Cyraguard (Pty) Ltd

PROPOSED HYPERION SOLAR DEVELOPMENT 2, NEAR KATHU, IN THE NORTHERN CAPE PROVINCE

LANDSCAPE & VISUAL IMPACT ASSESSMENT REPORT

MARCH 2019

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TABLE OF CONTENTS

APPENDICES

MAPS

PHOTOGRAPHIC PLATES

1 INTRODUCTION

1.1 GENERAL

This Landscape and Visual Impact Assessment forms part of the Scoping and Environmental Impact Assessment that is being undertaken for the proposed Hyperion Solar Development by Savannah Environmental (Pty) Ltd on behalf of Cyraguard (Pty) Ltd. The project comprises a 75MW solar photovoltaic (PV) facility.

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

This Visual Impact Assessment Report has been prepared for inclusion in the project Environmental Impact Assessment report.

1.2 PROJECT LOCATION

The project is located in the Gamagara Local Municipality and the John Taolo Gaetsewe District Municipality (**Map 1: Locality Map**).

The approximate geographic coordinates for the centre of the proposed site are;

South	27^0	33'	47.30"
East	23^0	04'	34.21"

1.3 BACKGROUND OF SPECIALIST

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

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

1.4 BRIEF AND RELEVANT GUIDELINES

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

Work was undertaken in accordance with the following guideline documents:

a. The Government of the Western Cape Guideline for Involving Visual and Aesthetic Specialists in EIA Processes (Western Cape Guideline) (Oberholzer, 2005). This is the only relevant local guideline, setting various levels of assessment subject to the nature of the proposed development and surrounding landscape **(Appendix II)**; and
b. The Landscape Institute and Institute of Environmental Management and Assessment (UK) Guidelines for Landscape and Visual Impact

Assessment (GVLIA) which provides detail of international best practice (UK Guidelines) (Landscape Institute and Institute of Environmental Assessment and Management, 2013).

1.4.1 Western Cape Guidelines

The Western Cape Guidelines provide a useful guide as to the level of impact necessary for various types of developments and in various types of landscape. It also provides guidance as to the necessary consideration and content of an assessment. This information is applied in Section 6, Methodology.

1.4.2 UK Guideline

This document provides the following criteria which, at least, should be borne in mind as it could help the professional in carrying out the process of assessing the Landscape Effects as follows:

- Consider the physical state of the landscape. This includes the extent to which typical character is represented in individual areas, the intactness of the landscape from visual, functional and ecological perspectives and the condition of individual elements of the landscape;
- Consider scenic quality which depends upon perception and reflects the particular combination and pattern of elements in the landscape, its aesthetic qualities, its more intangible sense of place or 'genius loci' and other more intangible qualities;
- Consider the rarity of the landscape, it might be valued because it is a rare type, or because it contains rare elements, features or attributes;
- Consider representativeness, as a landscape may be valued because it is considered to be a particularly good example of its type either in terms of its overall character or because of the elements or features it contains;
- Consider conservation interests, i.e. the presence of features of wildlife, earth science or archaeological or historical and cultural interest can add to the value of the landscape as well as having value in their own right.
- Consider perceptual aspects as a landscape may be valued for its perceptual qualities, notably wildness and/or tranquillity; and
- If public opinion has been sought consider if there may be a consensus of opinion, expressed by the public, informed professionals, interest groups, and artists, writers and other media, on the importance of the landscape.

As regards the Visual Effects, the Guideline suggests the selection of the final viewpoints used for the assessment should take account of a range of factors including:

- Accessibility to the public;
- Potential number and sensitivity of viewers who may be affected;
- Viewing distance (i.e. short, medium and long distance views) and elevation
- View type (for example panoramas, vistas, glimpses);
- Nature of viewing experience (for example static views, views from settlements and points along sequential routes);
- Potential for cumulative views of the proposed development in conjunction with other developments

1.5 LIMITATIONS AND ASSUMPTIONS

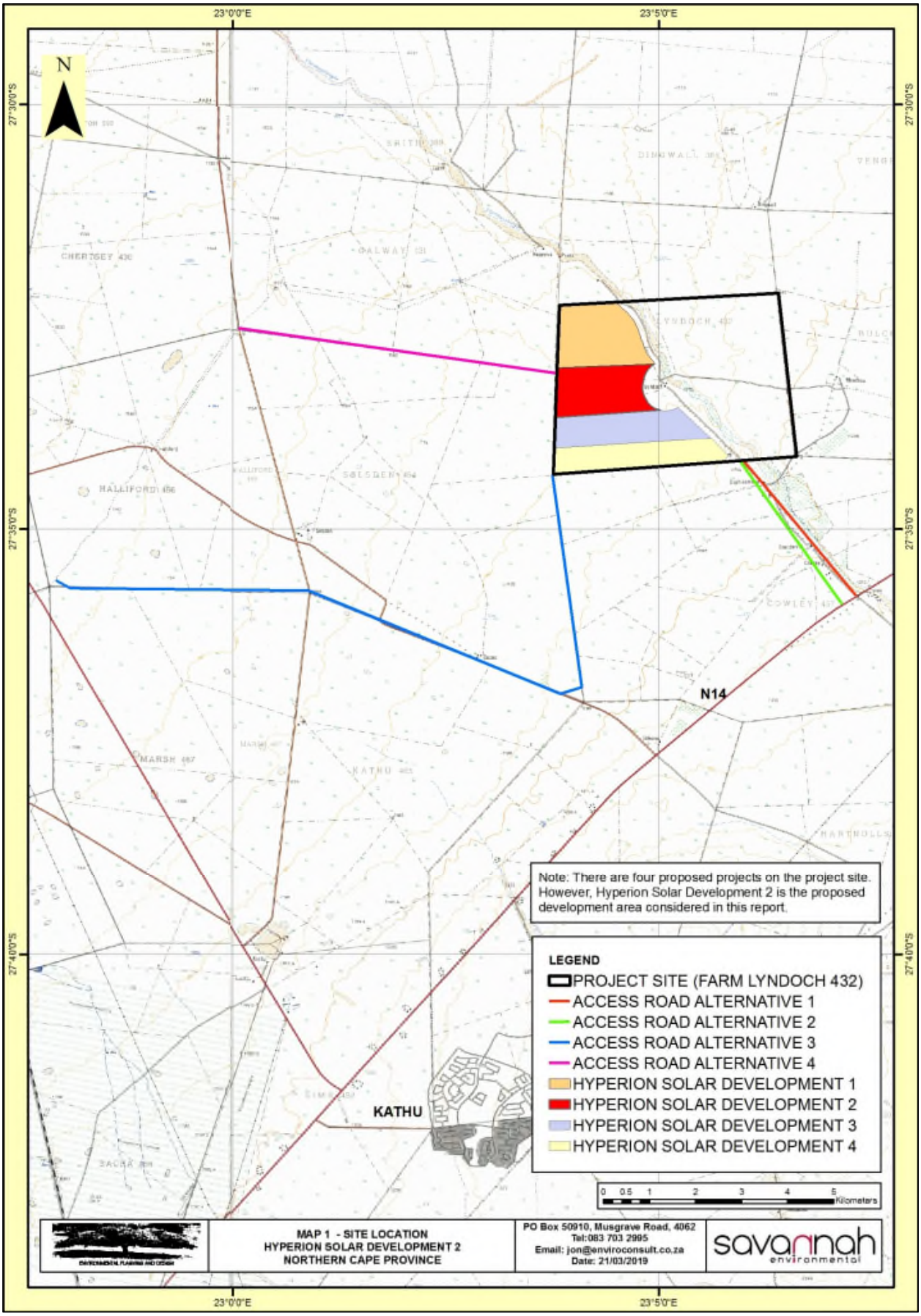
The following limitations and assumptions should be noted:

In the assessment tables the subjective judgement as to whether an impact is negative or positive is based on the assumption that the majority of people are likely to prefer to view a natural or a rural landscape than an industrial landscape.

A site visit was undertaken on a single day (5th January 2019) to verify the likely visibility of the proposed development, the nature of the affected landscape and affected receptors.

The site visit was planned to ensure that weather conditions were clear ensuring maximum visibility.

The timing of photography was planned to ensure that the sun was as far as possible behind the photographer. This was to ensure that as much detail as possible was recorded in the photographs.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N
N14
KATHU
Note: There are four proposed projects on the project site. However, Hyperion Solar Development 2 is the proposed development area considered in this report.
LEGEND
PROJECT SITE (FARM LYNDOCH 432)
ACCESS ROAD ALTERNATIVE 1
ACCESS ROAD ALTERNATIVE 2
ACCESS ROAD ALTERNATIVE 3
ACCESS ROAD ALTERNATIVE 4
HYPERION SOLAR DEVELOPMENT 1
HYPERION SOLAR DEVELOPMENT 2
HYPERION SOLAR DEVELOPMENT 3
HYPERION SOLAR DEVELOPMENT 4
0 0.5 1 2 3 4 5 Kilometers
MAP 1 - SITE LOCATION
HYPERION SOLAR DEVELOPMENT 2
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2. PROJECT DESCRIPTION

2.1 MOTIVATION AND CONTEXT

In response to the Department of Energy's requirement for power generation from renewable energy, the applicant is proposing the establishment of a photovoltaic (PV) solar energy generation facility with a generating capacity of up to 75MW to generate electricity for input into the national grid to augment Eskom's power supply.

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

2.1 PROJECT DESCRIPTION

Refer to Map 2, Site Layout

The application is for construction of a commercial PV solar energy facility as well as associated infrastructure. The contracted capacity of the proposed solar energy facility will be up to 75 MW.

The Hyperion Solar Development 2 is part of a larger overall PV development that includes three other PV projects on the same property.

The projects will each include:

- Several arrays of photovoltaic solar panels over an area of approximately 156ha;
- Mounting structures to support the PV panels;
- On-site inverters to step up the power; and
- On-site step-up transformers from 33kV to 132 kV.

Each facility will be connected to an onsite collector substation via a 132kV power line. The collector substation will be connected to the Eskom Ferrum substation in Kathu via a double circuit power line. This grid infrastructure will be the subject of a separate EIA process and is not considered in this report.

The PV panels will be attached to a support structure up to 6m off the ground set at an angle so to receive the maximum amount of solar radiation (fixed technology), or set to track the sun (tracking technology) in order to increase the amount of energy produced.

The PV panels can either comprise a fixed/static support structure set at an angle or a tracking axis, where the system tracks the sun. The angle of the panel is dependent on the latitude of the proposed facility and the angles may be adjusted to optimise for summer or winter solar irradiation characteristics.

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

Based on the outcome of the meeting and consultations with affected landowners during the Scoping Phase, the following four access road alternatives were identified for consideration for the project within the EIA studies;

Access Road Alternative 1:

This alternative formed part of the Scoping Phase and entails the upgrade of approximately 3.6km of the existing T26 gravel road situated between the project site and the N14 national road. The existing road will be upgraded from approximately 5m to 9m in width and will traverse four properties; the Remaining Extent of the Farm Lyndoch 432; Portion 1, 2 and the Remaining Extent of the Farm Cowley 457.

Access Road Alternative 2:

This is a new alternative identified for consideration in the EIA process. Alternative 2 entails the establishment of a new access road approximately 3.6km in length and 9m in width. The new access road is proposed to be located adjacent to the existing T26 gravel road and will traverse four properties; the Remaining Extent of the Farm Lyndoch 432, Portion 1, 2 and the Remaining Extent of the Farm Cowley 457.

Access Road Alternative 3:

Alternative 3 entails the establishment of a new access road approximately 5.1km in length and 9m in width and the upgrade of approximately 10.3km of the existing T25 gravel road up to 9m in width. This alternative was previously known as Alternative 2 in the Scoping Phase and was realigned in order to avoid the protected Kathu Forest. Alternative 3 will traverse five properties; the Remaining Extent of the Farm Lyndoch 432, Portion 1 of the Farm Selsden 464, the Remaining Extent of the Farm Kathu 465, Portion 1 of the Farm Halliford 466 and the Remaining Extent of the Farm Marsh 467.

Access Road Alternative 4:

Access Road Alternative 4 entails the establishment of a new access road approximately 6.2km in length and 9m in width situated between the western boundary of the project site and the R380 regional road. This alternative was proposed by the DAFF as an additional alternative which will traverse four properties; the Remaining Extent of the Farm Lyndoch 432, Portion 1 and the Remaining Extent of the Farm Selsden 464 and the Remaining Extent of the Farm Halliford 466.

A 20m wide corridor for all four alternatives has been considered and assessed during the EIA Phase in order to determine the most preferred route from an environmental perspective.

Access Road alternative alignments are indicated on Map 1.

2.2 LIKELY SCALE OF DEVELOPMENT AND NATURE OF VISUAL IMPACTS

The proposed project layout is indicated on Map 2.

In visual terms, a PV array is generally comprised of a combination of elements that may be obvious in the landscape. The most obvious are likely to include:

2.2.1 Photovoltaic Panels

Solar photovoltaic (PV) panels consist primarily of glass and various semiconductor materials and in a typical solar PV project, will be arranged in rows to form solar

arrays. The PV panels are designed to operate continuously for more than 20 years with minimal maintenance required.

PV units are generally aligned in rows with only sufficient space between the rows to allow access for maintenance and replacement. This means that when an array is set in and viewed from level ground, it appears as a single row of units. However when viewed from a slightly elevated position, the individual rows combine to increase the visual mass.

In addition to the way that a mass of PV units may change the landscape, reflection and glare is often highlighted as a potential issue. Whilst PV units are designed to absorb as much energy as possible, the intensity of glare can be an issue when light is received at glancing angles as less light is absorbed and more light reflected. These conditions are likely to occur when the elevation of the sun is low during early morning and late afternoon for viewers at a similar level as the array. For observers that are significantly higher than the array however, such as those on an aircraft flight path, the timing of adverse conditions will vary subject to the location of the aircraft relative to the array.

If it is problematic, glare is likely to be a temporary impact in most instances only causing nuisance during a certain time of day and time of year.

2.2.2 Substation and Inverters

The photovoltaic effect produces electricity in direct current (DC). Inverters must be used to convert DC to alternating current (AC) for transmission in the national grid.

