ENVIRONMENTAL IMPACT ASSESSMENT FOR THE PROPOSED VELD PV SOUTH SOLAR ENERGY FARM, NAMAKWA DISTRICT, NORTHERN CAPE

SPECIALIST REPORT: VISUAL IMPACT ASSESSMENT

FINAL: 23th AUGUST 2019

Document prepared for AURECON South Africa (Pty) Ltd;

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TABLE OF CONTENTS

TABLE OF FIGURES

LIST OF TABLES

GLOSSARY

Best Practicable Environmental Option (BPEO)

This is the option that provides the most benefit, or causes the least damage, to the environment as a whole, at a cost acceptable to society, in the long, as well as the short, term.

Cumulative Impact

The impact on the environment, which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency or person, undertakes such other actions. Cumulative impacts can result from individually minor, but collectively significant, actions taking place over a period of time.

Impact (visual)

A description of the effect of an aspect of a development on a specified component of the visual, aesthetic or scenic environment, within a defined time and space.

Issue (visual)

Issues are concerns related to the proposed development, generally phrased as questions, taking the form of “what will the impact of some activity be on some element of the visual, aesthetic or scenic environment?”

Key Observation Points (KOPs)

KOPs refer to receptors (people affected by the visual influence of a project) located in the most critical locations surrounding the landscape modification, who make consistent use of the views associated with the site where the landscape modifications are proposed. KOPs can either be a single point of view that an observer/evaluator uses to rate an area or panorama, or a linear view along a roadway, trail or river corridor.

Management Actions

Actions that enhance the benefits of a proposed development, or avoid, mitigate, restore or compensate for, negative impacts.

Receptors

Individuals, groups or communities who would be subject to the visual influence of a particular project.

Sense of Place

The unique quality or character of a place, whether natural, rural or urban.

Scenic Corridor

A linear geographic area that contains scenic resources, usually, but not necessarily, defined by a route.

Scoping

The process of determining the key issues, and the space and time boundaries, to be addressed in an environmental assessment.

Viewshed

The outer boundary defining a view catchment area, usually along crests and ridgelines. Similar to a watershed. This reflects the area in which, or the extent to which, the landscape modification is likely to be seen.

Zone of Visual Influence (ZVI)

The ZVI is defined as 'the area within which a proposed development may have an influence or effect on visual amenity.'

Glare and Glint

Glare is defined in the Oxford dictionary (http://www.oxforddictionaries.com) as 'shine with a strong or dazzling light'. Glint is defined as the circumstance relating to 'reflect small flashes of light'

LIST OF ACRONYMS

APHP	Association of Professional Heritage Practitioners
BLM	Bureau of Land Management (United States)
BPEO	Best Practicable Environmental Option
CALP	Collaborative for Advanced Landscape Planning
DEA	Department of Environmental Affairs (National)
DEA&DP	Department of Environmental Affairs and Development Planning (Western Cape Province)
DEM	Digital Elevation Model
DoC	Degree of Contrast
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
GIS	Geographic Information System
I&APs	Interested and Affected Parties
IEMA	Institute of Environmental Management and Assessment (United Kingdom)
IEMP	Integrated Environmental Management Plan
KOP	Key Observation Point
MAMSL	Metres above mean sea level
NELPAG	New England Light Pollution Advisory Group
PSDF	Provincial Spatial Development Framework
SAHRA	South African National Heritage Resources Agency
SDF	Spatial Development Framework
SEA	Strategic Environmental Assessment
VAC	Visual Absorption Capacity
VIA	Visual Impact Assessment
VRM	Visual Resource Management
ZVI	Zone of Visual Influence
REDZ	Renewable Energy Development Zone

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This document was completed by Silver Solutions 887 cc trading as VRM Africa, a Visual Impact Study and Mapping organisation located in George, South Africa. VRM Africa cc was appointed as an independent professional visual impact practitioner to facilitate this VIA.

This document was undertaken by the following team:

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1 EXECUTIVE SUMMARY

In conclusion, the landscape and Visual Impact Assessment found that there are advantages and disadvantages to the proposed landscape modification. Due to the remoteness of the proposed site that is well topographically screened, there are few receptors located in the project Zone of Visual Influence. Receptors that are exposed to the project will mainly have background views of the landscape modification. Advantages also include the location of the proposed project within the draft Renewable Energy Development Zones (REDZ 7). Potential benefits also include synergies with the Khâi-Ma Local Municipality IDP in terms of alleviating employment problems and shortage of appropriate labour skills. Disadvantages include a strong change to local landscape character, as well as the potential for strong lights at night and impacts to an existing dark-sky night-time landscape. The Impact Assessment found that while ***Visual Intrusion is likely to be Low-Negative with mitigation*** due to the remoteness of the location where there are few receptors with the rocky outcrops providing some visual screening. Visual intrusion can be further reduced with the reduction in the height of the PV structures to below 5m above ground level. However, as the landscape change is associated with the PV structures, no mitigation is provided, and as such, the ***impacts to local Landscape Character are expected to remain High-Negative*** for the duration of the project.

As this project is the first of its kind located in this scenic area, long term risks to the landscape resources need to be considered. The local landscape character is rated High for scenic quality and landscape character due to the many large rocky outcrops, the arid terrain and dune fields. These landscape elements create a unique sense of place that does add value to the area and creates an opportunity for eco-tourism. An eco-tourism activity is taking place to the north of the site but is located outside of the project Zone of Visual Influence. The assessment found that there ***is value in the No-Go Option***, in terms of maintaining existing landscape resources in an area where the existing sense of place is strongly associated with a natural / wilderness sense of place. However, the remoteness of the locality is likely to be a factor in limiting the full potential of the visual resources for eco-tourism.

As the site does fall within the Gazetted REDZ 7 area, the No-Go option is not considered, but potential negative cumulative risks to regional landscape character have been riased should this development set a precedent for further PV developent in the area. Mitigations have been defined to minimise the visual intrusion of the project. Mitigation also requires the removal of the proposed power line should this infrastructure not be required post-closure.

2 INTRODUCTION

Visual Resource Management Africa CC (VRMA) was appointed by Aurecon South Africa (Pty) Ltd to undertake a ***Visual Impact Assessment*** for the proposed Veld PV South Facility. A site visit was undertaken on the 2th / 3rd of November 2016.

The Proponent proposes to develop three solar sites on two farms, Naroep (Remainder of Farm no. 45) and Haramoep (Remainder of Farm no. 53) approximately 20 km north-west of Aggeneys in the Northern Cape. The solar farms would consist of one concentrated solar power facility (CSP) and two photovoltaic (PV) energy facilities and associated infrastructure which would have a maximum generation capacity of up to 150 MW for the CSP and 75 MW each for the PV with a combined generation capacity of up to 300 MW. The development has been designed with the intention that the solar farms would make up a consolidated development, known as 'the proposed Namakwa 300 MW Combined Solar Technology Facility', and would utilise shared infrastructure where possible to minimise their overall footprint and associated impacts.

The following farm portions are included in the proposed PV South assessment area:

Table 1: Property Name per Proposed Development Type

Development	Property Name	SG Number
Veld PV South	Haramoep	C05300000000005300000

2.1 Terms of Reference

The scope of this study is to cover the entire proposed project area and the terms of reference for the study are as follows:

- Collate and analyse all available secondary data relevant to the affected proposed project area. This includes a site visit of the full site extent, as well as of areas where potential impacts may occur beyond the site boundaries.
- Consider all cumulative effects in all impact reports.
- Specific attention is to be given to the following:
  - Quantifying and assessing existing scenic resources/visual characteristics on, and around, the proposed site.
  - Evaluation and classification of the landscape in terms of sensitivity to a changing land use.
  - Determining viewsheds, view corridors and important viewpoints in order to assess the visual impacts of the proposed project.
  - Determining visual issues, including those identified in the public participation process.
  - Reviewing the legal framework that may have implications for visual/scenic resources.
  - Assessing the significance of potential visual impacts resulting from the proposed project for the construction, operation and decommissioning phases of the proposed project.
  - Assessing the potential cumulative impacts associated with the visual impact.
  - Identifying possible mitigation measures to reduce negative visual impacts for inclusion into the proposed project design, including input into the Environmental Management Programme (EMPr).

2.2 Assumptions and Limitations

- Although every effort to maintain accuracy was undertaken, as a result of the Digital Elevation Model (DEM) being generated from satellite imagery and not being a true representation of the earth's surface, the viewshed mapping is approximate and may not represent an exact visibility incidence.
- The use of open source satellite imagery was utilised for base maps in the report.
- The viewsheds were generated using ASTER elevation data. (NASA, 2009)
- Some of the mapping in this document was created using Bing Maps (previously *Live Search Maps*, *Windows Live Maps*, *Windows Live Local*, and *MSN Virtual Earth*) and powered by the Enterprise framework.
- Determining visual resources can be a subjective process where absolute terms are not achievable. Evaluating a landscape's visual quality is complex, as assessment of the visual landscape applies mainly qualitative standards. Therefore, subjectivity cannot be excluded in the assessment procedure (Lange, 1994). The project deliverables, including electronic copies of reports, maps, data, shape files and photographs are based on the author's professional knowledge, as well as available information.
- VRM Africa reserves the right to modify aspects of the project deliverables if and when new/additional information may become available from research or further work in the applicable field of practice, or pertaining to this study.

2.3 Visual Impact Methodology Summary

The process that VRM Africa follows when undertaking a VIA is based on the United States Bureau of Land Management's (BLM) Visual Resource Management method (USDI., 2004). This mapping and GIS-based method of assessing landscape modifications allows for increased objectivity and consistency by using standard assessment criteria.

The VRM process involves the systematic classification of the broad-brush landscape types within the receiving environment into one of four VRM Classes. Each VRM Class is associated with management objectives that serve to guide the degree of modification of the proposed site. The Classes are derived by means of a simple matrix with the three variables being the scenic quality, the expected receptor sensitivity to landscape change, and the distance of the proposed landscape modification from key receptor points. The Classes are not prescriptive and are utilised as a guideline to determine visual carrying capacity, where they represent the relative value of the visual resources of an area. Classes I and II are the most valued, Class III represents a moderate value; and Class IV is of least value.

To determine impacts, a degree of contrast exercise is required. This is an assessment of the expected change to the receiving environment in terms of the form, line, colour and texture, as seen from the surrounding Key Observation Points. This is to determine if the proposed project meets the visual objectives defined for each of the Classes. If the expected visual contrast is strong, mitigations and recommendations are made to assist in meeting the visual objectives. To assist in the understanding of the proposed landscape modifications, visual representation, such as photomontages or photos depicting the impacted areas, can be generated. There is an ethical obligation in the visualisation process, as visualisation can be misleading if not undertaken ethically.

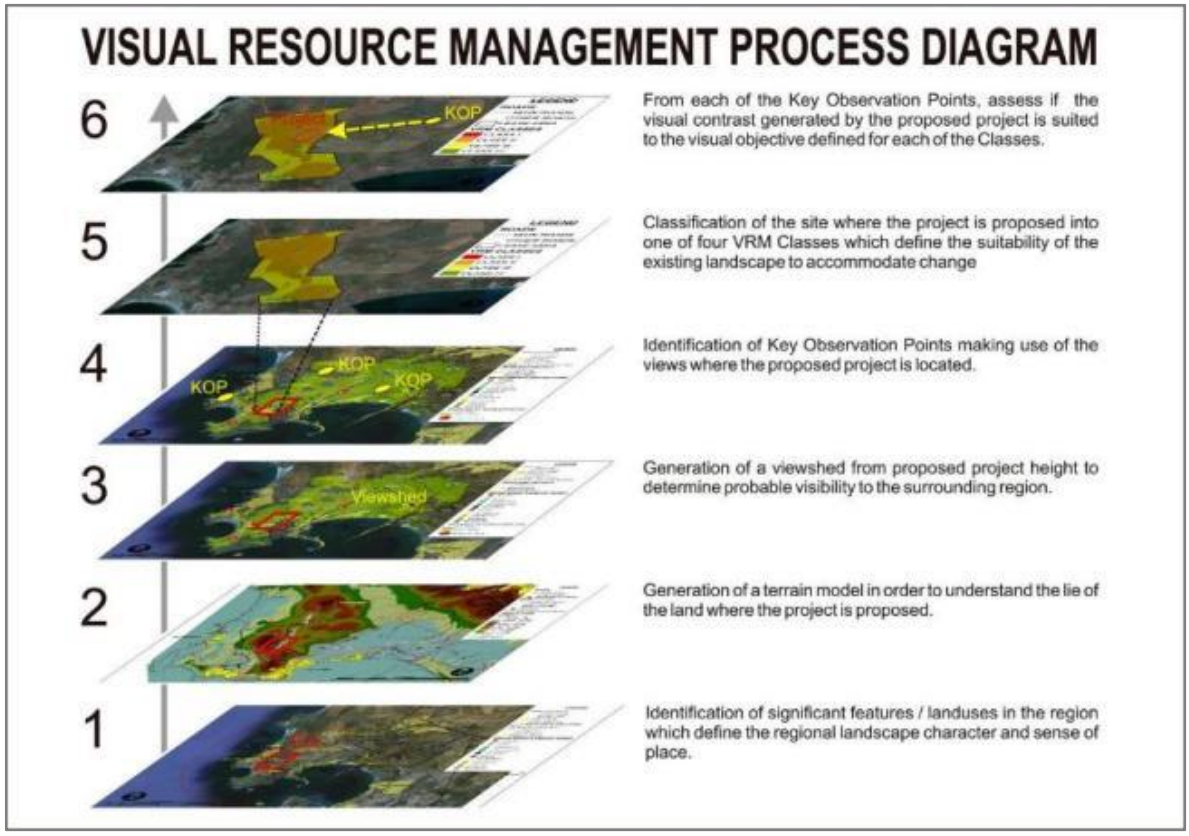

Figure 1: VRM process diagram

3 PROJECT DESCRIPTION

Aurecon provided the following project description for an area covering a footprint of approximately 300 ha. The proposed project will include the following components:

- Numerous arrays of PV solar panels;
- Internal access roads;
- An operations and maintenance building;
- A temporary laydown area;
- An on-site substation, including switching yard;
- Internal cabling laid underground when feasible;
- Site access mostly via existing road (widened to 6 m); and
- A loop in loop out line would be built between the facility and an existing 220 kV transmission line to the south west, approximately 2-3 km m in length, or;
- A grid

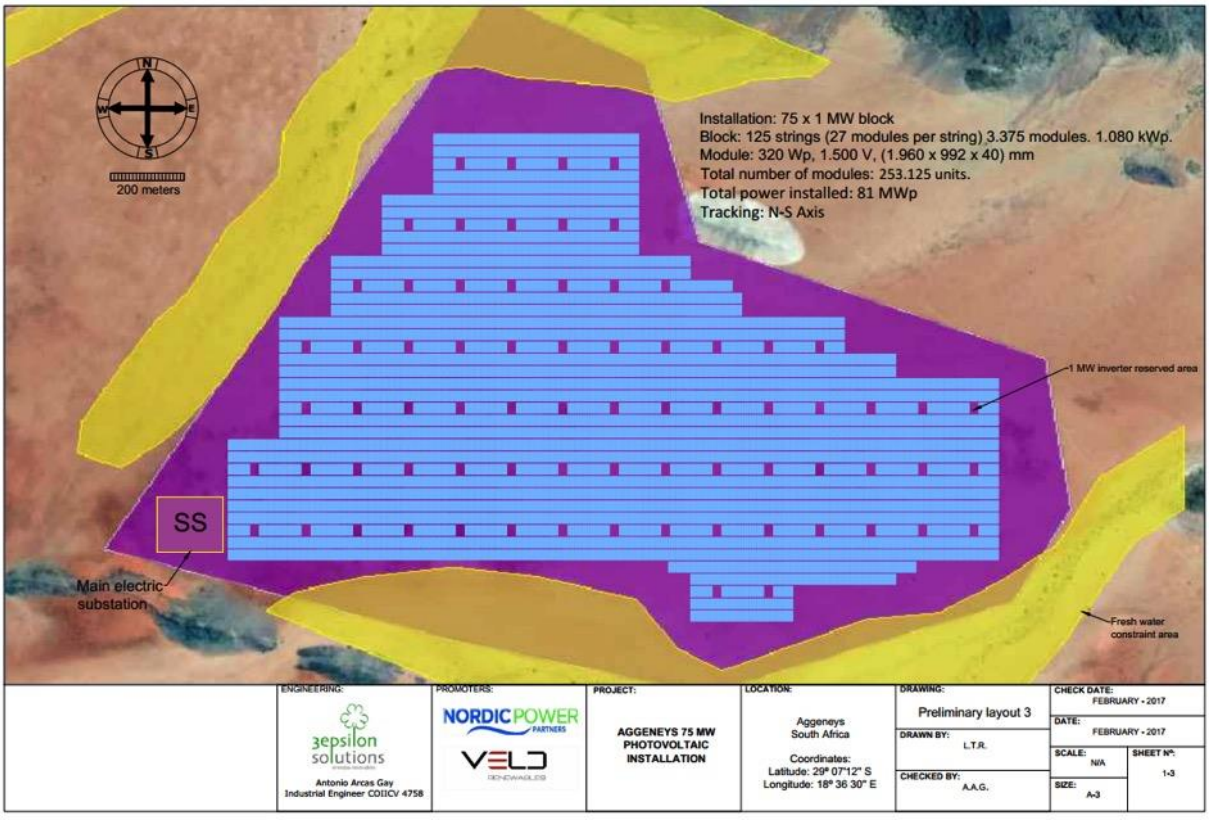

Figure 2: Veld PV South: Proposed preliminary layout

3.1 Photovoltaic Technology

For the proposed ***Photovoltaic Technology*** single axis tracking and fixed access technology was assessed. In single axis tracking technology, the PV panels are mounted in rows aligned north to south. The PV panel is controlled via motors to track the sun from east to west. In fixed axis, the PV panels are mounted onto stationary structures and the panels would all face to the north.

Figure 3: Photographic example of a Single Access Tracking PV technology (Solar Professional)

3.2 Proposed Road Access and Grid Connection

No alternative for road and grid access is proposed. The road access following the existing 40km farm road that connects to the property to the N14 National Road. No alternatives for the grid connection are proposed and 24.6km grid connection is proposed that following the existing 220kV Eskom power line to the substation south of Aggeneys.

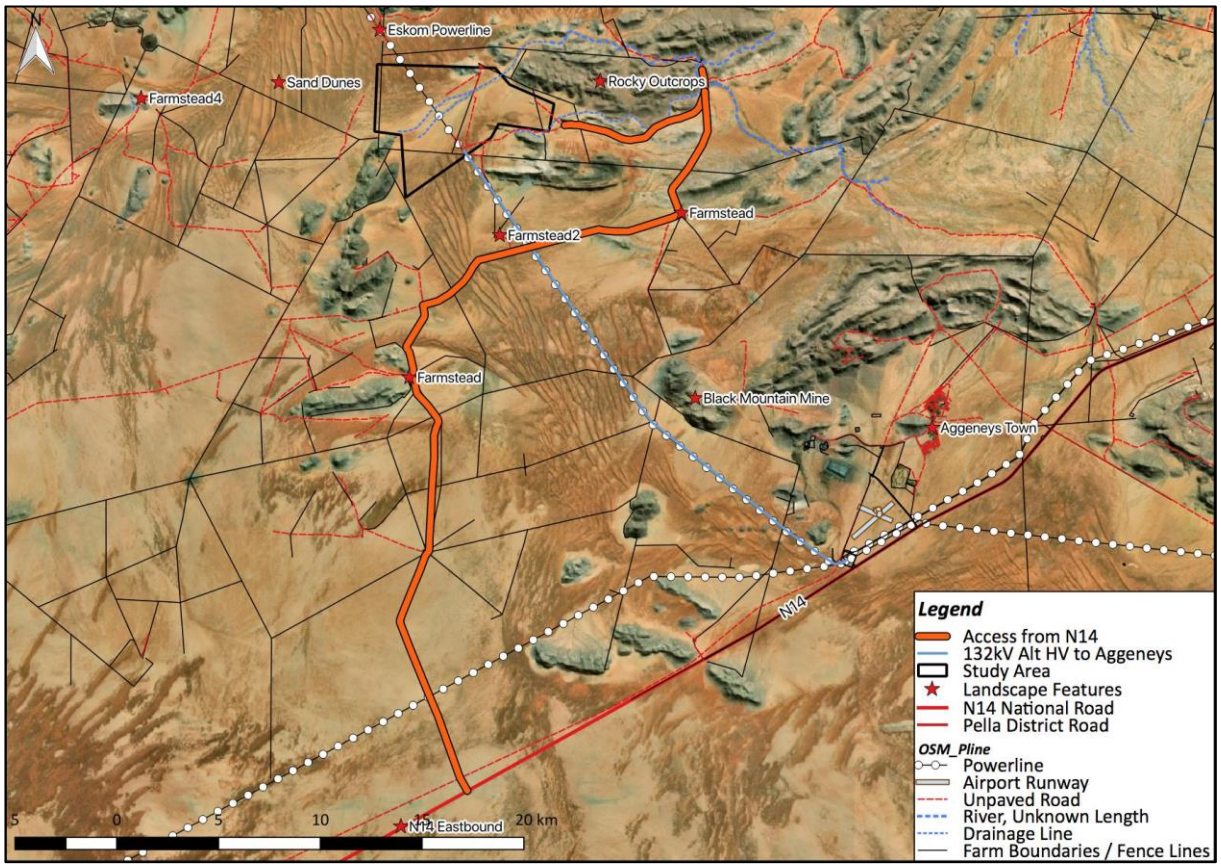

Figure 4: Road access and grid connection routing map

3.3 Legislative and Planning Context

In order to comply with the Visual Resource Management methodology, it is necessary to clarify which planning policies govern the proposed property area to ensure that the scale, density and nature of activities or developments are harmonious and in keeping with the sense of place and character of the area. The proposed landscape modifications must be viewed in the context of the planning policies from the following organisations guidelines:

3.3.1 *The Draft Strategic Environmental Assessment Department of Environmental Affairs Guidelines for Solar and Wind Energy Negative Mapping Document*

According to the draft negative mapping undertaken for the Solar and Wind Energy Strategic Environmental Assessment (SEA) conducted by the CSIR for the Department of Environment Affairs (DEA), the following distance criteria were recommended as road buffers for proposed wind and solar projects. (Department of Environment Affairs, 2013)

Roads

Attributes	Wind Buffer	Solar Buffer
Major Roads (national, arterial, main)	500m	500m
Secondary Roads (secondary)	500m	500m
Tourist Routes (WC)	2km	2km

Source: DRDLR 50k Topo, 2006

3.3.2 *International Finance Corporation (IFC)*

The IFC prescribes eight performance standards (PS) on environmental and social sustainability. The first is to identify and evaluate the environmental and social risks and impacts of a project, as well as to avoid, minimise or compensate for any such impacts. Under PS 6, ecosystem services are organised into four categories, with visual / aesthetic benefits falling into the category of cultural services, which are the non-material benefits people obtain from ecosystems. (IFC, 2012)

In particular, the General Note 17 identify that “the intention of the requirement is that clients identify project-related impacts, especially those on habitat connectivity and/or on downstream catchment areas, outside the boundaries of the project site. ***Landscape/seascape analysis is a fundamental step in determining ecologically-appropriate mitigation options that align with broader conservation efforts in the region.*** Such analyses support decision-making as to whether impacts should be avoided or are appropriate for offsets, and support the selection and design of a mitigation strategy, including offset mitigation, that contributes to regional-level conservation goals rather than solely site-level impacts”. (IFC, 2012)

3.3.3 *DEA&DP Guideline for involving Visual and Aesthetic Specialists in EIA Processes*

The Western Cape Department of Environmental Affairs and Development Planning (DEA&DP) Guideline for involving visual and aesthetic specialists in EIA processes is applicable. This states that the Best Practicable Environmental Option (BPEO) should address the following:

- Ensure that the scale, density and nature of activities or developments are harmonious and in keeping with the sense of place and character of the area. The BPEO must also ensure that development must be located to prevent structures from being a visual intrusion (i.e. to retain open views and vistas).
- "Long term protection of important scenic resources and heritage sites.
- Minimisation of visual intrusion in scenic areas.
- Retention of wilderness or special areas intact as far as possible.
- Responsiveness to the area's uniqueness, or sense of place." (Oberholzer, 2005)

3.3.4 *Renewable Energy Development Zones (REDZs)*

A SEA commissioned by the Department of Environmental Affairs, undertaken by the CSIR, identified draft Renewable Energy Development Zones (REDZs). These proposed geographical areas were identified in which "wind and solar PV development projects will have the lowest negative impact on the environment while yielding the highest possible social and economic benefit to the country". (Department of Environment Affairs, 2013) The proposed Veld PV South site falls into the proposed REDZ Area 8.

