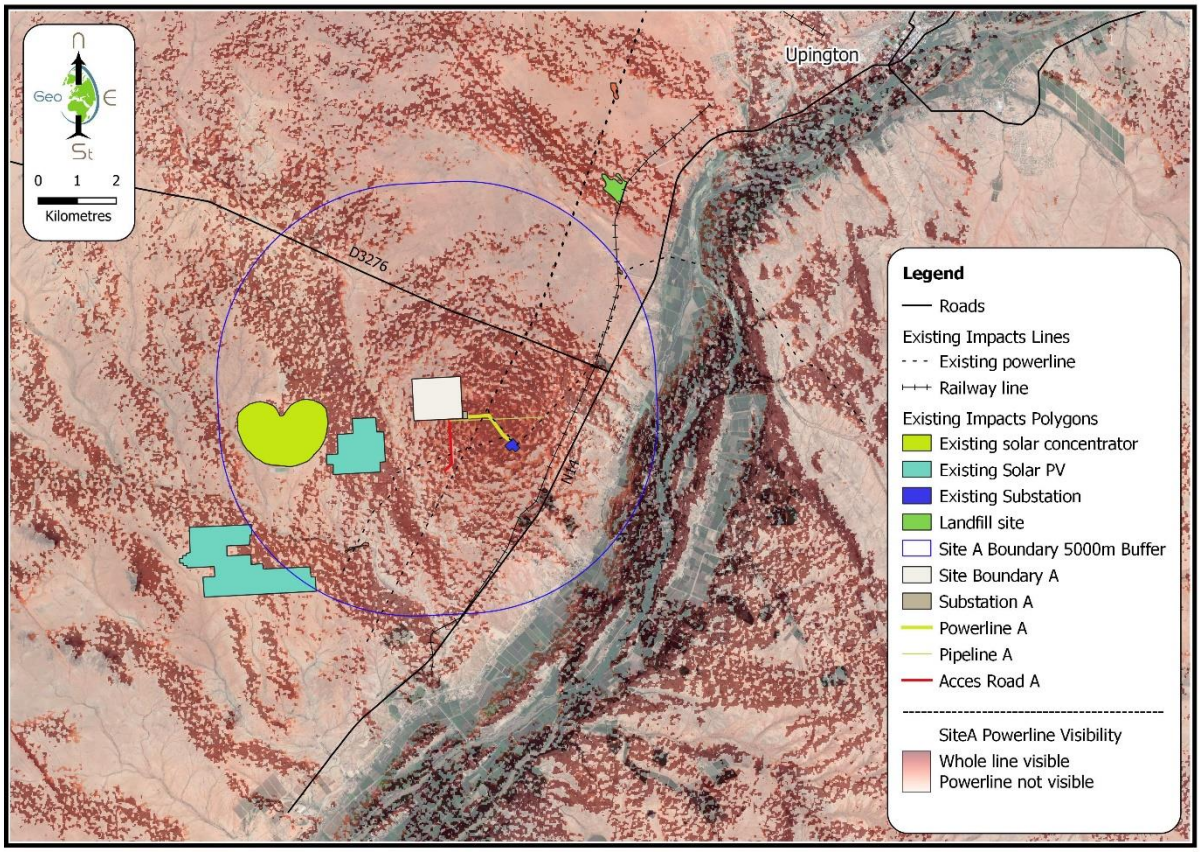

Figure 22: Viewshed model for the powerline associated with Site A

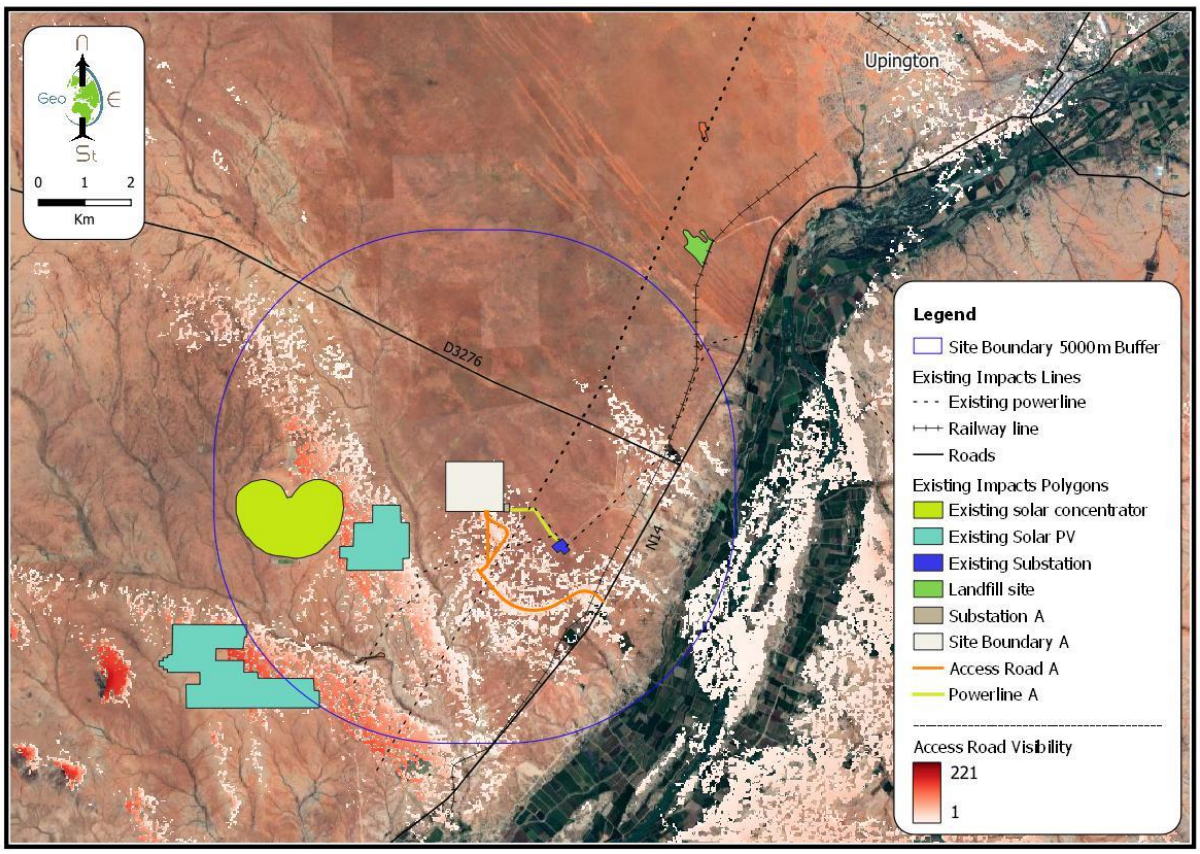

Figure 23: Viewshed model for the access road at Site A

5.3.1.2 Site B

Site B is located north of the D3276 and on a site that is slightly elevated relative to Site A. The result of this is that it is more widely visible. This visibility extends to many west facing slopes to the east of the Orange River. These sites are however mostly beyond the 5km radius from the site and any impacts will be negligible for these distant viewpoints. Visibility of the site is shown to be high along a series of dunes located to the north-east of the site and orientated in a north-west to south-east direction. These dunes screen much of the area behind them. The Upington landfill site is located in these dunes. The site is supposedly visible from several parts of Upington itself, however as with the viewpoints across the Orange River, the distance to the site from Upington is likely to mitigate any potential impact.

The Site B powerline is widely visible. This is because it travels at the crest of the ridge that screens the site itself from the N14 Corridor and because the pylons are appreciable higher than the solar panels.

The Site B access road is modelled as being flush with the ground. As a result, it is visible only from very few locations, most of which are adjacent to or in very close proximity to the road and the site itself.