A "Power Block" is a set of solar panels that feed a dedicated inverter station inclusive of medium voltage transformer. The size of Power Blocks will depend on the detailed design of the plant and final inverter selection. A Power Block is typically in the range of ± 2 – 4MW.

The PV combining switchgear (PVCS), which is dispersed among the arrays, collects the power from the arrays for transmission to the project's substation.

The inverters are likely to have a height of approximately 2.0 – 3.0m which is lower than the surrounding PV panel height. This will mean that from outside the site they will be hidden behind solar panels.

An on-site substation is necessary for the project to step up current to 132kV in order that it can be fed into the National Grid. It is anticipated that this substation will be an outdoor type within a fenced compound. From experience it is expected that the tallest solid structure other than connecting power lines would be in the region of 2m to 3m. The tallest structures associated with the substation are likely to include bus-bars to connect power lines to an overhead power line. The bus-bars are likely to be slender construction comprised of steel lattice structures in the order of 10m high.

2.2.3 Offices and Workshops

A small workshop will be necessary to repair and maintain the electrical and support elements within each project. This is likely to be housed in a small building adjacent to each PV project.

Other ancillary buildings within each project will include an office, ablutions, first aid and rest room facilities. These are likely to be located within one or a small group of single storey buildings and are therefore likely to be a similar height as the proposed PV array.

2.3.4 Overhead Power Lines

A new 132kV overhead power line will be required to connect the output from each of the four facility sub-stations to the National Grid. The connection point is likely to be the Eskom Ferrum substation / or other in Kathu, approximately 18km to the south of the site area.

The necessary overhead power line will be the subject of a separate environmental permitting process.

2.3.4 Other Infrastructure

Other infrastructure will include a gate house and security, a small office building, a control room, a work shop, warehouses, a staff canteen, a visitor centre, a staff locker room, a 2m to 3m high fence, water storage tanks and internal roads.

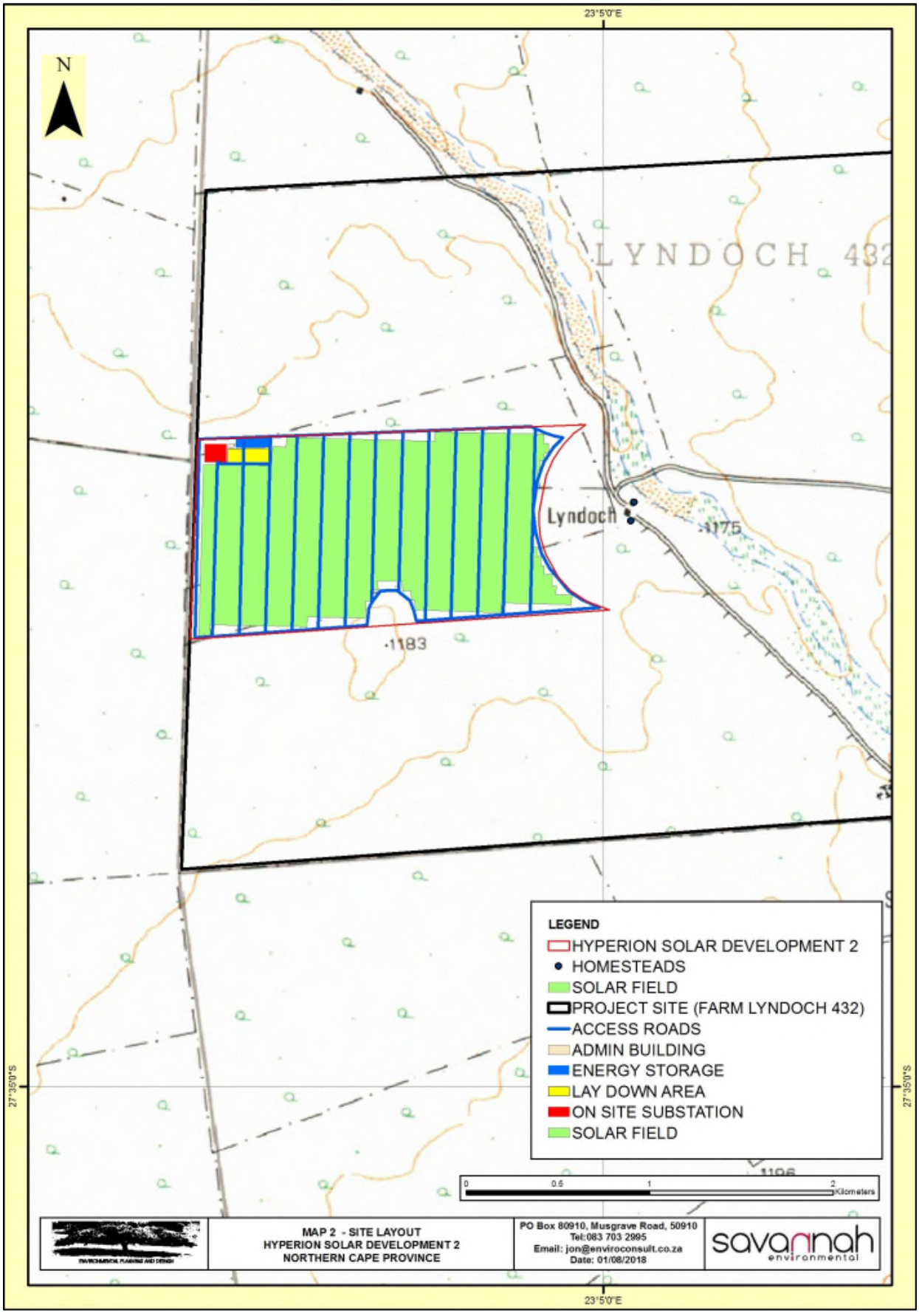
2.2.5 Security Lighting

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

2.2.6 Road Access

A permanent access road will be constructed linking to the adjacent road system. The access road will either link to the N14 to the south or the R380 to the west of the site. One access road will service all four proposed projects. Four (4) access road alternatives are under investigation in this EIA process.

In a flat landscape, road construction is likely to only have an impact on the area immediately surrounding it. Whilst a busy road might be visible from a distance due to vehicles being obvious, for much of the time a road that is lightly used where disturbance of surrounding vegetation has been minimised is unlikely to be obvious past 100m from the road edge.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LYNDOCH 432
Lyndoch
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1183
27°35'0"S
LEGEND
HYPERION SOLAR DEVELOPMENT 2
HOMESTEADS
SOLAR FIELD
PROJECT SITE (FARM LYNDOCH 432)
ACCESS ROADS
ADMIN BUILDING
ENERGY STORAGE
LAY DOWN AREA
ON SITE SUBSTATION
SOLAR FIELD
0
0.5
1
2
Kilometers
MAP 2 - SITE LAYOUT
HYPERION SOLAR DEVELOPMENT 2
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3 DESCRIPTION OF RECEIVING ENVIRONMENT AND RECEPTORS

It is possible that landscape change due to the proposed development could impact the character of an important landscape. Landscape character can be derived from specific features relating to the urban or rural setting and may include key natural, historic or culturally significant elements. Importance might also relate to landscapes that are uncommon or under threat from development.

This section will:

- Provide an initial description of the types of landscape that may be impacted;
- Provide an initial Indication of the likely degree of sensitivity; and
- Provide an initial description of how the landscape areas may be impacted.

The study area is defined by the limit of visibility of the proposed project. As a guide the limit has been set at 8.7km from the proposed site being the approximate limit of visibility of a 6m high structure. Refer to Section 4.3 for the justification for this distance.

Whilst it is possible that the 10m high structures associated with the on-site substation could be visible beyond this, the nature of these structures that are likely to be comprised of relatively slender lattice elements is likely to limit their visibility to within the limit of visibility of the solar array.

3.1 LANDSCAPE CHARACTER

Landscape character is defined as "a distinct, recognisable and consistent pattern of elements in the landscape that makes one landscape different from another"[1].

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

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

3.1.1 Landform and Drainage

The proposed project is located on a broad valley floor that is drained by the Vlermuisleegte which is an intermittent stream that flows from south to north through the proposed site area.

The valley floor falls from south east to northwest at a gentle gradient of approximately 1:200.

The visual implications of landform are;

Because the N14 is located approximately 7km to the south at an elevation approximately 30m higher than the proposed project, it is possible that the project will be visible from this road. The shallow gradient is likely to mean that the project will be viewed largely in elevation with little or no extended overview and that intervening vegetation is likely to play a major role in screening the project.

[1] UK Guideline

Refer to Map 3, Landform and Drainage.

3.1.2 Landcover

The population density of the area immediately surrounding the proposed development varies.

Kathu is the largest town of five towns within the Gamagara Local Municipality. However both are relatively small towns. At the 2011 census, the municipality had a total population of approximately 41,617 people approximately 71% of which are based in urban areas.

The area of the Municipality is 2,619km^2.

Rural homesteads were found to have an average occupancy of 3.5 people. This means that there is a rural homestead for approximately every 0.75km^2.

Given the province's dry conditions and dependence on irrigation, many Northern Cape farmers are branching out into value-added activities such as game farming. This is apparent in rural areas surrounding the proposed alignment as low intensity grazing appears to be mixed with game farming, hunting operations and bush lodges.

Kathu is primarily a rural service centre. It is likely also that a proportion of its economy is derived from local mining operations as well as its position on the N14 as it acts as a transit stop for travellers including tourists.

Kathu has a regional airport that is located approximately 11.7km to the west of the proposed project site.

Apart from agriculture, mining is the largest industrial activity in the area. Kathu is the centre of this activity. Mines in the area include iron ore and manganese. The mine to the west of Kathu and south of the proposed project is the Mamatwan Manganese Mine that is operated by Anglo American.

In addition to Mamatwan, there are numerous areas of degraded land as indicated on **Map 3**. It is possible that these areas have resulted from informal mining operations.

All major mining activities are a significant distance from the proposed development area and are unlikely to have a major influence on the character of the landscape surrounding the project site.

Visual implications of landcover include the potential that homesteads on adjacent farms could have tourism importance if they have been developed with bush lodges and are used for game viewing or hunting operations, in which case they could be sensitive to the potential change in view associated with the proposed development.

Refer to Map 4, Landcover.

3.1.3 Vegetation Patterns

According to Mucina and Rutherford[2] (2006), the proposed project is located in a relatively natural area. The vegetation types include:

- Kuruman Thornveld;
- Kathu Bushveld; and
- Kuruman Mountain Bushveld.

All vegetation types are usually open tree and shrub cover with a sparse grass layer.

Visual implications include;

- Where the viewer is amongst natural vegetation, it is likely that there will be a degree of screening provided by the natural vegetation.
- Where the viewer is set back from natural vegetation or where ground elevation provides a slightly elevated overview of the landscape, the extent of screening provided by natural vegetation is likely to be limited.

3.1.4 Future Development

From reference to the Department of Environmental Affairs web site that records the location of current renewable energy applications (https://dea.maps.arcgis.com), it is obvious that there are currently twenty one other similar and authorised projects proposed on twelve properties within 30km of the proposed development. From reference to Google Earth, a number of these projects are under construction. It is also understood that all preferred bidder projects in this area are operational. The list of projects is indicated in Appendix III.

These developments are likely to result in a degree of industrialisation of what in essence is currently a rural landscape. The majority of the projects are located well away from main roads, so it is possible that the average person will not realise the extent of development. There are however six other projects that are located at a similar distance or closer to the N14 as the proposed Hyperion Projects. Whilst no detailed work has been undertaken, this could mean that other projects will be visible from the road.

3.2 LANDSCAPE CHARACTER AREAS & VISUAL ABSORPTION CAPACITY

Landscape Character Areas (LCAs) are defined as "single unique areas which are the discrete geographical areas of a particular landscape type"[3].

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

[2] Vegetation types of South Africa (including Prince Edward and Marion Islands), Lesotho and Swaziland, 2006

[3] UK Guidelines.

The landscape within the Approximate Limit of Visibility appears relatively uniform.

Overlaying the landform, landcover and vegetation, all potentially affected areas appear to be a composite of relatively flat topography, natural landcover which is generally comprised of Kathu Bushveld. This combination of characteristics could provide a significant degree of VAC due to the following factors:

- Because the solar project will be viewed in a flat landscape it is likely to be seen in profile meaning that at any distance it will appear as a narrow dark band in the landscape;
- The Kathu Bushveld includes woody vegetation that extends above head height. This taller vegetation may not be very dense but the cumulative screening effect over distance is significant. Vegetation is therefore likely to at least visually break the horizontal dark line of solar panels.

Approximately 15km to the east of the project area is a north south running ridgeline that forms the eastern side of the valley. This ridgeline rises approximately 150m above the relatively flat valley floor. Due to distance it is unlikely that this ridgeline will be significant either in contributing to landscape character or providing an area from which an overview of the development is possible.

Approximately 12km to the south of the project area is the settlement of Kathu which is also located on the flat valley floor. Due to distance it is unlikely that this settlement will be significant either in contributing to landscape character or providing an area from which an overview of the development is possible.

3.3 LANDSCAPE QUALITY AND IMPORTANCE

The affected landscape currently consists of relatively flat topography that is covered with natural bush veldt and low intensity grazing is likely to be the predominant agricultural activity. In areas, some landowners may have diversified into game farming, hunting and bush lodges. Sparsely scattered homesteads are apparent in the landscape.

From the site visit it was apparent that none of the affected homesteads include lodge development.

There are no protected areas within the affected area.

The landscape is primarily important for its productivity including agriculture and mining.

3.4 VISUAL RECEPTORS

3.4.1 Definition

Visual Receptors are defined as "individuals and / or defined groups of people who have the potential to be affected by the proposal"[4].