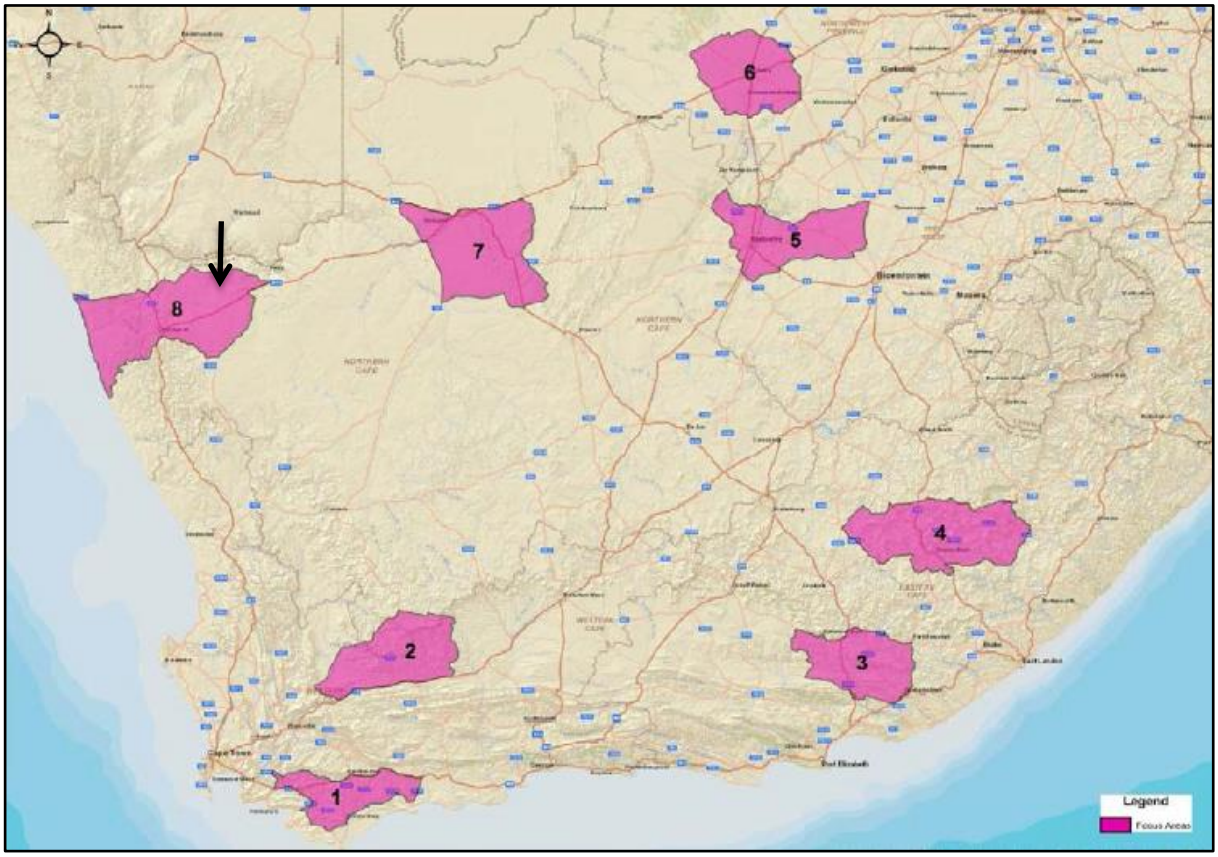

Figure 5: Renewable Energy Development Zones (REDZs) map with the approximate location of the proposed project indicated. (Department of Environment Affairs, 2013)

3.3.5 *Khâi-Ma Municipality Integrated Development Plan (2012)*

The proposed facility is located within the Khâi-Ma Municipality. The report identified the following current Challenges and Dilemmas for Local Economic Development (LED) in Khâi-Ma:

- "The shortage of appropriate labour skills in the area is a central constraint to investment and development;
- The economic and cash flow situation of the Municipality is under pressure at present. The necessary steps and precautionary measurements should be identified and implemented".

The report identified the importance of tourism in terms of Local Economic Development (LED) Opportunities in Khâi-Ma stating, "The Municipality should develop and implement an aggressive marketing strategy. Tourism opportunities should be packed and marketed accordingly. New Tourism Opportunities should be explored and communicated through the LED forum. The report also highlights the importance that development orientation of the municipality needs to be more closely aligned with the "corridors of development" identified in the IDP of the district. "Possibly, more direction and strategic planning needs to take place with other municipalities and the district to better enhance Khâi-Ma's position on the N14 route. Likewise, the Orange River, like the N14, provides a potential corridor of both agricultural and tourism development. While this may suggest more investment from outside government, the municipality should look to providing a better business-enabling environment to promote such investments". (Page 61)

In Chapter 6.1.7 the following Environmental Conservation Zones are identified:

- The wilderness area along the Orange River, including the Dabenoris Berge and Groot Pella Mountains forming a continuous ecological unit along the Orange River.
- A corridor of mountainous and ecologically sensitive areas stretching from the Groot Pella Mountains to Pofadder and further south east.
- Another east-west ecological corridor stretching from Aggeneys to the eastern boundary of Khâi-Ma including Aggeneys, Gamsberg and Namies Mountains.
- Orange River, Kaboep, Koa River valley and different drainage line types important for ecological processes. Rivers and associated riparian vegetation form important biodiversity corridors and should therefore be protected from human settlement.
- Wetlands located along the Orange River and non-perennial pans located to the south along the R358 road.

3.3.6 *BirdLife South Africa Haramoep & Black Mountain Mine Important Bird and Biodiversity Area (Birdlife South Africa)*

BirdLife South Africa has identified the area where the development is proposed as the Haramoep & Black Mountain Mine Important Bird and Biodiversity Area (IBA). The BirdLife South Africa website identifies the importance of the area for birdlife as well as biodiversity. The website indicates that "approximately 35 threatened, rare and endemic plant species occur in the IBA, most of which are dwarf succulents and geophytes. There are two known populations of the near-endemic halfmens *Pachypodium namaquanum*, as well as many quiver trees *Aloe dichotoma* (Vulnerable)". (Birdlife South Africa)

4 BASELINE

4.1 Broad Brush Landscape Context

4.1.1 *Locality*

The proposed development site is located in the Northern Cape Province, Namakwa District Municipality and within the Khâi-Ma Local Municipality. The remoteness of the locality is depicted in Figure 5 below, with the proposed project located 30km to the northwest of the town of Aggeneys, and approximately 30km to the south of the Orange River which is the international boundary between South Africa and Namibia. The area is characterised by an arid landscape of extensive sandy and gravel plains, with sparse vegetation, surrounding inselbergs and rocky outcrops. The Digital Elevation Model of the surrounding area (Figure 6) depicts the rugged and rocky terrain area along the Orange River which has been eroded to form Inselbergs and rocky outcrops that create interesting landforms. The gravel plains can be covered by sparse dwarf shrubs and short bushman grasses, and riverbeds support some woody vegetation. Scenic features of this arid environment are sand dunes with their linear wind shaped landforms. The overall landscape in the surrounding areas is very picturesque, offering potential for eco-tourism, as identified in the Khâi-Ma Local Municipality IDP.

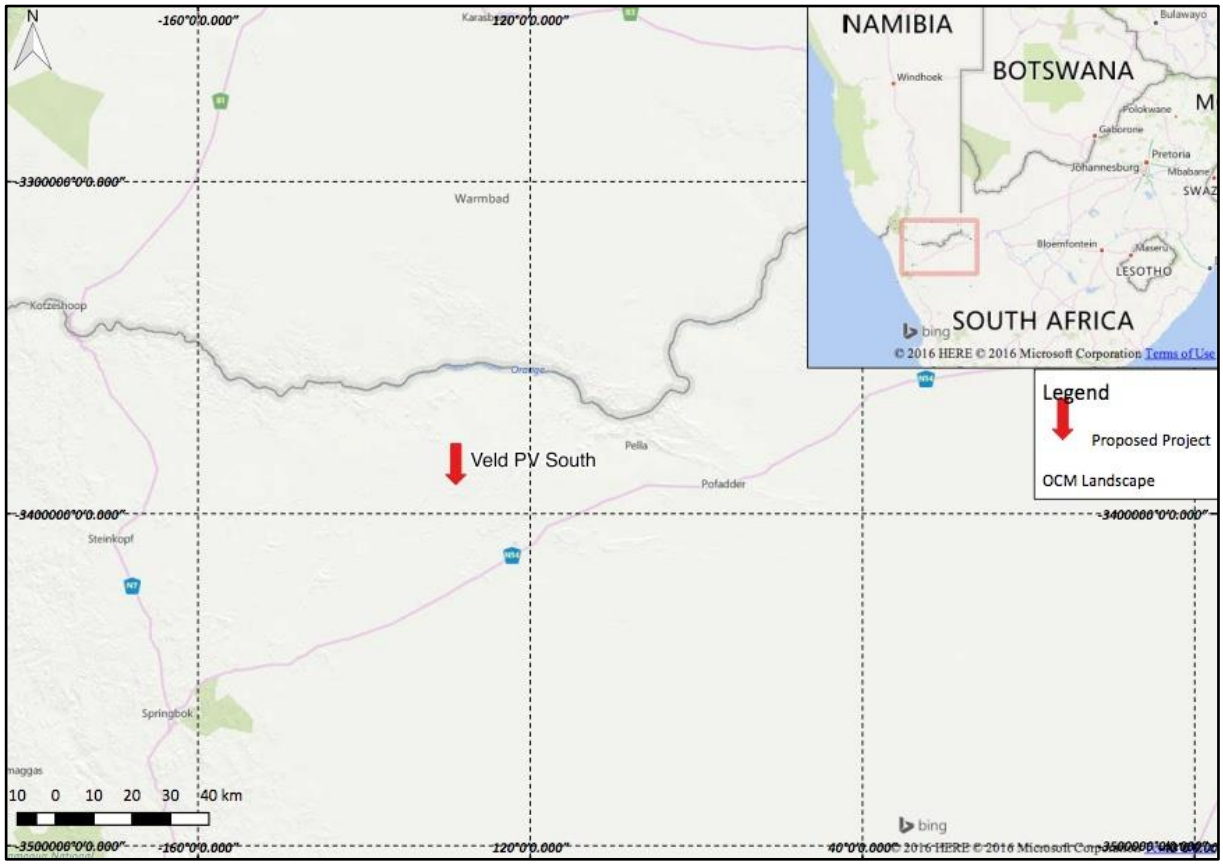

Figure 6: Regional locality map.

4.1.2 *Regional Landscape Topography*

The key topographic feature in the region is the Orange River Valley which is located approximately 30km to the north of the proposed site. The river system has cut away the surface geology exposing rough and textures rocky outcrops on either side of the river valley. Some higher terrain is located to the east of the site which is strongly undulating and would limit visibility from south-eastern receptors. The overall terrain is relatively flat but with rocky outcrops and small hills defined as strong landforms.

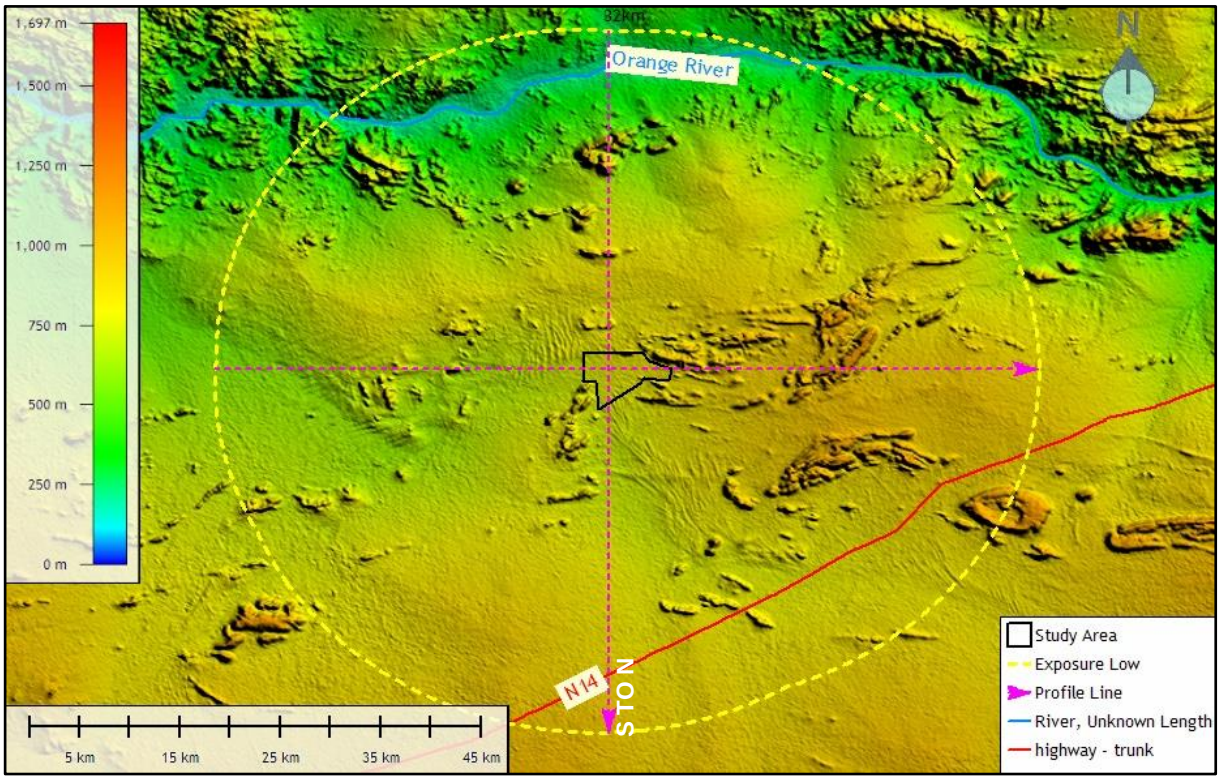

Figure 7: Regional Digital Elevation Model Map.

Figure 7 (below) is the profile line reflecting the elevations from west to east through the proposed southern study area (note that this included a wider study area incorporating Veld PV South and Veld Nama Sun). Elevations range from 600 metres above mean sea level (mamsl) in the west, to a high of 750 mamsl in the east. The proposed development site is located approximately within the 750 to 760 mamsl elevation range. The aspect is to the west and the gradient shallow. Along this axis, mountain and hill topographic screening is clearly visible to the east that is of a sufficient size and scale to result in significant topographic screening. In areas to the west where topographic screening is not apparent, the viewshed is likely to extend into the Middleground distance zones should the proposed project heights extend above local topographic features.

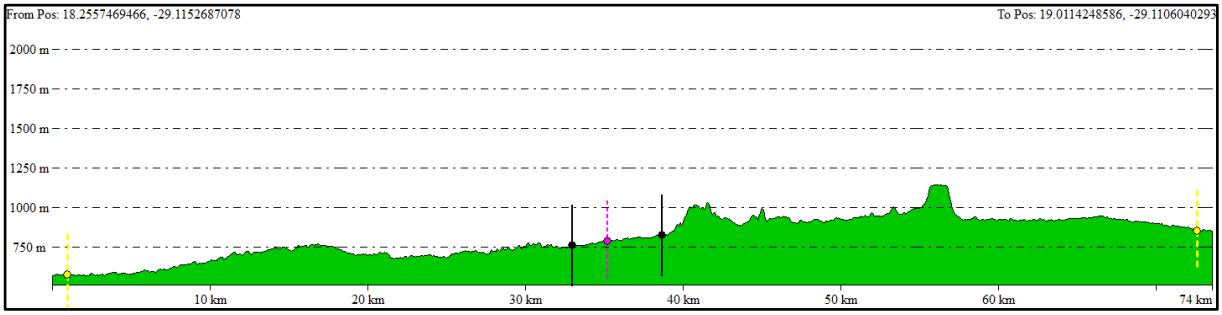

Figure 8: West to East Terrain Profile Graph

The North to South Elevation Profile (Figure 8) reflects the elevations across the north to south axis. Along this axis, the elevation high is to the south at just under 800 mamsl, with the elevation low being to the north at the Orange River, with an elevation low of less than 250 mamsl. The site aspect is to the north with the proposed site elevation ranging from 760 to 750 mamsl. The slight rise in elevation to the north would offer some constraint of the Zone Of Visual Influence, but the dropping off in elevation towards the south, would open up views from the southern areas.

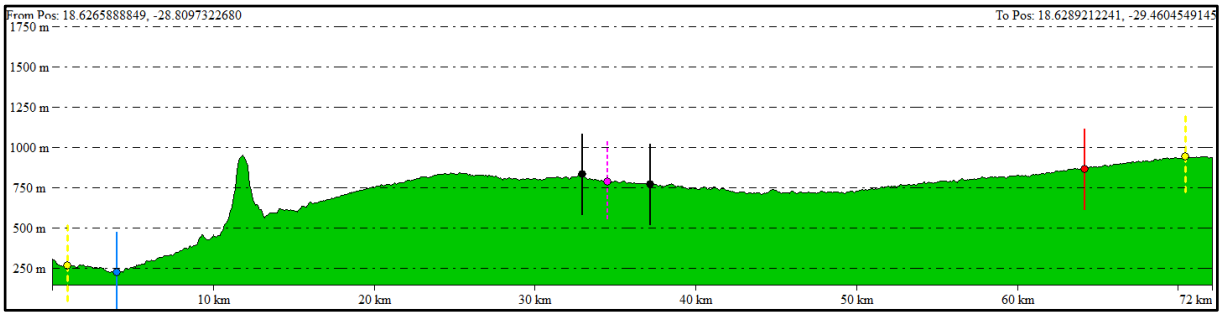

Figure 9: North to South Terrain Profile Graph

4.1.3 *Vegetation*

According to the South African National Biodiversity Institute (SANBI) 2012 Vegetation Map of South Africa, Lesotho and Swaziland, the vegetation biome is described as Nama-Karoo. (South African National Biodiversity Institute, 2012) The Nama-Karoo Biome "occurs on the central plateau of the western half of South Africa, at altitudes between 500 and 2000m, with most of the biome failing between 1000 and 1400m. It is the second-largest biome in the region". The website indicates that the vegetation distribution of this biome is determined primarily by rainfall which "rain falls in summer, and varies between 100 and 520mm per year. This also determines the predominant soil type - over 80% of the area is covered by a lime-rich, weakly developed soil over rock. Although less than 5% of rain reaches the rivers, the high erodibility of soils poses a major problem where overgrazing occur. The dominant vegetation is a grassy, dwarf shrubland. Grasses tend to be more common in depressions and on sandy soils, and less abundant on clayey soils". (Plantzafrica) The SANBI website indicates that the site could include Bushmanland Arid Grassland. This would need to be confirmed by the botanical specialist.