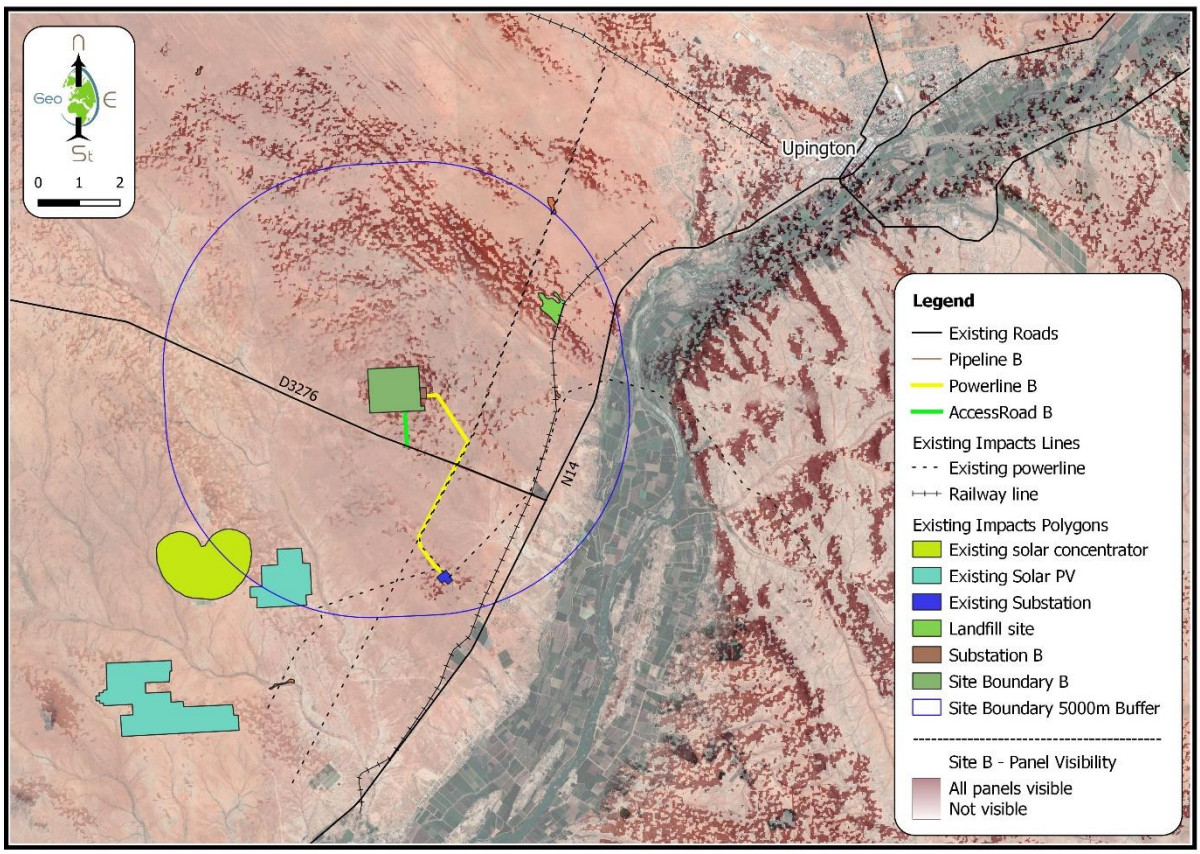

Figure 24: Visibility model for the PV panels of Site B

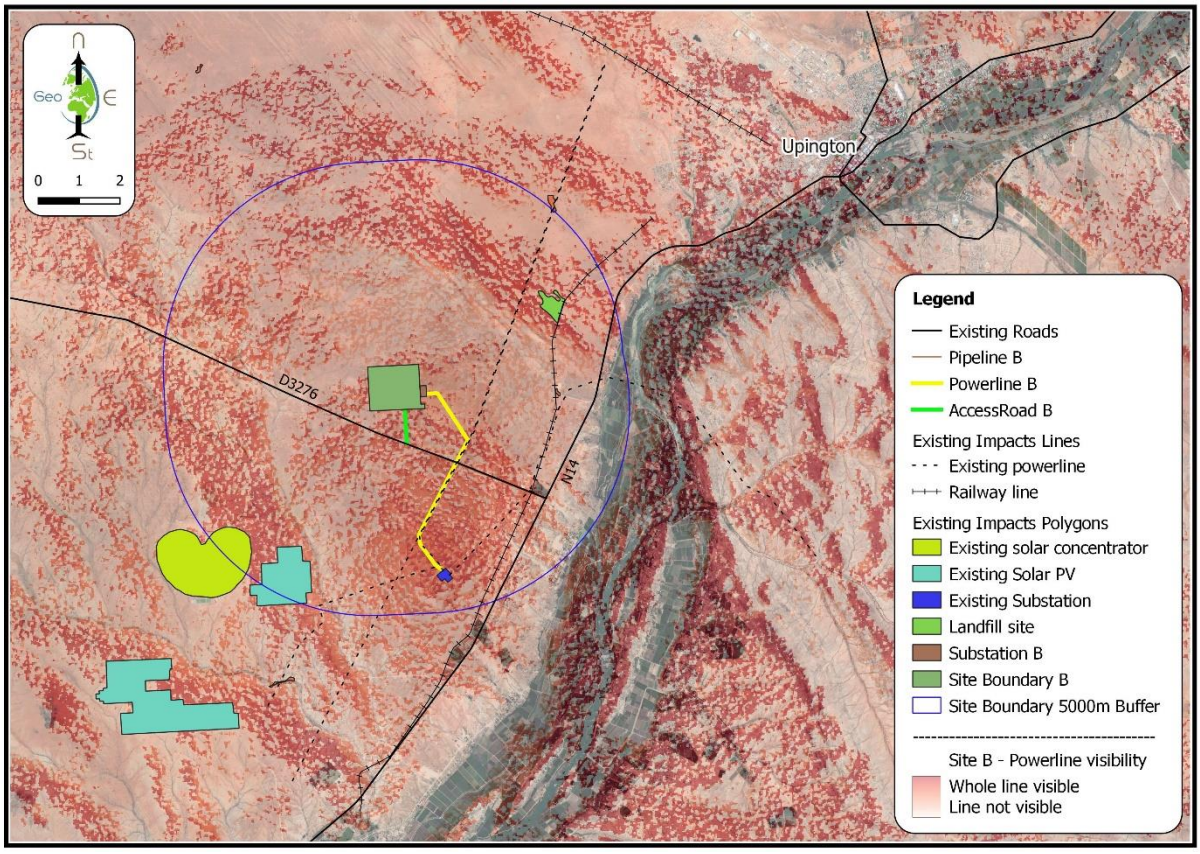

Figure 25: Visibility model for the powerline associated with Site B

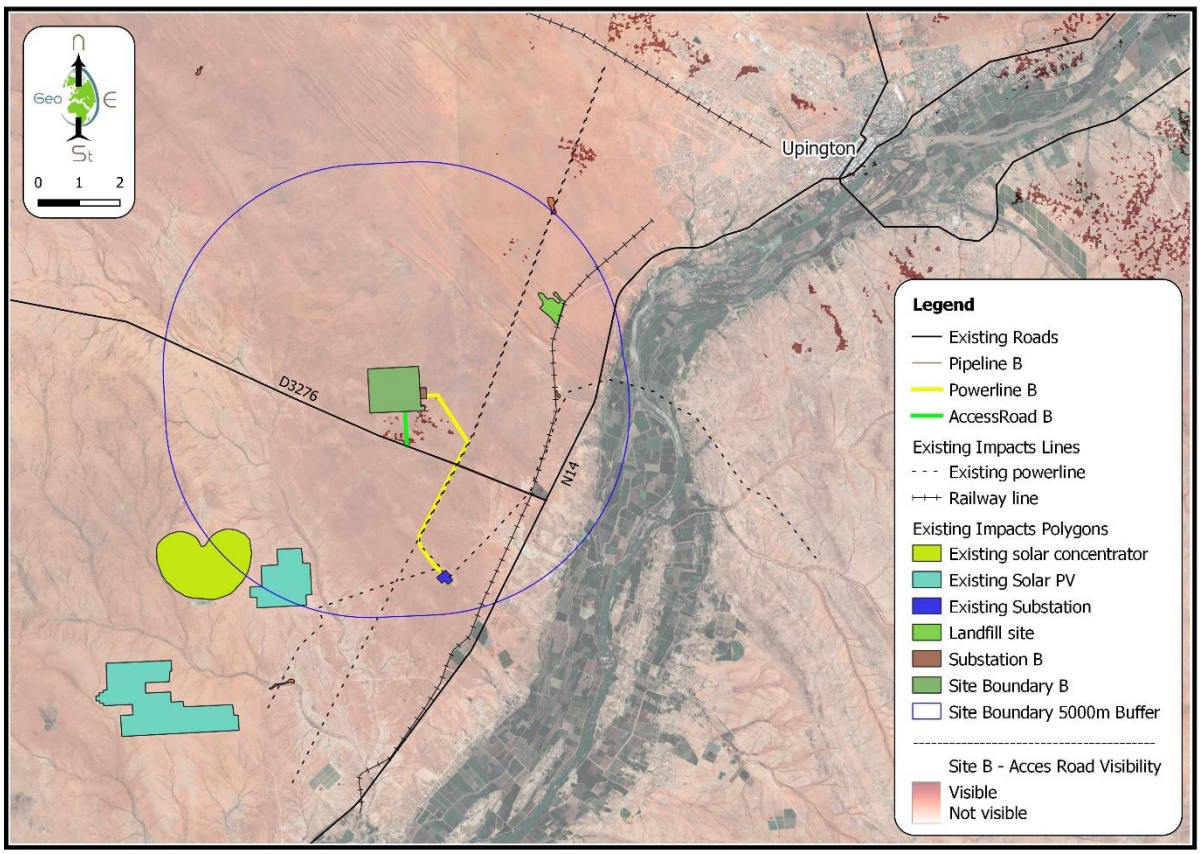

Figure 26: Visibility model for the access road associated with Site B

5.4 Landscape exposure / enclosure

The Kalahari Rangelands consists of an expansive flat landscape. The vast majority of the area is very exposed and enclosure potential is thus very low i.e., there is very little opportunity for mitigating visual impacts through siting developments within enclosed valleys. The exception is the very shallow valley running from the north of the site to the south in which both alternative sites are located. This valley, and its south-eastern edge is effective in ensuring views of the low profiled PV installation at either site will be limited largely to unpopulated areas and areas that have been identified as being of low sensitivity from a visual receptor perspective.

5.5 Visual absorption capacity

The visual absorption capacity of the Kalahari Rangelands is considered low. The extremely flat landscape with very low vegetation and its limited colour palette provides little natural visual contrast. The lack of relief also however means that there is a lack of elevated observation points and as such the landscape is almost always viewed at a very oblique angle, exaggerating its flat and linear nature. This is important in the context of this assessment as the visual profile of a PV installation is very flat and linear. This fits within the very flat and linear landscape and allows the landscape to better absorb visual intrusion of this nature, particularly when viewed from a distance (Figure 27).