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

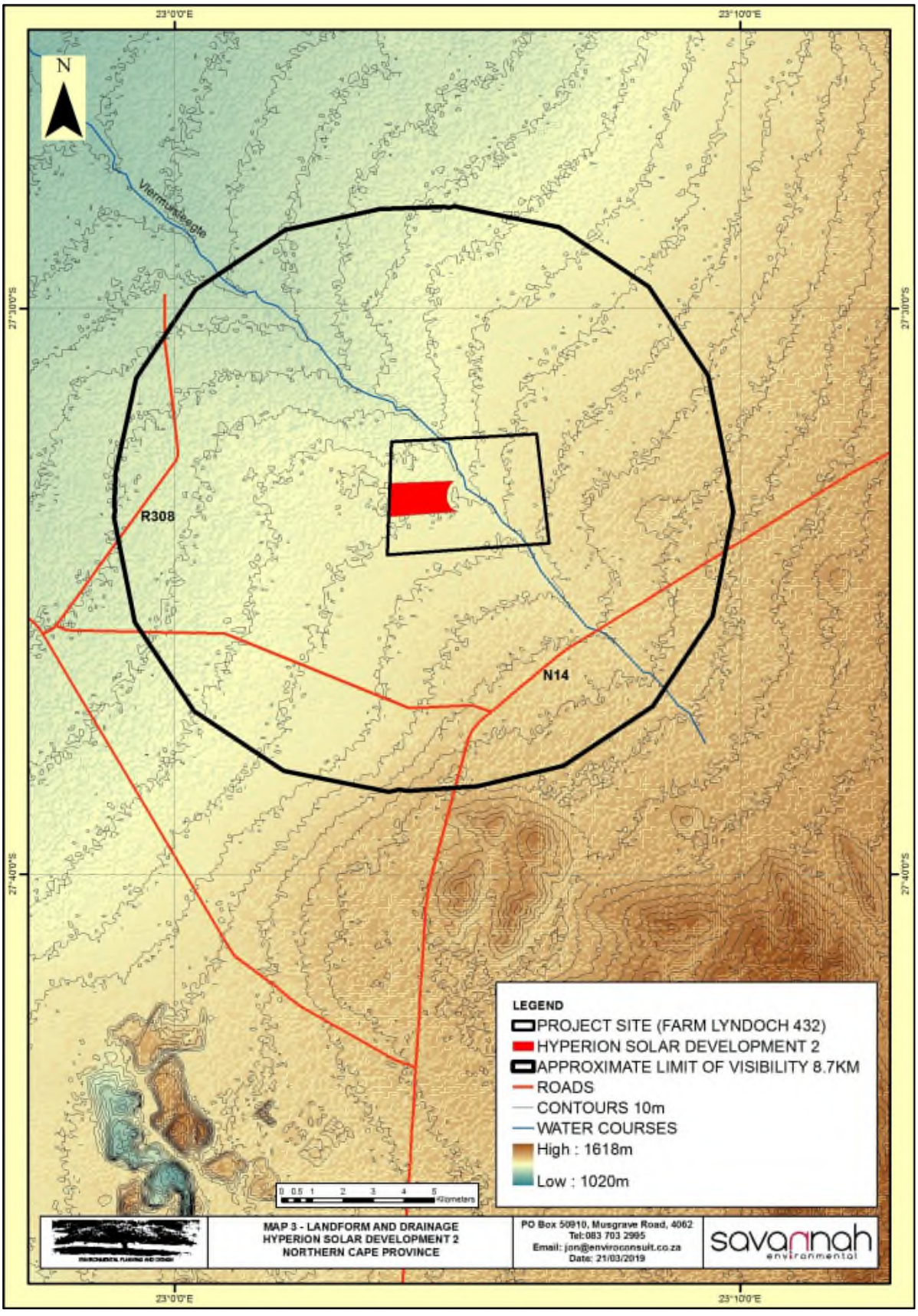
[4] UK Guidelines.

3.4.2 Visual receptors

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

- Point Receptors that include homesteads that are scattered throughout the area. From the site visit, it is understood that no affected homesteads are likely to have a tourism use. It is therefore likely that the focus for people residing in surrounding rural homesteads is likely to be agricultural production. There are eight groups of buildings within the Approximate Limit of Visibility,
- Linear Receptors that include the N14, the R380 and local routes through the area:
    - The N14 is a primary tourism route. Local routes surrounding the development are likely to be mainly used by local people and relate to agricultural activities;
    - The R380 which provides access to mining areas around Hotazel which is approximately 50km to the north of the proposed site. The road also links to northern Namibia and because of this it probably carries a proportion of tourism traffic;
    - Local roads including a minor road that runs to the south and south west of the site that provides a link between the N14 and the R380;
- The Kathu (Sishen) Airport which is located approximately 11.7km to the southwest of the proposed array. The airport is a regional airport with daily SA Airlink flights to and from O R Tambo. The main concern that is likely with regard to the airport is the potential for glint and glare affecting flights, particularly on approach to the airport.

Plate 1, Typical view of the landscape adjacent to the proposed site. The character is generally comprised of relatively flat topography, natural landcover which is generally comprised of Kathu Bushveld with isolated homesteads.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R308
N14
LEGEND
PROJECT SITE (FARM LYNDOCH 432)
HYPERION SOLAR DEVELOPMENT 2
APPROXIMATE LIMIT OF VISIBILITY 8.7KM
ROADS
CONTOURS 10m
WATER COURSES
High : 1618m
Low : 1020m
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MAP 3 - LANDFORM AND DRAINAGE
HYPERION SOLAR DEVELOPMENT 2
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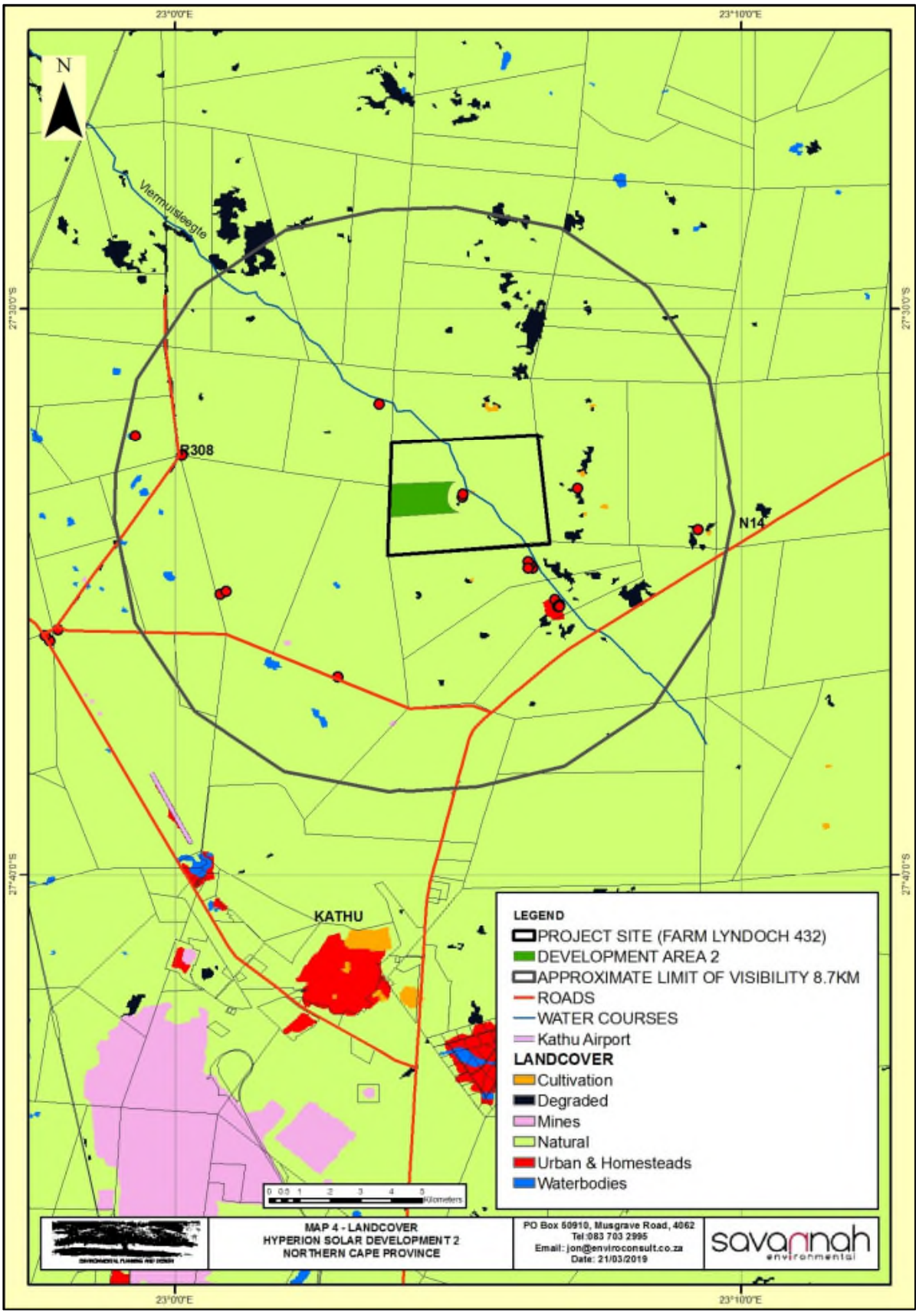
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LEGEND
PROJECT SITE (FARM LYNDOCH 432)
DEVELOPMENT AREA 2
APPROXIMATE LIMIT OF VISIBILITY 8.7KM
ROADS
WATER COURSES
Kathu Airport
LANDCOVER
Cultivation
Degraded
Mines
Natural
Urban & Homesteads
Waterbodies
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MAP 4 - LANDCOVER
HYPERION SOLAR DEVELOPMENT 2
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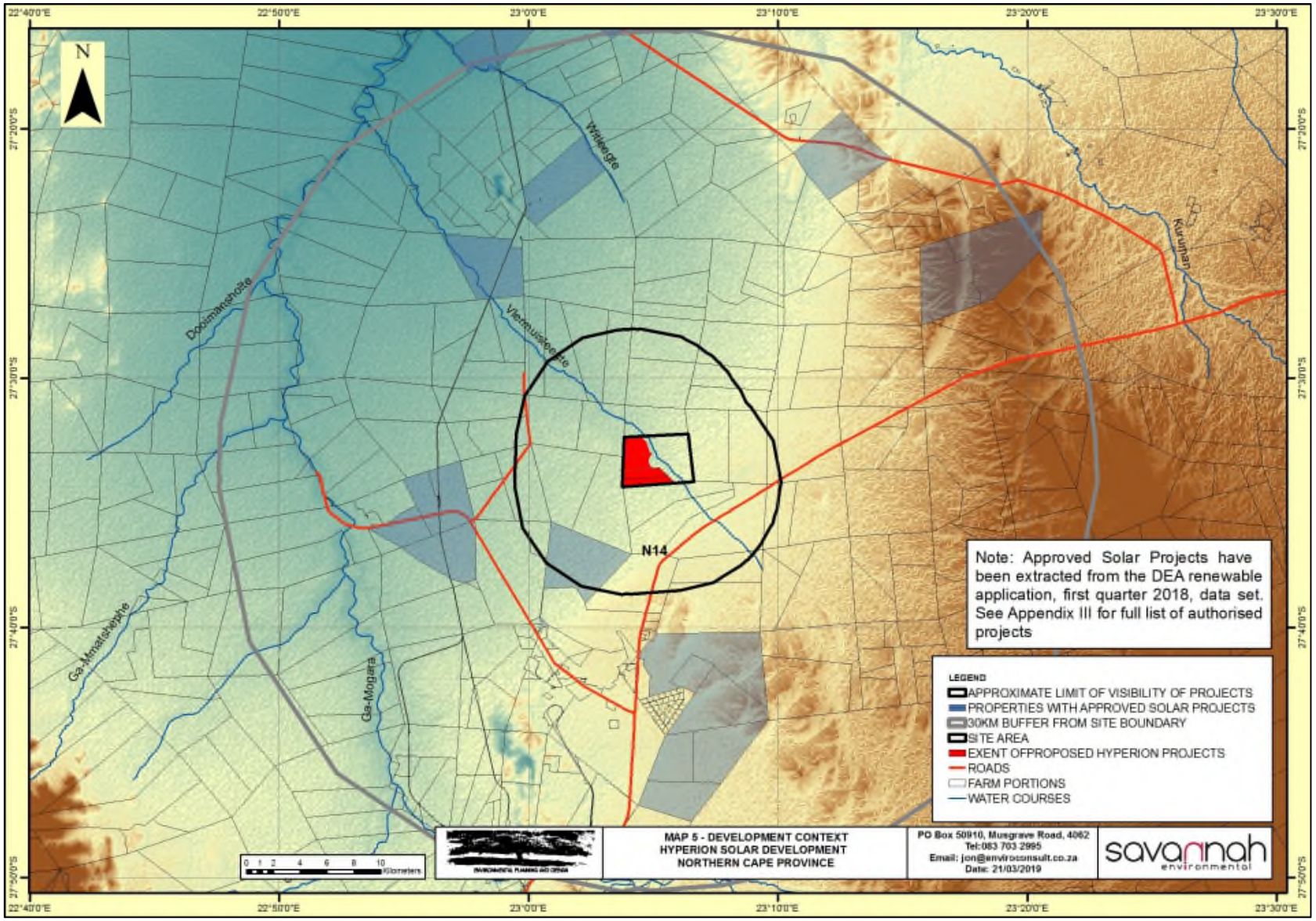
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N14
Note: Approved Solar Projects have been extracted from the DEA renewable application, first quarter 2018, data set. See Appendix III for full list of authorised projects
LEGEND
APPROXIMATE LIMIT OF VISIBILITY OF PROJECTS
PROPERTIES WITH APPROVED SOLAR PROJECTS
30KM BUFFER FROM SITE BOUNDARY
SITE AREA
EXENT OFPROPOSED HYPERION PROJECTS
ROADS
FARM PORTIONS
WATER COURSES
0 1 2 4 6 8 10 Kilometers
MAP 5 - DEVELOPMENT CONTEXT
HYPERION SOLAR DEVELOPMENT
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4 THE NATURE OF POTENTIAL VISUAL IMPACTS

4.1 THE NATURE OF VISUAL IMPACT

Visual impacts may relate to a general change in the character of an area or in the change of a specific view for a person or group of people.

Visual impacts can be positive or negative and a degree of subjectivity is required in deciding this point. The approach of any visual assessment should, as objectively as possible, describe a landscape and as far as is possible reflect the likely majority view regarding positive / negative aspect of an impact. This can be difficult particularly in South Africa due to different values and cultures associated with various sectors of the population. For example, poorer and particularly rural based sectors of the population are possibly more concerned with the productive nature of a landscape than its appearance, whereas the wealthier sectors might be more concerned with scenic value particularly if it is associated with property values. If possible the values and opinions of all impacted sectors of the community should be considered.