Vegetation screening in this biome is likely to be very limited and would not restrict the proposed project Zone of Visual Influence (ZVI). The use of vegetation as a potential project mitigation screening is limited, as the high temperatures and low rainfall of the area would not

be conducive to tree screening growth. The growth of trees would also create contrast, as the trees would look un-characteristic in the Nama-Karoo and Desert cultural landscapes.

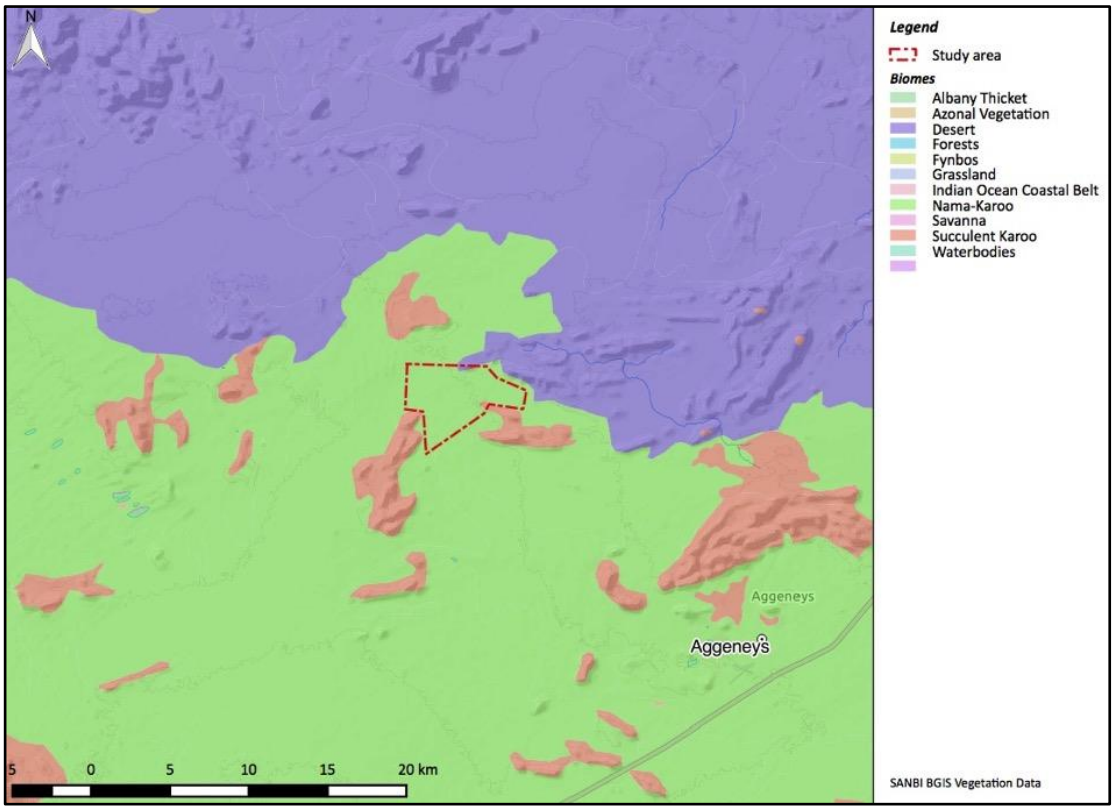

Figure 10: Vegetation Biome Map (South African National Biodiversity Institute, 2012)

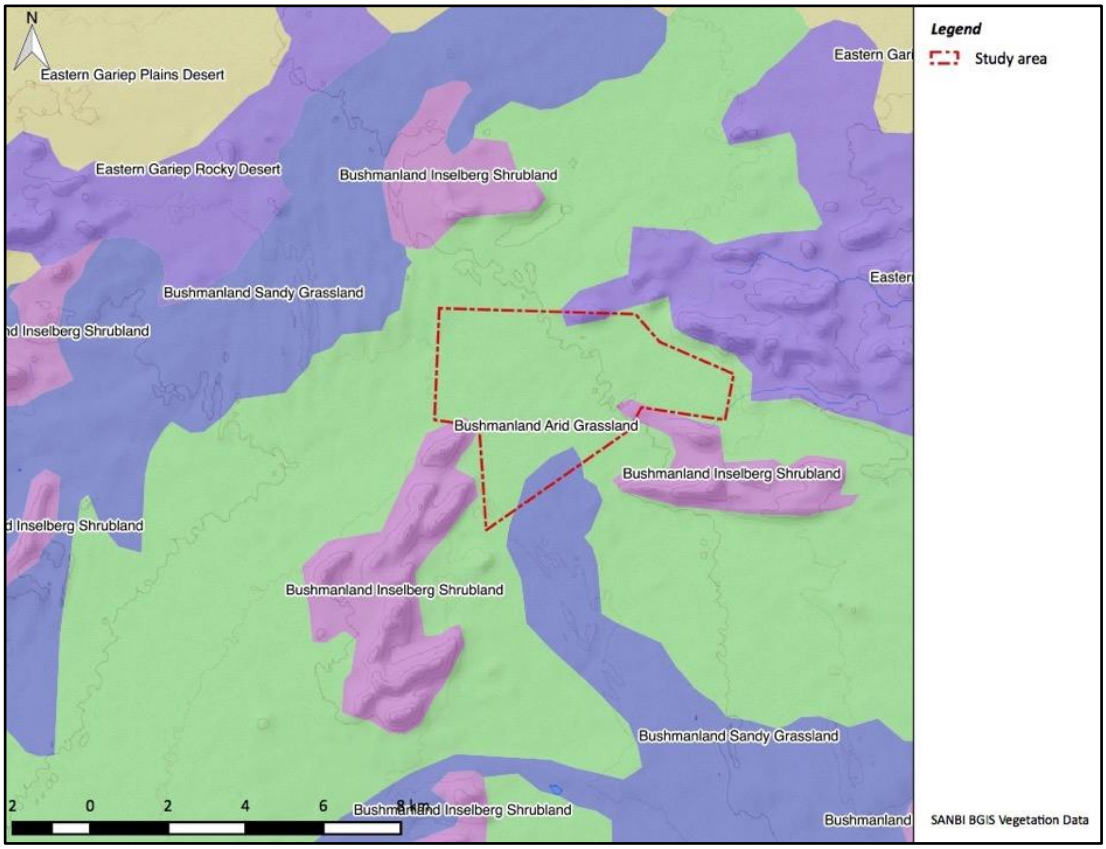

Figure 11: Vegetation Type Map (South African National Biodiversity Institute, 2012)

4.1.4 *Other Renewable Energy Projects*

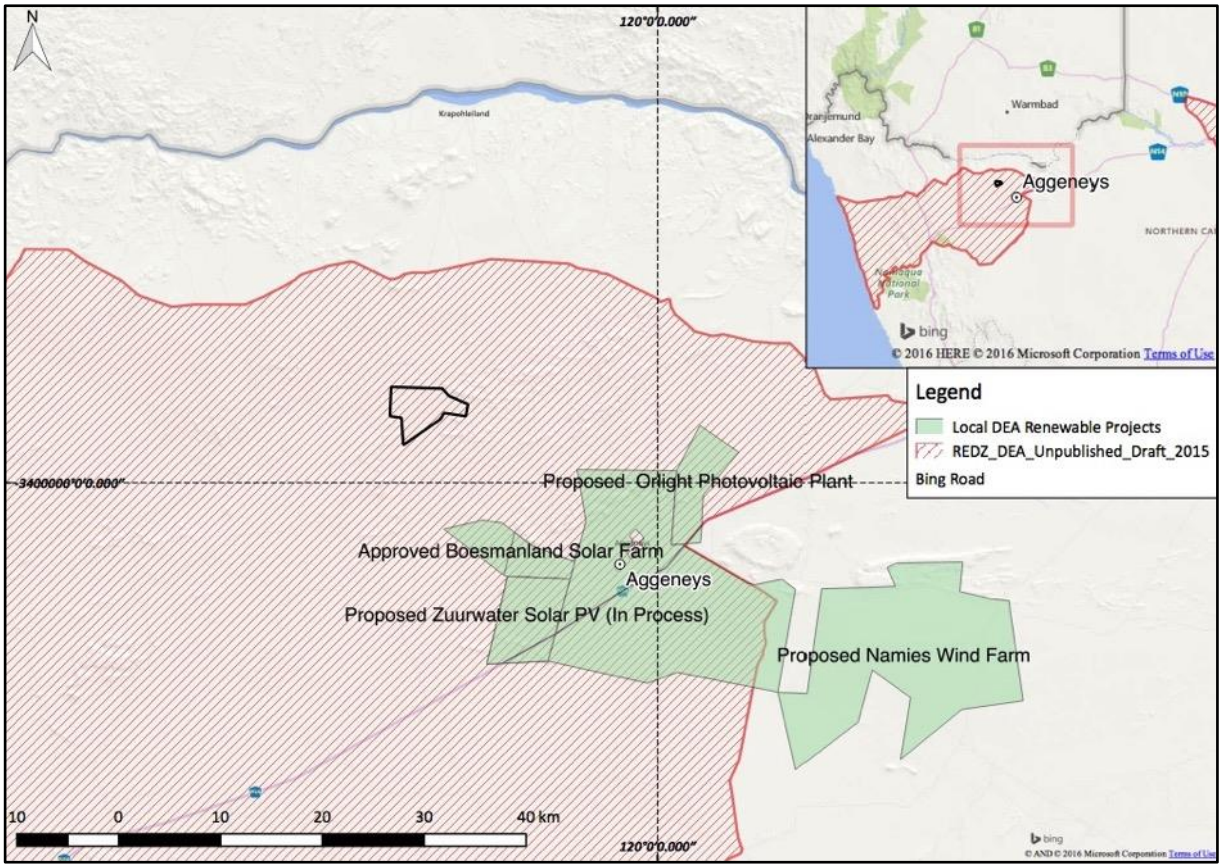

Figure 12: Map depicting the 2017 Gazetted DEA Renewable Energy mapping in relation to the approximate development area.

As identified in the map above, six other renewable energy projects located within the Aggeneys vicinity and its proximity to the Aggeneys Eskom Substation. Listed on the DEA database within the immediate vicinity are the following projects:

- Approved Boesmanland Solar Farm
- Approved Black Mountain Solar Farm
- Proposed Orlight Solar Farm
- Proposed Zuurwater solar Farm (3 phases)
- Proposed Namies Wind Farm

Due to the predominance of the inselbergs in the area, it is likely that the Zone of Visual Influence of the proposed and approved developments around the town of Aggeneys would not extend to these proposed development sites which are located approximately 10km to the northwest. The site visit to the proposed development areas found that as yet, no construction of the proposed solar energy developments has taken place. All the projects are listed as having 'Non Preferred Bidder' status, which increases the likelihood of the proposed developments not taking place. It must also be noted that a Phase 2 REDZ Strategic Environmental Process is currently taking place. The preliminary mapping for the Phase priority areas does not include the proposed development area, which is excluded in the Features of Critical Importance mapping. As this is in draft form, the 2017 Gazetted REDZ areas still refer.

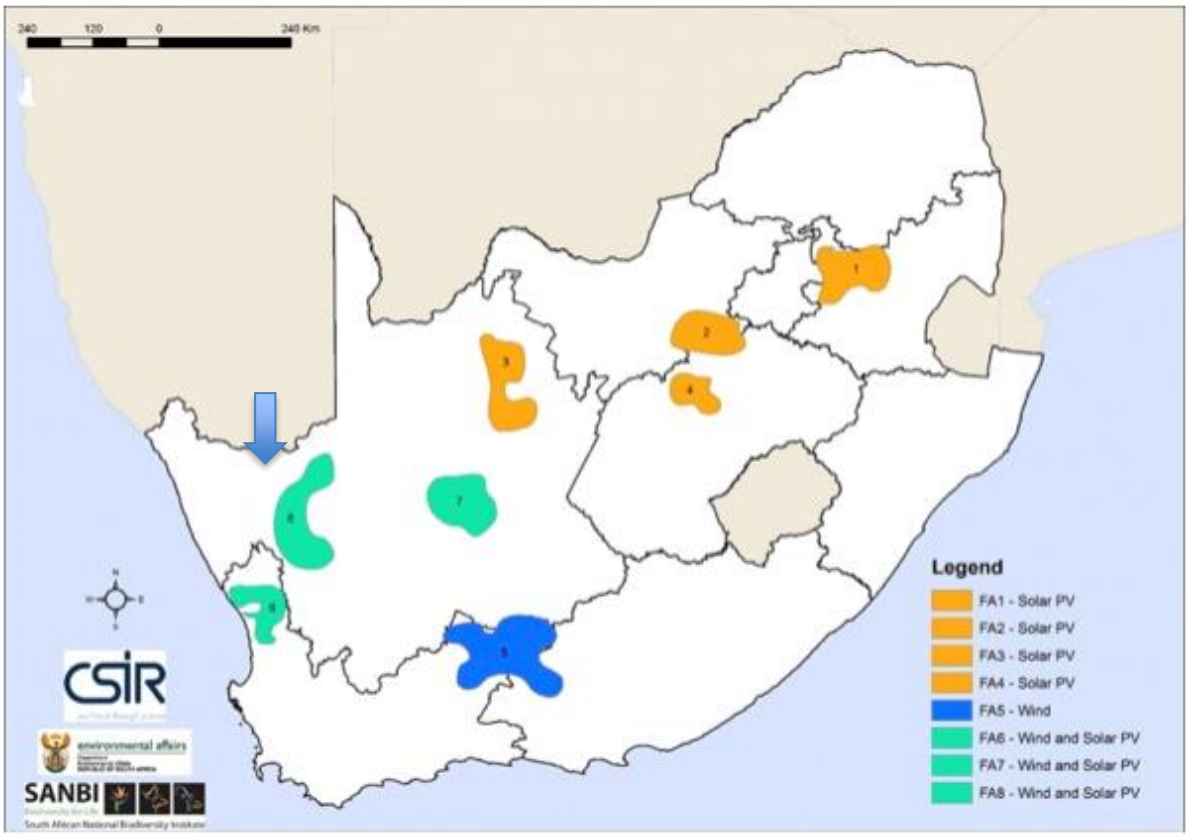

Figure 1: Phase 2 Wind and Solar PV SEA Draft Focus Areas

Figure 13: Map depicting CSIR Phase 2 Wind and Solar SEA Draft Focus Areas Map with the approximate location of the proposed development area ((DEA, 2019)

4.1.5 *Key Landmarks and Infrastructure*

Due to the arid climate and regional isolation, development in the surrounding areas has been limited and mainly characterised by low intensity farming. The main road infrastructure is the N14 that is located approximately 25km to the south-east of the proposed study area. This road is an important regional route, connecting the towns of Upington in the east, and Springbok in the west. The road was identified in the Local Municipality IDP as an important tourist development route. Due to the weighted importance of this road in the IDP, as well as the high scenic quality along the route, the N14 should be considered as a tourist view corridor.

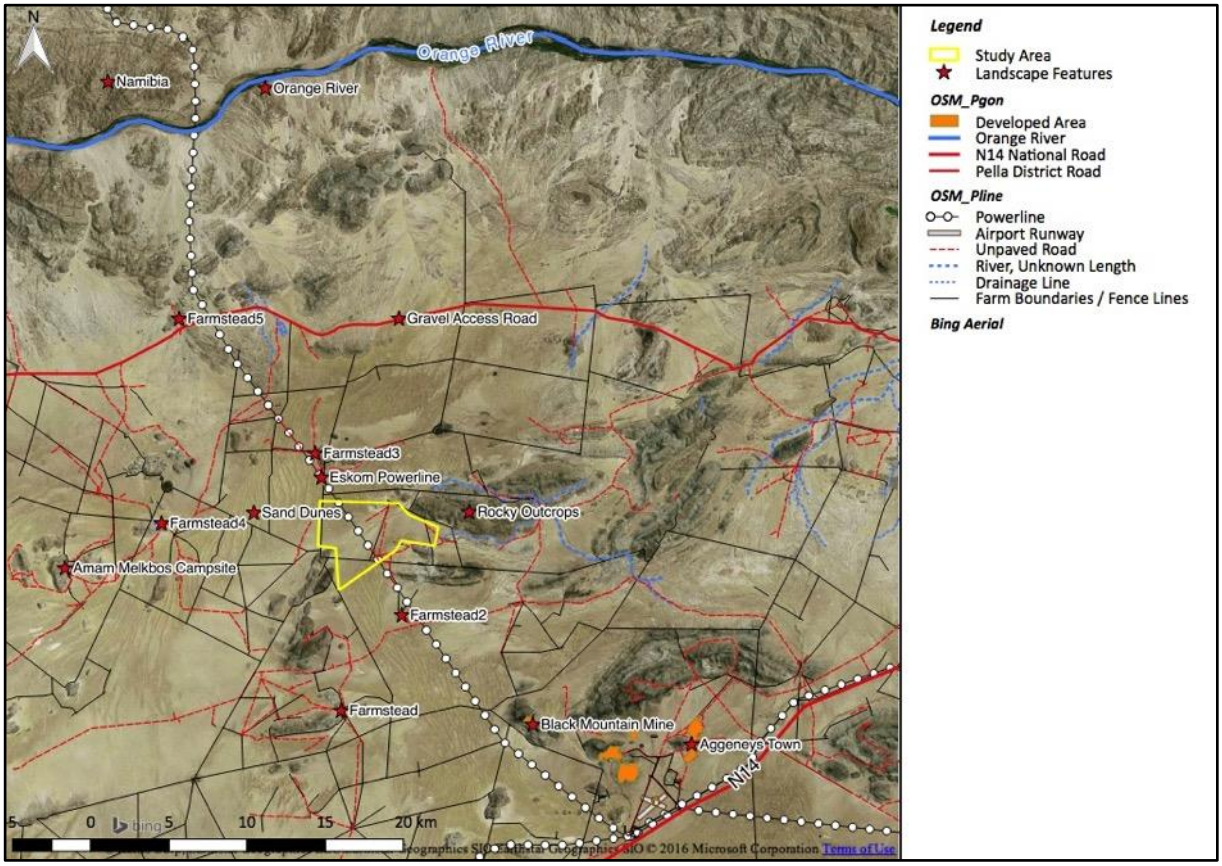

Figure 14: Key Landmarks and Infrastructure Map

Figure 15: Photograph of the N14 National Road northbound just before Aggeneys town.

The only other district road is located to the north of both the northern and southern proposed sites. This gravel road starts in the Pella area in the east, follows the Orange River before diverting to the south to the town of Springbok. Due to the remoteness of the location, users of this road would be mainly rural farmers, and would carry very little traffic. However, this road is routed along the Orange River Valley through areas of high scenic quality and as such has been identified in the Local Municipal IDP as a potential tourist development area. Currently there is one eco-tourism activity in the area which caters for camping and 4 * 4 activities called Amam 4 * 4. This Dune Trails 4 * 4 route and Melkbos Camp Site currently uses the farm road that is routed through the proposed Veld PV North site for access.

Figure 16: Amam 4 * 4 signage at the location of the proposed Veld PV North site.

Figure 17: Photograph of the northern gravel road travelling westbound.

Other linear infrastructure includes farm tracks, as well as four Eskom Power Lines that converge at the Aggeneys Substation. One of the 220kV lines is routed through the proposed development nodes, and would influence the local sense of place to some degree. However, this landscape is also of value as the power line contrasting to the stark desert-scapes of the dunes still creates an interesting, high scenic quality landscape as depicted below.

Figure 18: Photograph of the Eskom 220kV power line as seen from the proposed southern CSP site.

The other important land uses in the area include the Black Mountain Mine located at Aggeneys and farming. The mine was established in 1976 to extract zinc / lead / copper / silver minerals. The town of Aggeneys was built to house local labour. Due to the inselbergs surrounding the mine site, the zone of visual influence of the mine landscape is localised, with the tailings dam being the most dominating feature as seen from the N14 National Road. The mine zone of visual influence does not extend to the proposed development area, which results in a sense of place which is strongly characterised by desert wilderness with high scenic quality, which is identified in the Local Municipality IDP as having potential for eco-tourism.

Figure 19: Photograph of the Eskom substation and town of Aggeneys as seen from the N14 National Road south of Aggeneys.

Five farmsteads were identified in the surrounding landscapes. These landscapes usually comprised a few dwellings, some shade trees and water reservoirs. Located against the backdrop of the rocky outcrops and inselbergs, these cluster of dwellings make for an interesting farm setting and do not detract from the overall landscape character.

Figure 20: Photograph of the rural farmstead cluster of dwellings surrounded by small shade trees.

In conclusion, although the area does carry some modified landscapes such as the 220kV Eskom power line and the Black Mountain Mine, the Zone of Visual Influence of these man–made features is contained by the surrounding rocky outcrops. The resultant overview of the wide-open spaces of the Nama-Karoo, interspersed with the shifting sand dunes and rocky outcrops of the desert-scapes, creates an interesting and diverse landscape which has potential for tourism.

4.2 Project Visibility and Key Observation Points

The visible extent, or viewshed, is "the outer boundary defining a view catchment area, usually along crests and ridgelines" (Oberholzer, 2005). In order to define the extent of the possible influence of the proposed project, a viewshed analysis was undertaken from the proposed site at a specified height above ground level as indicated in the table below, making use of open source NASA ASTER Digital Elevation Model data (NASA, 2009). The extent of the viewshed analysis was restricted to a defined distance that represents the approximate Zone of Visual Influence (ZVI) of the proposed activities, which takes the scale, and size of the proposed projects into consideration in relation to the natural visual absorption capacity of the receiving environment. The maps are informative only as visibility tends to diminish exponentially with distance, which is well recognised in visual analysis literature (Hull & Bishop, 1988).