Figure 27: View from the D3276, across Site A (left middle ground) to an existing PV installation. Note that the existing PV installation is barely visible at this distance as opposed to the heliostats of the Khi Solar One facility (right).

5.6 Existing impacts

There are a number of existing visual impacts in the study area that are important to consider. The most important of these is the Khi Solar One CSP (Figure 28). This structure is over 200m high and when the sun is reflecting off the heliostats onto the tower, it glows like an incandescent light bulb. This structure then catches the eye and dominates views from great distances.

Other electricity related infrastructure (Figure 29) is also present in the landscape and represents existing visual impact. This includes two other PV farms, a number of powerlines and a large substation. A noticeable feature of all of these facilities is the lack of noise or movement at these sites. In addition to electrical infrastructure, a railway line passes through the area and the municipal landfill site is located within 5km of Site B.

Figure 28: The Khi Solar One solar CSP facility dominates views and sense of place from a great distance.

Figure 29: Electricity related infrastructure is a strong feature in the landscape

6.0 Impact assessment

6.1 Site A

6.1.1 Site A - Design Phase

Impact Description		Impact type	Extent (E)	Duration (D)	Potential Intensity (P)	Likelihood (L)	Impact Rating & Significance (IR&S)	Mitigation & Management Measures
Impact	Direct Impact:	**Significance without Mitigation**						A colour palette should be selected for the development that matches the surrounding landscape. All structures and roofs constructed should be colour treated / painted to conform to this colour palette. This includes small surfaces such as the reverse side of signs, fence poles and mesh, etc. No reflective surfaces of any infrastructure constructed as part of this development should be left exposed.
Impact Direction:	Negative	Existing Impact	2	3	8	1	13 - HIGH	
Aspect:	Visual Impact	Project Impact	2	1	2	1	5 - MOD	
Potential Impact:		**Significance with Mitigation**						
Structures' colour and design potentially contrast vividly with the surrounding landscape, causing reflection, enhancing visibility and increasing artificial contrast in the landscape		Residual Impact	2	3	1	0.1	1 - LOW	
		Reversibility	High reversibility					
		Irreplaceability	Resources are replaceable					
		Cumulative Impact						**Description of Cumulative Impact**
		Cumulative Impact	2	3	8	1	13 - HIGH	The existing visual impact of other renewable energy facilities will still dominate the landscape, particularly the Khi One CSP. The addition of the Kiwano PV infrastructure will add to this. If site A is selected the cumulative impacts will be clustered together and less area visually impacted, particularly since one side of the D3276 is left undisturbed. The bulk of the cumulative impact is however imposed by existing infrastructure.
		Confidence	High					
Impact Description		**Impact type**	**E**	**D**	**P**	**L**	**IR&S**	**Mitigation & Management Measures**
Impact	Direct Impact:	**Significance without Mitigation**						Where powerlines can be placed in parallel with and adjacent to existing lines and pylons are placed in sync with existing pylons, this should be done. In these cases, design of pylon, colour treatment (if used), position and size should mirror the existing powerlines.
Impact Direction:	Negative	Existing Impact	2	3	2	1	7 - MOD	
Aspect:	Visual Impact	Project Impact	2	1	2	0.5	3 - MOD	
Potential Impact:		**Significance with Mitigation**						
Powerline infrastructure adds additional visual impact to the existing impacted landscape		Residual Impact	2	3	1	0.2	1 - LOW	
		Reversibility	High reversibility					

		Irreplaceability	Resources are replaceable					
		Cumulative Impact						**Description of Cumulative Impact**
		Cumulative Impact	2	3	2	1	7 - MOD	A number of existing powerlines are present in the area. The proposed development will add to this situation, however, if designed with parallel and adjacent alignment as described above, this cumulative impact will be minimised
		Confidence	High					
Impact Description		**Impact type**	**E**	**D**	**P**	**L**	**IR&S**	**Mitigation & Management Measures**
Impact	Direct Impact:	**Significance without Mitigation**						PV panels and their support structures should be designed with as low a profile as possible. This will minimise the visibility of the panels. All surfaces (exception of PV surfaces) should be painted using the selected colour palette to eliminate reflection and to match the natural surroundings.
Impact Direction:	Negative	Existing Impact	2	3	4	1	9 - MOD	
Aspect:	Visual Impact	Project Impact	2	1	2	0.5	3 - MOD	
Potential Impact:		**Significance with Mitigation**						
PV panels will be visible in the landscape and will interrupt and fragment the natural monochromatic landscape		Residual Impact	2	1	1	0.2	1 - LOW	
		Reversibility	High reversibility					
		Irreplaceability	Resources are replaceable					
		Cumulative Impact						**Description of Cumulative Impact**
		Cumulative Impact	2	3	4	1	9 - MOD	There are existing PV facilities in the area and the construction of the proposed development will add to this existing impact. Site A will be adjacent to an existing facility, limiting the extent of this impact. The bulk of the cumulative impact is however imposed by existing infrastructure.
		Confidence	High					
Impact Description		**Impact type**	**E**	**D**	**P**	**L**	**IR&S**	**Mitigation & Management Measures**
Impact	Direct Impact:	**Significance without Mitigation**						In this unlit landscape, lighting should be kept to an absolute requisite minimum both with respect to number of lights as well as the strength of those lights. A lighting plan should be drawn up to identify the minimum number, strength and locations of required lights. Wherever possible, non-permanent lighting options should be used (e.g., motion sensor lights instead of permanent security flood lights) and reflective markers should be used rather than illuminated signs. Any lighting used should be focused downward and inward to eliminate light spill. No lighting should be directed horizontally at vertical walls or structures. All lights should be fully shielded to ensure no escape of uplight and sky glow. All lights should be amber or warm colours as opposed to blueish / white lights.
Impact Direction:	Negative	Existing Impact	2	3	2	1	7 - MOD	
Aspect:	Visual Impact	Project Impact	2	1	2	1	5 - MOD	
Potential Impact:		**Significance with Mitigation**						
Security and other operational lighting will introduce unnatural lighting into an unlit landscape		Residual Impact	1	3	1	0.2	1 - LOW	
		Reversibility	High reversibility					
		Irreplaceability	Resources are replaceable					
		Cumulative Impact						**Description of Cumulative Impact**
		Cumulative Impact	2	3	2	1	7 - MOD	There is a relatively strong night lighting impact already from Upington and from the vehicles, homes and businesses along the N14 corridor. The existing renewable energy infrastructure and substation also emit light. Any impacts by the proposed Site A will be limited insofar as when viewed from the D3671, they are integrated into these existing impacts.
		Confidence	High					

6.1.2 Site A - Construction Phase

In assessing the construction phase, it is assumed that all activities will be undertaken within the site boundaries supplied, and that any disturbance of areas outside of these boundaries will be prohibited.

Impact Description		Impact type	Extent (E)	Duration (D)	Potential Intensity (P)	Likelihood (L)	Impact Rating & Significance (IR&S)	Mitigation & Management Measures
Impact	Direct Impact:	**Significance without Mitigation**						Reversing of construction vehicles should be kept to a minimum to minimise the use of reverse warning sounds and wherever possible vehicles should be turned around without using reverse gear.
Impact Direction:	Negative	Existing Impact	1	1	1	0.1	0 - LOW	
Aspect:	Visual Impact	Project Impact	2	1	2	0.75	4 - MOD	
Potential Impact:		**Significance with Mitigation**						
The construction activities may disturb the quiet sense of peaceful solitude of the Kalahari rangelands. This impact would be moderate to low given that there are few sensitive receptors		Residual Impact	2	1	1	0.5	2 - LOW	
		Reversibility	High reversibility					
		Irreplaceability	Resources are replaceable					
		Cumulative Impact						**Description of Cumulative Impact**
		Cumulative Impact	2	1	1	0.5	2 - LOW	The existing renewable energy infrastructure is completely constructed and the existing infrastructure operates with minimal noise or activity. As such no existing noise and construction activity is present on site and would not contribute to a cumulative impact. The N14 national road does provide road noise and movement to the east and south of the site.
		Confidence	High					
Impact Description		**Impact type**	**E**	**D**	**P**	**L**	**IR&S**	**Mitigation & Management Measures**
Impact	Indirect Impact:	**Significance without Mitigation**						The extent of land cleared of vegetation at any one time should be kept to a minimum. A dust suppression plan should be implemented during construction phase on all bare areas. Transportation of any abnormal loads and high volumes of heavy trucks should be scheduled for low traffic times on the N14 to limit the impact of this on tourists and people travelling for work.
Impact Direction:	Negative	Existing Impact	1	1	1	0.1	0 - LOW	
Aspect:	Visual Impact	Project Impact	3	1	2	0.2	1 - LOW	
Potential Impact:		**Significance with Mitigation**						
Construction activities, particularly noise and dust, heavy vehicles and abnormal load vehicles, may impact the experience of tourists to the region and result in impacts to tourist sentiment and tourism revenue.		Residual Impact	2	1	1	0.1	0 - LOW	
		Reversibility	High reversibility					
		Irreplaceability	Resources are replaceable					
		Cumulative Impact						**Description of Cumulative Impact**