General change to a landscape might have greater or lesser significance subject to issues listed in 1.4.2.

In terms of change to a specific view this might be defined as either visual intrusion or visual obstruction.

a) Visual intrusion is a change in a view of a landscape that reduces the quality of the view. This can be a highly subjective judgement. Subjectivity has been removed as far as possible in this assessment by classifying the landscape character of the area and providing a description of the change in the landscape that will occur due to the proposed development.
b) Visual obstruction is the blocking of views or foreshortening of views. This can generally be measured in terms of extent.

4.2 TYPICAL VISUAL EFFECTS ASSOCIATED WITH PV PROJECTS

4.2.1 Views of the PV Array

The PV units will be set at an acute angle to the ground and orientated in order to maximise power output. The PV units will be aligned to face north.

In a fixed mounted PV array, units are generally aligned in rows with only sufficient space between the rows to allow access for maintenance and replacement. This means that when an array is viewed from ground level, it appears as a single row of units. However, when viewed from a slightly elevated position or if the project is situated on an incline facing the viewer, the individual rows combine to increase visual mass.

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

compared with the proposed project, it does illustrate the effect of distance in mitigating the visibility of the solid line of solar panels.

Plate 2 indicates the location of the existing array at Upington Airport. **Plates 3, and 4** illustrate how the array is seen from distances of 700m and 1500m respectively.

The following effects are noted;

- From 700m the array is clearly visible. For the same effect relative to a 6.0m high array, this distance will be approximately 2100m.
- From 1500m, the array is visible but even with the minimal vegetation providing screening at the airport, the dark line of panels is starting to blend into the background. The array is clearly visible but might be missed by a casual viewer. For the same effect relative to a 6.0m high array, this distance will be approximately 4500m.

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

4.2.2 Security Lighting

Security lighting could result in the array being obvious at night from surrounding areas.

4.2.3 Glint and Glare

Glint and glare occur when the sun reflects off surfaces with specular (mirror-like) properties. Examples of these include glass windows, water bodies and potentially some solar energy generation technologies (e.g. parabolic troughs and CSP heliostats). Glint is generally of shorter duration and is described as "a momentary flash of bright light", whilst glare is the reflection of bright light for a longer duration.

The visual impact of glint and glare relates to the potential it has to negatively affect sensitive visual receptors in relative close proximity to the source (e.g. residents of neighbouring properties), or aviation safety risk for pilots (especially where the source interferes with the approach angle to the runway). The Federal Aviation Administration (FAA) of the United States of America have researched glare as a hazard for aviation pilots on final approach and may prescribe specific glint and glare studies for solar energy facilities in close proximity to aerodromes (airports, airfields, airbases, etc.). It is generally possible to mitigate the potential glint and glare impacts through the design and careful placement of the infrastructure.

PV panels are designed to generate electricity by absorbing the rays of the sun and are therefore constructed of dark-coloured materials and are covered by anti-reflective coatings. Indications are that as little as 2% of the incoming sunlight is reflected from the surface of modern PV panels[5].

[5] *Blue Oak Energy, FAA and Meister Consultants Group*

Because of the nature of tracking arrays that orientate the PV panels to capture as much energy as possible throughout the day, the glare associated with these systems is likely to vary and may be less than the glare associated with a fixed array.

Research indicates that glint and glare problems are most likely to occur to the east and north-east of a facility in the morning, to the west and north-west in the afternoon and evening. Glint and glare that is likely to be most problematic is likely to occur in the early morning and late afternoon/ evening as the sun is lowest in the north and light is reflected at a low level along the PV panels.

4.2.4 Timing of Likely Visual Impacts

During the construction phase, it is expected that traffic will be slightly higher than normal as trucks will be required to transport materials and equipment such as PV panels and other project components to the site.

Site preparation will generally include the following activities:

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

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

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

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

The construction phase is programmed to take approximately 18 months.

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

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

The main visible elements are likely to include the solar array, the onsite substation and minor buildings located within a fence line.

Plate 2 - Existing Solar Arrays at Upington Airport as seen from the air.

Plate 3 - Existing array seen in a flat landscape from approximately 700m. The array is clearly visible.

Plate 4 - **Existing array seen in a flat landscape from approximately 1500m**. The array is visible but even with the minimal vegetation providing screening at the airport, the dark line of panels is starting to blend into the background. The array is clearly visible but might be missed by a casual viewer who was not aware of its existence.

Plate 5 - PV array viewed from above. Note the array rows are read as one and have a similar impact as the roof of a large industrial building.

Plate 6 - PV array viewed from behind and the side. The dark face of the PV units are not obvious and subject to the colour of the undersides of the units, the supporting structures are likely to become more apparent. This might appear as a long industrial structure from close quarters. From a distance however, the shadow cast by the structure will be read and will probably appear similar in nature to the front view of the array.

Plate 7 - Glare experienced in the Control Tower at Boston Regional Airport from a PV array

4.3 ZONES OF THEORETICAL VISIBILITY

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

The proposed order of height of the proposed array is 6m.

The ZTV analysis has been undertaken using Arc Spatial Analyst Geographic Information System (GIS). The assessment is based on terrain data that has been derived from satellite imagery. This data was originally prepared by the National Aeronautics and Space Administration (NASA) and is freely available on the International Centre for Tropical Agriculture's- Climate Change, Agriculture and Food Security (CIAT-CCAFS) website (http://www.cgiar-csi.org).

The GIS Assessment does not take the curvature of the earth into account. In order to provide an indication of the likely limit of visibility due to this effect a universally accepted navigational formula has been used to calculate the likely distance that the proposed structures might be visible over(**Appendix IV**). This indicates that in a flat landscape the proposed structures may be visible for the following distances;

Approximate limit of Visibility (ALV)

ELEMENT	APPROXIMATE LIMIT OF VISIBILITY
Array solar PV panels and other minor buildings and infrastructure, up to 6m high	8.7 kilometres
On-site substation up to, 10m high	11.3 kilometres

Whilst it is possible that the 10m high structures associated with the on-site substation could be visible for up to 11.3km, the nature of these structures (i.e. relatively slender lattice elements) is likely to limit their visibility to within the limit of visibility of the solar array. The solid elements associated the facility including transformers and buildings are likely to be less than 6m high and it will therefore be seen within the visual mass of the PV array.

8.7km has therefore been adopted as the ALV for the overall project.

In reality this distances could be reduced by:

- Weather conditions that limit visibility. This could include hazy conditions during fine weather as well as mist and rain;
- Scale and colour of individual elements making it difficult to differentiate structures from background; and
- The fact that as the viewer gets further away, the apparent height of visible elements reduces. At the limit of visibility it will only be possible that the very tip of an object may be visible. This reducing scale means that an object will become increasingly more difficult to see as the distance from it increases.

4.4 LIKELY VISIBILITY OF THE PROPOSED ELEMENTS

The ZTV analysis indicated on **Map 5** is based on a matrix of points located throughout the proposed site. The analysis therefore is an indication of the areas to which the proposed project may be visible. The mapping indicates that key

receptors are likely to include travellers on the N14, the R380, other minor local roads as well as inhabitants of local homesteads.

4.4.1 Implications for Visual Receptors

Visual implications of the proposed project for identified receptors are likely to include:

a) Views from Roads

The project may be visible from the N14. The proposed project is located approximately 6.5km from the road. The ZTV analysis indicates that the project could potentially be seen over approximately 12.6km length of the road.

Due to the relatively flat topography, the proposed array is likely to be seen as a narrow dark band in the landscape that at this distance and is unlikely to be obvious. It is also likely that vegetation between the road and the array is likely to at least break views of the development.

It also has to be understood that there are two additional solar PV projects that are similar to Hyperion Solar Development 2 that could be constructed between the proposed project and the road. Should these projects be developed they will screen Hyperion Solar Development 2 from the road.

The project may also be visible to the R380 which at its closest is approximately 6.4km to the west of the proposed array. As with views from the N14, the proposed array will be viewed over flat topography and through natural vegetation. The ZTV analysis indicates that views from this road may be possible over approximately 0.9km of the road and at a distance of approximately 7.6km. Given the topography, screening provided by vegetation and the distance, it is highly unlikely that the array will be visible from the R380.

The ZTV analysis indicates that views may be possible of the proposed array from approximately 7.6km of a minor road that runs to the south and south west of the site at a minimum distance of approximately 7.3km. However given the flat topography, the likelihood that at least a degree of screening will be provided by vegetation and the distance involved, it seems highly unlikely that the proposed array will be obvious from this road.

At the distances involved, the taller structures associated with the on-site substation are highly unlikely to be obvious.

The access road alternative alignments are only likely to be obvious from these roads in the vicinity of their junctions with local roads.

Plate 8, View looking towards the proposed site from the N14.

Plate 9, View looking towards the proposed site from the minor road to the south west

Plate 10, View looking towards the proposed site from the R380

b) Homesteads

There are fourteen groups of buildings within the Approximate Limit of Visibility of which eight fall within the ZTV.

The closest homestead is approximately 500m from the edge of the development. From discussion with the Environmental Assessment Practitioner, this homestead is inhabited by the landowner who is in agreement with the project proceeding. In order to ensure that views from the homestead are not totally compromised, a buffer of 500m has been allowed for in development planning. The buildings are orientated in a manner that focuses outlook towards the south and away from the proposed development.

The on-site substation is located approximately 2km from this homestead on the opposite side (western) of the project. It is possible that the taller elements associated with the substation may be visible from the homestead, however, they will not be highly obvious and it is likely that existing vegetation will help to soften the view.

There is a homestead approximately 2.6km to the north of the proposed array. From Google Earth, the main house is orientated east to west with relatively dense trees on its southern side. It is therefore unlikely that it will be possible to see the proposed project from the house. Views of the project may be possible from the surrounding area; however, it is likely that existing vegetation will at least partly screen the development.

The on-site substation is located approximately 2.2km from this homestead. It is possible that the taller elements associated with the substation may be visible;

however, they will not be highly obvious and it is likely that existing vegetation will help to soften the view.

There is also a group of buildings approximately 2.6km to the southeast of the proposed array. It includes a single homestead with other farm buildings. These buildings are also surrounded by trees which are likely to provide a degree of screening. Any visual impact is likely to be part mitigated by distance as well as screening that is provided by existing natural vegetation.

The on-site substation is located approximately 4.5km from this group of buildings. It is unlikely that the taller elements associated with the substation will be obvious at this distance.

The remaining five groups of buildings are in excess of 3.5km from the proposed array. It is possible that glimpses of the development may be possible from these, however, distance and intervening natural vegetation are likely to largely screen views of the proposed development.

Access road alternatives have the potential to impact visually on homesteads. Alternative alignments 1 and 2 pass close to homesteads to the south east of the proposed project. It is possible that owners of the homesteads could favour this as it is likely to result in an upgraded access road that they might use. It will also mean that there will be an increased volume of traffic visible to the homesteads. This however is likely to be largely during the construction phase.

Plate 11, View of the existing homestead within 500m of the proposed project from the north east. Note the vegetation behind the house (right of picture) will largely screen the development.

Plate 12, View of the existing homestead within 2.6km of the proposed project to the north from the northern site boundary. Note, only the roof of the homestead is visible meaning that the development will be screened from the lower floor of the house and surrounding area.

Plate 13, View of the existing homestead within 2.6km to the south east looking north west towards the proposed project. Existing vegetation is likely to partially screen the development.

c) Kathu Airport

Kathu Airport is located approximately 10.9km from the proposed array. Largely due to distance and vegetation, the proposed array is highly unlikely to be visible from the airport. It is likely to be visible from planes on approach and exit from the airport. However, there are other solar facilities some of which are closer to the airport that will also be visible.

d) Lighting Impacts

Security and operational lighting at night could make the development obvious to receptors.

e) Glare

There are three areas where glare may be a concern for stakeholders including:

- The Kathu aerodrome;
- The un-surfaced road and the R308 to the west of the project ; and
- The N14 to the south of the project.

Kathu aerodrome is located approximately10.9km to the south west of the proposed project. Due to the location of the facility relative to the airport it would only be possible for reflected light from the array to affect pilots on the northern flight path into the aerodrome. The northern end of the runway is located approximately 7km further south than the proposed project. If the array is fixed and the PV panels are aligned facing north, areas furthest south that reflected light from the panels might affect would have to be approximately 270°T from the project. At this bearing an aircraft would be approximately 7km from the end of the runway. At this angle, the pilot's peripheral vision only would be affected. Whilst a plane may be on the final approach at this distance, it is likely to be relatively high and above any low-level reflected light from the array. At a recommended approach path of 3° an aircraft would be flying at a height in excess of 350m.

Given the distance and given that there is only potential for a pilot to see reflected light from the array in his / her peripheral vision on approach and will not affect the straight ahead view or the view of instruments, it can be concluded that the proposed facility is highly unlikely to have any significant effect on the airport.

The US Federal Aviation Authority (US FAA) have led the way in terms of assessing the impacts of glare created by solar projects around airports. Because the US FAA has no specific standards for airport solar facilities and potential glare, the type of glare analysis that they require varies. Depending on site specifics (e.g., existing land uses, location and size of a project) an acceptable evaluation could involve one or more of the following levels of assessment:

a) A qualitative analysis of potential impact in consultation with the Air Traffic Control Tower, pilots, and airport officials;
b) A demonstration field test with solar panels at the proposed site in coordination with Air Traffic Control Tower personnel; or
c) A geometric analysis to determine days and times when there may be an ocular impact[6].

[6] US FAA

The information provided above provides a basic geometric analysis.

From reference to the ZTV, the project could be visible intermittently over a section of the N14. This section of road however to the south or the proposed project which makes it impossible for glare from the project to affect it. Because glare is reflected light from an inclined panel, it will generally affect areas above the level of the panel surface and slightly to the north east or north west of the project

As the un-surfaced local road that runs to approximately 8km to the south west and the R308 that runs in excess of 12km from the proposed project are highly unlikely to be affected due to distance as well as the fact that there is significant natural vegetation between the roads and the proposed development which will effectively screen views and therefore will also screen reflected light from the PV panels.