Table 2: Proposed Project Heights Table

Proposed Activity	Approx. Height (metres above ground level)	Probable Zone of Visual Influence (ZVI) (km)
PV Fixed	5	12
PV Single Axis	10	24

The Offset value for the proposed PV Technology was set at 5m – 10m above ground to represent the approximate height of the proposed PV panels, structures and internal power line structures. Due to the medium to low height of the proposed structures, the viewshed was constrained to 24km as it is unlikely that the ZVI would extend beyond this distance due to atmospheric influences. As indicated in Figure 19 below, the approximate viewshed of the

proposed PV facility viewshed is fragmented and patchy in coverage, extending mainly over the south-western extents due to raised ground and hilly terrain to the north and east. Within the immediate locality, total view incidence is likely within the Foreground 2km distance range. However, outside of this area, the undulating terrain fragments clear views of the 10m high structures, with limited view corridors forming between topographic features. Extended views into the Background would be limited, and are mainly concentrated to the south in small patches. Due to the fragmented nature of the expected viewshed due to the topographic screening created by the surrounding rocky outcrops, the ZVI of this proposed development alternative is rated as ***Medium to Low***.

Due to the remote nature of the area, exposure to receptors is limited. Within the High Exposure areas (2km) no permanent receptors were identified, but with a few local farmsteads located in the Medium to High Exposure (6km) Zone. Tourist receptors include the Amam Melkbos Campsite, but due to its location approximately 14km due west of the proposed development site, direct visibility of the 10m structure would be limited in the background distance with low exposure. It is unlikely that the N14 National Road receptors could fall within the visibility incidence. Due to the remoteness of the area, the Visual Exposure to the proposed 10m Trough Structures is described as ***Medium to Low***.

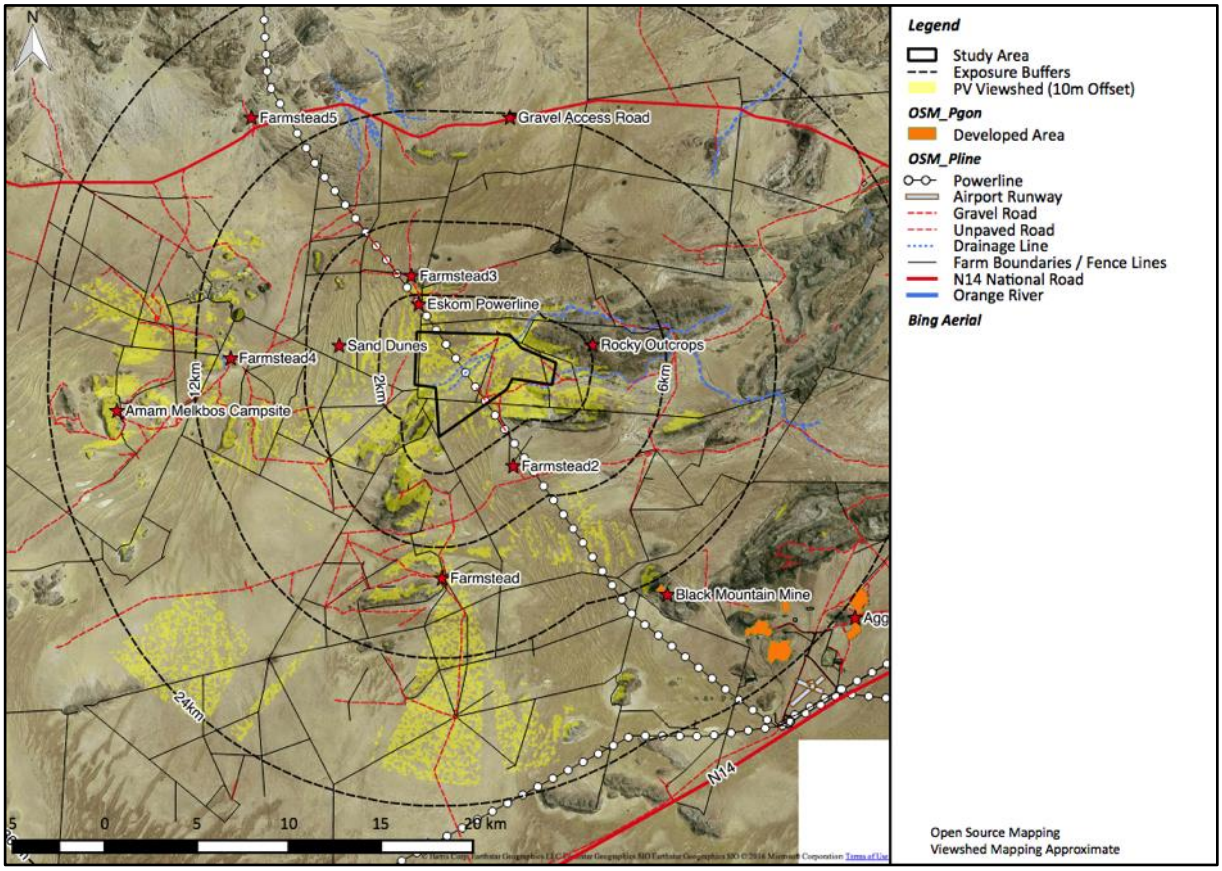

Figure 21: Proposed Veld PV South site approximate visibility map generated from a 10m Offset.

4.2.1 *Key Observation Points*

Key Observation Points (KOPs) are defined by the Bureau of Land Management (BLM) as the people (receptors) located in strategic locations surrounding the property that make consistent use of the views associated with the site where the landscape modifications are proposed. These locations are important in terms of the VRM methodology, which requires that the degree of contrast that the proposed landscape modifications will make to the existing landscape be measured from these most critical locations, or receptors, surrounding the property. The main receptors for this site, where clear views of the proposed project could result in a change to local visual resources, are:

- Local farmsteads;
- Local farm roads.

Figure 22: View towards the proposed development site which is located 12km in the background at the rocky hills as seen from the local farm road travelling northbound.

4.3 Visual Resource Management (VRM) Classes

In terms of the VRM methodology, landscape character is derived from a combination of scenic quality, receptor sensitivity to landscape change, and distance of the proposed landscape modification from key receptor points. These three criteria are rated in terms of the VRM scenic quality and receptor sensitivity questionnaires that are appended to this report as Annexure 3. The VRM Classes then defined are not prescriptive and are utilised as a guideline to determine the carrying capacity of a visually preferred landscape and to assess the suitability of the landscape change associated with the proposed project.

Based on the vegetation type as well as the photographs taken during the site visit of the proposed study area (depicted below), four landscapes were defined for the areas where development is proposed:

- Bushmanland Grasslands;
- Drainage lines;
- Dunefield;
- Rocky outcrops.

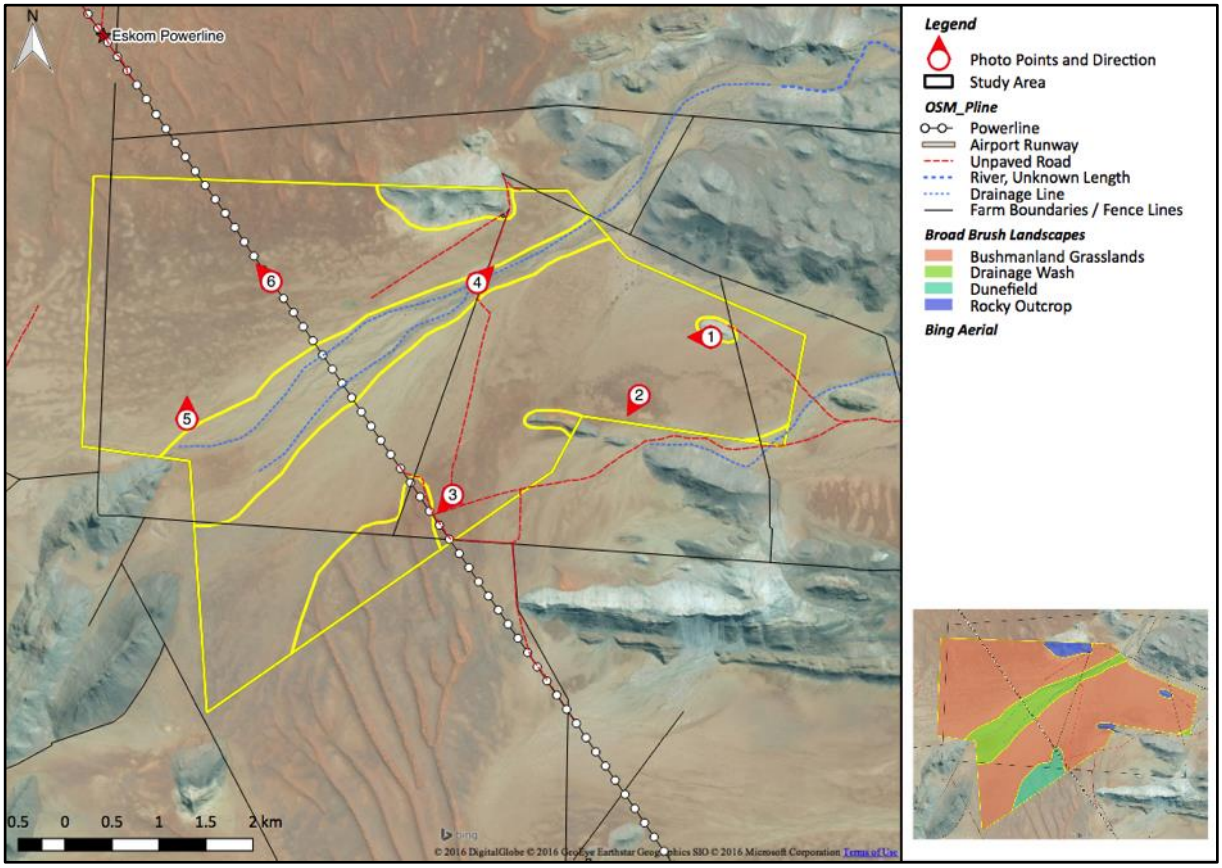

Figure 23: Southern study area broad brush landscapes and photograph points map

Figure 24: View west from Photograph 1 of the small rocky outcrop and the Bushmanland Grasslands.

Figure 25: View southwest from Photograph 2 of the Bushmanland Grasslands in the foreground and the rocky hills in the Mid-ground which would block views to the southwest.

Figure 26: View southwest from Photograph 3 of the low dunes and the Eskom 220kV power line in the mid-ground with rocky hills in the background.

Figure 27: View northeast from Photograph 4 of the river wash in the foreground with the rocky hills in the mid-ground that would block views to the northeast.

Figure 28: View north from Photograph 5 of the flat terrain of the Bushmanland Grasslands with rocky hills to the north which would fragment views in this direction.

Figure 29: View to the northwest from Photograph 6 of the Eskom access track along the 220kV power line.

4.3.1 *Scenic Quality*

The scenic quality of the receiving landscape is determined making use of the VRM scenic quality questionnaire (refer to Annexure 3). Seven scenic quality criteria are scored on a 1 (Low) to 5 (High) scale. The scores are totalled and assigned a A (High), B (Moderate) or C (Low) based on the following split:
A= scenic quality rating of ≥19;
B = rating of 12 – 18,
C= rating of ≤11

Table 3: Landscape Scenic Quality rating table.

Landscape	Bushmanland	Rocky Outcrops	Dune field	Drainage Washes
Landform	2	4	4	2
Vegetation	2	2	2	4
Water	1	0	0	3
Colour	3	4	4	4
Adjacent scenery	5	5	5	5
Scarcity	2	4	4	4
Cultural modifications	-2	0	0	0
Score	13	19	19	22
Category	B	A	A	A

(A= scenic quality rating of ≥19; B = rating of 12 – 18, C= rating of ≤11)

4.3.2 *Receptor Sensitivity*

Sensitivity levels are a measure of public concern for scenic quality. Receptor sensitivity to landscape change is determined by rating the following factors in terms of Low to High:

Table 4: Landscape Receptor Sensitivity rating table.

Landscape	Bushmanland	Rocky Outcrops	Dune field	Drainage Washes
Type of user	L	M	M	H
Amount of use	L	L	L	L
Public interest	M	M	M	M
Adjacent land users	M	M	H	H
Special areas	L	M	M	H
Score	ML	M	M	H

(H = High, M = Moderate, L = Low sensitivity)

4.3.3 *VRM Class Objectives*

The BLM has defined four Classes that represent the relative value of the visual resources of an area and are defined making use of the VRM Matrix below:

i. **Classes I and II** are the most valued
ii. **Class III** represent a moderate value
iii. **Class IV** is of least value

Table 5: VRM Class Matrix Table

		VISUAL SENSITIVITY LEVELS								
		High			Medium			Low		
SCENIC QUALITY	A (High)	II	II	II	II	II	II	II	II	II
	B (Medium)	II	III	III/ IV *	III	IV	IV	IV	IV	IV
	C (Low)	III	IV	IV	IV	IV	IV	IV	IV	IV
DISTANCE ZONES		Fore/middle ground	Background	Seldom seen	Fore/middle ground	Background	Seldom seen	Fore/middle ground	Background	Seldom seen

* If adjacent areas are **Class III** or lower, assign **Class III**, if higher, assign **Class IV**

Table 6: VRM Class Summary Table

Landscape Area	Distance	Scenic Quality	Receptor sensitivity	Visual Inventory	Visual Resource Management
Significant vegetation and drainage lines	NA				Class I
Bushmanland Grasslands	MG	Medium	Medium	Class III	Class III
Rocky Outcrops	MG	High	Medium	Class II	Class II
Dune Field	MG	High	High	Class II	Class II
River Washes	MG	High	High	Class II	Class II

(Key: FG = Foreground, MG = Middle ground, BG = Background)

4.4 Baseline Findings

4.4.1 *Project Visibility*

The proposed project visibility is rated ***Medium to High***. Although some topographic screening is provided by the adjacent hills, which would fragment views of the proposed project, the surrounding desert landscapes allow open views to the southwest that could extend into the Background distance zone.

4.4.2 *Visual Absorption Capacity*

The Visual Absorption Capacity (VAC) of the site is rated ***Medium to High***. Vegetation is desert related and low in height and density, and would not offer any visual screening. The cultural landscape is that of arid land farming which is low in intensity and mainly comprises fencing, wind pumps, reservoirs and a few very isolated dwellings. However, rocky outcrops and hills that would allow topographic screening of the proposed project for much of the northern and eastern areas surrounding the site.

4.4.3 *Project Exposure*

Exposure to surrounding receptors is rated ***Medium***. The area is remote and rural which results in limited receptors located within the 12km distance. There are no receptors within the 2km distance high exposure zone. Three farmsteads are located in the 6km Foreground / Mid-ground distance zone but it is unlikely that the PV landscape modification would be visible due to topographic screening from the rocky hills that mainly surround the proposed study area.

4.4.4 *Scenic Quality*

The Scenic Quality of the study area is rated ***Medium to High***. Four broad-brush landscapes were identified on the proposed development site which include the Bushmanland Grasslands,

dune fields, rocky outcrops and a dry river wash. Landform ratings were increased by the interesting shapes and forms created by the gentle curves of the dunes, contrasting with the rugged rocky outcrops. Vegetation was rated medium to low due to the uniformity of the Bushmanland Grasslands vegetation. The grassland areas added value to the scenic colour element, contrasting to the orange-red colour of the sand and dunes, with the darker browns of the surrounding hills. Adjacent scenery was rated high due to the open views of the Nama-Karoo with the rugged inselbergs contrasting with the smooth and even textures created by the dunes and Bushmanland Grassland vegetation. Scarcity was rated higher for the dune fields and the river washes due to these features being less common in the arid environment. Cultural modifications were only applicable in the Bushmanland Grasslands area and consist of farm tracks and fences from the rural agricultural cultural landscape, and the Eskom power line. The farming man-made changes added value to the landscape, but the intrusion created by the Eskom power line is a visual disturbance and detracts from the local sense of place to some degree.

4.4.5 *Receptor Sensitivity*

Receptor Sensitivity is rated ***Medium***. Due to the remoteness of the proposed PV Site, the Type of Receptor is limited to local farmers. The Amam 4 * 4 route and Melkbos Campsite is located within the possible visibility area, but being located in the background area, it is unlikely that these tourist receptors would have clear views of the proposed PV landscape modification. The Amount of Use was rated Low as the area is remote, but Public Interest was rated Medium, as the area has high levels of scenic quality and has been identified by BirdLife SA (Birdlife South Africa) as an important biodiversity area. Adjacent Users currently include some tourist activities which are using the existing high visual resources to attract existing, and future, tourism and as such are their sensitivity to landscape change could be strongly experienced.

4.5 Visual Resource Management Classes

4.5.1 *Class I*

Class I is assigned when legislation restricts development in certain areas. The visual objective is to preserve the existing character of the landscape, the level of change to the characteristic landscape should be very low, and must not attract attention. A Class I visual objective was assigned to the following features within the proposed development area due to their protected status within the South African legislation:

- Any river / streams or associated drainage line buffers identified as significant in terms of the Water Use Licence Approval (WULA) process.
- Any ecological areas (or plant species) identified as having a high significance by ecological specialists.

4.5.2 *Class II*

Class II visual inventory was assigned to the following features:

- Dune Field;
- River Washes;
- Rocky Outcrops.

Due to High levels of Scenic Quality of the arid desert landscapes and interesting arid region vegetation, as well as Medium to High Receptor Sensitivity, these broad landscapes were rated Class II. The Class II objective is to retain the existing character of the landscape and the level of change to the characteristic landscape should be low. Management activities may be seen, but should not attract the attention of the casual observer, and should repeat the basic elements of form, line, colour and texture found in the predominant natural features of the characteristic landscape. Development in this area could create a precedent for further development in river washes and dune fields, with their high levels of scenic quality, and as such these areas are defined as 'Not-Preferred' for development.

4.5.3 *Class III*

Class III visual inventory was assigned to the following landscape:

- Bushmanland Grasslands.

Due to Medium levels of Scenic Quality relating to the arid desert landscapes and interesting arid region vegetation, Medium Receptor Sensitivity, the Bushmanland Grasslands were rated Class III. The Class III Visual Objectives is to partially retain the existing character of these rural landscapes, where the level of change to the characteristic landscape should be moderate. Management activities may attract attention, but should not dominate the view of the casual observer, and changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.

4.5.4 *Class IV*

Due to the visual significance of the landscape, no Class IV visual inventory areas were identified.

5 VISUAL IMPACT ASSESSMENT

The following Aurecon Impact Assessment criteria is utilised for determining the Visual Impacts associated with the landscape modification.

5.1 Aurecon Impact Methodology

This section outlines the proposed method for assessing the significance of the potential environmental impacts. For each impact, the EXTENT (spatial scale), MAGNITUDE (severity of impact) and DURATION (time scale) are described.

These criteria are used to ascertain the SIGNIFICANCE of the impact, firstly in the case of no mitigation and then with the most effective mitigation measure(s) in place. The mitigation described would represent the full range of plausible and pragmatic measures but does not necessarily imply that they would be implemented.

The tables below indicate the scale used to assess these variables, and defines each of the rating categories.

Table 7: Aurecon Impact Criteria Table

CRITERIA	CATEGORY	DESCRIPTION
Extent or spatial influence of impact	**Regional**	Beyond a 10km radius of the candidate site.
	Local	Within a 10km radius of the candidate site.
	Site specific	On site or within 100m of the candidate site.
Magnitude of impact (at the indicated spatial scale)	**High**	Natural and/ or social functions and/ or processes are *severely* altered
	Medium	Natural and/ or social functions and/ or processes are *notably* altered
	Low	Natural and/ or social functions and/ or processes are *slightly* altered
	Very Low	Natural and/ or social functions and/ or processes are *negligibly* altered
	Zero	Natural and/ or social functions and/ or processes remain *unaltered*
Duration of impact	**Construction period**	18 – 24 months
	Short Term	Up to 3 years after construction
	Medium Term	3-10 years after construction
	Long Term	More than 10 years after construction

Table 8: Aurecon Definition of Significance Rating Table

SIGNIFICANCE RATINGS	LEVEL OF CRITERIA REQUIRED
High	• High magnitude with a regional extent and long term duration • High magnitude with either a regional extent and medium term duration or a local extent and long term duration • Medium magnitude with a regional extent and long term duration
Medium	• High magnitude with a local extent and medium term duration • High magnitude with a regional extent and construction period or a site specific extent and long term duration • High magnitude with either a local extent and construction period duration or a site specific extent and medium term duration • Medium magnitude with any combination of extent and duration except site specific and construction period or regional and long term • Low magnitude with a regional extent and long term duration
Low	• High magnitude with a site specific extent and construction period duration • Medium magnitude with a site specific extent and construction period duration • Low magnitude with any combination of extent and duration except site specific and construction period or regional and long term • Very low magnitude with a regional extent and long term duration

Very low	• Low magnitude with a site specific extent and construction period duration • Very low magnitude with any combination of extent and duration except regional and long term
Neutral	• Zero magnitude with any combination of extent and duration

The **SIGNIFICANCE** of an impact is derived by taking into account the temporal and spatial scales and magnitude. Once the significance of an impact has been determined, the **PROBABILITY** of this impact occurring as well as the **CONFIDENCE** in the assessment of the impact would be determined using the rating systems outlined in Table 9 and Table 10 respectively. It is important to note that the significance of an impact should always be considered in conjunction with the probability of that impact occurring. Lastly, the **REVERSIBILITY** and **IRREPLACEABILITY** of the impact is estimated using the rating system outlined in Table 11 and Table 12.