		Cumulative Impact	3	1	1	0.1	1 - LOW	There are presently no large construction projects underway in this area, though the landfill site provides a level of smoke and dust. The proposed project will potentially add to this for a short period.
		Confidence	Medium					
Impact Description		**Impact type**	**E**	**D**	**P**	**L**	**IR&S**	**Mitigation & Management Measures**
Impact	Direct Impact:	**Significance without Mitigation**						The area of land cleared of vegetation should be kept to a minimum. Wherever possible, existing natural vegetation should be left in-situ, to maintain some level of natural screening.
Impact Direction:	Negative	Existing Impact	2	2	1	1	5 - MOD	
Aspect:	Visual Impact	Project Impact	2	1	2	0.5	3 - MOD	
Potential Impact:		**Significance with Mitigation**						
The construction activities related to the construction of the KBPF facility may negatively affect the expansive views of the Kalahari Rangelands from the N14, D3257 and other sensitive view points by introducing unnatural elements, movement and contrast.		Residual Impact	2	1	1	0.5	2 - LOW	
		Reversibility	High reversibility					
		Irreplaceability	Resources are replaceable					
		Cumulative Impact						**Description of Cumulative Impact**
		Cumulative Impact	2	1	1	1	4 - MOD	Whilst there are no other construction activities currently present in the landscape, the existing impacts of powerlines, railway, agricultural activities etc present a relatively active landscape. The construction activities will be visible only from a limited number of viewpoints, and as such will not add significantly to the existing impacts.
		Confidence	High					

6.1.3 Site A - Operation Phase

Impact Description		**Impact type**	**Extent (E)**	**Duration (D)**	**Potential Intensity (P)**	**Likelihood (L)**	**Impact Rating & Significance (IR&S)**	**Mitigation & Management Measures**
Impact	Direct Impact:	**Significance without Mitigation**						Non-reflective materials should be used in construction of rooves, fences and other infrastructure. Any walls should be painted in dull earthen colours. Lighting should be kept to a minimum and all lighting fixtures should be full cutoff luminaries. These should be focused downward and should be mounted as low as possible to achieve their function. Permanent flood lighting is to be avoided and security lights should use a motion sensor. Locally indigenous shrubs should be encouraged / planted along the outside
Impact Direction:	Negative	Existing Impact	2	3	4	1	9 - MOD	
Aspect:	Visual Impact	Project Impact	2	1	2	0.5	3 - MOD	
Potential Impact:		**Significance with Mitigation**						
		Residual Impact	2	1	1	0.2	1 - LOW	

The presence of the KBPF facility may negatively affect the expansive views of the Kalahari Rangelands from the D3276 due to reflection, glare, night lighting and contrast of buildings in the monochromatic landscape.		Reversibility	High reversibility				perimeter and indigenous vegetation (grasses) should be retained beneath and in between the solar panels.
		Irreplaceability	Resources are replaceable				
		Cumulative Impact					**Description of Cumulative Impact**
		Cumulative Impact	2	3	4	1	9 - MOD	There are several renewable energy facilities in existence in the immediate vicinity of the proposed sites. In particular, the Khi Solar One CSP is a strong visual presence that has impacted the vast majority of views in this area. Views from the D3276 towards site A are dominated by this facility. A number of powerlines also already fragment the landscape. The new facility would add slightly to this existing impact but would be largely overshadowed by existing infrastructure.
		Confidence	High				
Impact Description		**Impact type**	**E**	**D**	**P**	**L**	**IR&S**	**Mitigation & Management Measures**
Impact	Direct Impact:	**Significance without Mitigation**						Non-reflective materials should be used in construction of rooves, fences and other infrastructure. Any walls should be painted in dull earthen colours. Lighting should be kept to a minimum and all lighting fixtures should be full cutoff luminaries. These should be focused downward and should be mounted as low as possible to achieve their function. Permanent flood lighting is to be avoided and security lights should use a motion sensor. Locally indigenous shrubs should be encouraged / planted along the outside perimeter and indigenous vegetation (grasses) should be retained beneath and in between the solar panels.
Impact Direction:	Negative	Existing Impact	2	3	4	1	9 - MOD	
Aspect:	Visual Impact	Project Impact	2	1	1	0.2	1 - LOW	
Potential Impact:		**Significance with Mitigation**						
The presence of the KBPF facility may negatively affect the expansive views of the Kalahari Rangelands from the N14 due to reflection, glare, night lighting and contrast of buildings in the monochromatic landscape.		Residual Impact	2	1	1	0.2	1 - LOW	
		Reversibility	High reversibility					
		Irreplaceability	Resources are replaceable					
		Cumulative Impact					**Description of Cumulative Impact**
		Cumulative Impact	2	3	4	1	9 - MOD	There are several renewable energy facilities in existence in the immediate vicinity of the proposed sites. In particular, the Khi Solar One CSP is a strong visual presence that has impacted the vast majority of views in this area. Views from the N14 towards site A are dominated by this facility and are in most cases limited by landform. A number of powerlines also already fragment the landscape. The new facility would add ever so slightly to this existing impact but would be largely overshadowed by existing infrastructure.
		Confidence	High				
Impact Description		**Impact type**	**E**	**D**	**P**	**L**	**IR&S**	**Mitigation & Management Measures**
Impact	Direct Impact:	**Significance without Mitigation**						Non-reflective materials should be used in construction of rooves, fences and other infrastructure. Any walls should be painted in dull earthen colours. Lighting should be kept to a minimum and all lighting fixtures should be full cutoff luminaries. These should be focused downward and should be mounted as low as possible to achieve their function. Permanent flood lighting is to be avoided and security lights should use a motion sensor. Locally indigenous shrubs should be encouraged / planted along the outside perimeter and indigenous vegetation (grasses) should be retained beneath and in between the solar panels.
Impact Direction:	Negative	Existing Impact	2	3	4	1	9 - MOD	
Aspect:	Visual Impact	Project Impact	2	1	1	0.2	1 - LOW	
Potential Impact:		**Significance with Mitigation**						
The presence of the KBPF facility may negatively affect the experience of tourists visiting the Orange River Vineyards and resorts along the N14 corridor.		Residual Impact	2	1	1	0.2	1 - LOW	
		Reversibility	High reversibility					
		Irreplaceability	Resources are replaceable					

		Cumulative Impact					**Description of Cumulative Impact**
		Cumulative Impact	2	3	4	1	9 - MOD	There are several renewable energy facilities in existence in the immediate vicinity of the proposed sites. In particular, the Khi Solar One CSP is a strong visual presence that has impacted the vast majority of views in this area. Views from the N14 towards site A are dominated by this facility and are in most cases limited by landform. A number of powerlines also already fragment the landscape. The new facility would add ever so slightly to this existing impact but would be largely overshadowed by existing infrastructure. In addition, tourist views are largely focused on the river and vineyards and the contribution of the development to the cumulative development is thus negligible.
		Confidence	High					
Impact Description		**Impact type**	**E**	**D**	**P**	**L**	**IR&S**	**Mitigation & Management Measures**
Impact	Direct Impact:	**Significance without Mitigation**						Non-reflective materials should be used in construction of rooves, fences and other infrastructure. Any walls should be painted in dull earthen colours. Lighting should be kept to a minimum and all lighting fixtures should be full cutoff luminaries. These should be focused downward and should be mounted as low as possible to achieve their function. Permanent flood lighting is to be avoided and security lights should use a motion sensor. Locally indigenous shrubs should be encouraged / planted along the outside perimeter and indigenous vegetation (grasses) should be retained beneath and in between the solar panels.
Impact Direction:	Negative	Existing Impact	2	3	4	1	9 - MOD	
Aspect:	Visual Impact	Project Impact	2	3	1	0.2	1 - LOW	
<u>Potential Impact:</u>		**Significance with Mitigation**						
The presence of the KBPF facility may negatively affect the views and thus the quality of life of people in residential areas and businesses along the N14 corridor.		Residual Impact	2	3	1	0.2	1 - LOW	
		Reversibility	High reversibility					
		Irreplaceability	Resources are replaceable					
		Cumulative Impact					**Description of Cumulative Impact**
		Cumulative Impact	2	3	4	1	9 - MOD	There are several renewable energy facilities in existence in the immediate vicinity of the proposed sites. In particular, the Khi Solar One CSP is a strong visual presence that has impacted the vast majority of views in this area. Views from the N14 towards site A are dominated by this facility and are in most cases limited by landform. A number of powerlines also already fragment the landscape. The new facility would add ever so slightly to this existing impact but would be largely overshadowed by existing infrastructure. In addition, residents' and business' views are largely focused towards the river and vineyards and the contribution of the development to the cumulative development is thus negligible.
		Confidence	High					
Impact Description		**Impact type**	**E**	**D**	**P**	**L**	**IR&S**	**Mitigation & Management Measures**
Impact	Direct Impact:	**Significance without Mitigation**						Non-reflective materials should be used in construction of rooves, fences and other infrastructure. Any walls should be painted in dull earthen colours. Lighting should be kept to a minimum and all lighting fixtures should be full cutoff luminaries. These should be focused downward and should be mounted as low as possible to achieve their function. Permanent flood lighting is to be avoided and security lights should use a motion sensor. Locally indigenous shrubs should be encouraged / planted along the outside
Impact Direction:	Negative	Existing Impact	2	3	4	1	9 - MOD	
Aspect:	Visual Impact	Project Impact	2	3	1	0.2	1 - LOW	
<u>Potential Impact:</u>		**Significance with Mitigation**						
		Residual Impact	2	3	1	0.2	1 - LOW	