4.5 LIKELY IMPLICATIONS FOR LANDSCAPE CHARACTER

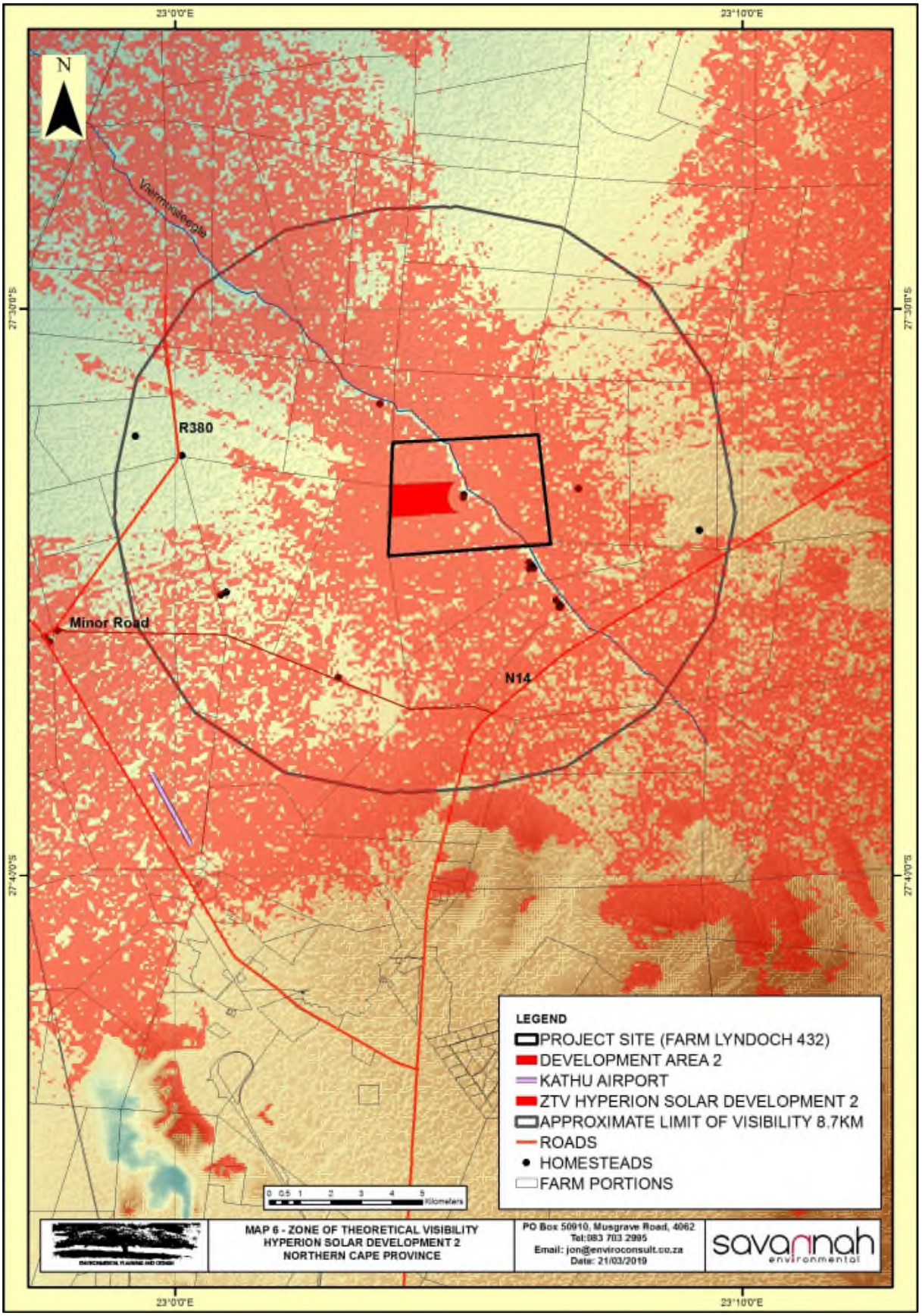
As indicated in Section 4.3, the visibility of the proposed project is likely to be limited, it is therefore unlikely to have a major influence on the character of the landscape as experienced by the majority of people.

The proposed project will result in removal of a significant area of vegetation, however, vegetation remaining between the project and possible receptors is likely to mean that this removal of vegetation will not be obvious.

It is possible that glimpses of the array may be seen through existing vegetation. From reference to Map 4, it seems that other solar projects in the area will be experienced in a similar way. The proposed project is therefore likely to reinforce the general impression that the landscape is part industrialised.

At night lighting could make the development obvious in the landscape. This will be seen against the backdrop of other projects in the area. The general area is not a pristine night time landscape as lighting is also likely to be obvious from mining operations as well as the Kathu Airport. However, the area immediately around the project is relatively dark with only homesteads providing isolated low level lighting.

Alternative road alignments will result in varying degrees of vegetation removal. Alternative alignment 1 being the upgrade of an existing road will result in significantly less removal of natural vegetation compared with alternative alignments 2, 3 and 4.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R380
Minor Road
N14
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LEGEND
PROJECT SITE (FARM LYNDOCH 432)
DEVELOPMENT AREA 2
KATHU AIRPORT
ZTV HYPERION SOLAR DEVELOPMENT 2
APPROXIMATE LIMIT OF VISIBILITY 8.7KM
ROADS
HOMESTEADS
FARM PORTIONS
0 0.5 1 2 3 4 5
Kilometers
MAP 6 - ZONE OF THEORETICAL VISIBILITY
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5 VISUAL IMPACT ASSESSMENT

5.1 ISSUES TO BE ADDRESSED

From the review of the proposed project, it is proposed that the following issues should be addressed during the EIA phase;

1) The proposed development could impact on the general rural landscape character of the area;
2) The proposed development could impact on views from roads including the N14, the R308 and local roads;
3) The proposed development could impact on views from local homesteads; and
4) Glint and glare associated with the proposed development could impact negatively on the flight path into Kathu Airport.
5) Lighting potentially creating light pollution and making the project obvious within a relatively dark night time landscape.

These issues will be considered in the context of Landscape Character, visual effects identified and the possible cumulative influence of other projects.

Possible mitigation measures will also be identified.

5.2 ASSESSMENT METHODOLOGY

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

The methodology for the assessment of potential visual impacts includes:

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

    - permanent - assigned a score of 5.
- The **magnitude**, quantified on a scale from 0-10, where a score is assigned:
    - 0 is small and will have no effect on the environment;
    - 2 is minor and will not result in an impact on processes;
    - 4 is low and will cause a slight impact on processes;
    - 6 is moderate and will result in processes continuing but in a modified way;
    - 8 is high (processes are altered to the extent that they temporarily cease); and
    - 10 is very high and results in complete destruction of patterns and permanent cessation of processes.
- The **probability** *of occurrence*, which shall describe the likelihood of the impact actually occurring. Probability will be estimated on a scale, and a score assigned:
    - Assigned a score of 1–5, where 1 is very improbable (probably will not happen);
    - Assigned a score of 2 is improbable (some possibility, but low likelihood);
    - Assigned a score of 3 is probable (distinct possibility);
    - Assigned a score of 4 is highly probable (most likely); and
    - Assigned a score of 5 is definite (impact will occur regardless of any prevention measures).
- The **significance**, which shall be determined through a synthesis of the characteristics described above (refer formula below) and can be assessed as low, medium or high.
- The **status**, which will be described as either positive, negative or neutral.
- The degree to which the impact can be reversed.
- The degree to which the impact may cause irreplaceable loss of resources.
- The *degree* to which the impact can be *mitigated.*
- The **significance** is determined by combining the criteria in the following formula:
    - S=(E+D+M)P; where S = Significance weighting, E = Extent, D = Duration, M = Magnitude, P = Probability

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

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

5.3 VISUAL IMPACT ASSESSMENT

5.3.1 The proposed development could impact on the general rural landscape character of the area

This impact is likely to be influenced by both the proposed project and the site access road alternatives.

Nature of Impact: Loss of natural vegetation and industrialisation of the landscape caused by the proposed project

The issue relates to the further degradation / industrialisation of the general rural landscape character.

The development area is located within an area that is perceived as being a semi-natural rural landscape. It is however being developed rapidly with other similar solar projects. However, the initial review indicates that whilst glimpses of these projects may be possible, the perception of a semi-natural landscape is likely to remain.

The proposed development is likely to have limited impact due to the general limited visibility.

The proposed development is not likely to significantly change this perception.

	Without mitigation	**With mitigation**
Extent	Site and immediate surroundings, **(2)**	Site and immediate surroundings, **(2)**
Duration	Long term, **(4)**	Long term, **(4)**
Magnitude	Small to minor, **(1)**	Small, **(0)**
Probability	Probable **(3)**	Improbable **(2)**
Significance	Low, **(21)**	Low, **(12)**
Status	**Negative**	**Negative**
Reversibility	High	High
Irreplaceable loss	The proposed development can be dismantled and removed at the end of the operational phase. There will therefore be **no irreplaceable loss**. However, given the likely long term nature of the project, it is possible that a proportion of stakeholders will view the loss of view as irreplaceable.	**No irreplaceable loss**
Can impacts be mitigated?	**Yes**	**N/A**
Mitigation / Management:		

Planning:

- Plan development levels to minimise earthworks to ensure that levels are not elevated;
- Plan to maintain the height of structures as low as possible;
- Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development;
- Retain and augment natural vegetation on all sides of the proposed project.
- Ensure that the colour of the back face of panels looks black and paint support structures closest to receptors mid grey (southern most row). If other projects are developed to the south, this mitigation measure is not necessary.

Operations:

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

Decommissioning:

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

Cumulative Impacts:

Development of this site is likely to result in minimal cumulative impact due to the likely limited visibility of the project. **See appendix IV.**

Residual Risks:

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

Nature: Loss of natural vegetation due to access road construction eroding the natural character of the landscape								
	Alternative 1		**Alternative 2**		**Alternative 3**		**Alternative 4**	
	Without mitigation	**With mitigation**	**Without mitigation**	**With mitigation**	**Without mitigation**	**With mitigation**	**Without mitigation**	**With mitigation**
Extent	Site and immediate surroundings (2)	Site and immediate surroundings (2)	Site and immediate surroundings (2)	Site and immediate surroundings (2)	Site and immediate surroundings (2)	Site and immediate surroundings (2)	Site and immediate surroundings (2)	Site and immediate surroundings (2)
Duration	Long term (4)	Long term (4)	Long term (4)	Long term (4)	Long term (4)	Long term (4)	Long term (4)	Long term (4)
Magnitude	Small to minor (1)	Small (0)	Minor to low (3)	Minor (2)	Minor to low (3)	Minor (2)	Minor to low (3)	Minor (2)
Probability	Improbable (2)	Improbable (3)	Probable (3)	Probable (3)	Probable (3)	Probable (3)	Probable (3)	Probable (3)
Significance	**Low (14)**	**Low (12)**	**Low (27)**	**Low (24)**	**Low (27)**	**Low (24)**	**Low (27)**	**Low (24)**
Status (positive or negative)	Negative	Negative	Negative	Negative	Negative	Negative	Negative	Negative
Reversibility	High	High	High	High	High	High	High	High
Irreplaceable loss of resources?	No irreplaceable loss	No irreplaceable loss	No irreplaceable loss	No irreplaceable loss	No irreplaceable loss	No irreplaceable loss	No irreplaceable loss	No irreplaceable loss
Can impacts be mitigated?	Yes		Yes		Yes		Yes	

Mitigation:

Planning:

- Plan levels to minimise earthworks;
- Plan alignment to avoid as many trees as possible;
- Minimise disturbance of the surrounding landscape and maintain existing vegetation on either side of the road;
- Plan to replace lost vegetation.

Operations:

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

Decommissioning:

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

Residual Impacts:

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

5.3.2 The proposed development could impact on views from roads including the N14, the R308 and local roads

Nature of Impact: The issue relates to the industrialisation of the rural landscape due to views of the project from roads.

Possible receptors include travellers on the N14, the R308 and a local road that runs to the south and south west between the N14 and the R308.

The affected sections of all roads are in excess of 6.5km from the proposed project. Due to the flat topography, the distance involved and the natural vegetation which is likely to provide a degree of screening, it is unlikely that the project will be obvious from these roads.

The proposed development is therefore likely to have limited impact due to the general limited visibility.

The proposed development is not likely to significantly change this perception.

	Without mitigation	**With mitigation**
Extent	Site and immediate surroundings, **(2)**	Site and immediate surroundings, **(2)**
Duration	Long term, **(4)**	Long term, **(4)**
Magnitude	Small to minor, **(1)**	Small, **(0)**
Probability	Probable **(3)**	Improbable **(2)**
Significance	Low, **(21)**	Low, **(12)**
Status	**Negative**	**Negative**
Reversibility	High	High
Irreplaceable loss	The proposed development can be dismantled and removed at the end of the operational phase. There will therefore be **no irreplaceable loss**. However, given the likely long term nature of the project, it is possible that a proportion of stakeholders will view the loss of view as irreplaceable.	**No irreplaceable loss**
Can impacts be mitigated?	**Yes**	**N/A**

Mitigation / Management:.

Planning:

- Plan development levels to minimise earthworks to ensure that levels are not elevated;
- Plan to maintain the height of structures as low as possible;

- Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development;
- Retain and augment natural vegetation on all sides of the proposed project.
- Ensure that the colour of the back face of panels looks black and paint support structures closest to receptors mid grey (southern most row). If other projects are developed to the south, this mitigation measure is not necessary.

Operations:

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

Decommissioning:

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

Cumulative Impacts:

Development of this site is likely to result in minimal cumulative impact due to the likely limited visibility of the project. **See appendix IV.**

Residual Risks:

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

5.3.3. The proposed development could negatively impact on views from local homesteads

This impact is likely to be influenced by both the proposed project and the site access road alternatives.

Nature of Impact: The issue relates to the industrialisation of the rural landscape due to views of the project from homesteads.

There is one homestead approximately 500m from the proposed development. However, this is inhabited by the affected landowner and his family. It has been confirmed that he is in agreement with the proposed development. A 500m buffer has also been allowed by the developer to ensure that whilst the development may be obvious, it doesn't completely impose a new aesthetic on the homesteads surroundings. As this homestead belongs to the owner of the property on which the project is proposed, it is not considered in the assessment below.

There is a homestead approximately 2.6km to the north of the proposed array. It is unlikely that the development will be highly obvious from the house due to existing trees around the building and its orientation. Views of the array may be possible from the surrounding area. However, it is likely that existing vegetation will at least part screen the development.