Table 9: Definition of probability ratings

PROBABILITY RATINGS	CRITERIA
Definite	Estimated greater than 95 % chance of the impact occurring.
Probable	Estimated 5 to 95 % chance of the impact occurring.
Unlikely	Estimated less than 5 % chance of the impact occurring.

Table 10: Definition of confidence ratings

CONFIDENCE RATINGS	CRITERIA
Certain	Wealth of information on and sound understanding of the environmental factors potentially influencing the impact.
Sure	Reasonable amount of useful information on and relatively sound understanding of the environmental factors potentially influencing the impact.
Unsure	Limited useful information on and understanding of the environmental factors potentially influencing this impact.

Table 11: Definition of reversibility ratings

REVERSIBILITY RATINGS	CRITERIA
Irreversible	The activity will lead to an impact that is in all practical terms permanent.
Reversible	The impact is reversible within 2 years after the cause or stress is removed.

Table 12: Definition of irreplaceability ratings

REVERSIBILITY RATINGS	CRITERIA
Low	The affected resource is not unique and or does not serve an critical function or is degraded

Medium	The affected resource is moderately important in terms of uniqueness and function or in pristine condition
High	The affected resource is important in terms of uniqueness and function and or in pristine condition and warrants conservation / protection

5.2 The Nature of the Impact to Visual and Landscape Resources

The following impacts were identified as having a likelihood of occurring during the construction and operation of the proposed project.

- Construction Phase
  - Loss of site landscape character from the removal of vegetation and the construction of the PV structures and associated infrastructure;
  - Wind-blown dust due to the removal of large areas of vegetation;
  - Loss of site landscape character from the increased presence of moving vehicles accessing the area;
  - Possible soil erosion from temporary roads crossing drainage lines;
  - Windblown litter from the laydown and construction sites.
- Operation Phase
  - Loss of local visual resources due to the semi-industrial landscape created by the PV project that limits opportunities for local eco-tourism associated with the existing higher scenic quality of the area;
  - Light spillage making a glow effect that would be clearly noticeable to the surrounding dark sky night landscapes to the north of the proposed site;
  - On-going soil erosion;
  - On-going windblown dust.
- Decommissioning Phase
  - Movement of vehicles and associated dust;
  - Windblown dust from the disturbance of cover vegetation / gravel.
- Cumulative Impacts
  - A long-term change in land use setting a precedent for other similar types of solar and wind energy projects that could further reduce future eco-tourism opportunities in this area.

The following impacts are rated for the PV Project:

- Lights at night;
- Wind blown dust;
- Loss of local landscape character;
- Visual intrusion to surrounding receptors;
- Cumulative impacts to landscape character.

The following impacts are rated for the Access Route:

- Loss of local landscape character;
- Visual intrusion to surrounding receptors;
- Cumulative impacts to landscape character.

The following impacts are rated for the Power Line routing:

- Loss of local landscape character;

- Visual intrusion to surrounding receptors;
- Cumulative impacts to landscape character.

For all impacts, the No-Go option was also assessed. The executive summary tables are included in the report in Annexure 1.

5.3 PV Project Impact Discussion

5.3.1 *Lights at Night*

Construction Phase

Although construction phase lights at night have the potential to impact the current dark night sky sense of place, the impacts are moderated by the short time period of the construction phase. With mitigation, the impacts can be reduced to Very Low – Negative by not operating at night, and strict management of security lighting to ensure that light spillage does not take place. Generic lights at night recommendations are provided in the Annexure. A light spillage management plan needs to be compiled prior to construction to ensure that light spillage is site contained without compromising security.

Operation Phase

Due to the long-term duration of the operation phase lights at night impacts, without mitigation the potential impact is rated Moderate-Negative. With mitigation that includes a detailed light spillage plan, the impacts can be reduced to Low-Negative and intrusion restricted to the local extent. As for construction phase, light spillage needs to be controlled and monitoring on a regular bases. No overhead lights or broad area spotlights should be utilised without compromising security.

No-Go

The current dark sky sense of place adds value to the region as a natural wilderness area and in association with the higher levels of landscape character created by the rocky outcrops and dune fields, increases potential for eco-tourism opportunities. For this reason, maintaining the status quo is rated as Medium-Positive.

5.3.2 *Wind Blown Dust*

Construction Phase

Due to the fact that the arid area is already likely to be associated with wind blown dust events, construction phase impacts from further wind blown dust due to removal of vegetation is likely to be Low-Negative. With dust suppression mitigations, this impact can be reduce to Very Low-Negative.

Operation Phase

For operation the wind blown dust effect could be exacerbated without mitigation and is rated Low-Negative. With the long-term management of un-vegetated surface areas with dust suppression methods, the impact is rated Neutral (likely to be similar to surrounding natural effects).

No-Go

As wind-blown dust is a natural occurrence, the effect is likely to be a permanent feature of the rural landscape and is rated Neutral.

5.3.3 *Landscape Degradation*

Construction Phase

The locality where the PV project is proposed is currently strongly associated with a natural / wilderness sense of place that has high levels of scenic quality. Changes to this current natural landscape from the contraction of the PV project are expected to by High, but are moderated by the Short-term period of intensive activity on the site. This is no mitigation to change the nature of a large construction project and as such the impact remains un-mitigated.

Operation Phase

The resultant semi-industrial nature of the PV project in operation is likely to result in High-negative Magnitude impact over a long time period and is rated High-Negative without mitigation. As the landscape change is associated with the PV structures, no mitigation is provided and as such the impacts to *local* landscape character with remain High-Negative for the duration of the project. To ensure that landscape integrity remains after the project decommissioning, no natural features relating to dunes or rocky outcrops should be impacts. For this reason, the small dune backed up against the rocky outcrop within southwest section of the project footprint should be retained and this area excluded from the development footprint.

No-Go

The local landscape character is rated high for scenic quality and landscape character due to the many large rocky outcrops, the arid terrain and dune fields. These landscape elements create a unique sense of place that does add value to the area and create opportunity for eco-tourism which his already taking place in a limited capacity to the north of the site (out side of the zone of visual influence). As the location is remote, the benefit of maintaining the landscape status quo for tourism potential is rated Moderate-Positive.

5.3.4 *Visual Intrusion*

Construction Phase

Although the change to the landscape from construction phase related effects is likely to be strongly experienced by receptors (High-Negative Magnitude), the area is very remote. The rural area as a limited number of receptors falling within the project ZVI due to the topographic screening provided by the surrounding rocky outcrops. Construction impacts will be moderated by the short-term duration and likely to be Low Negative. As mitigation of the visual impacts from construction is limited, the rating for without mitigation remains Low Negative.

Operation Phase

Without mitigation, the visual intrusion is likely to have a High-Negative Magnitude to an area that exceeds two kilometres around the site. Medium-Negative Magnitude, as views of the resultant PV landscape will be in the background for the few receptors located in the area and is Very Likely to take place. To reduce the visual intrusion to existing and possible future tourist receptors accessing the area, it is recommended that the PV height should not exceed 5m above ground level. With this height mitigation, the visual intrusion can be further limited (this reduction in impact is not reflected by the impact criteria remain Medium-Negative.

No-Go
While local value to eco-tourism is taking place to the north of the proposed project site (outside of the ZVI), landscape value is being obtained by eco-tourism. However, as the location is very remote, this benefit to tourist receptors is limited and is rated Low-Positive.

5.3.5 *Cumulative Effects*

Construction and Operation Phase
Cumulative impacts associated with the project include the change in landuse limiting other landuse opportunities within the project ZVI, as well as the precedent being set for PV projects in the area where currently there is only a precedent for natural / agricultural land uses. As the scenic quality of the region is high and does have value for eco-tourism, further construction and operation of PV project in the area is likely to have a High-Negative Magnitude. Some moderation of the loss of regional landscape character is provided by the large extent of similar visual resources in the region, and as such the Cumulative Landscape and Visual Effects is rated Medium-Negative.

No-Go
Tourism is emphasised in the provincial planning as an important aspect of the regional economy that does add weight to the argument for retaining the natural landscapes. It must also be noted that a Phase 2 REDZ Strategic Environmental Process is currently taking place. The preliminary mapping for the Phase priority areas does not include the proposed development area, which is excluded in the Features of Critical Importance mapping. As this is in draft form, the 2017 Gazetted REDZ areas still refer. However, this possible lack of alignment to Phase 2 REDZ mapping is listed as a potential risk, given the high scenic qualities of the surrounding areas.

For this reason, it is important to ensure that large PV development nodes do not create massing effects that detract from the potential for natural landscape creating opportunities for eco-tourism. However, the area is remote and does fall with the 2017 Gazetted REDZ and as such, maintaining the status quo as a natural landscape is rated Moderate-Positive.

5.4 Road Access Impact Discussion

5.4.1 *Visual Intrusion*

Construction Phase
Construction phase visual impacts are likely to be experienced strongly by the local receptors due to the very close proximity of the road to the farmsteads. For this reason, the Magnitude is rated High-Negative as dust from moving vehicles travelling along the road is Definitely going to influence the local farmsteads. As the impact is Short-term in Duration, the Significance before mitigation is rated Moderate-Negative. To reduce the (long-term) impacts of dust on the two remote homesteads, it is recommended that the portion of the road adjacent to the farmsteads be hard surfaced with a suitable long-term dust suppressant alternative. Due to the remote location, water suppression methods to reduce dust from increased traffic is likely to be compromised by lack of access to water to spray on the road (arid region), as well as the long distances that trucks will have to travel to spray the roads. With an effective long-term

dust suppressant strategy (not requiring transport of water) for the roads adjacent to the two farmsteads, the impact significance is reduced to Low-Negative.

Operation Phase
The impacts are similar to those of the Construction Phase, but with a longer Duration. The Impact Significance is also rated Moderate-Negative without mitigation, but with effective dust suppression, it is likely that the conditions of the existing gravel road will improve and impacts post mitigation are rated Low-Positive.

No-Go
As the gravel road is already resulting in dust from existing (limited) traffic, the value of maintaining the status quo of the road is rated Low-Negative without and with mitigation.

5.4.2 *Landscape Degradation*

Construction Phase
Alignment changes to the existing road are limited and as such, the resultant changes to the local landscape character are limited and would mainly be associated with minor changes to the road routing, possible widening and a marked increased in the number of vehicles moving along the road during construction. As there is an existing road there is the expectation of vehicle movement and is rated Low-Negative without mitigation. As mitigation of the number of vehicles is not possible, post mitigation impacts remain the same.

Operation Phase
Without the visual intrusion of the many moving vehicles required for construction of the PV project, the landscape impacts from the road change are likely to be Low-Negative if the road is not maintained or kept in good condition. With road maintenance, the improved road could result in a Very Low-Positive impact for some road users.

No-Go
The district municipality already maintains the existing road and as such, the status remains Neutral.

5.4.3 *Cumulative Effects*

Construction Phase
Cumulative effects associated with the road relate to the road becoming a negative externality to the point that dust and vehicle movement in close proximity to remote farmsteads result in the residents leaving the houses. Due to the short time period of construction phase, this effect is unlikely to take place and is rated Very Low-Negative for both mitigation scenarios.

Operation Phase
As only two houses could be impacted, the Extent is Local and although Magnitude is High-Negative, the significance is Low-Negative without mitigation. With mitigation and the long-term improvement of the road could open up opportunities for eco-tourism to the surrounding areas which could result in a positive impact of the local area. However, as the area is remote, the impact is rated Very Low-Positive.

No-Go

The district municipality already maintains the existing road and as such, the status remains Neutral.

5.5 Power Line Impact Discussion

5.5.1 *Visual Intrusion and Landscape Degradation*

Construction Phase

The construction phase impacts associated with the raising of the monopoles and lines take place adjacent to an existing 132kV power line routing. While the visual intrusion is likely to be noticeable to the surrounding receptors, the landscape is already dominated by the existing power line context. As such, construction phase impacts are likely to be Low-Negative and Local in Extent. With mitigation and making use of the existing 132kV access road to access the new power line, construction phase impacts can be reduced to Very Low-Negative.

Operation Phase

Similar to construction phase impacts, the existing 132kV power line will absorb the visual intrusion to some degree. Impacts are thus rated Very Low-Negative for both scenarios.

No-Go

Due to the size of the power line, the on-site landscape context is already compromised and detracts to some degree from the higher levels of scenic quality of the surrounding local visual resources. The status quo is thus rated Moderate-Negative.

5.5.2 *Cumulative Effects*

Construction and Operation Phase

Cumulative impacts associated with the power line construction relate to the landscape modification limiting other landuse opportunities within the project ZVI, as well as setting a the precedent for further routings along the existing 132kV routing that has the potential to create a massing effect. As the corridor landscape character is already compromised to some degree, the probability of the short-term construction phases adding to this risk is unlikely and thus rated Very-Low Negative for both scenarios (as mitigation is limited).

No-Go

The locality is already compromised by the existing 132kV power line and is rated Low-Negative for both scenarios.

6 ENVIRONMENTAL MANAGEMENT PLAN

6.1 PV Project

6.1.1 *Pre-Construction Phase*

- The small dune backed up against the rocky outcrop within southwest section of the project footprint should be retained and this area excluded from the development footprint.

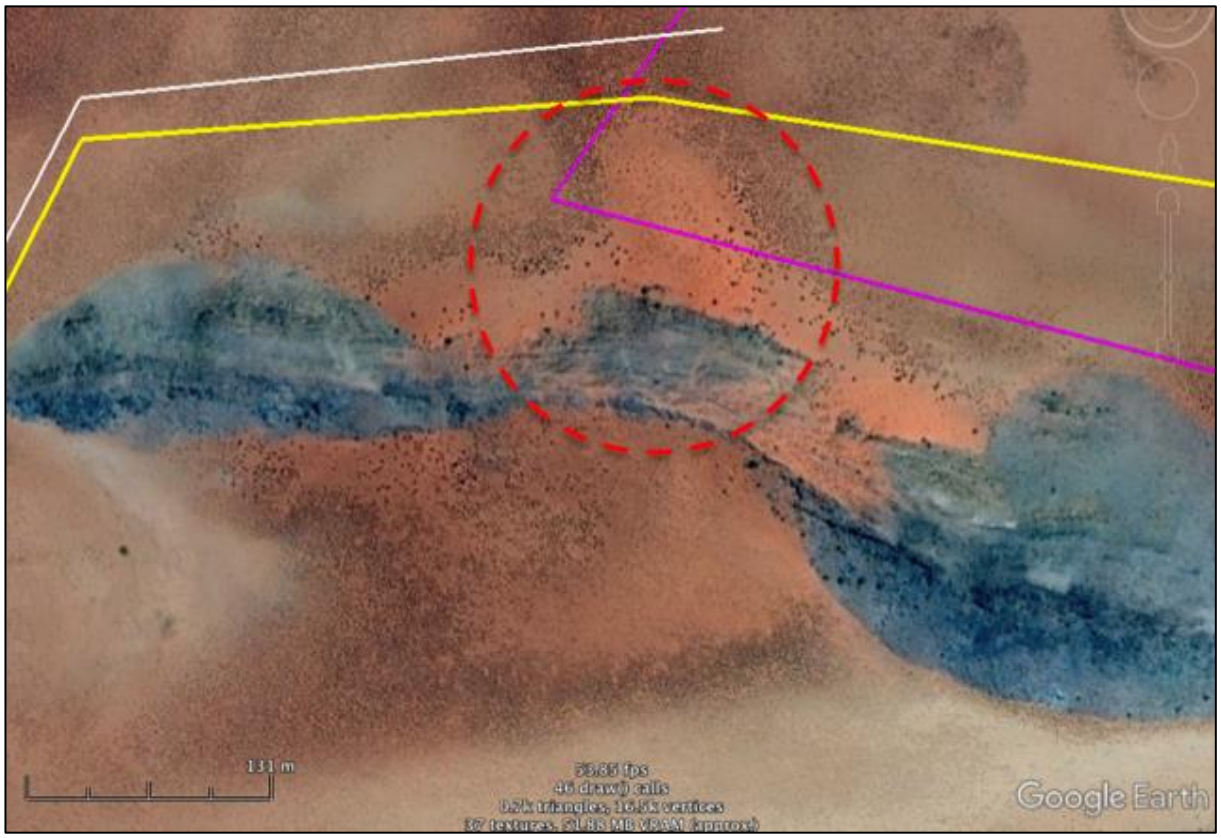

Figure 30: Sand dune area that falls within the proposed development footprint.

6.1.2 *Construction Phase*

During the construction phase heavy vehicles, components, equipment and construction crews will frequent the area and may cause, at the very least, a cumulative visual nuisance to landowners and residents in the area as well as to road users. The proposed project is semi-industrial in nature and would be located in an agricultural area with limited man made infrastructure. The following actions should be implemented during the construction phase:

- Adopt responsible construction practices aimed at containing the construction activities to specifically demarcated areas thereby limiting the removal of natural vegetation to the minimum.
- Limit access to the construction site to existing access roads.
- Rehabilitate all disturbed areas to acceptable visual standards as soon as possible after construction is complete in each area.
- Construction should not take place at night-time.

- The laydown area should be sited away from the N14 road and preferably not located on areas that are prominent.
- Topsoil from the footprints of the road and structures should be stockpiled for rehabilitation and restoration purposes.
- If very dry conditions prevail and dust becomes a nuisance, water should be sprayed on the road surface (or implement another suitable mitigation to reduce wind-blown dust).
- Strict litter control.
- Temporary roads should be well marked and should only cross drainage lines on areas identified as permanent road features where erosion and soil loss management can be contained.
- Signage on the N14 should be moderated.
- All buildings should be painted a grey-brown colour.
- Fencing should be simple, diamond shaped (to catch wind-blown litter) and be transparent in appearance. The fences should be checked on a monthly basis for the collection of litter caught on the fence.
- No overhead or broad area spotlights should be utilised without jeapardising security.
- Strict light spillage control needs to be set in place to ensure that security lighting is site contained and provides adiquate security lighting without resulting in light spillage.
- All the sides and roof sections of the battery storage facility containers need to be painted a matt, textured grey-brown colour so that they blend into the natural envionment.
- Limit the heights of the PV structures to a effective minimum, with a visual preference of approximately 5m above gound level.

6.1.3 *Operation Phase*

During the operation phase movement of vehicles frequenting the area may cause, at the very least, a cumulative visual nuisance to landowners and residents in the area as well as to road users. The proposed project is semi-industrial in nature and is located in an agricultural area with limited man made infrastructure.

The following actions should be implemented during operation phase:

- If very dry conditions prevail and dust becomes a nuisance, water should be sprayed on the gravel road surface.
- Strict litter control.
- Continued erosion control and management of dust by ensuring that soil is covered.
- Continue with strict light spillage control needs to be set in place to ensure that security lighting is site contained and provides adiquate security lighting without resulting in light spillage (refer to Annexure 4 for guidelines that need to be implemented).

6.1.4 *De-Commissioning Phase*

During the de-construction phase heavy vehicles, components, equipment and construction crews will frequent the area and may cause, at the very least, a cumulative visual nuisance to landowners and residents in the area as well as to road users. The following actions should be implemented during construction phase:

- Adopt responsible de-construction practices aimed at containing the activities to impacted areas only.
- Rehabilitate all disturbed areas to acceptable visual standards as soon as possible after de-construction is complete in an area.
- De-construction should not take place at night-time.
- If very dry conditions prevail and dust becomes a nuisance, water should be sprayed on the road surface (or implement another suitable mitigation to reduce wind-blown dust).
- Strict litter control.
- Signage on the N14 should be removed.
- All PV panels and structures need to be removed from site and adequately processed in accordance with national legislation.
- All buildings should be broken down and the rubble and the foundations removed and dumped in accordance with national legislation.
- Fencing should be removed and preferably re-used / recycled.
- Strict light spillage control needs to be set in place to ensure that security lighting is site contained and provides adiquate security lighting without resulting in light spillage.

6.2 Road Access Project

6.2.1 *Construction Phase*

During the construction phase heavy vehicles, components, equipment and construction crews will frequent the area and may cause, at the very least, a cumulative visual nuisance to landowners and residents in the area as well as to road users. The following actions should be implemented during the construction phase:

- Adopt responsible construction practices aimed at containing the construction activities to specifically demarcated areas thereby limiting the removal of natural vegetation to the minimum.
- Rehabilitate all disturbed areas to acceptable visual standards as soon as possible after construction is complete in each area.
- Construction should not take place at night-time.
- The laydown area should be sited away from the N14 road and preferably not located on areas that are prominent.
- If very dry conditions prevail and dust becomes a nuisance, water should be sprayed on the road surface.
- Strict litter control.
- The sections of the road that pass in close proxmity to the three isolated farm settlements need to be hard surfaced to ensure that dust can effectively mitigated for the duration of the project.