The presence of the KBPF facility may negatively affect the views and thus the quality of life of people in residential areas, tourist resorts and businesses on the opposite side of the Orange River.		Reversibility	High reversibility				perimeter and indigenous vegetation (grasses) should be retained beneath and in between the solar panels.
		Irreplaceability	Resources are replaceable				
		Cumulative Impact					**Description of Cumulative Impact**
		Cumulative Impact	2	3	4	1	9 - MOD	There are several renewable energy facilities in existence in the immediate vicinity of the proposed sites. In particular, the Khi Solar One CSP is a strong visual presence that has impacted the vast majority of views in this area. A number of powerlines also already fragment the landscape. The contrast offered by the busy orange river valley additionally mitigates this impact. The new facility would add slightly to this existing impact, but its contribution to the cumulative impact is very low.
		Confidence	High				
Impact Description		**Impact type**	**E**	**D**	**P**	**L**	**IR&S**	**Mitigation & Management Measures**
Impact	Direct Impact:	**Significance without Mitigation**						Alignment of powerlines must be parallel and adjacent to existing powerlines wherever possible, ensuring that the visual impact of these features is blended into existing powerline infrastructure.
Impact Direction:	Negative	Existing Impact	3	4	2	1	9 - MOD	
Aspect:	Visual Impact	Project Impact	2	2	1	1	5 - MOD	
Potential Impact:		**Significance with Mitigation**						
Erection of powerlines may adversely impact views of Kalahari landscapes from key viewpoints		Residual Impact	2	2	1	0.2	1 - LOW	
		Reversibility	High reversibility					
		Irreplaceability	Resources are replaceable					
		Cumulative Impact						**Description of Cumulative Impact**
		Cumulative Impact	3	4	2	1	9 - MOD	A number of powerlines are already present in the landscape and various sections of these lines are visible from almost all points in the area. If the additional lines are aligned parallel and adjacent to these existing lines, the contribution of the new powerlines to the cumulative impact will be minimised.
		Confidence	High					

6.1.4 Site A - Decommissioning

Impact Description		**Impact type**	**Extent (E)**	**Duration (D)**	**Potential Intensity (P)**	**Likelihood (L)**	**Impact Rating & Significance (IR&S)**	**Mitigation & Management Measures**
Impact	Direct Impact:	**Significance without Mitigation**						

Impact Direction:	Negative	Existing Impact	1	1	1	0.1	0 - LOW
Aspect:	Visual Impact	Project Impact	2	1	1	0.75	3 - MOD
Potential Impact:		**Significance with Mitigation**					
The decommissioning activities may disturb the quiet sense of peaceful solitude of the Kalahari rangelands. This impact would be moderate to low given that there are few sensitive receptors		Residual Impact	2	1	1	0.5	2 - LOW
		Reversibility	High reversibility				
		Irreplaceability	Resources are replaceable				
		Cumulative Impact					
		Cumulative Impact	2	1	1	0.5	2 - LOW
		Confidence	Medium				

As with construction activities, reversing of site vehicles should be kept to a minimum to minimise the use of reverse warning sounds and wherever possible vehicles should be turned around without using reverse gear.

Description of Cumulative Impact

It is not possible to know what the level of activity and noise will be at the time of decommissioning. Scoring therefore only includes activities related to the decommissioning of the proposed development.

Impact Description		**Impact type**	**E**	**D**	**P**	**L**	**IR&S**
Impact	Direct Impact:	**Significance without Mitigation**					
Impact Direction:	Negative	Existing Impact	2	1	1	0.1	0 - LOW
Aspect:	Visual Impact	Project Impact	2	1	1	0.5	2 - LOW
Potential Impact:		**Significance with Mitigation**					
Decommissioning activities, particularly those that generate noise and dust, heavy vehicles and abnormal load vehicles, may impact the experience of tourists to the region and result in impacts to tourist sentiment and tourism revenue.		Residual Impact	2	1	1	0.2	1 - LOW
		Reversibility	High reversibility				
		Irreplaceability	Resources are replaceable				
		Cumulative Impact					
		Cumulative Impact	2	1	1	0.2	1 - LOW
		Confidence	Medium				

Mitigation & Management Measures

The extent of land cleared of vegetation at any one time should be kept to a minimum. A dust suppression plan should be implemented during the decommissioning phase on all bare areas. Transportation of any abnormal loads away form site and high volumes of heavy trucks should be scheduled for low traffic times on the N14 to limit the impact of this on tourists and people travelling for work. The site should be re-vegetated with appropriate locally indigenous vegetation as soon as possible.

Description of Cumulative Impact

It is not possible to know what the level of activity and noise will be at the time of decommissioning. Scoring therefore only includes activities related to the decommissioning of the proposed development.

6.2 Site B

6.2.1 Site B - Design Phase

Impact Description		Impact type	Extent (E)	Duration (D)	Potential Intensity (P)	Likelihood (L)	Impact Rating & Significance (IR&S)	Mitigation & Management Measures
Impact	Direct Impact:	**Significance without Mitigation**						A colour palette should be selected for the development that matches the surrounding landscape. All structures and roofs constructed should be colour treated / painted to conform to this colour palette. This includes small surfaces such as the reverse side of signs, fence poles and mesh, etc. No reflective surfaces of any infrastructure constructed as part of this development should be left exposed.
Impact Direction:	Negative	Existing Impact	2	3	8	1	13 - HIGH	
Aspect:	Visual Impact	Project Impact	2	1	2	1	5 - MOD	
Potential Impact:		**Significance with Mitigation**						
Structures' colour and design potentially contrast vividly with the surrounding landscape enhancing visibility and increasing artificial contrast in the landscape		Residual Impact	2	1	2	0.2	1 - LOW	
		Reversibility	High reversibility					
		Irreplaceability	Resources are replaceable					
		Cumulative Impact						**Description of Cumulative Impact**
		Cumulative Impact	2	3	8	1	13 - HIGH	The existing visual impact of other renewable energy facilities will still dominate the landscape, particularly the Khi One CSP. The addition of the Kiwano PV infrastructure will add to this. If site B is selected the cumulative impacts will be extended to both sides of the D3276. The bulk of the cumulative impact is however imposed by existing infrastructure.
		Confidence	High					
Impact Description		**Impact type**	**E**	**D**	**P**	**L**	**IR&S**	**Mitigation & Management Measures**
Impact	Direct Impact:	**Significance without Mitigation**						Where powerlines can be placed in parallel with and adjacent to existing lines and pylons are placed in sync with existing pylons, this should be done. In these cases, design of pylon, colour treatment (if used), position and size should mirror the existing powerlines.
Impact Direction:	Negative	Existing Impact	2	3	2	1	7 - MOD	
Aspect:	Visual Impact	Project Impact	2	1	2	0.5	3 - MOD	
Potential Impact:		**Significance with Mitigation**						
Powerline infrastructure adds additional visual impact to the existing impacted landscape		Residual Impact	2	1	1	0.2	1 - LOW	
		Reversibility	High reversibility					
		Irreplaceability	Resources are replaceable					
		Cumulative Impact						**Description of Cumulative Impact**
		Cumulative Impact	2	3	2	1	7 - MOD	A number of existing powerlines are present in the area. The proposed development will add to this situation, however, if designed with parallel and adjacent alignment as

		Confidence	High					described above, this cumulative impact will be minimised. The bulk of the cumulative impact is however imposed by existing infrastructure.
Impact Description		**Impact type**	**E**	**D**	**P**	**L**	**IR&S**	**Mitigation & Management Measures**
Impact	Direct Impact:	**Significance without Mitigation**						PV panels and their support structures should be designed with as low a profile as possible. This will minimise the visibility of the panels. All surfaces (exception of PV surfaces) should be painted using the selected colour palette to eliminate unnecessary reflection and to match the natural surroundings.
Impact Direction:	Negative	Existing Impact	2	3	4	1	9 - MOD	
Aspect:	Visual Impact	Project Impact	2	1	2	0.5	3 - MOD	
<u>Potential Impact:</u>		**Significance with Mitigation**						
PV panels will be visible in the landscape and will interrupt and fragment the natural monochromatic landscape		Residual Impact	2	1	1	0.5	2 - LOW	
		Reversibility	High reversibility					
		Irreplaceability	Resources are replaceable					
		Cumulative Impact						**Description of Cumulative Impact**
		Cumulative Impact	2	3	4	1	9 - MOD	There are existing PV facilities in the area and the construction of the proposed development will add to this existing impact. Site B is located away from the existing impacts, thus extending this impact into additional areas of Kalahari Rangeland LCU. The bulk of the cumulative impact is however imposed by existing infrastructure.
		Confidence	High					
Impact Description		**Impact type**	**E**	**D**	**P**	**L**	**IR&S**	**Mitigation & Management Measures**
Impact	Direct Impact:	**Significance without Mitigation**						In this unlit landscape, lighting should be kept to an absolute requisite minimum both with respect to number of lights as well as the strength of those lights. A lighting plan should be drawn up to identify the minimum number, strength and locations of required lights. Wherever possible, non-permanent lighting options should be used (e.g., motion sensor lights instead of permanent security flood lights) and reflective markers should be used rather than illuminated signs. Any lighting used should be focused downward and inward to eliminate light spill. No lighting should be directed horizontally at vertical walls or structures. All lights should be fully shielded to ensure no escape of uplight and sky glow. All lights should be amber or warm colours as opposed to blueish white lights.
Impact Direction:	Negative	Existing Impact	2	3	2	1	7 - MOD	
Aspect:	Visual Impact	Project Impact	2	1	2	1	5 - MOD	
<u>Potential Impact:</u>		**Significance with Mitigation**						
Security and other operational lighting will introduce unnatural lighting into an unlit landscape		Residual Impact	2	1	1	0.75	3 - MOD	
		Reversibility	High reversibility					
		Irreplaceability	Resources are replaceable					
		Cumulative Impact						**Description of Cumulative Impact**
		Cumulative Impact	2	3	2	1	7 - MOD	There is a relatively strong night lighting impact already from Upington and from the vehicles, homes and businesses along the N14 corridor. The existing renewable energy infrastructure and substation also emit light. Site B will expand night light impacts into presently unlit areas. The bulk of the cumulative impact is however imposed by existing infrastructure.
		Confidence	High					

1.1 Site B - Construction Phase

In assessing the construction phase, it is assumed that all activities will be undertaken within the site boundaries supplied, and that any disturbance of areas outside of these boundaries will be prohibited.