There is also a group of buildings approximately 2.6km to the southeast of the proposed array. The buildings are also surrounded by trees which are likely to provide a degree of

screening. Any visual impact is also likely to be part mitigated by distance as well as screening that is likely to be provided by existing natural vegetation.

The remaining five groups of buildings are in excess of 3.5km from the proposed array. It is possible that glimpses of the development may be possible from these; however, distance and intervening natural vegetation is likely to largely screen views.

	Without mitigation	**With mitigation**
Extent	Site and immediate surroundings, **(2)**	Site and immediate surroundings, **(2)**
Duration	Long term, **(4)**	Long term, **(4)**
Magnitude	Small to minor, **(1)**	Small, **(0)**
Probability	Probable **(3)**	Probable **(3)**
Significance	Low, **(21)**	Low, **(18)**
Status	**Negative**	**Negative**
Reversibility	High	High
Irreplaceable loss	The proposed development can be dismantled and removed at the end of the operational phase. There will therefore be **no irreplaceable loss**. However, given the likely long term nature of the project, it is possible that a proportion of stakeholders will view the loss of view as irreplaceable.	**No irreplaceable loss**
Can impacts be mitigated?	**Yes**	**N/A**

Mitigation / Management:.

Planning:

- Plan development levels to minimise earthworks to ensure that levels are not elevated;
- Plan to maintain the height of structures as low as possible;
- Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development;
- Retain and augment natural vegetation on all sides of the proposed project.
- Ensure that the colour of the back face of panels looks black and paint support structures closest to receptors mid grey (southern most row). If other projects are developed to the south, this mitigation measure is not necessary.

Operations:

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

- Minimise disturbance and maintain existing vegetation as far as is possible both within and surrounding the development area.
- Maintain and augment natural vegetation around the proposed project.

Decommissioning:

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

Cumulative Impacts:

Development of this site is likely to result in minimal cumulative impact due to the likely limited visibility of the project. **See appendix IV.**

Residual Risks:

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

Nature: Loss of integrity of the natural landscape due to views of traffic on access roads.								
	Alternative 1		**Alternative 2**		**Alternative 3**		**Alternative 4**	
	Without mitigation	**With mitigation**	**Without mitigation**	**With mitigation**	**Without mitigation**	**With mitigation**	**Without mitigation**	**With mitigation**
Extent	Site and immediate surroundings (2)	Site and immediate surroundings (2)	Site and immediate surroundings (2)	Site and immediate surroundings (2)	Site and immediate surroundings (2)	Site and immediate surroundings (2)	Site and immediate surroundings (2)	Site and immediate surroundings (2)
Duration	Long term (4)	Long term (4)	Long term (4)	Long term (4)	Long term (4)	Long term (4)	Long term (4)	Long term (4)
Magnitude	Minor to low (3)	Minor to low (3)	Minor to low (3)	Minor (2)	Small (0)	Small (0)	Small (0)	Small (0)
Probability	Probable (3)	Probable (3)	Probable (3)	Probable (3)	Very improbable (1)	Very improbable (1)	Very improbable (1)	Very improbable (1)
Significance	**Low (27)**	**Low (27)**	**Low (27)**	**Low (24)**	**Low (6)**	**Low (6)**	**Low (6)**	**Low (6)**
Status (positive or negative)	Negative	Negative	Negative	Negative	Neutral	Neutral	Neutral	Neutral
Reversibility	High	High	High	High	High	High	High	High
Irreplaceable loss of resources?	No irreplaceable loss	No irreplaceable loss	No irreplaceable loss	No irreplaceable loss	No irreplaceable loss	No irreplaceable loss	No irreplaceable loss	No irreplaceable loss
Can impacts be mitigated?	No		Yes		Not necessary		Not necessary	

Mitigation:

Planning:

- Plan levels to minimise earthworks;
- Plan alignment to avoid as many trees as possible;
- Minimise disturbance of the surrounding landscape and maintain existing vegetation on either side of the road;
- Plan to replace lost vegetation particularly between the proposed alignment and existing homesteads.

Operations:

- Reinstate any areas of vegetation that have been disturbed during construction;
- Remove all temporary works;
- Monitor rehabilitated areas post-construction and implement remedial actions;
- Minimise disturbance and maintain existing vegetation as far as is possible both within and surrounding the development area.
- Maintain and augment natural vegetation around the road alignment, particularly between the road and existing homesteads.

Decommissioning:

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

Residual Impacts:

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

5.3.4 Glint and glare associated with the proposed development could impact negatively on the flight path into Kathu Airport

Nature of impact:

Kathu Airport is located approximately 10.9km to the south west of the proposed project.

It is possible but given the distance unlikely that reflected light from the array could be visible from the northern flight path particularly during early mornings during summer months. This however is unlikely and it will not affect the straight ahead pilot's view or the view of instruments.

	Without mitigation	**With mitigation**
Extent	Site and immediate surroundings **(2)**	Site and immediate surroundings **(2)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Minor **(2)**	Small **(0)**
Probability	Improbable **(2)**	Very improbable **(1)**
Significance	Low **(16)**	Low **(6)**
Status	**Negative**	**Negative**
Reversibility	High	High
Irreplaceable loss	**no irreplaceable loss**.	**No irreplaceable loss.**
Can impacts be mitigated?	Yes	

Mitigation / Management:

Operations:

If glare proves to be problematic, the only mitigation possible would be adjustment of the angle of repose of the panels. Due to distance, a minor adjustment in the angle is likely to be all that is needed.

Cumulative Impacts:

It is possible that glare associated with the proposed project could add to glare associated with other projects. With mitigation however, glare associated with this project is highly unlikely to impact. The likely contribution to cumulative impacts is therefore assessed as **low**.

See appendix IV.

Residual Risks:

There are no residual risks.

5.3.5 Lighting potentially creating light pollution and making the project obvious within a relatively dark night time landscape

Nature of impact:

Security and operational lighting could make the project visible to receptors at night.

This will be seen in the context of other projects as well as lighting associated with mining and settlement.

Currently the only lighting in the immediate vicinity of the project is associated with homesteads and is relatively low level.

It should be noted that from observations made on site, the majority of the closest projects that is to the south west and within the ALV of Hyperion solar PV 2 (Kalahari Solar Power Project) is relatively dark at night. Only the turbine house of this development is lit with relatively low key lighting.

Plate 14, View of Kalahari Solar Power Project at night from the Kathu Airport

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

Lighting from passing traffic on the N14 is also obvious.

There is potential therefore for the project to extend the influence of lighting into an area that would otherwise be relatively dark at night.

	Without mitigation	**With mitigation**
Extent	Site and immediate surroundings **(2)**	Site **(1)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Low **(4)**	Small to minor **(1)**

Probability	Definite **(5)**	Improbable **(2)**
Significance	Medium **(50)**	Low **(12)**
Status	The appearance of a large lit area may be accepted by most people because it is so close to the N14, major mining operations as well as Kathu, all of which are well lit. It is likely however that some people will see the expansion of lighting as a **negative** impact.	If the lights are generally not visible then the occasional light is unlikely to be seen as negative. **Neutral**
Irreplaceable loss	It would be possible to change the lighting / camera system so the impact cannot be seen as an irreplaceable loss.	No irreplaceable loss
Reversibility	High	High
Can impacts be mitigated?	Yes	

Mitigation / Management:

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

Cumulative Impact:

There is potential for security lighting and operational lighting associated with solar energy projects to further impact on the area but with mitigation the contribution of this project to possible cumulative impacts is likely to be of low significance.

See appendix IV.

Residual Risks:

No residual risk has been identified.

6 IMPACT STATEMENT

6.1 LANDSCAPE CHARACTER

The affected landscape currently largely has a semi-natural rural character. However, there is evidence that this character is being eroded by additional solar energy developments in the vicinity of the proposed project.

Whilst there are a significant number of additional projects proposed in the area, it seems unlikely the authorised projects will change the overall character of the landscape as experienced by the majority of receptors. This is because of the relatively flat topography that allows limited elevated views, the vegetation that will provide a large degree of screening and the fact that they are likely to be set back from major roads.

6.2 RECEPTORS

The assessment has indicated that the sensitive receptors are likely to include:

1) Roads in the vicinity including the N14, the R308 and a local road;
2) Homesteads in the vicinity; and
3) The Kathu Airport.

6.3 VISUAL IMPACTS

Potential impacts associated with roads and homesteads relate to visual intrusion and the general industrialisation of a semi-natural rural landscape.

The potential impact associated with Kathu Airport includes possible problems associated with glint and glare affecting the approach flight path.

The initial assessment has indicated that;

It is possible that glimpses of the development could be visible from sections of the affected roads. However, these views are likely to be mitigated by distance, the fact that the project will be seen in a flat landscape, meaning that there will be no overview and existing vegetation is likely to provide a large degree of screening. There is therefore only likely to be a low level of impact on the identified roads.

There are a small number of homesteads in the vicinity of the proposed development, the closest being in the order of 500m distance from the array. However, this homestead is inhabited by the owner of the land on which the project is proposed. It is reported that he is in favour of the project as planned. A buffer has been allowed for in the development planning to ensure that the solar array does not completely dominate the setting.

There is a homestead approximately 2.6km to the north of the proposed array. It is unlikely that the development will be highly obvious from the house due to existing trees around the building and its orientation. Views of the array may be possible from the surrounding area. However, it is likely that existing vegetation will at least part screen the development.

There is also a group of buildings approximately 2.6km to the southeast of the proposed array. The buildings are also surrounded by trees which are likely to provide a degree of screening. Any visual impact is also likely to be part mitigated

by distance as well as screening that is likely to be provided by existing natural vegetation.

The remaining five groups of buildings identified within the ZTV are in excess of 3.5km from the proposed array. It is possible that glimpses of the development may be possible from these; however, distance and intervening natural vegetation is likely to largely screen views.

Visual impacts on homesteads are therefore assessed as having a low significance after the implementation of mitigation.

The PV panels will face towards the north and slightly away from the northern approach flight path into Kathu Airport. This orientation and the distance from the flight path (approximately 7km) are both likely to mean that glint and glare are unlikely to cause a significant problem for approaching aircraft.

Kathu Airport is approximately 10.9km from the proposed array. Largely due to distance and vegetation, the proposed array is highly unlikely to be visible from the airport.

It is possible that glare could impact on the northern approach into the airport. However, due to distance and the likely height of aircraft on the potentially affected section of the flight path (7km from the runway) and the fact that only peripheral vision could be impacted, it is unlikely that a significant impact will occur.

There is potential for light pollution to change the nature of the night time landscape by creating a brightly lit area in a relatively dark setting. With mitigation however, this impact will be largely avoided.

The proposed alternative access road alignments are likely to cause relatively low levels of visual impact. The main issue issues relate to proximity to homesteads which could result in traffic being obvious to residents as well as the loss of vegetation which could have negative influence in terms of character change. Alternative alignment 1 being an upgrade of an existing road is likely to cause the least overall impact on existing natural vegetation and therefore the least impact on the overall landscape character. However, alternative alignments 1 and 2 being aligned closest to existing homesteads are likely to have the greatest impact on residents. All alternatives are acceptable from a visual impact perspective.

7.4 CUMULATIVE IMPACTS

The cumulative impact on general landscape character, impacts on views from roads and from local homesteads due to renewable energy projects in the area is assessed as having a medium significance. The contribution of the proposed project to these cumulative impacts is assessed as low. This is generally due to distance of the project from receptors and the VAC of the landscape.

The possible cumulative effect of glare on Kathu Airport and the cumulative contribution of the proposed project are both assessed as low. This is largely due to the relatively effective mitigation measures that might be employed.

7.5 CONCLUSION

Identified visual impacts are all assessed as low. Appropriate mitigation measures can also reduce anticipated impacts further.

There is no reason from a landscape and visual impact perspective why the proposed development should not proceed.

REFERENCES

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APPENDIX I
ASSESSOR'S BRIEF CURRICULUM VITAE

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

Qualifications

Education	Diploma in Landscape Architecture, Gloucestershire College of Art and Design, UK (1979) Environmental Law, University of KZN (1997)
Professional	Registered Professional Landscape Architect (SACLAP) Chartered Member of the Landscape Institute (UK) Member of the International Association of Impact Assessment, South Africa

Languages	English	-	Speaking	-	Excellent
		-	Reading	-	Excellent
		-	Writing	-	Excellent

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General

Jon qualified as a Landscape Architect (Dip LA) at Cheltenham (UK) in 1979. He has been a chartered member of the Landscape Institute UK since 1986. He is also a Registered Landscape Architect (SACLAP, 2009) and he has extensive experience working as an Environmental Assessment Practitioner in South Africa.

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

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

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

VIA work undertaken during the last twelve months includes VIA input for wind energy projects, numerous solar plant projects (CSP and PV), a new coal fired power station as well as electrical infrastructure.