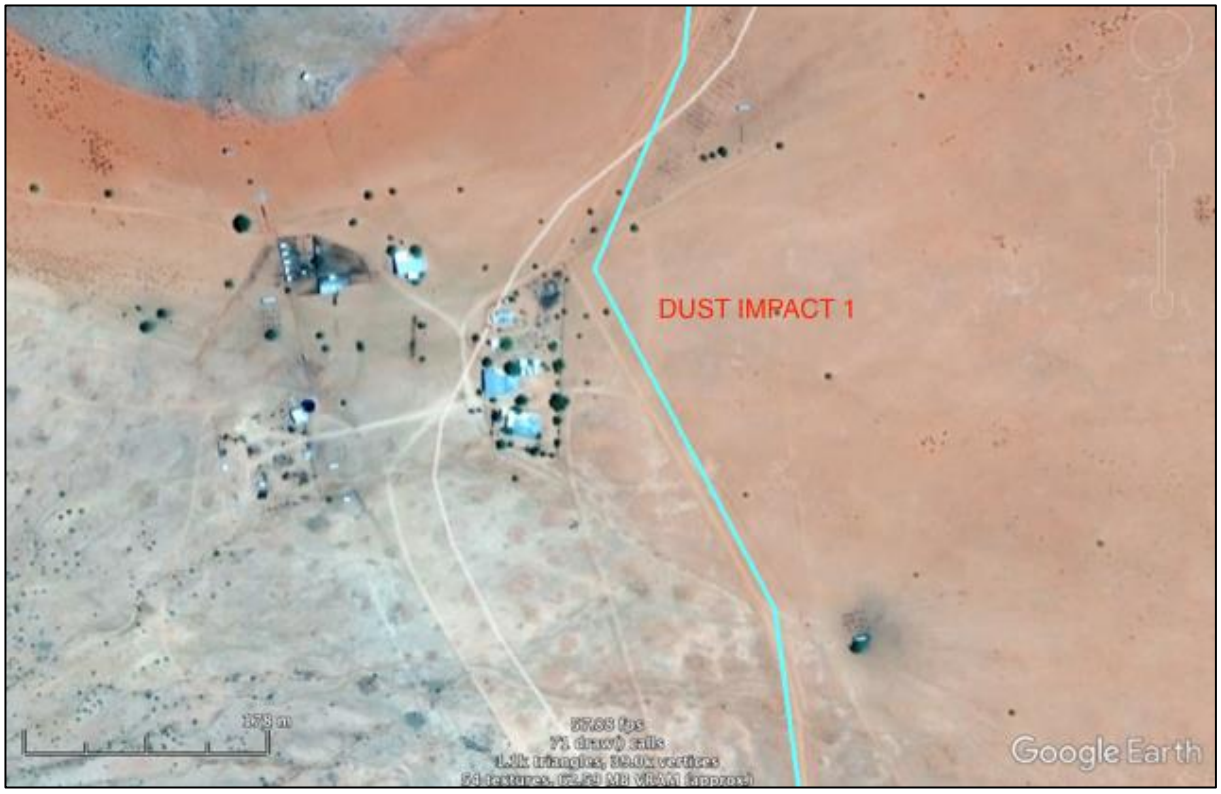

Figure 31: Dust impact to adjacent farm settlement 1

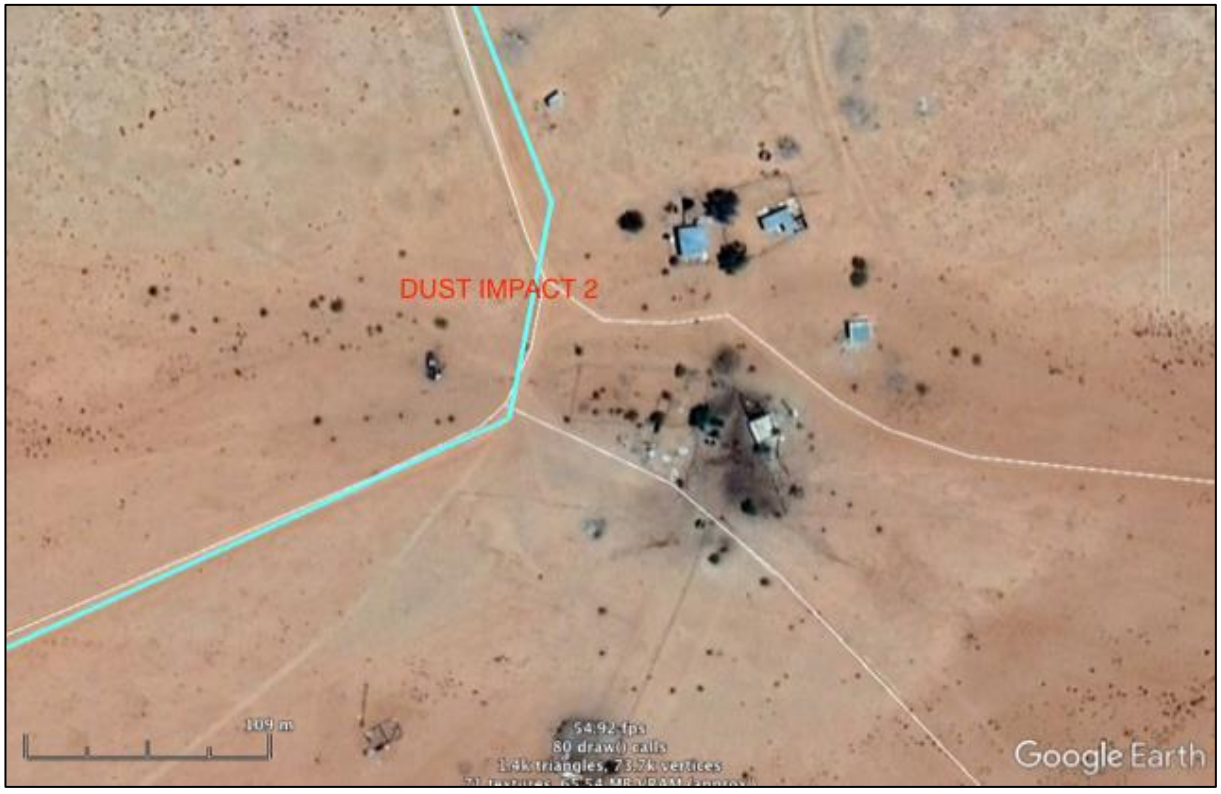

Figure 32: Dust impact to adjacent farm settlement 2

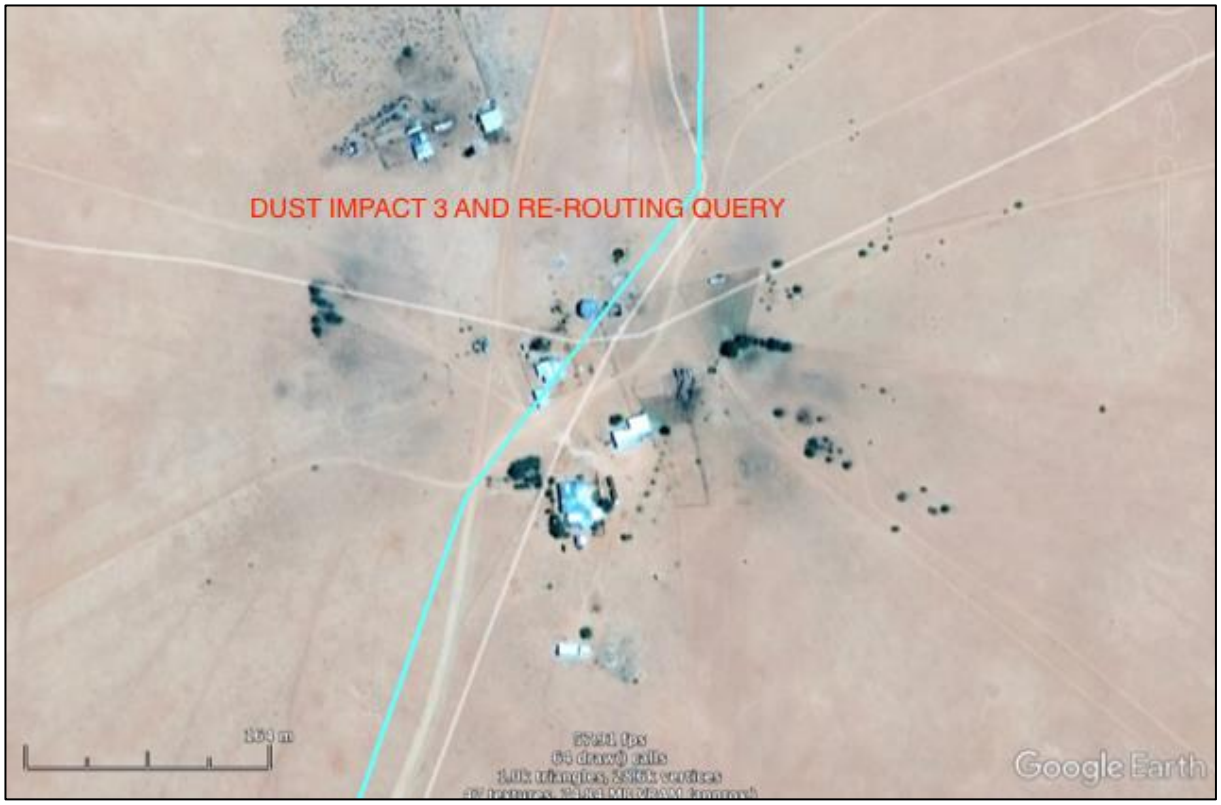

Figure 33: Dust impact to adjacent farm settlement 3 and road re-alignment.

6.2.2 *Operation Phase*

During the operation phase movement of vehicles frequenting the area may cause, at the very least, a cumulative visual nuisance to landowners and residents in the area as well as to road users.

The following actions should be implemented during operation phase:

- If very dry conditions prevail and dust becomes a nuisance, water should be sprayed on the gravel road surface.
- Strict litter control.
- Continued erosion control and management of dust.

6.2.3 *De-Commissioning Phase*

The road will remain a permanent feature

6.3 Grid Connection Project

6.3.1 *Construction Phase*

During the construction phase heavy vehicles, components, equipment and construction crews will frequent the area and may cause, at the very least, a cumulative visual nuisance to landowners and residents in the area as well as to road users. The following actions should be implemented during the construction phase:

- Adopt responsible construction practices aimed at containing the construction activities to specifically demarcated areas thereby limiting the removal of natural vegetation to the minimum.
- Utilised the existing 220kV power line access road for contrusion.
- Rehabilitate all disturbed areas to acceptable visual standards as soon as possible after construction is complete in each area.
- Construction should not take place at night-time.
- The laydown area should be sited away from the N14 road and preferably not located on areas that are prominent.
- Strict litter control.

6.3.2 *Operation Phase*

During the operation phase movement of vehicles frequenting the area may cause, at the very least, a cumulative visual nuisance to landowners and residents in the area as well as to road users.

The following actions should be implemented during operation phase:

- Strict litter control.
- Continued erosion control and management of dust.

6.3.3 *De-Commissioning Phase*

- As the area is not included in draft Phase 2 REDZ areas, should no other PV projects be making use of the power line post-operation, the power line needs to be de-constructed and removed from site and adequately processed in accordance with national legislation.
- Continued erosion control and management of dust.

7 ADVANTAGES AND DISADVANTAGES

7.1 PV Technology

7.1.1 *Alternative Fixed Axis*

Development of Fixed Axis PV (up to 5m in height) that would entail the development of a construction camp, construction of access roads by heavy earth moving equipment, construction of PV panels as well as impacts from lights at night for security purposes. The development would also require the construction of structures for offices and workshops.

Opportunities

- National generation of renewable energy;
- Potential to alleviate identified challenges for Local Economic Development in Khâi-Ma Local Municipality;
- Medium to Low Visual Impacts expected due to remoteness of the proposed site in relation to the effective screening potential of the surrounding terrain;
- Located within the Draft Renewable Energy Development Zone 8;

- A remote locality with limited residential receptors;
- Good surrounding topographic screening from rocky outcrops and hills.

Constraints

- High long-term impacts to the local landscape character where the resultant semi-industrial PV landscape will degrade local landscape character and the current wilderness sense of place;
- Potential for long-term Medium Visual Impacts from lights at night as visual contrast to an existing dark-sky night-time landscape from security lighting will be clearly noticeable;
- Medium potential for negative cumulative risks to local landscape character associated with the development setting a precedent for a PV growth node in a landscape that has high levels of scenic quality;
- Excluded from the Draft REDZ Phase 2 areas.

7.2 PV South Access

7.2.1 *Alternative D3 N14 National Road Access*

Upgrading where necessary the existing farm access road that links the proposed southern sites with the N14 National Road. This would entail the moment of heavy earth moving equipment and dust generated from the moving vehicles. Construction would also entail the movement of large trucks carrying equipment for the construction of the proposed project. This would also include some lights at night as well as dust generated from the moving vehicles. Operation impacts would result in a continuation of some moving vehicles and associated dust.

Opportunities

- National generation of renewable energy as part of the Veld PV South project;
- Alignment to an existing district road;
- Potential to alleviate identified challenges for Local Economic Development in Khâi-Ma Local Municipality;
- Located within the Gazetted 2017 Renewable Energy Development Zone 8;
- A remote locality with limited residential receptors;
- Good surrounding topographic screening from rocky outcrops and hills in some of the areas.

Constraints

- Potential for dust impacts from moving vehicles in an arid environment that is routed in close proximity to adjacent farmsteads;
- The long length of the access road increases the potential for dust as well as mitigation costs;
- Excluded from the Draft Renewable Energy Development Zone Phase 2 areas.

7.3 PV South Power Line Linkages

For both power line options (LILO and connection to Aggeneys substation), regional visual intrusion is expected to be Moderate due to the weaker contrast generated vertical contrast

created by the monopoles located in close proximity to the existing Eskom 220kV power line. The proposed grid connection to the Eskom Substation located south of Aggeneys is aligned adjacent to an existing Eskom 132kV power line that increases the visual absorption capacity for the location.

Opportunities

- National generation of renewable energy as part of the Veld PV South project;
- Potential to alleviate identified IPD challenges for Local Economic Development in Khâi-Ma Local Municipality;
- Located within the Gazetted 2017 Renewable Energy Development Zone 8;
- A remote locality with limited residential receptors;
- Good surrounding topographic screening from rocky outcrops and hills in some of the areas.

Constraints

- Strong change to local landscape character from ***Local*** visibility in Nama-Karoo landscapes that have high levels of scenic quality;
- Potential for dust impacts from moving vehicles in an arid environment that is routed in close proximity to adjacent farmstead;
- Excluded from the Draft Renewable Energy Development Zone Phase 2 areas.

8 CONCLUSION

In conclusion, the landscape and Visual Impact Assessment found that there are advantages and disadvantages to the proposed landscape modification. Due to the remoteness of the proposed site that is well topographically screened, there are few receptors located in the project Zone of Visual Influence. Receptors that are exposed to the project will mainly have background views of the landscape modification. Advantages also include the location of the proposed project within the draft Renewable Energy Development Zones (REDZ 7). Potential benefits also include synergies with the Khâi-Ma Local Municipality IDP in terms of alleviating employment problems and shortage of appropriate labour skills. Disadvantages include a strong change to local landscape character, as well as the potential for strong lights at night and impacts to an existing dark-sky night-time landscape. The Impact Assessment found that while ***Visual Intrusion is likely to be Low-Negative with mitigation*** due to the remoteness of the location where there are few receptors with the rocky outcrops providing some visual screening. Visual intrusion can be further reduced with the reduction in the height of the PV structures to below 5m above ground level. However, as the landscape change is associated with the PV structures, no mitigation is provided, and as such, the ***impacts to local Landscape Character are expected to remain High-Negative*** for the duration of the project.

The assessment found that there ***is value in the No-Go Option***, in terms of maintaining existing landscape resources in an area where the existing sense of place is strongly associated with a natural / wilderness sense of place. However, the remoteness of the locality is likely to be a factor in limiting the full potential of the visual resources for eco-tourism. As the site does fall within the Gazetted REDZ 7 area, the No-Go option is not considered, but potential negative cumulative risks to regional landscape character have been riased should this development set a precedent for further PV developent in the area. Mitigations have been

defined to minimise the visual intrusion of the project. Mitigation also requires the removal of the proposed power line should this infrastructure not be required post-closure.

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10 ANNEXURE 1: IMPACT ASSESSMENT SUMMARY TABLES

10.1 PV Project

Table 13: PV Lights at night Impact Tables

Code	Impact	Pre-mitigation:						Recommended mitigation	Post-mitigation:					
		Duration	Extent	Magnitude	Consequence	Probability	Significance		Duration	Extent	Magnitude	Consequence	Probability	Significance
VIS_PV_LIGHTS	CONSTRUCTION Impact from lights at night	Short-term	Regional	High - negative	Moderately detrimental	Definite	Moderate - negative	Generic light mitigations which limit the intensity and direction of lights at night spillage to the surrounding areas.	Short-term	Local	Low - negative	Slightly detrimental	Fairly likely	Very low - negative
VIS_PV_LIGHTS	OPERATION Impact from lights at night	Permanent	Local	Medium - negative	Highly detrimental	Definite	Moderate - negative	Generic light mitigations which limit the intensity and direction of lights at night spillage to the surrounding areas.	Permanent	Local	Low - negative	Moderately detrimental	Very likely	Low - negative
VIZ_PV_LIGHTS	NO-GO Impact from lights at night	Permanent	Local	Medium - positive	Highly beneficial	Definite	Moderate - positive	NA	Permanent	Local	Low - positive	Moderately beneficial	Definite	Moderate - positive

Table 14: PV Wind Blown Dust Impact Tables

Code	Impact	Pre-mitigation:						Recommended mitigation	Post-mitigation:					
		Duration	Extent	Magnitude	Consequence	Probability	Significance		Duration	Extent	Magnitude	Consequence	Probability	Significance
VIZ_PV_DUST	CONSTRUCTION Impacts from Dust	Short-term	Local	Medium - negative	Slightly detrimental	Definite	Low - negative	Wind blown dust suppression practice.	Short-term	Local	Very Low - negative	Negligible	Fairly likely	Very low - negative
VIZ_PV_DUST	OPERATION Impacts from Dust	Permanent	Local	Medium - negative	Highly detrimental	Fairly likely	Low - negative	Wind blown dust suppression practice.	Permanent	None	None	None	None	Neutral
VIZ_PV_DUST	NO-GO Impacts from Dust	Permanent	Local	None	None	Very likely	Neutral	NA	None	None	None	None	None	Neutral

Table 15: PV Local Landscape Degradation Impact Tables

Code	Impact	Pre-mitigation:						Recommended mitigation	Post-mitigation:					
		Duration	Extent	Magnitude	Consequence	Probability	Significance		Duration	Extent	Magnitude	Consequence	Probability	Significance
VIZ_PV_LANDSC	CONSTRUCTION Impact to Landscape	Short-term	Regional	High - negative	Moderately detrimental	Definite	Moderate - negative	NA	Short-term	Regional	High - negative	Moderately detrimental	Definite	Moderate - negative
VIZ_PV_LANDSC	OPERATION Impact to Landscape	Permanent	Local	High - negative	Highly detrimental	Definite	High - negative	Reduce southwest footprint which overlaps with a low dune that is banked up onto a rocky outcrop.	Permanent	Local	High - negative	Highly detrimental	Definite	High - negative
VIZ_PV_LANDSC	NO-GO Impact to Landscape	Permanent	Local	Medium - positive	Highly beneficial	Very likely	Moderate - positive	NA	Permanent	Local	Medium - positive	Highly beneficial	Very likely	Moderate - positive

Table 16: PV Visual Intrusion Impact Tables

Code	Impact	Pre-mitigation:						Recommended mitigation	Post-mitigation:					
		Duration	Extent	Magnitude	Consequence	Probability	Significance		Duration	Extent	Magnitude	Consequence	Probability	Significance
VIZ_PV_INTRUSION	CONSTRUCTION Receptor visual intrusion	Short-term	Local	High - negative	Moderately detrimental	Very likely	Low - negative	NA	Short-term	Local	Medium - negative	Slightly detrimental	Very likely	Low - negative
VIZ_PV_INTRUSION	OPERATION Receptor visual intrusion	Permanent	Regional	High - negative	Extremely detrimental	Very likely	Moderate - negative	Restrict height of the PV structrue to 5m above ground level.	Permanent	Local	Medium - negative	Highly detrimental	Very likely	Moderate - negative
VIZ_PV_INTRUSION	NO-GO Receptor visual intrusion	Permanent	Local	Low - positive	Moderately beneficial	Very likely	Low - positive	NA	Permanent	Local	Low - positive	Moderately beneficial	Very likely	Low - positive

Table 17: PV Regional Landscape Cumulative Impact Tables

Code	Impact	Pre-mitigation:						Recommended mitigation	Post-mitigation:					
		Duration	Extent	Magnitude	Consequence	Probability	Significance		Duration	Extent	Magnitude	Consequence	Probability	Significance
VIZ_PV_CUML	CONSTRUCTION Cumulative impact	Permanent	Regional	High - negative	Extremely detrimental	Very likely	Moderate - negative	NA	Permanent	Regional	High - negative	Extremely detrimental	Very likely	Moderate - negative
VIZ_PV_CUML	OPERATION Cumulative impact	Permanent	Regional	High - negative	Extremely detrimental	Very likely	Moderate - negative	NA	Permanent	Regional	High - negative	Extremely detrimental	Very likely	Moderate - negative
VIZ_PV_CUML	NO-GO Cumulative impact	Permanent	Regional	Medium - positive	Highly beneficial	Very likely	Moderate - positive	NA	Permanent	Regional	Medium - positive	Highly beneficial	Very likely	Moderate - positive