Impact Description		Impact type	Extent (E)	Duration (D)	Potential Intensity (P)	Likelihood (L)	Impact Rating & Significance (IR&S)	Mitigation & Management Measures
Impact	Direct Impact:	**Significance without Mitigation**						Reversing of construction vehicles should be kept to a minimum to minimise the use of reverse warning sounds and wherever possible vehicles should be turned around without using reverse gear.
Impact Direction:	Negative	Existing Impact	1	1	1	0.1	0 - LOW	
Aspect:	Visual Impact	Project Impact	2	1	2	0.75	4 - MOD	
Potential Impact:		**Significance with Mitigation**						
The construction activities may disturb the quiet sense of peaceful solitude of the Kalahari rangelands. This impact would be moderate to low given that there are few sensitive receptors		Residual Impact	2	1	1	0.5	2 - LOW	
		Reversibility	High reversibility					
		Irreplaceability	Resources are replaceable					
		Cumulative Impact						**Description of Cumulative Impact**
		Cumulative Impact	2	1	1	0.5	2 - LOW	The existing renewable energy infrastructure is completely constructed and the existing infrastructure operates with minimal noise or activity. As such no existing noise and construction activity is present on site and would not contribute to a cumulative impact. The N14 national road does provide road noise and movement to the east and south of the site.
		Confidence	High					
Impact Description		**Impact type**	**E**	**D**	**P**	**L**	**IR&S**	**Mitigation & Management Measures**
Impact	Indirect Impact:	**Significance without Mitigation**						The extent of land cleared of vegetation at any one time should be kept to a minimum. A dust suppression plan should be implemented during construction phase on all bare areas. Transportation of any abnormal loads and high volumes of heavy trucks should be scheduled for low traffic times on the N14 to limit the impact of this on tourists and people travelling for work.
Impact Direction:	Negative	Existing Impact	1	1	1	0.1	0 - LOW	
Aspect:	Visual Impact	Project Impact	3	1	2	0.2	1 - LOW	
Potential Impact:		**Significance with Mitigation**						
Construction activities, particularly noise and dust, heavy vehicles and abnormal load vehicles, may impact the experience of tourists to the region and result in impacts to tourist sentiment and tourism revenue.		Residual Impact	2	1	1	0.1	0 - LOW	
		Reversibility	High reversibility					
		Irreplaceability	Resources are replaceable					
		Cumulative Impact						**Description of Cumulative Impact**

		Cumulative Impact	3	1	1	0.1	1 - LOW	There are presently no large construction projects underway in this area, though the landfill site provides a level of smoke and dust. The proposed project will potentially add to this for a short period.
		Confidence	Medium					
Impact Description		**Impact type**	**E**	**D**	**P**	**L**	**IR&S**	**Mitigation & Management Measures**
Impact	Direct Impact:	**Significance without Mitigation**						The area of land cleared of vegetation should be kept to a minimum. Wherever possible, existing natural vegetation should be left in-situ, to maintain some level of natural screening.
Impact Direction:	Negative	Existing Impact	2	2	1	1	5 - MOD	
Aspect:	Visual Impact	Project Impact	2	1	2	0.5	3 - MOD	
Potential Impact:		**Significance with Mitigation**						
The construction activities related to the construction of the KBPF facility may negatively affect the expansive views of the Kalahari Rangelands from the N14, D3257 and other sensitive view points by introducing unnatural elements, movement and contrast.		Residual Impact	2	1	1	0.5	2 - LOW	
		Reversibility	High reversibility					
		Irreplaceability	Resources are replaceable					
		Cumulative Impact						**Description of Cumulative Impact**
		Cumulative Impact	2	2	1	1	5 - MOD	Whilst there are no other construction activities currently present in the landscape, the existing impacts of powerlines, railway, agricultural activities etc present a relatively active landscape. The construction activities will be visible only from a limited number of viewpoints, and as such will not add significantly to the existing impacts.
		Confidence	High					

1.1 Site B - Operation Phase

Impact Description		**Impact type**	**Extent (E)**	**Duration (D)**	**Potential Intensity (P)**	**Likelihood (L)**	**Impact Rating & Significance (IR&S)**	**Mitigation & Management Measures**
Impact	Direct Impact:	**Significance without Mitigation**						Non-reflective materials should be used in construction of rooves, fences and other infrastructure. Any walls should be painted in dull earthen colours. Lighting should be kept to a minimum and all lighting fixtures should be full cutoff luminaries. These should be focused downward and should be mounted as low as possible to achieve their function. Permanent flood lighting is to be avoided and security lights should use
Impact Direction:	Negative	Existing Impact	2	3	4	1	9 - MOD	
Aspect:	Visual Impact	Project Impact	2	1	4	0.75	5 - MOD	

Potential Impact:		**Significance with Mitigation**					a motion sensor. Locally indigenous shrubs should be encouraged / planted along the outside perimeter and indigenous vegetation (grasses) should be retained beneath and in between the solar panels.
The presence of the KBPF facility may negatively affect the expansive views of the Kalahari Rangelands from the D3276 due to reflection, glare, night lighting and contrast of buildings in the monochromatic landscape.		Residual Impact	2	1	2	0.2	1 - LOW
		Reversibility	High reversibility				
		Irreplaceability	Resources are replaceable				
		Cumulative Impact					**Description of Cumulative Impact**
		Cumulative Impact	2	3	4	1	9 - MOD
		Confidence	High				There are several renewable energy facilities in existence in the immediate vicinity of the proposed sites. In particular, the Khi Solar One concentrator is a strong visual presence that has impacted the vast majority of views in this area. A number of powerlines also already fragment the landscape. The new facility would add slightly to this existing impact, slightly more so if Site B is selected (relative to the selection of Site A) as this would extend the impacted area onto the north eastern side of the D3276
Impact Description		**Impact type**	**E**	**D**	**P**	**L**	**IR&S**	**Mitigation & Management Measures**
Impact	Direct Impact:	**Significance without Mitigation**						Non-reflective materials should be used in construction of rooves, fences and other infrastructure. Any walls should be painted in dull earthen colours. Lighting should be kept to a minimum and all lighting fixtures should be full cutoff luminaries. These should be focused downward and should be mounted as low as possible to achieve their function. Permanent flood lighting is to be avoided and security lights should use a motion sensor. Locally indigenous shrubs should be encouraged / planted along the outside perimeter and indigenous vegetation (grasses) should be retained beneath and in between the solar panels.
Impact Direction:	Negative	Existing Impact	2	3	4	1	9 - MOD	
Aspect:	Visual Impact	Project Impact	2	3	1	0.1	1 - LOW	
Potential Impact:		**Significance with Mitigation**						
The presence of the KBPF facility may negatively affect the expansive views of the Kalahari Rangelands from the N14 due to reflection, glare and contrast of buildings in the monochromatic landscape.		Residual Impact	2	3	1	0.1	1 - LOW	
		Reversibility	High reversibility					
		Irreplaceability	Resources are replaceable					
		Cumulative Impact						**Description of Cumulative Impact**
		Cumulative Impact	2	3	4	1	9 - MOD	There are several renewable energy facilities in existence in the immediate vicinity of the proposed sites. In particular, the Khi Solar One concentrator is a strong visual presence that has impacted the vast majority of views in this area. A number of powerlines also already fragment the landscape. Site B is largely hidden from view from the N14 and so would not add to this cumulative impact.
		Confidence	High					
Impact Description		**Impact type**	**E**	**D**	**P**	**L**	**IR&S**	**Mitigation & Management Measures**
Impact	Direct Impact:	**Significance without Mitigation**						Non-reflective materials should be used in construction of rooves, fences and other infrastructure. Any walls should be painted in dull earthen colours. Lighting should be kept to a minimum and all lighting fixtures should be full cutoff luminaries. These should be focused downward and should be mounted as low as possible to achieve their function. Permanent flood lighting is to be avoided and security lights should use a motion sensor. Locally indigenous shrubs should be encouraged / planted along the outside
Impact Direction:	Negative	Existing Impact	2	3	4	1	9 - MOD	
Aspect:	Visual Impact	Project Impact	2	1	1	0.5	2 - LOW	
Potential Impact:		**Significance with Mitigation**						
		Residual Impact	2	3	1	0.2	1 - LOW	