Select List of Visual Impact Assessment Projects

- **Establishment of Upmarket Tourism Accommodation on the Selati Bridge, Kruger National Park** – Assessment of visual implications of providing tourism accommodation in 12 railway carriages on an existing railway bridge at the Skukuza Rest Camp in the Kruger Park.
- **Jozini TX Transmission Tower** – Assessment of visual implications of a proposed MTN transmission tower on the Lebombo ridgeline overlooking the Pongolapoort Nature reserve and dam.
- **Bhangazi Lake Development** – Visual Impact Assessment for a proposed tourism development within the iSimangaliso Wetlend Park World Heritage Site.
- **Palesa Power Station** - VIA for a new 600MW power station near Kwamhlanga in Mpumalanga for a private client.
- **Heuningklip PV Solar Project** – VIA for a solar project in the Western Cape Province for a private client.
- **Kruispad PV Solar Project** – VIA for a solar project in the Western Cape Province for a private client.
- **Doornfontein PV Solar Project** – VIA for a solar project in the Western Cape Province for a private client.
- **Olifantshoek Power Line and Substation** – VIA for a new 10MVA 132/11kV substation and 31km powerline, Northern Cape Province, for Eskom.
- **Noupoort Concentrating Solar Plants -** Scoping and Visual Impact Assessments for two proposed parabolic trough projects.
- **Drakensberg Cable Car –** Preliminary Visual Impact Assessment and draft terms of reference as part of the feasibility study.
- **Paulputs Concentrating Solar Plant (tower technology)** – Visual Impact Assessment for a new CSP project near Pofadder in the Northern Cape.
- **Ilanga Concentrating Solar Plants 1, 2, 3, 4 & 5** – Scoping and Visual Impact Assessments for the proposed extension of five authorised CSP projects including parabolic trough and tower technology within the Karoshoek Solar Valley near Upington in the Northern Cape.
- **Ilanga Concentrating Solar Plants 1, 2, 3, 4 & 5 Shared Infrastructure** –Visual Impact Assessment for the necessary shared infrastructure including power lines, substation, water pipeline and roads for these projects.
- **Ilanga Concentrating Solar Plants 7, 8 & 9** - Scoping and Visual Impact Assessments for three new CSP projects including parabolic trough and tower technology within the Karoshoek Solar Valley near Upington in the Northern Cape.
- **Sol Invictus Solar Plants** - Scoping and Visual Impact Assessments for three new Solar PV projects near Pofadder in the Northern Cape.
- **Gunstfontein Wind Energy Facility** – Scoping and Visual Impact Assessment for a proposed WEF near Sutherland in the Northern Cape.
- **Moorreeesburg Wind Energy Facility** – Visual Impact Assessment for a proposed WEF near Moorreeesburg in the Western Cape.
- **Semonkong Wind Energy Facility** - Visual Impact Assessment for a proposed WEF near Semonkong in Southern Lesotho.
- **Great Karoo Wind Energy Facility** – Addendum report to the Visual Impact Assessment Report for amendment to this authorised WEF that is located near Sutherland in the Northern Cape. Proposed amendments included layout as well as rotor diameter.
- **Perdekraal East Power Line** – Visual Impact Assessment for a proposed power line to evacuate power from a wind energy facility near Sutherland in the Northern Cape.
- **Tshivhaso Power Station** – Scoping and Visual Impact Assessment for a proposed new power station near Lephalale in Limpopo Province.
- **Saldanha Eskom Strengthening** – Scoping and Visual Impact Assessment for the upgrading

of strategic Eskom infrastructure near Saldanha in the Western Cape.

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

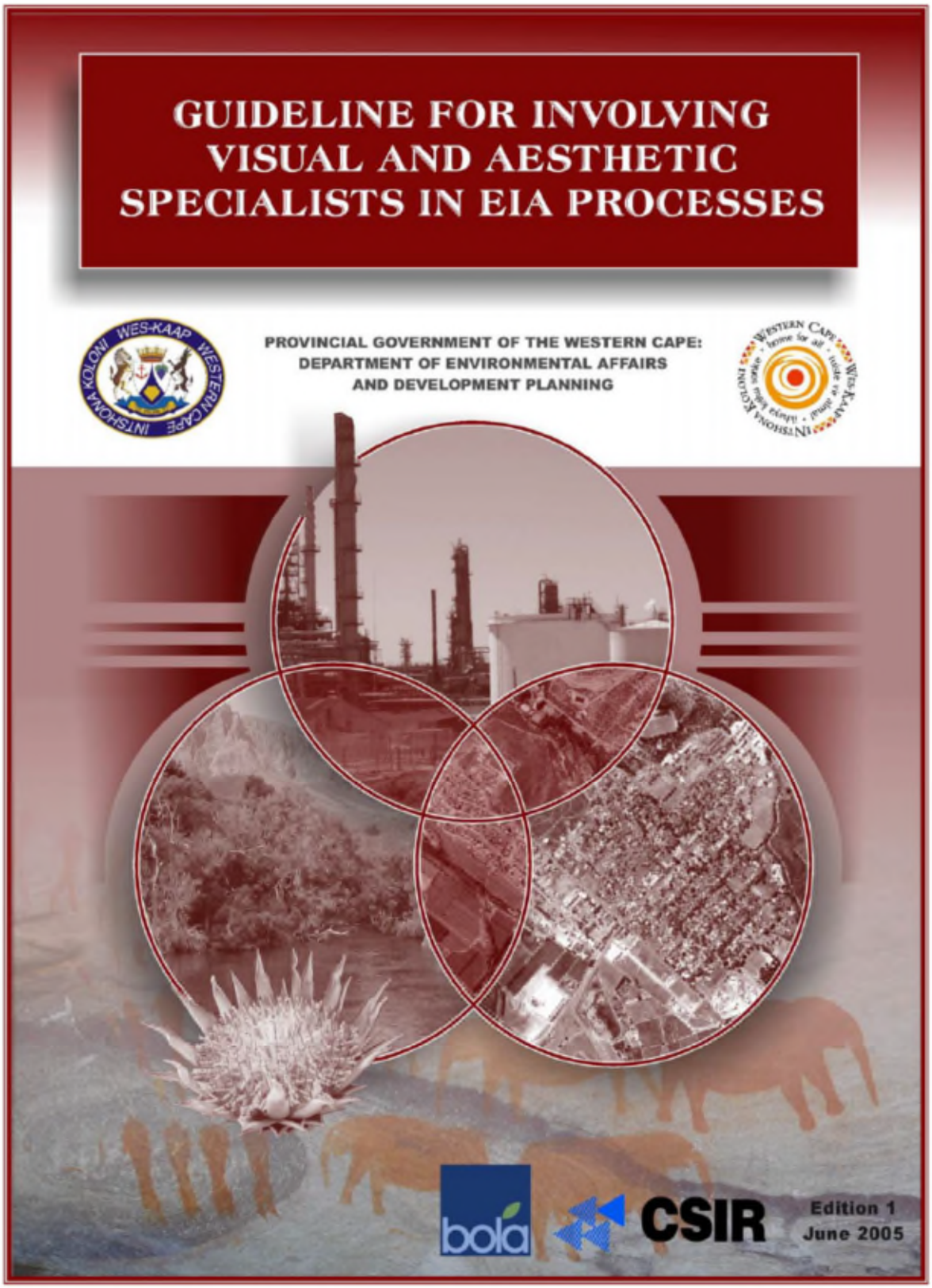
developments for Blast Media.

- **Signage Strategy** – Preparation of an environmental strategy report for a national advertising campaign on National Roads for Visual Image Placements.
- **Zeekoegatt, Durban** - Computer aided visual impact assessment. EDP acted as advisor to the Province of KwaZulu Natal in an appeal brought about by a developer to extend a light industrial development within a 60 metre building line from the National N3 Highway.
- **La Lucia Mall Extension** - Visual impact assessment using three dimensional computer modelling / photo realistic rendering and montage techniques for proposed extension to shopping mall for public consultation exercise.
- **Redhill Industrial Development** - Visual impact assessment using three dimensional computer modelling / photo realistic rendering and montage techniques for proposed new industrial area for public consultation exercise.
- **Avondale Reservoir** - Visual impact assessment using three dimensional computer modelling / photo realistic rendering and montage techniques for proposed hilltop reservoir as part of Environmental Impact Assessment for Umgeni Water.
- **Hammersdale Reservoir** - Visual impact assessment using three dimensional computer modelling / photo realistic rendering and montage techniques for proposed hilltop reservoir as part of Environmental Impact Assessment for Umgeni Water.
- **Southgate Industrial Park, Durban** - Computer Aided Visual Impact Assessment and Landscape Design for AECI.
- **Sainsbury's Bryn Rhos** - Computer Aided Visual Impact Assessment/ Planning Application for the development of a new store within the Green Wedge North of Swansea.
- **Ynyston Farm Access** - Computer Aided Impact Assessment of visual intrusion of access road to proposed development of Cardiff for the Land Authority for Wales.
- **Cardiff Bay Barrage** – Preparation of the Visual Impact Statement for inclusion in the Impact Statement for debate by parliament (UK) prior to the passing of the Cardiff Bay Barrage Bill.
- **A470, Cefn Coed to Pentrebach** - Preparation of landscape frameworks for the assessment of the impact of the proposed alignment on the landscape for The Welsh Office.
- **Sparkford to Illchester Bye Pass** - The preparation of the landscape framework and the draft landscape plan for the Department of Transport.
- **Green Island Reclamation Study** - Visual Impact Assessment of building massing, Urban Design Guidelines and Masterplanning for a New Town extension to Hong Kong Island.
- **Route 3** - Visual Impact Assessment for alternative road alignments between Hong Kong Island and the Chinese Border.
- **China Border Link** - Visual Impact Assessment and initial Landscape Design for a new border crossing at Lok Ma Chau.
- **Route 81, Aberdeen Tunnel to Stanley** - Visual Impact Assessment for alternative highway alignments on the South side of Hong Kong Island.

APPENDIX II

GUIDELINES FOR INVOLVING VISUAL AND AESTHETIC SPECIALISTS IN EIA PROCESSES

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


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

Edition 1

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Stakeholders engaged in the guideline development process:

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

In particular, thanks are due to Jan Glazewski (University of Cape Town), Keith Wiseman (City of Cape Town), Paul Britton (SANPARKS), Graham Young (University of Pretoria), Lisa Parkes (Ninham Shand) and Paul Claassen (Environomics) for providing useful information and in-depth comments.

Finalisation of report figures and formatting:

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PREFACE

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

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

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

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

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

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

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

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

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

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

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

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

Who is the target audience for these guidelines?

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

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

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

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

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

What will these guidelines not do?

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

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

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

How are these guidelines structured?

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

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

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

SUMMARY

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

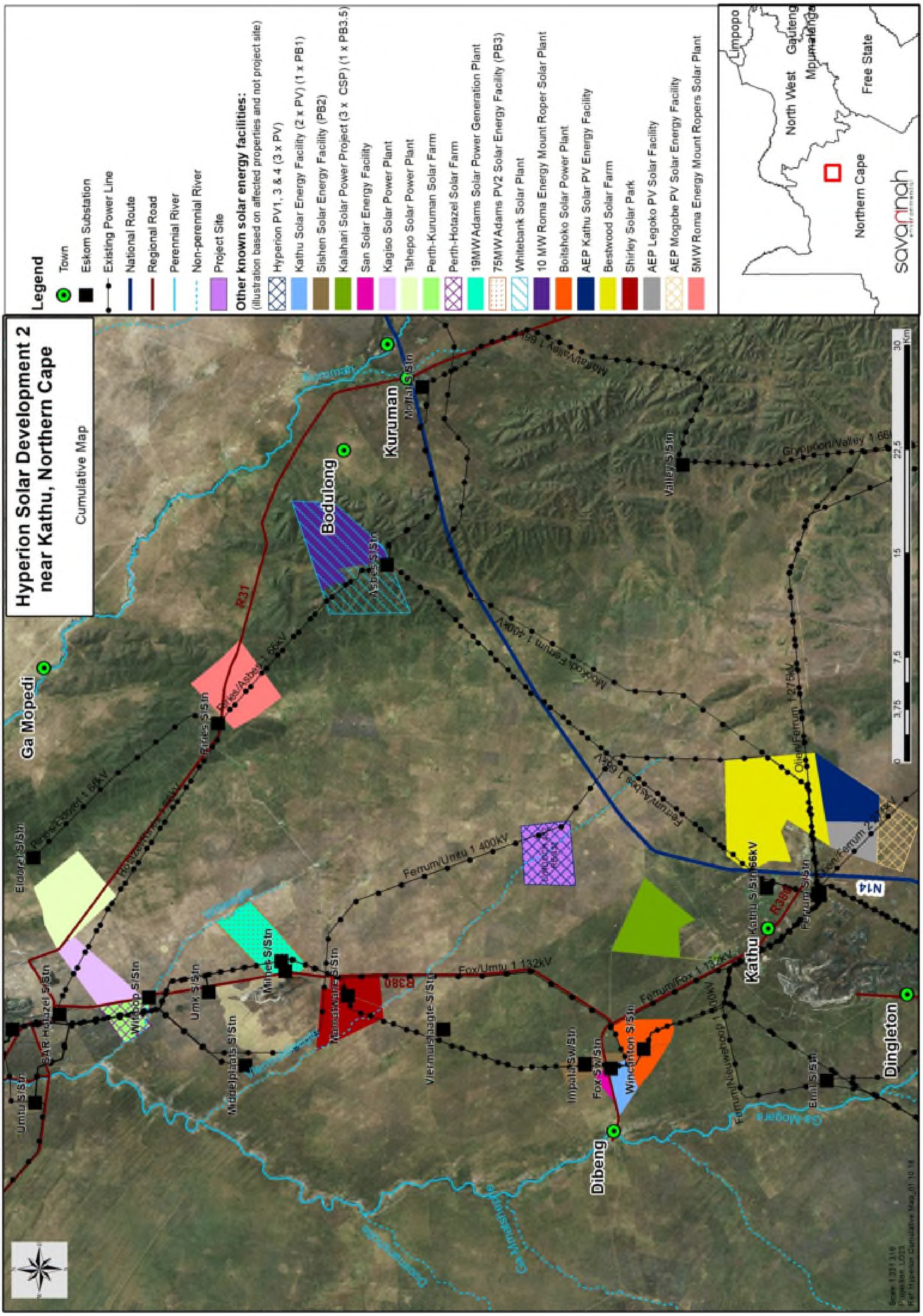
Finally, pointers for the effective communication of the findings are given.