10.2 PV Road Access

Table 18: PV Road Visual Impact Tables

Code	Impact	Pre-mitigation:						Recommended mitigation	Post-mitigation:					
		Duration	Extent	Magnitude	Consequence	Probability	Significance		Duration	Extent	Magnitude	Consequence	Probability	Significance
LVIA_ACCESS_VIS	CONSTRUCTION Visual Intrusion	Short-term	Local	High - negative	Moderately detrimental	Definite	Moderate - negative	Tar portions of the road that are routed adjacnet to two farm settlements. Re-route road so as to not require loss of structures and follow existing road to reduce impact.	Short-term	Local	Medium - negative	Slightly detrimental	Definite	Low - negative
LVIA_ACCESS_VIS	OPERATION Visual Intrusion	Permanent	Local	High - negative	Highly detrimental	Very likely	Moderate - negative	Tar portions of the road that are routed adjacnet to two farm settlements. Re-route road so as to not require loss of structures and follow existing road to reduce impact.	Permanent	Local	Low - positive	Moderately beneficial	Fairly likely	Low - positive
LVIA_ACCESS_VIS	NO-GO Visual Intrusion	Permanent	Local	Low - negative	Moderately detrimental	Very likely	Low - negative	NA	Permanent	Local	Low - negative	Moderately detrimental	Very likely	Low - negative

Table 19: PV Road Landscape Impact Tables

Code	Impact	Pre-mitigation:						Recommended mitigation	Post-mitigation:					
		Duration	Extent	Magnitude	Conse-quence	Proba-bility	Signifi-cance		Duration	Extent	Magnitude	Conse-quence	Proba-bility	Signifi-cance
LVIA_ACCESS_LAND	CONSTRUCTION Landscape Degradation	Short-term	Site-specific	Medium - negative	Slightly detrimental	Very likely	Low - negative	Retain existing alignment as much as possible and exclude any impacts to dunes.	Short-term	Site-specific	Medium - negative	Slightly detrimental	Very likely	Low - negative
LVIA_ACCESS_LAND	OPERATION Landscape Degradation	Long-term	Site-specific	Medium - negative	Moderately detrimental	Fairly likely	Low - negative	Continued maintenance of the road with on-going water suppression.	Long-term	Site-specific	Low - positive	Slightly beneficial	Fairly likely	Very low - positive
LVIA_ACCESS_LAND	NO-GO Landscape Degradation	Long-term	Site-specific	None	None	None	Neutral		Long-term	Site-specific	None	None	None	Neutral

Table 20: PV Road Cumulative Effects Impact Tables

Code	Impact	Pre-mitigation:						Recommended mitigation	Post-mitigation:					
		Duration	Extent	Magnitude	Conse-quence	Proba-bility	Signifi-cance		Duration	Extent	Magnitude	Conse-quence	Proba-bility	Signifi-cance
LVIA_ACCESS_CUML	CONSTRUCTION Cumulative Effects	Short-term	Site-specific	Low - negative	Negligible	Fairly likely	Very low - negative	NA	Long-term	Site-specific	Low - negative	Slightly detrimental	Fairly likely	Very low - negative
LVIA_ACCESS_CUML	OPERATION Cumulative Effects	Long-term	Local	High - negative	Highly detrimental	Fairly likely	Low - negative	Effective maintenance of the road.	Long-term	Local	Very Low - positive	Slightly beneficial	Fairly likely	Very low - positive
LVIA_ACCESS_CUML	NO-GO Cumulative Effects	Long-term	Local	None	None	None	Neutral		Long-term	Local	None	None	None	Neutral

10.3 Transmission Line Route

Table 21: Transmission Line Landscape and Visual Impact Tables

Code	Impact	Pre-mitigation:						Recommended mitigation	Post-mitigation:					
		Duration	Extent	Magnitude	Conse-quence	Proba-bility	Signifi-cance		Duration	Extent	Magnitude	Conse-quence	Proba-bility	Signifi-cance
LVIS_TX_ VIS_LAND	CONSTRUCTION Visual intrusion and Landscape Degradation	Short-term	Local	Low - negative	Slightly detrimental	Very likely	Low - negative	Utilisation of existing 132kV aceess route.	Short-term	Local	Very Low - negative	Negligible	Very likely	Very low - negative
LVIS_TX_ VIS_LAND	OPERATION Visual intrusion and Landscape Degradation	Permanent	Local	Low - negative	Moderately detrimental	Unlikely	Very low - negative	Erosion maintenance	Permanent	Local	Low - negative	Moderately detrimental	Unlikely	Very low - negative
LVIS_TX_ VIS_LAND	NO-GO Visual intrusion and Landscape Degradation	Permanent	Local	Low - negative	Moderately detrimental	Definite	Moderate - negative	NA	Permanent	Local	Low - negative	Moderately detrimental	Definite	Moderate - negative

Table 22: Transmission Line Cumulative Effects Impact Tables

Code	Impact	Pre-mitigation:						Recommended mitigation	Post-mitigation:					
		Duration	Extent	Magnitude	Conse-quence	Proba-bility	Signifi-cance		Duration	Extent	Magnitude	Conse-quence	Proba-bility	Signifi-cance
LVIS_TX_ CUML	CONSTRUCTION Cumulative Effects	Short-term	Site-specific	Low - negative	Negligible	Fairly likely	Very low - negative	NA	Short-term	Site-specific	Low - negative	Negligible	Fairly likely	Very low - negative
LVIS_TX_ CUML	OPERATION Cumulative Effects	Permanent	Local	Low - negative	Moderately detrimental	Unlikely	Very low - negative	NA	Permanent	Local	Low - negative	Moderately detrimental	Unlikely	Very low - negative
LVIS_TX_ CUML	NO-G0 Cumulative Effects	Permanent	Local	Medium - negative	Highly detrimental	Fairly likely	Low - negative	NA	Permanent	Local	Low - negative	Moderately detrimental	Fairly likely	Low - negative

11 ANNEXURE 2: SPECIALIST INFORMATION

11.1 Curriculum Vitae

Curriculum Vitae (CV)

1. **Position**: Owner / Director
2. **Name of Firm**: Visual Resource Management Africa cc *(www.vrma.co.za)*
3. **Name of Staff**: Stephen Stead
4. **Date of Birth**: 9 June 1967
5. **Nationality:** South African
6. **Contact Details:** **Tel: +27 (0) 44 876 0020**
   Cell: +27 (0) 83 560 9911
   Email: steve@vrma.co.za

7. **Educational qualifications**:
   - University of Natal (Pietermaritzburg):
   - Bachelor of Arts: Psychology and Geography
   - Bachelor of Arts (Hons): Human Geography and Geographic Information Management Systems

8. **Professional Accreditation**
   - Association of Professional Heritage Practitioners (APHP) Western Cape
     - Accredited VIA practitioner member of the Association (2011)

9. **Association involvement:** :
   - International Association of Impact Assessment (IAIA) South African Affiliate
     - Past President (2012 - 2013)
     - President (2012)
     - President-Elect (2011)
     - Conference Co-ordinator (2010)
     - National Executive Committee member (2009)
     - Southern Cape Chairperson (2008)

10. **Conferences Attended:**
    - IAIAsa 2012
    - IAIAsa 2011
    - IAIA International 2011 (Mexico)
    - IAIAsa 2010
    - IAIAsa 2009
    - IAIAsa 2007

11. **Continued Professional Development:**
    - Integrating Sustainability with Environment Assessment in South Africa (IAIAsa Conference, 1 day)

- Achieving the full potential of SIA (Mexico, IAIA Conference, 2 days 2011)
- Researching and Assessing Heritage Resources Course (University of Cape Town, 5 days, 2009)

12. Countries of Work Experience:

- South Africa, Mozambique, Malawi, Lesotho, Kenya and Namibia

13. Relevant Experience:

Stephen gained six years of experience in the field of Geographic Information Systems mapping and spatial analysis working as a consultant for the KwaZulu-Natal Department of Health and then with an Environmental Impact Assessment company based in the Western Cape. In 2004 he set up the company Visual Resource Management Africa that specializes in visual resource management and visual impact assessments in Africa. The company makes use of the well documented Visual Resource Management methodology developed by the Bureau of Land Management (USA) for assessing the suitability of landscape modifications. In association with ILASA qualified landscape architect Liesel Stokes, he has assessed of over 100 major landscape modifications throughout southern and eastern Africa. The business has been operating for eight years and has successfully established and retained a large client base throughout Southern Africa which include amongst other, Rio Tinto (Pty) Ltd, Bannerman (Pty) Ltd, Anglo Coal (Pty) Ltd, Eskom (Pty) Ltd, NamPower and Vale (Pty) Ltd, Ariva (Pty) Ltd, Harmony Gold (Pty) Ltd, Mellium Challenge Account (USA), Pretoria Portland Cement (Pty) Ltd

14. Languages:

- English – First Language
- Afrikaans – fair in speaking, reading and writing

15. Projects:

A list of ***some*** of the large scale projects that VRMA has assessed has been attached below with the client list indicated per project (Refer to www.vrma.co.za for a full list of projects undertaken).

YEAR	NAME	DESCRIPTION	LOCATION
2018	Mogara PV	Solar Energy	Northern Cape (SA)
2018	Gaetsewe PV	Solar Energy	Northern Cape (SA)
2017	Kalungwishi Hydroelectric (2) and power line	Hydroelectric	Zambia
2017	Mossel Bay UISP (Kwanoqaba)	Settlement	Western Cape (SA)
2017	Pavua Dam and HEP	Hydroelectric	Mozambique (SA)
2017	Penhill UISP Settlement (Cape Town)	Settlement	Western Cape (SA)
2016	Kokerboom WEF * 3	Wind Energy	Northern Cape (SA)
2016	Hotazel PV	Solar Energy	Northern Cape (SA)
2016	Eskom Sekgame Bulkop Power Line	Infrastructrue	Northern Cape (SA)
2016	Ngonye Hydroelectric	Hydroelectric	Zambia
2016	Levensdal Infill	Settlement	Western Cape (SA)
2016	Arandis CSP	Solar Energy	Namibia
2016	Bonnievale PV	Solar Energy	Western Cape (SA)
2015	Noblesfontein 2 & 3 WEF (Scoping)	Wind Energy	Eastern Cape (SA)
2015	Ephraim Sun SEF	Solar Energy	Nothern Cape (SA)
2015	Dyasonsklip and Sirius Grid TX	Solar Energy	Nothern Cape (SA)
2015	Dyasonsklip PV	Solar Energy	Nothern Cape (SA)

2015	Zeerust PV and transmission line	Solar Energy	North West (SA)
2015	Bloemsmond SEF	Solar Energy	Nothern Cape (SA)
2015	Juwi Copperton PV	Solar Energy	Nothern Cape (SA)
2015	Humansrus Capital 14 PV	Solar Energy	Nothern Cape (SA)
2015	Humansrus Capital 13 PV	Solar Energy	Nothern Cape (SA)
2015	Spitzkop East WEF (Scoping)	Solar Energy	Western Cape (SA)
2015	Lofdal Rare Earth Mine and Infrastructure	Mining	Namibia
2015	AEP Kathu PV	Solar Energy	Nothern Cape (SA)
2014	AEP Mogobe SEF	Solar Energy	Nothern Cape (SA)
2014	Bonnievale SEF	Solar Energy	Western Cape (SA)
2014	AEP Legoko SEF	Solar Energy	Northern Cape (SA)
2014	Postmasburg PV	Solar Energy	Northern Cape (SA)
2014	Joram Solar	Solar Energy	Northern Cape (SA)
2014	RERE PV Postmasberg	Solar Energy	Northern Cape (SA)
2014	RERE CPV Upington	Solar Energy	Northern Cape (SA)
2014	Rio Tinto RUL Desalinisation Plant	Industrial	Namibia
2014	NamPower PV * 3	Solar Energy	Namibia
2014	Pemba Oil and Gas Port Expansion	Industrial	Mozambique
2014	Brightsource CSP Upington	Solar Energy	Northern Cape (SA)
2014	Witsand WEF (Scoping)	Wind Energy	Western Cape (SA)
2014	Kangnas WEF	Wind Energy	Western Cape (SA)
2013	Cape Winelands DM Regional Landfill	Industrial	Western Cape (SA)
2013	Drennan PV Solar Park	Solar Energy	Eastern Cape (SA)
2013	Eastern Cape Mari-culture	Mari-culture	Eastern Cape (SA)
2013	Eskom Pantom Pass Substation	Substation /Tx lines	Western Cape (SA)
2013	Frankfort Paper Mill	Plant	Free State (SA)
2013	Gibson Bay Wind Farm Transmission lines	Tranmission lines	Eastern Cape (SA)
2013	Houhoek Eskom Substation	Substation /Tx lines	Western Cape (SA)
2013	Mulilo PV Solar Energy Sites (x4)	Solar Energy	Northern Cape (SA)
2013	Namies Wind Farm	Wind Energy	Northern Cape (SA)
2013	Rossing Z20 Pit and WRD	Mining	Namibia
2013	SAPPI Boiler Upgrade	Plant	Mpumalanga (SA)
2013	Tumela WRD	Mine	North West (SA)
2013	Weskusfleur Substation (Koeburg)	Substation /Tx lines	Western Cape (SA)
2013	Yzermyn coal mine	Mining	Mpumalanga (SA)
2012	Afrisam	Mining	Western Cape (SA)
2012	Bitterfontein	Solar Energy	Northern Cape (SA)
2012	Kangnas PV	Solar Energy	Northern Cape (SA)
2012	Kangnas PV	Solar Energy	Northern Cape (SA)
2012	Kathu CSP Tower	Solar Energy	Northern Cape (SA)
2012	Kobong Hydro	Hydro & Powerline	Lesotho

2012	Letseng Diamond Mine Upgrade	Mining	Lesotho
2012	Lunsklip Wind Farm	Wind Energy	Western Cape (SA)
2012	Mozambique Gas Engine Power Plant	Plant	Mozambique
2012	Ncondezi Thermal Power Station	Substation /Tx lines	Mozambique
2012	Sasol CSP Tower	Solar Power	Free State (SA)
2012	Sasol Upington CSP Tower	Solar Power	Northern Cape (SA)
2011	Beaufort West PV Solar Power Station	Solar Energy	Western Cape (SA)
2011	Beaufort West Wind Farm	Wind Energy	Western Cape (SA)
2011	De Bakke Cell Phone Mast	Structure	Western Cape (SA)
2011	ERF 7288 PV	Solar Energy	Western Cape (SA)
2011	Gecko Industrial park	Industrial	Namibia
2011	Green View Estates	Residential	Western Cape (SA)
2011	Hoodia Solar	Solar Energy	Western Cape (SA)
2011	Kalahari Solar Power Project	Solar Energy	Northern Cape (SA)
2011	Khanyisa Power Station	Power Station	Western Cape (SA)
2011	Olvyn Kolk PV	Solar Energy	Northern Cape (SA)
2011	Otjikoto Gold Mine	Mining	Namibia
2011	PPC Rheebieck West Upgrade	Industrial	Western Cape (SA)
2011	George Southern Arterial	Road	Western Cape (SA)
2010	Bannerman Etango Uranium Mine	Mining	Namibia
2010	Bantamsklip Transmission	Transmission	Eastern Cape (SA)
2010	Beaufort West Urban Edge	Mapping	Western Cape (SA)
2010	Bon Accord Nickel Mine	Mining	Mapumalanga (SA)
2010	Etosha National Park Infrastructure	Housing	Namibia
2010	Herolds Bay N2 Development Baseline	Residential	Western Cape (SA)
2010	MET Housing Etosha	Residential	Namibia
2010	MET Housing Etosha Amended MCDM	Residential	Namibia
2010	MTN Lattice Hub Tower	Structure	Western Cape (SA)
2010	N2 Herolds Bay Residental	Residential	Western Cape (SA)
2010	Onifin(Pty) Ltd Hartenbos Quarry Extension	Mining	Western Cape (SA)
2010	Still Bay East	GIS Mapping	Western Cape (SA)
2010	Vale Moatize Coal Mine and Railway	Mining / Rail	Mozambique
2010	Vodacom Mast	Structure	Western Cape (SA)
2010	Wadrif Dam	Dam	Western Cape (SA)
2009	Asazani Zinyoka UISP Housing	Residential Infill	Western Cape (SA)
2009	Eden Telecommunication Tower	Structure	Western Cape (SA)
2009	George SDF Landscape Characterisation	GIS Mapping	Western Cape (SA)
2009	George SDF Visual Resource Management	GIS Mapping	Western Cape (SA)
2009	George Western Bypass	Road	Western Cape (SA)
2009	Knysna Affordable Housing Heidevallei	Residential Infill	Western Cape (SA)
2009	Knysna Affordable Housing Hornlee Project	Residential Infill	Western Cape (SA)

2009	Rossing Uranium Mine Phase 2	Mining	Namibia
2009	Sun Ray Wind Farm	Wind Energy	Western Cape (SA)
2008	Bantamsklip Transmission Lines Scoping	Transmission	Western Cape (SA)
2008	Erf 251 Damage Assessment	Residential	Western Cape (SA)
2008	Erongo Uranium Rush SEA	GIS Mapping	Namibia
2008	Evander South Gold Mine Preliminary VIA	Mining	Mpumalanga (SA)
2008	George SDF Open Spaces System	GIS Mapping	Western Cape (SA)
2008	Hartenbos River Park	Residential	Western Cape (SA)
2008	Kaaimans Project	Residential	Western Cape (SA)
2008	Lagoon Garden Estate	Residential	Western Cape (SA)
2008	Moquini Beach Hotel	Resort	Western Cape (SA)
2008	NamPower Coal fired Power Station	Power Station	Namibia
2008	Oasis Development	Residential	Western Cape (SA)
2008	RUL Sulpher Handling Facility Walvis Bay	Mining	Namibia
2008	Stonehouse Development	Residential	Western Cape (SA)
2008	Walvis Bay Power Station	Structure	Namibia
2007	Calitzdorp Retirement Village	Residential	Western Cape (SA)
2007	Calitzdorp Visualisation	Visualisation	Western Cape (SA)
2007	Camdeboo Estate	Residential	Western Cape (SA)
2007	Destiny Africa	Residential	Western Cape (SA)
2007	Droogfontein Farm 245	Residential	Western Cape (SA)
2007	Floating Liquified Natural Gas Facility	Structure tanker	Western Cape (SA)
2007	George SDF Municipality Densification	GIS Mapping	Western Cape (SA)
2007	Kloofsig Development	Residential	Western Cape (SA)
2007	OCGT Power Plant Extension	Structure Power Plant	Western Cape (SA)
2007	Oudtshoorn Municipality SDF	GIS Mapping	Western Cape (SA)
2007	Oudtshoorn Shopping Complex	Structure	Western Cape (SA)
2007	Pezula Infill (Noetzie)	Residential	Western Cape (SA)
2007	Pierpoint Nature Reserve	Residential	Western Cape (SA)
2007	Pinnacle Point Golf Estate	Golf/Residential	Western Cape (SA)
2007	Rheebok Development Erf 252 Appeal	Residential	Western Cape (SA)
2007	Rossing Uranium Mine Phase 1	Mining	Namibia
2007	Ryst Kuil/Riet Kuil Uranium Mine	Mining	Western Cape (SA)
2007	Sedgefield Water Works	Structure	Western Cape (SA)
2007	Sulpher Handling Station Walvis Bay Port	Industrial	Namibia
2007	Trekkopje Uranium Mine	Mining	Namibia
2007	Weldon Kaya	Residential	Western Cape (SA)
2006	Farm Dwarsweg 260	Residential	Western Cape (SA)
2006	Fynboskruin Extention	Residential	Western Cape (SA)
2006	Hanglip Golf and Residential Estate	Residential	Western Cape (SA)
2006	Hansmoeskraal	Slopes Analysis	Western Cape (SA)

2006	Hartenbos Landgoed Phase 2	Residential	Western Cape (SA)
2006	Hersham Security Village	Residential	Western Cape (SA)
2006	Ladywood Farm 437	Residential	Western Cape (SA)
2006	Le Grand Golf and Residential Estate	Residential	Western Cape (SA)
2006	Paradise Coast	Residential	Western Cape (SA)
2006	Paradyskloof Residential Estate	Residential	Western Cape (SA)
2006	Riverhill Residential Estate	Residential	Western Cape (SA)
2006	Wolwe Eiland Access Route	Road	Western Cape (SA)
2005	Harmony Gold Mine	Mining	Mpumalanga (SA)
2005	Knysna River Reserve	Residential	Western Cape (SA)
2005	Lagoon Bay Lifestyle Estate	Residential	Western Cape (SA)
2005	Outeniquabosch Safari Park	Residential	Western Cape (SA)
2005	Proposed Hotel Farm Gansevallei	Resort	Western Cape (SA)
2005	Uitzicht Development	Residential	Western Cape (SA)
2005	West Dunes	Residential	Western Cape (SA)
2005	Wilderness Erf 2278	Residential	Western Cape (SA)
2005	Wolwe Eiland Eco & Nature Estate	Residential	Western Cape (SA)
2005	Zebra Clay Mine	Mining	Western Cape (SA)
2004	Gansevallei Hotel	Residential	Western Cape (SA)
2004	Lakes Eco and Golf Estate	Residential	Western Cape (SA)
2004	Trekkopje Desalination Plant	Structure Plant	Namibia (SA)
1995	Greater Durban Informal Housing Analysis	Photogrammetry	KwaZulu-Natal (SA)

12 ANNEXURE 3: QUESTIONNAIRES AND VRM TERMINOLOGY

12.1 Methodology Detail

Viewshed

The visible extent, or viewshed, is 'the outer boundary defining a view catchment area, usually along crests and ridgelines' *(Oberholzer, 2005).* This reflects the area, or extent, where the landscape modification would probably be seen. However, visibility tends to diminish exponentially with distance, which is well recognised in visual analysis literature. Therefore the views of a landscape modification would not necessarily influence the landscape character within all areas of the viewshed. The information for the terrain used in the 3D computer model on which the visibility analysis is based on the Advanced Spaceborne Thermal Emission and Reflection (ASTER) Radiometer Data, a product of Japan's Ministry of Economy, Trade and Industry (METI) and National Aeronautics and Space Administration (NASA) in USA. (NASA, 2009)

Receptor Exposure

The area where a landscape modification starts to influence the landscape character is termed the Zone of Visual Influence (ZVI) and is defined by the U.K. Institute of Environmental Management and Assessment's (IEMA) *'Guidelines for Landscape and Visual Impact Assessment'* as 'the area within which a proposed development may have an influence or effect on visual amenity (of the surrounding areas).'