The presence of the KBPF facility may negatively affect the experience of tourists visiting the Orange River Vineyards and resorts along the N14 corridor.		Reversibility	High reversibility				perimeter and indigenous vegetation (grasses) should be retained beneath and in between the solar panels.
		Irreplaceability	Resources are replaceable				
		Cumulative Impact					**Description of Cumulative Impact**
		Cumulative Impact	2	3	4	1	9 - MOD	There are several renewable energy facilities in existence in the immediate vicinity of the proposed sites. In particular, the Khi Solar One CSP is a strong visual presence that has impacted the vast majority of views in this area. A number of powerlines also already fragment the landscape. The new facility would add slightly to this existing impact if Site B is selected as this would extend the impacted area onto the north eastern side of the D3276, thereby expanding the area of disturbed views to a wider extent. Site B is visible from a very limited number of sites in the corridor and tourist views in this area are largely focused inwards towards the river and the vineyards. The contribution of this development to the cumulative impact is thus minimal.
		Confidence	High				
Impact Description		**Impact type**	**E**	**D**	**P**	**L**	**IR&S**	**Mitigation & Management Measures**
Impact	Direct Impact:	**Significance without Mitigation**						Non-reflective materials should be used in construction of rooves, fences and other infrastructure. Any walls should be painted in dull earthen colours. Lighting should be kept to a minimum and all lighting fixtures should be full cutoff luminaries. These should be focused downward and should be mounted as low as possible to achieve their function. Permanent flood lighting is to be avoided and security lights should use a motion sensor. Locally indigenous shrubs should be encouraged / planted along the outside perimeter and indigenous vegetation (grasses) should be retained beneath and in between the solar panels.
Impact Direction:	Negative	Existing Impact	2	3	4	1	9 - MOD	
Aspect:	Visual Impact	Project Impact	2	3	1	0.2	1 - LOW	
Potential Impact:		**Significance with Mitigation**						
The presence of the KBPF facility may negatively affect the views and thus the quality of life of people in residential areas and businesses along the N14 corridor.		Residual Impact	2	3	1	0.2	1 - LOW	
		Reversibility	High reversibility					
		Irreplaceability	Resources are replaceable					
		Cumulative Impact					**Description of Cumulative Impact**
		Cumulative Impact	2	3	4	1	9 - MOD	There are several renewable energy facilities in existence in the immediate vicinity of the proposed sites. In particular, the Khi Solar One CSP is a strong visual presence that has impacted the vast majority of views in this area. A number of powerlines also already fragment the landscape. The new facility would add slightly to this existing impact in the few places from where it will be visible,
		Confidence	High				
Impact Description		**Impact type**	**E**	**D**	**P**	**L**	**IR&S**	**Mitigation & Management Measures**
Impact	Direct Impact:	**Significance without Mitigation**						Non-reflective materials should be used in construction of rooves, fences and other infrastructure. Any walls should be painted in dull earthen colours. Lighting should be kept to a minimum and all lighting fixtures should be full cutoff luminaries. These should be focused downward and should be mounted as low as possible to achieve their function. Permanent flood lighting is to be avoided and security lights should use a motion sensor. Locally indigenous shrubs should be encouraged / planted along the outside
Impact Direction:	Negative	Existing Impact	2	3	4	1	9 - MOD	
Aspect:	Visual Impact	Project Impact	2	3	2	0.5	4 - MOD	
Potential Impact:		**Significance with Mitigation**						
		Residual Impact	2	3	1	0.2	1 - LOW	

The presence of the KBPF facility may negatively affect the views and thus the quality of life of people in residential areas, tourist resorts and businesses on the opposite side of the Orange River.		Reversibility	High reversibility				perimeter and indigenous vegetation (grasses) should be retained beneath and in between the solar panels.
		Irreplaceability	Resources are replaceable				
		Cumulative Impact					**Description of Cumulative Impact**
		Cumulative Impact	2	3	4	1	9 - MOD	There are several renewable energy facilities in existence in the immediate vicinity of the proposed sites. In particular, the Khi Solar One CSP is a strong visual presence that has impacted the vast majority of views in this area. A number of powerlines also already fragment the landscape. The new facility would add slightly to this existing impact in the few places from where it will be visible (more so than from the north-western bank)
		Confidence	High				
Impact Description		**Impact type**	**E**	**D**	**P**	**L**	**IR&S**	**Mitigation & Management Measures**
Impact	Direct Impact:	**Significance without Mitigation**						Alignment of powerlines must be parallel and adjacent to existing powerlines wherever possible, ensuring that the visual impact of these features is blended into existing powerline infrastructure.
Impact Direction:	Negative	Existing Impact	3	4	2	1	9 - MOD	
Aspect:	Visual Impact	Project Impact	2	2	1	1	5 - MOD	
Potential Impact:		**Significance with Mitigation**						
Erection of powerlines may adversely impact views of Kalahari landscapes from key viewpoints		Residual Impact	2	2	1	0.2	1 - LOW	
		Reversibility	High reversibility					
		Irreplaceability	Resources are replaceable					
		Cumulative Impact						**Description of Cumulative Impact**
		Cumulative Impact	3	4	2	1	9 - MOD	A number of powerlines are already present in the landscape and various sections of these lines are visible from almost all points in the area. If the additional lines are aligned parallel and adjacent to these existing lines, the cumulative impact will be minimised.
		Confidence	High					

1.1 Site B - Decommissioning Phase

In assessing the potential impacts of the decommissioning phase, it is assumed that all activities will be conducted within the given site boundary and that and disturbance of surrounding areas will be prohibited.

Impact Description		**Impact type**	**Extent (E)**	**Duration (D)**	**Potential Intensity (P)**	**Likelihood (L)**	**Impact Rating & Significance (IR&S)**	**Mitigation & Management Measures**
Impact	Direct Impact:	**Significance without Mitigation**						

Impact Direction:	Negative	Existing Impact	1	1	1	0.1	0 - LOW
Aspect:	Visual Impact	Project Impact	2	1	1	0.75	3 - MOD
Potential Impact:		**Significance with Mitigation**					
The decommissioning activities may disturb the quiet sense of peaceful solitude of the Kalahari rangelands. This impact would be moderate to low given that there are few sensitive receptors		Residual Impact	2	1	1	0.5	2 - LOW
		Reversibility	High reversibility				
		Irreplaceability	Resources are replaceable				
		Cumulative Impact					
		Cumulative Impact	2	1	1	0.5	2 - LOW
		Confidence	Medium				

As with construction activities, reversing of site vehicles should be kept to a minimum to minimise the use of reverse warning sounds and wherever possible vehicles should be turned around without using reverse gear.

Description of Cumulative Impact

It is not possible to know what the level of activity and noise will be at the time of decommissioning. Scoring therefore only includes activities related to the decommissioning of the proposed development.

Impact Description		**Impact type**	**E**	**D**	**P**	**L**	**IR&S**
Impact	Direct Impact:	**Significance without Mitigation**					
Impact Direction:	Negative	Existing Impact	2	1	1	0.1	0 - LOW
Aspect:	Visual Impact	Project Impact	2	1	1	0.5	2 - LOW
Potential Impact:		**Significance with Mitigation**					
Decommissioning activities, particularly those that generate noise and dust, heavy vehicles and abnormal load vehicles, may impact the experience of tourists to the region and result in impacts to tourist sentiment and tourism revenue.		Residual Impact	2	1	1	0.2	1 - LOW
		Reversibility	High reversibility				
		Irreplaceability	Resources are replaceable				
		Cumulative Impact					
		Cumulative Impact	2	1	1	0.2	1 - LOW
		Confidence	Medium				

Mitigation & Management Measures

The extent of land cleared of vegetation at any one time should be kept to a minimum. A dust suppression plan should be implemented during the decommissioning phase on all bare areas. Transportation of any abnormal loads away form site and high volumes of heavy trucks should be scheduled for low traffic times on the N14 to limit the impact of this on tourists and people travelling for work. The site should be re-vegetated with appropriate locally indigenous vegetation as soon as possible.

Description of Cumulative Impact

It is not possible to know what the level of activity and noise will be at the time of decommissioning. Scoring therefore only includes activities related to the decommissioning of the proposed development.

2.0 Conclusion and recommendations

Whilst the landscape in the region of the proposed sites is potentially sensitive to visual impacts due to lack of visual contrast in the landscape and the lack of significant enclosure or relief, the specific sites chosen for the alternative sites (Site A and Site B), the limited number of visual receptors and sensitive views in the area and the low height and flat, linear nature of the development mean that there will be limited impact on the visual and aesthetic environment. This is primarily due to the very subtle ridge of high lying ground located between the proposed sites and the N14 that screens the majority of receptors from any visual impacts.

Important also is the fact that such a development, once constructed, involves very little movement or noise in its operation. It will thus not intrude on the sense of quiet solitude in the area. There are also a number of existing renewable energy facilities in the area which have asserted a change on the visual character of the area. The proposed development is in keeping with this character and whilst further PV infrastructural development may be considered adding to the cumulative impact, the development is also consistent with local, regional and national planning policy.