The inverse relationship of distance and visual impact is well recognised in visual analysis literature *(Hull, R.B. and Bishop, I.E., 1988)*. According to Hull and Bishop, exposure, or visual impact, tends to diminish exponentially with distance. The areas where most landscape modifications would be visible are located within 2 km from the site of the landscape modification. Thus the potential visual impact of an object diminishes at an exponential rate as the distance between the observer and the object increases due to atmospheric conditions prevalent at a location, which causes the air to appear greyer, thereby diminishing detail. For example, viewed from 1000 m from a landscape modification, the impact would be 25% of the impact as viewed from 500 m from a landscape modification. At 2000m it would be 10% of the impact at 500 m. The relationship is indicated in the following graph generated by Hull and Bishop.

The VRM methodology also takes distance from a landscape modification into consideration in terms of understanding visual resource. Three distance categories are defined by the Bureau of Land Management. The distance zones are:

i. ***Foreground / Middle ground***, up to approximately 6km, which is where there is potential for the sense of place to change;
ii. ***Background areas***, from 6km to 24km, where there is some potential for change in the sense of place, but where change would only occur in the case of very large landscape modifications; and
iii. ***Seldom seen areas***, which fall within the Foreground / Middle ground area but, as a result of no receptors, are not viewed or are seldom viewed.

Scenic Quality

In terms of the VRM methodology, landscape character is derived from a combination of scenic quality, receptor sensitivity to landscape change, and distance of the proposed landscape modification from key receptor points. The scenic quality is determined making use of the VRM scenic quality questionnaire (refer to addendum). Seven scenic quality criteria area scored on a 1 (low) to 5 (high) scale. The scores are totalled and assigned a A (High), B (Moderate) or C (low) based on the following split:
A= scenic quality rating of ≥19;
B = rating of 12 – 18,
C= rating of ≤11

The seven scenic quality criteria are defined below:

- **Land Form:** Topography becomes more of a factor as it becomes steeper, or more severely sculptured.
- **Vegetation:** Primary consideration given to the variety of patterns, forms, and textures created by plant life.
- **Water:** That ingredient which adds movement or serenity to a scene. The degree to which water dominates the scene is the primary consideration.
- **Colour:** The overall colour(s) of the basic components of the landscape (e.g., soil, rock, vegetation, etc.) are considered as they appear during seasons or periods of high use.
- **Scarcity:** This factor provides an opportunity to give added importance to one, or all, of the scenic features that appear to be relatively unique or rare within one physiographic region.
- **Adjacent Land Use:** Degree to which scenery and distance enhance, or start to influence, the overall impression of the scenery within the rating unit.
- **Cultural Modifications:** Cultural modifications should be considered, and may detract from the scenery or complement or improve the scenic quality of an area.

Receptor Sensitivity

Sensitivity levels are a measure of public concern for scenic quality. Receptor sensitivity to landscape change is determined by rating the following factors in terms of Low to High:

- **Type of Users:** Visual sensitivity will vary with the type of users, e.g. recreational sightseers may be highly sensitive to any changes in visual quality, whereas workers who pass through the area on a regular basis may not be as sensitive to change.
- **Amount of Use:** Areas seen or used by large numbers of people are potentially more sensitive.
- **Public Interest:** The visual quality of an area may be of concern to local, or regional, groups. Indicators of this concern are usually expressed via public controversy created in response to proposed activities.
- **Adjacent Land Uses:** The interrelationship with land uses in adjacent lands. For example, an area within the viewshed of a residential area may be very sensitive, whereas an area surrounded by commercially developed lands may not be as visually sensitive.
- **Special Areas:** Management objectives for special areas such as Natural Areas, Wilderness Areas or Wilderness Study Areas, Wild and Scenic Rivers, Scenic Areas,

Scenic Roads or Trails, and Critical Biodiversity Areas frequently require special consideration for the protection of their visual values.

- **Other Factors:** Consider any other information such as research or studies that include indicators of visual sensitivity.

Visual Resource Management (VRM) Classes

The VRM Classes represent the relative value of the visual resources of an area and are determined making use of the VRM Class Matrix see Table 8 below:

i. **Classes I and II** are the most valued;
ii. **Class III** represents a moderate value; and
iii. **Class IV** is of least value.

The Classes are not prescriptive and are utilised as a guideline to determine visual carrying capacity. The Visual Inventory Classes are defined using the matrix below and with motivation, can be adjusted to Visual Resource Management Classes:

The visual objectives of each of the classes is listed below:

- The Class I objective is to preserve the existing character of the landscape, the level of change to the characteristic landscape should be very low, and must not attract attention. Class I is assigned when a specialist decision is made to maintain a natural landscape.
- The Class II objective is to retain the existing character of the landscape and the level of change to the characteristic landscape should be low. Management activities may be seen, but should not attract the attention of the casual observer, and should repeat the basic elements of form, line, colour and texture found in the predominant natural features of the characteristic landscape.
- The Class III objective is to partially retain the existing character of the landscape, where the level of change to the characteristic landscape should be moderate. Management activities may attract attention, but should not dominate the view of the casual observer, and changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.
- The Class IV objective is to provide for management activities which require major modifications of the existing character of the landscape. The level of change to the landscape can be high, and these management activities may dominate the view and be the major focus of the viewer's (s') attention.

Key Observation Points (KOPs)

KOPs are defined by the Bureau of Land Management as the people (receptors) located in strategic locations surrounding the property that make consistent use of the views associated with the site where the landscape modifications are proposed. These locations are important in terms of the VRM methodology, which requires that the Degree of Contrast (DoC) that the proposed landscape modifications will make to the existing landscape be measured from these most critical locations, or receptors, surrounding the property.

To define the KOPs, potential receptor locations were identified in the viewshed analysis, and screened, based on the following criteria:

- Angle of observation;
- Number of viewers;
- Length of time the project is in view;
- Relative project size;
- Season of use;
- Critical viewpoints, e.g. views from communities, road crossings; and
- Distance from property.

Contrast Rating

The contrast rating, or impacts assessment phase, is undertaken to determine if the VRM Class Objectives are met. The suitability of landscape modification is assessed by comparing the degree of potential contrast from the proposed activity in comparison to the existing contrast created by the existing landscape. This is done by evaluating the level of change to the existing landscape by assessing the line, colour, texture and form, in relation to the visual objectives defined for the area. The following criteria are utilised in defining the DoC:

- **None**: The element contrast is not visible or perceived.
- **Weak**: The element contrast can be seen but does not attract attention.
- **Moderate**: The element contrast begins to attract attention and begins to dominate the characteristic landscape.
- **Strong**: The element contrast demands attention, will not be overlooked, and is dominant in the landscape.

As an example, in a Class I area, the visual objective is to preserve the existing character of the landscape, and the resultant contrast to the existing landscape should not be notable to the casual observer and cannot attract attention. In a Class IV area example, the objective is to provide for proposed landscape activities which require major modifications of the existing character of the landscape. Based on whether the VRM objectives are met, mitigations, if required, are defined to avoid, reduce or mitigate the proposed landscape modifications so that the visual impact does not detract from the surrounding landscape sense of place.

Photo Montages and 3D Visualisation

- As a component in this contrast rating process, visual representation, such as photo montages are vital in large-scale modifications, as this serves to inform Interested & Affected Parties and decision-making authorities of the nature and extent of the impact associated with the proposed project/development. There is an ethical obligation in this process, as visualisation can be misleading if not undertaken ethically. In terms of adhering to standards for ethical representation of landscape modifications, VRMA subscribes to the Proposed Interim Code of Ethics for Landscape Visualisation developed by the Collaborative for Advanced Landscape Planning (CALP). (Sheppard, 2000) This code states that professional presenters of realistic landscape visualisations are responsible for promoting full understanding of proposed landscape changes, providing an honest and neutral visual representation of the expected landscape, by seeking to avoid bias in responses and demonstrating the legitimacy of the visualisation process. Presenters of landscape visualisations should adhere to the principles of:

- Access to Information
- Accuracy
- Legitimacy
- Representativeness
- Visual Clarity and Interest

The Code of Ethical Conduct states that the presenter should:

- Demonstrate an appropriate level of qualification and experience.
- Use visualisation tools and media that are appropriate to the purpose.
- Choose the appropriate level of realism.
- Identify, collect and document supporting visual data available for, or used in, the visualisation process.
- Conduct an on-site visual analysis to determine important issues and views.
- Seek community input on viewpoints and landscape issues to address in the visualisations.
- Provide the viewer with a reasonable choice of viewpoints, view directions, view angles, viewing conditions and timeframes appropriate to the area being visualised.
- Estimate and disclose the expected degree of uncertainty, indicating areas and possible visual consequences of the uncertainties.
- Use more than one appropriate presentation mode and means of access for the affected public.
- Present important non-visual information at the same time as the visual presentation, using a neutral delivery.
- Avoid the use, or the appearance of, ‘sales’ techniques or special effects.
- Avoid seeking a particular response from the audience.
- Provide information describing how the visualisation process was conducted and how key decisions were taken *(Sheppard, S.R.J., 2005)*.

12.2 Questionnaires

Scenic Quality Rating Questionnaire

KEY FACTORS	RATING CRITERIA AND SCORE		
SCORE	**5**	**3**	**1**
Land Form	High vertical relief as expressed in prominent cliffs, spires or massive rock outcrops, or severe surface variation or highly eroded formations or detail features that are dominating and exceptionally striking and intriguing.	Steep-sided river valleys, or interesting erosion patterns or variety in size and shape of landforms; or detail features that are interesting, though not dominant or exceptional.	Low rolling hills, foothills or flat valley bottoms; few or no interesting landscape features.
Vegetation	A variety of vegetative types as expressed in interesting forms, textures and patterns.	Some variety of vegetation, but only one or two major types.	Little or no variety or contrast in vegetation.
Water	Clear and clean appearing, still or cascading white water, any of which are a dominant factor in the landscape.	Flowing, or still, but not dominant in the landscape.	Absent, or present but not noticeable.
Colour	Rich colour combinations, variety or vivid colour: or pleasing contrasts in the soil, rock, vegetation, water.	Some intensity or variety in colours and contrast of the soil, rock and vegetation, but not a dominant scenic element.	Subtle colour variations contrast or interest: generally mute tones.
Adjacent Scenery	Adjacent scenery greatly enhances visual quality.	Adjacent scenery moderately enhances overall visual quality.	Adjacent scenery has little or no influence on overall visual quality.
Scarcity	One of a kind: unusually memorable, or very rare within region. Consistent chance for exceptional wildlife or wildflower viewing etc.	Distinctive, though somewhat similar to others within the region.	Interesting within its setting, but fairly common within the region.
SCORE	**2**	**0**	**-4**
Cultural Modification	Modifications add favourably to visual variety, while promoting visual harmony.	Modifications add little or no visual variety to the area, and introduce no discordant elements.	Modifications add variety but are very discordant and promote strong disharmony.

Sensitivity Level Rating Questionnaire

FACTORS	QUESTIONS	
Type of Users	**Maintenance of visual quality is:**	
	A major concern for most users	High
	A moderate concern for most users	Moderate
	A low concern for most users	Low
Amount of use	**Maintenance of visual quality becomes more important as the level of use increases:**	
	A high level of use	High
	Moderately level of use	Moderate
	Low level of use	Low
Public interest	**Maintenance of visual quality:**	
	A major concern for most users	High
	A moderate concern for most users	Moderate
	A low concern for most users	Low
Adjacent land Users	**Maintenance of visual quality to sustain adjacent land use objectives is:**	
	Very important	High
	Moderately important	Moderate
	Slightly important	Low
Special Areas	**Maintenance of visual quality to sustain Special Area management objectives is:**	
	Very important	High
	Moderately important	Moderate
	Slightly important	Low

12.3 VRM Terminology

FORM	LINE	COLOUR	TEXTURE
Simple	Horizontal		Smooth
Weak	Vertical		Rough
Strong	Geometric		Fine
Dominant	Angular		Coarse
Flat	Acute		Patchy
Rolling	Parallel		Even
Undulating	Curved	Dark	Uneven
Complex	Wavy	Light	Complex
Plateau	Strong	Mottled	Simple
Ridge	Weak		Stark
Valley	Crisp		Clustered
Plain	Feathered		Diffuse
Steep	Indistinct		Dense
Shallow	Clean		Scattered
Organic	Prominent		Sporadic
Structured	Solid		Consistent

Simple	Basic, composed of few elements	**Organic**	Derived from nature; occurring or developing gradually and naturally
Complex	Complicated; made up of many interrelated parts	**Structure**	Organised; planned and controlled; with definite shape, form, or pattern
Weak	Lacking strength of character	**Regular**	Repeatedly occurring in an ordered fashion
Strong	Bold, definite, having prominence	**Horizontal**	Parallel to the horizon
Dominant	Controlling, influencing the surrounding environment	**Vertical**	Perpendicular to the horizon; upright
Flat	Level and horizontal without any slope; even and smooth without any bumps or hollows	**Geometric**	Consisting of straight lines and simple shapes
Rolling	Progressive and consistent in form, usually rounded	**Angular**	Sharply defined; used to describe an object identified by angles
Undulating	Moving sinuously like waves; wavy in appearance	**Acute**	Less than 90°; used to describe a sharp angle
Plateau	Uniformly elevated flat to gently undulating land bounded on one or more sides by steep slopes	**Parallel**	Relating to or being lines, planes, or curved surfaces that are always the same distance apart and therefore never meet
Ridge	A narrow landform typical of a highpoint or apex; a long narrow hilltop or range of hills	**Curved**	Rounded or bending in shape
Valley	Low-lying area; a long low area of land, often with a river or stream running through it, that is surrounded by higher ground	**Wavy**	Repeatedly curving forming a series of smooth curves that go in one direction and then another
Plain	A flat expanse of land; fairly flat dry land, usually with few trees	**Feathered**	Layered; consisting of many fine parallel strands
Steep	Sloping sharply often to the extent of being almost vertical	**Indistinct**	Vague; lacking clarity or form
Prominent	Noticeable; distinguished, eminent, or well-known	**Patchy**	Irregular and inconsistent;
Solid	Unadulterated or unmixed; made of the same material throughout; uninterrupted	**Even**	Consistent and equal; lacking slope, roughness, and irregularity
Broken	Lacking continuity; having an uneven surface	**Uneven**	Inconsistent and unequal in measurement irregular
Smooth	Consistent in line and form; even textured	**Stark**	Bare and plain; lacking ornament or relieving features
Rough	Bumpy; knobbly; or uneven, coarse in texture	**Clustered**	Densely grouped
Fine	Intricate and refined in nature	**Diffuse**	Spread through; scattered over an area
Coarse	Harsh or rough to the touch; lacking detail	**Diffuse**	To make something less bright or intense

13 ANNEXURE 4: GENERAL LIGHTS AT NIGHT GUIDELINES

The International Dark-sky Association (IDA) recommend lighting with lower color temperatures has less blue in its spectrum and is referred to as being "warm." "Higher color temperature sources of light are rich in blue light. (International Dark-sky Association)
IDA recommends that only warm light sources be used for outdoor lighting. This includes LPS, HPS and low-color-temperature LEDs. In some areas, the white light of even a low-color-temperature LED can be a threat to the local nighttime environment. In those cases, LPS or narrow-spectrum LEDs are preferred choices". The following recommendations are presented by the New England Light Pollution Advisory Group (NELPAG)

What is good lighting? Good outdoor lights improve visibility, safety, and a sense of security, while minimizing energy use, operating costs, and ugly, dazzling glare.

Why should we be concerned? Many outdoor lights are poorly designed or improperly aimed. Such lights are costly, wasteful, and distractingly glary. They harm the night-time environment and neighbours' property values. Light directed uselessly above the horizon creates murky skyglow — the "light pollution" that washes out our view of the stars.

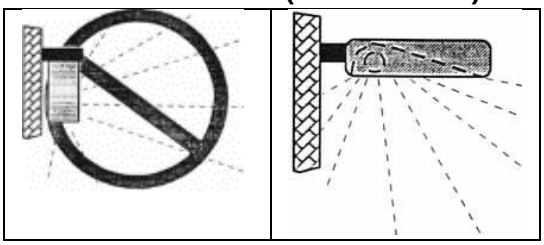
Glare Here's the basic rule of thumb: If you can see the bright bulb from a distance, it's a bad light. With a good light, you see lit ground instead of the dazzling bulb. "Glare" is light that beams directly from a bulb into your eye. It hampers the vision of pedestrians, cyclists, and drivers.

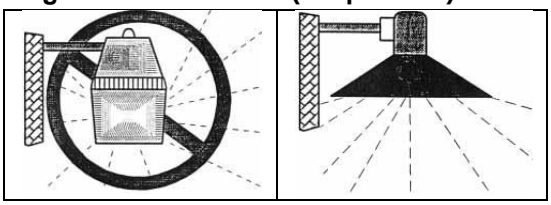
Light Trespass Poor outdoor lighting shines onto neighbours' properties and into bedroom windows, reducing privacy, hindering sleep, and giving the area an unattractive, trashy look.

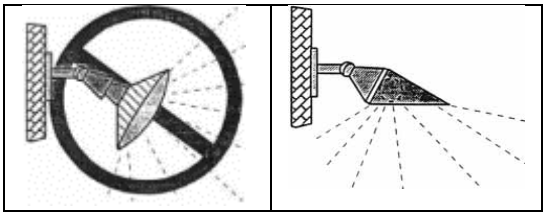
Energy Waste Many outdoor lights waste energy by spilling much of their light where it is not needed, such as up into the sky. This waste results in high operating costs. Each year we waste more than a billion dollars in the United States needlessly lighting the night sky.

Excess Lighting Some homes and businesses are flooded with much stronger light than is necessary for safety or security.

Good and Bad Light Fixtures

Typical "Wall Pack"	**Typical "Shoe Box" (forward throw)**
	
BAD Waste light goes up and sideways	**GOOD** Directs all light down

Typical "Yard Light"	**Opaque Reflector (lamp inside)**
	
BAD Waste light goes up and sideways	**GOOD** Directs all light down

Area Flood Light	**Area Flood Light with Hood**
	
BAD Waste light goes up and sideways	**GOOD** Directs all light down

How do I switch to good lighting?

Provide only enough light for the task at hand; don't over-light, and don't spill light off your property. Specifying enough light for a job is sometimes hard to do on paper. Remember that a full Moon can make an area quite bright. Some lighting systems illuminate areas 100 times more brightly than the full Moon! More importantly, by choosing properly shielded lights, you can meet your needs without bothering neighbours or polluting the sky.

1. Aim lights down. Choose "full-cutoff shielded" fixtures that keep light from going uselessly up or sideways. Full-cutoff fixtures produce minimum glare. They create a pleasant-looking environment. They increase safety because you see illuminated people, cars, and terrain, not dazzling bulbs.

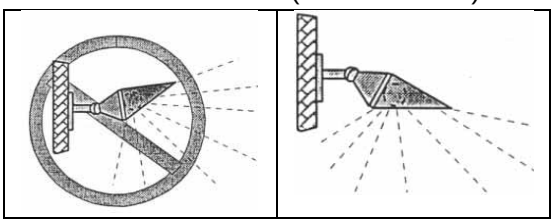
2. Install fixtures carefully to maximize their effectiveness on the targeted area and minimize their impact elsewhere. Proper aiming of fixtures is crucial. Most are aimed too high. Try to install them at night, when you can see where all the rays actually go. Properly aimed and shielded lights may cost more initially, but they save you far more in the long run. They can illuminate your target with a low-wattage bulb just as well as a wasteful light does with a high-wattage bulb.

3. If colour discrimination is not important, choose energy-efficient fixtures utilising yellowish high-pressure sodium (HPS) bulbs. If "white" light is needed, fixtures using compact fluorescent or metal-halide (MH) bulbs are more energy-efficient than those using incandescent, halogen, or mercury-vapour bulbs.

4. Where feasible, put lights on timers to turn them off each night after they are no longer needed. Put home security lights on a motion-detector switch, which turns them on only when someone enters the area; this provides a great deterrent effect!

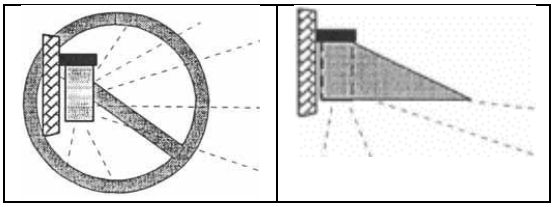
What You Can Do To Modify Existing Fixtures

Change this . . . to this (aim downward)



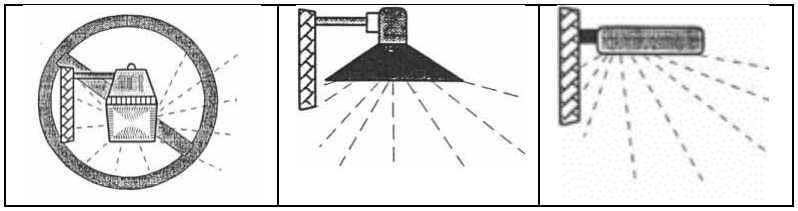
Floodlight:

Change this . . . to this (aim downward)



Wall Pack

Change this . . . to this or this



Yard Light | Opaque Reflecter | Show Box

Replace bad lights with good lights.

You'll save energy and money. You'll be a good neighbour. And you'll help preserve our view of the stars.