2.1 Impact Statement

The visual impact of this development is considered to be **LOW for both alternative sites**. Site A is slightly preferred as the more suitable alternative from a visual impact perspective as siting the development there will cluster the development together with existing renewable energy related impacts. It will also result in less powerline being required to be built, lessening that component's visual impact. Either site is however considered a viable development option from a visual impact perspective.

3.0 Inputs to the Environmental Management Programme

The following points are recommended for inclusion in the Environmental Management Programme (EMPr)

3.1 Design Phase

A colour palette should be selected for the development that matches the surrounding landscape. This palette should be documented in the EMPr and all structures and roofs (faces of PV panels obviously excluded) should be colour treated / painted to conform to this colour palette. This includes small surfaces such as the reverse side of signs, fence poles and fencing mesh, etc. No reflective metal surfaces should be left exposed.

Power pylons should be treated in the same manner as those pylons already in place to limit any source of contrast.

A suggested colour palette is provided in Figure 30. The colours used have been drawn from photographs of the site, and RGB and Hexadecimal colour codes are provided.

Figure 30: Suggested colour palette for colour treatment of all infrastructure.

- Powerline and pylon placement should wherever possible be aligned with existing powerlines.
- A lighting plan should be drawn up to identify the minimum number and locations of required lights. This can be drawn up by Eskom but should be done in consultation with a lighting specialist. The plan should be approved by the project Environmental Control Officer. The plan should:
    1. Consist of a detailed plan of the development site;
    2. Map out the activities / facilities requiring lighting;
    3. Identify critical lighting requirements such as minimum brightness required for safe working conditions;
    4. Position luminaires on the plan with the associated extent of lit area – this is to ensure the minimum number of luminaries are used.
    5. Provide specifications as to the type of luminaires (fully shielded cutoff (see Figure 31), motion sensor etc.), the lumens required, mounting height etc.
- Wherever possible, non-permanent lighting options should be used (e.g., motion sensor lights instead of permanent security flood lights) and reflective markers should be used rather than illuminated signs.
- Any lighting used should be focused downward and inward to eliminate light spill.
- All lights should be fully shielded to ensure no escape of uplight and sky glow.
- All lights should be amber or warm colours as opposed to blueish white lights.

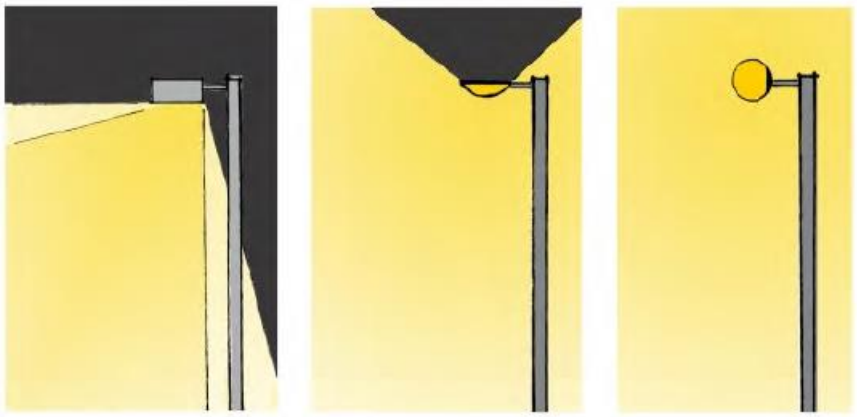

Figure 31: Only the light at left is a full-cutoff luminaire. The others allow escape of light upwards. (Taken from United States Department of Interior, Bureau of Land Management, 2013)

3.2 Construction Phase

- Vegetation removal should be kept to a minimum and vegetation should be retained wherever possible.
- Areas that are temporarily cleared must be rehabilitated as soon as the need for the use of that area ends.
- Locally indigenous shrubs and trees should be planted along perimeter fencing facing the D3276
- A dust suppression plan must be developed and implemented.
- Reversing of construction vehicles should be kept to a minimum to minimise the use of reverse warning sounds and wherever possible vehicles should be turned around without using reverse gear.
- Any abnormal loads that are to be delivered to or from site or activities involving a large numbers of delivery vehicles, should be scheduled to avoid peak traffic times on the N14 to limit the impact of traffic on the tourist experience.

3.3 Operational Phase

- Wherever possible, mobile lights should be used for night time maintenance activities (e.g., cleaning PV panels) and permanent lighting should not be installed for this purpose.
- All considerations given to lighting in the design phase should apply to maintenance or addition of lighting in the operational phase.
- All considerations given to colour and painting of reflective surfaces in the design phase should apply to any further construction (including erection of signage etc.) or maintenance activities on site in the operational phase.

3.4 Decommissioning Phase

- As with construction, vegetation removal should be kept to a minimum and vegetation should be retained wherever possible.
- All bare areas should be rehabilitated to a form resembling a natural vegetated state as soon as possible using locally indigenous shrubs and trees.
- A dust suppression plan must be developed and implemented while unvegetated areas are still present.
- Reversing of construction vehicles should be kept to a minimum to minimise the use of reverse warning sounds and wherever possible vehicles should be turned around without using reverse gear.

- Any abnormal loads that are to be delivered to or from site or activities involving a large numbers of delivery vehicles, should be scheduled to avoid peak traffic times on the N14 to limit the impact of traffic on the tourist experience.

4.0 References

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Swanwick, C. 2002. Landscape Character Assessment, guidance for England and Scotland. Prepared on behalf of The Countryside Agency and Scottish Natural Heritage.

The Landscape Institute, 2002. *Guidelines for Landscape and Visual Impact Assessment* 2nd ed. United Kingdom: Spon Press

United States Department of the Interior. 2013. Best Management Practices for Reducing Visual Impacts of Renewable Energy Facilities on BLM-Administered Lands. Bureau of Land Management. Cheyenne, Wyoming. 342 pp, April.

5.0 Addendum 1 – Preliminary technical scoping report

6.0 Addendum 2 – CV of VIA specialist

CURRICULUM VITAE - LEO MALCOLM QUAYLE (*PrSciNat*)

PERSONAL DETAILS

Date of Birth:	22 January 1977
Identity Number:	7701225076088
Nationality:	Dual South African/British
Languages:	English, Afrikaans
Education	Matric – B aggregate (Michaelhouse, KZN - 1994)
	BSc – Chemistry, Geography, (UN, PMB – 1997)
	BSc (hons) - GIS, Geomorphology, (UN, PMB – 1999)
	MPhil – Environmental Management, (UCT – 2001)
	Introduction to VB programming (UNISA – 2012)

KEY RELEVANT EXPERIENCE

Leo is a registered Professional Natural Scientist and a specialist in GIS and environmental spatial planning. He has a Master's degree in environmental management and 20 years' experience working in various environmental and planning fields. This includes working permanently for various periods in the United Kingdom, Ghana, and South Africa. He has worked as a project leader, GIS specialist and spatial environmental planner in a number of local and international environmental management roles and projects and has led the development of a number of GIS tools for various environmental planning projects including Environmental Management Frameworks (EMF) and Environmental Constraint Frameworks (for Eskom distribution master planning). He has worked in a number of roles involving visual impact assessment and the assessment of landscape character. The most relevant of these are:

1. As the GIS officer for the City of London Corporation, he was responsible for a variety of GIS related functions, including maintaining the view corridors associated with St Paul's Cathedral, and assessing city development proposals for impacts on these views.
2. He has assessed and described the character of landscapes in seven local municipalities adjacent to the uKhahlamba World Heritage Site and developed development capacity zones for these areas based on visual impact, sense of place, cultural value etc. These zones have been included in the development of the WHS buffer zone, which aims to (amongst other things) preserve the character of the landscapes associated with the WHS, including views of the surrounding landscape from within the WHS.
3. He has also undertaken a visual impact assessment as part of the Watson North Functional Area Plan in eThekwini Metro.
4. He has undertaken the visual impact assessment of the Hilton Dairy residential development in Hilton.

5. He has undertaken the visual impact assessment of a 132KW powerline associated with a proposed automotive supplier park development at Illovo on the KZN South Coast

RECORD OF EMPLOYMENT

Time frame	Employer	Position(s) held and responsibilities
2021 - Present	GeoNest (Pty) Ltd.	Director of GeoNest and Principal Scientist
2015 - 2020	Institute of Natural Resources	**Principal Environmental Scientist**: Responsible for leading the Environmental Monitoring and Environmental Information Systems work area at the INR, covering spatial analysis, terrestrial and aquatic monitoring, remote sensing and mapping.
2011 – 2014	Institute of Natural Resources	**Senior Environmental Scientist:** GIS leader and project leader / co-ordinator for water and biodiversity related studies. Contributing researcher in Integrated Environmental Management Theme
2008 - 2010	Institute of Natural Resources	**Environmental Scientist:** Primary researcher on water related studies on aquatic biota and water quality. INR leader in GIS and spatial analysis.
2003 - 2008	Various UK Based organisations including City of London Corporation (UK)	**GIS Specialist:** Providing GIS support to various borough functions, primarily town planning and maintaining borough GIS data.

MEMBERSHIP IN PROFESSIONAL SOCIETIES:

- Geo-Information Society of South Africa (GISSA)
- South African Council for Natural Scientific Professions (*PrSciNat* - water resources science, ecological science)