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

CONTENTS

APPENDIX III

AUTHORISED RENEWABLE ENERGY PROJECTS WITHIN 30KM OF THE SUBJECT SITE


Hyperion Solar Development 2 near Kathu, Northern Cape
Cumulative Map
Legend
Town
Eskom Substation
Existing Power Line
National Route
Regional Road
Perennial River
Non-perennial River
Project Site
Other known solar energy facilities:
(illustration based on affected properties and not project site)
Hyperion PV1, 3 & 4 (3 x PV)
Kathu Solar Energy Facility (2 x PV) (1 x PB1)
Sishen Solar Energy Facility (PB2)
Kalahari Solar Power Project (3 x CSP) (1 x PB3.5)
San Solar Energy Facility
Kagiso Solar Power Plant
Tshepo Solar Power Plant
Perth-Kuruman Solar Farm
Perth-Hotazel Solar Farm
19MW Adams Solar Power Generation Plant
75MW Adams PV2 Solar Energy Facility (PB3)
Whitebank Solar Plant
10 MW Roma Energy Mount Roper Solar Plant
Boitshoko Solar Power Plant
AEP Kathu Solar PV Energy Facility
Bestwood Solar Farm
Shirley Solar Park
AEP Legoko PV Solar Facility
AEP Mogobe PV Solar Energy Facility
5MW Roma Energy Mount Ropers Solar Plant
Limpopo
Gauteng
Mpumalanga
North West
Free State
Northern Cape
savannah
Ga Mopedi
Bodulong
Kuruman
Kathu
Dibeng
Dingleton
R31
R380
N14
0 3,75 7,5 15 22,5 30 Km

AUTHORISED RENEWABLE ENERGY PROJECTS WITHIN 30KM OF THE PROPOSED PROJECT				
Project Name	DEA Reference Number(s)	Location	Approximate distance from Hyperion Solar Development 2	Project Status
Kalahari Solar Power Project (CSP) (1 x 100MW project)	12/12/20/1994/1	Remaining Extent of the Farm Kathu 465	~9.3km south west	Preferred Bidder (already constructed)
Kalahari Solar Power Project (CSP) (1 x 150MW project)	12/12/20/1994/2	Remaining Extent of the Farm Kathu 465	~9.3km south west	Approved
Kalahari Solar Power Project (CSP) (1 x 150MW project)	12/12/20/1994/3	Remaining Extent of the Farm Kathu 465	~9.3km south west	Approved
Bestwood Solar Farm (PV)	12/12/20/1906	Remaining Extent of the Farm Bestwood 459	~14km south	Approved
Boitshoko Solar Power Plant (PV) (1 x 115MW project)	14/12/16/3/3/2/935	Remaining Extent of Portion 1 of the Farm Lime Bank 471	~15.4km south west	Approved
Sishen Solar Farm (PV) (1 x 75MW project)	12/12/20/1860	Portion 6 of the Farm Wincanton 472	~15.8km west	Preferred Bidder (already constructed)
Kathu SEF (PV) (1 x 75MW project)	12/12/20/1858/1	Portion 4 of the Farm Wincanton 472	~15.8km west	Preferred Bidder (already constructed)
Kathu SEF (PV) (1 x 25MW project)	12/12/20/1858/2	Portion 4 of the Farm Wincanton 472	~15.8km west	Approved
Shirley Solar Park (PV) (1 x 75MW project)	14/12/16/3/3/2/616	Portion 1 of the Farm Shirley 367	~17.9km north west	Approved
Adams Solar Power Generation Plant (PV) (1 x 19MW project)	12/12/20/2566	Remaining Extent of the Farm Adams 328	~22km north	Approved
Adams PV SEF (PV) (1 x 75MW project)	12/12/20/2567	Remaining Extent of the Farm Adams 328	~22km north	Preferred Bidder (already constructed)
AEP Kathu Solar PV Energy Facility (PV) (1 x 75MW project)	14/12/16/3/3/2/911	Remaining Extent of the Farm Legoko 460	~22.4km south	Approved
AEP Legoko PV Solar Facility (PV) (1 x 75MW)	14/12/16/3/3/2/819	Portion 2 of the Farm Legoko 460	~22.4km south	Approved

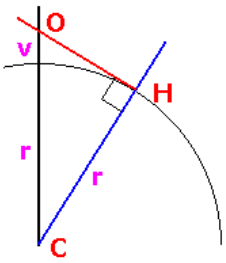
AUTHORISED RENEWABLE ENERGY PROJECTS WITHIN 30KM OF THE PROPOSED PROJECT				
Project Name	DEA Reference Number(s)	Location	Approximate distance from Hyperion Solar Development 2	Project Status
Roma Energy Mount Roper Solar Plant (PV) (1 x 10MW project)	14/12/16/3/3/1/474	Portion 4 of the Farm Whitebank 379	~25km north east	Approved
Whitebank Solar Plant (PV) (1 x 10MW project)	14/12/16/3/3/1/475	Portion 4 of the Farm Whitebank 379	~25km north east	Approved
Mogobe PV SEF (1 x 75MW project)	14/12/16/3/3/2/820	Portion 1 of the Farm Legoko 460	~25km south	Approved
Roma Energy Mount Ropers Solar Plant (PV) (1 x 5MW project)	14/12/16/3/3/1/1753	Remaining Extent of the Farm Mount Roper 321	~25.7km north east	Approved
Perth – Kuruman Solar Farm (PV) (1 x 75MW project)	14/12/16/3/3/2/761	Remaining Extent of the Farm Pert 276	~30km north	Approved
Perth – Hotazel Solar Farm (PV) (1 x 75MW project)	14/12/16/3/3/2/762	Remaining Extent of the Farm Pert 276	~30km north	Approved
Kagiso Solar Power Plant (PV) (1 x 115MW project)	14/12/16/3/3/2/934	Remaining Extent of the Farm Pert 276	~30km north	Approved
Tshepo Solar Power Plant (PV) (1 x 115MW project)	14/12/16/3/3/2/936	Remaining Extent of Farm 275	~30km north	Approved

APPENDIX IV
CALCULATION OF VISUAL HORIZON

The Mathematics behind this Calculation

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

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



APPENDIX V

CUMULATIVE IMPACT ASSESSMENT

1 Landscape Change

Nature:
The proposed project could extend the general influence of development and specifically solar projects into a relatively natural rural area

The project is one of four proposed projects on the same property.

Whilst there are twenty one similar projects within 30km of the proposed project, four are located within the ALV of Hyperion PV 2 and may be visible to a stakeholder at the same time (Kalahari Solar Power and Hyperion PV1, 3 & 4). These projects could combine visually to create the impression of a concentration of development.

Other projects could also combine to create this impression but the subject project will not add to this impression.

Whilst projects that are seen in isolation surrounded by relatively natural areas will also create the impression of industrialisation as a stakeholder moves through the area, they are unlikely to create the impression that solar development is the main landcover, in other words, they will appear as industrial elements within a general naturalistic landscape.

The proposed project is also unlikely to be obvious from any public areas or routes. Its contribution to the cumulative visual impact of solar projects is therefore likely to be limited.

	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Site and surroundings **(2)**	Region **(3)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Small to minor **(1)**	Moderate **(6)**
Probability	Improbable **(2)**	Probable **(3)**
Significance	**Low (14)**	**Medium (39)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	Unknown

Mitigation:
Planning:

- Plan development levels to minimise earthworks to ensure that levels are not elevated;
- Plan to maintain the height of structures as low as possible;
- Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development;
- Retain and augment natural vegetation on all sides of the proposed project.
- Ensure that the colour of the back face of panels looks black and paint support structures closest to receptors mid grey (southern most row). If other projects are developed to the south, this mitigation measure is not necessary.
- .

Operations:

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

Decommissioning:

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

Residual Impacts:
Residual impacts relate to the loss of indigenous vegetation as well as the failure to remove

development and infrastructure on decommissioning.

2 The proposed development could impact on views from roads including the N14, the R308 and local roads

Nature:
The proposed project is very unlikely to have any significant impact on the N14, the R308 or local roads.

A detailed visual analysis of other solar projects (other than Hyperion 1, 3 & 4) in the area has not been undertaken due to limited information available on these projects, however given the location of other projects in closer proximity to roads, it seems possible that other solar projects in the area could have a significant impact.

	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Site and immediate surroundings **(2)**	Region, **(3)**
Duration	Long term **(4)**	Long term, **(4)**
Magnitude	Small to minor **(1)**	Moderate to low, **(5)**
Probability	Very improbable **(2)**	Probable, **(3)**
Significance	**Low (14)**	**Medium, (36)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	Unknown

Mitigation:
Planning:

- Plan development levels to minimise earthworks to ensure that levels are not elevated;
- Plan to maintain the height of structures as low as possible;
- Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development;
- Retain and augment natural vegetation on all sides of the proposed project.
- Ensure that the colour of the back face of panels looks black and paint support structures closest to receptors mid grey (southern most row). If other projects are developed to the south, this mitigation measure is not necessary.
-

Operations:

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

Decommissioning:

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

Residual Impacts:
Residual impacts relate to the loss of indigenous vegetation as well as the failure to remove development and infrastructure on decommissioning.

3 Cumulative impact on local homesteads

Nature:
The proposed project may not be visible from existing homesteads but will be visible from areas surrounding homesteads.

It is likely that other closer projects will be more visible to homesteads and will in fact help screen the proposed development.

Whilst a detailed assessment of the impact of other projects (other than Hyperion 1, 3 & 4) has not been undertaken due to limited information available on these projects, from review of online mapping, it seems possible that other projects will impact negatively on homesteads in the region.

The cumulative impact is therefore also likely to be improbable with a low significance.

	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Site and immediate surroundings, **(2)**	Regional, **(3)**
Duration	Long term, **(4)**	Long term, **(4)**
Magnitude	Small to minor, **(1)**	Low to moderate, **(5)**
Probability	Probable **(3)**	Probable **(3)**
Significance	**Low, (21)**	**Medium, (36)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No irreplaceable loss.	No irreplaceable loss.
Can impacts be mitigated?	Yes	Unknown

Mitigation:

Planning:

- Plan development levels to minimise earthworks to ensure that levels are not elevated;
- Plan to maintain the height of structures as low as possible;
- Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development;
- Retain and augment natural vegetation on all sides of the proposed project.
- Ensure that the colour of the back face of panels looks black and paint support structures closest to receptors mid grey (southern most row). If other projects are developed to the south, this mitigation measure is not necessary.
-

Operations:

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

Decommissioning:

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

Residual Impacts:

Residual impacts relate to the loss of indigenous vegetation as well as the failure to remove development and infrastructure on decommissioning,

4 Cumulative impact of glare affecting Kathu Aerodrome.

Nature:

Whilst a detailed glare analysis of other solar projects in the area has not been undertaken due to limited information available on these projects, due to the number of projects in the area, the probability of glare being an issue will increase to probable and due to the spread of the possible projects the extent increases to "regional".

The proposed project is unlikely to add significantly to glare issues associated with solar PV development in the area.

	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Site and immediate surroundings **(2)**	Regional **(3)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Minor **(2)**	Minor **(2)**
Probability	Improbable **(2)**	Probable **(3)**
Significance	Low **(16)**	Low **(27)**
Status (positive or negative)	**Negative**	**Negative**
Reversibility	High	High
Irreplaceable loss of resources?	No irreplaceable loss.	No irreplaceable loss.
Can impacts be mitigated?	Yes	
Mitigation: Should glare prove problematic, mitigation might include a slight adjustment to the angle of repose of solar panels.		
Residual Impacts: None		

5 Night Time Lighting Impacts

Nature: Currently lighting in the area is comprised of low level lighting around homesteads and another solar project (Kalahari Solar) as well as lighting on the N14 to the south. There is a risk that the proposed project will intensify lighting impacts in the area. If additional solar development does occur on other sites, it is highly possible that these developments could also extend lighting impacts. If appropriate mitigation measures are applied as recommended for the subject project then cumulative impacts are anticipated to be low.		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Site **(1)**	Regional **(3)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Small to minor **(1)**	Small to minor **(1)**
Probability	Improbable **(2)**	Improbable **(3)**
Significance	Low **(12)**	**Low (24)**
Status (positive or negative)	If the lights are generally not visible then the occasional light is unlikely to be seen as negative. **Neutral**	**Neutral**
Reversibility	High	High
Irreplaceable loss of resources?	No irreplaceable loss	No irreplaceable loss
Can impacts be mitigated?	Yes	
Mitigation: 1) Use low key lighting around buildings and operational areas that is triggered only when people are present. 2) Plan to utilise infra-red security systems or motion sensor triggered security lighting; 3) Ensure that lighting is focused on the development with no light spillage outside the site; and 4) Keep lighting low, no tall mast lighting should be used.		
Residual Impacts: No residual risk has been identified.		

APPENDIX V
ENVIRONMENTAL MANAGEMENT PLAN

Project component/s	Hyperion Solar PV 2, Construction, Operation and Decommissioning
Potential Impact	Change in Landscape Character and the nature of stakeholder views: • Extending the influence of development into relatively natural areas; • Changing the nature of views from the N14, the R308, local roads and homesteads and; • Extending lighting impacts into natural areas that are currently dark during the hours of darkness; • Glint and glare affecting the northern flight path into Kathu Aerodrome.
Activity/risk source	• Engineered change in landform being obvious against natural contours. • Vegetation clearance and lack of rehabilitation during construction and decommissioning making the development more obvious particularly from a distance. • The development industrialising the outlook for stakeholders. • Lighting extending into natural areas that are currently dark during the hours of darkness. • Glare affecting pilots approaching and leaving the Kathu Aerodrome.
Mitigation: Target/Objective	• Plan platforms and earthworks to blend into surrounding natural contours. • Minimise and reinstate vegetation loss. • Maintain and augment exiting surrounding natural vegetation in order to soften views of the development and maintain continuity with the surrounding natural landscape. • Ensure that the colour of the back face of panels looks black and paint support structures closest to receptors mid grey (southern most row). If other projects are developed to the south, this mitigation measure is not necessary. • Remove structures and rehabilitate site to its natural condition on decommissioning. • Ensure PV panels use non reflective surfaces in order to minimise the potential for glint and glare. • Monitor glint and glare impacts on the Kathu Aerodrome and undertake additional mitigation as necessary which may include the adjustment of panels.

Mitigation: Action/control	**Responsibility** Contractor (C) Environmental Officer (EO) Environmental Liaison Officer (ELO)	**Timeframe** Construction Phase (C) Operational Phase (O) Decommissioning Phase (D)
Ensure that the face of panels have the most effective non reflective surface possible at the time of ordering.	C	C

Minimise disturbance and maintain existing vegetation as far as is possible both within and surrounding the development area.	C, EO	C
Reinstate any areas of vegetation that have been disturbed during construction.	C, EO	C
Maintain and augment vegetation within the area surrounding the development.	C, EO	C
Rehabilitate disturbed areas to their natural state on decommissioning.	C, EO	D
Monitor rehabilitated areas post-construction and post-decommissioning and implement remedial actions.	C, EO	C, D
Ensure that back face of the southernmost row of panels associated with the Hyperion group of solar projects is painted mid grey in order to help the structure blend with the landscape.	C, EO	C,D
Monitor for impacts of glint and glare affecting Kathu Aerodrome. It will be necessary to liaise with the operator of the aerodrome in order to that he / she can report glare issues that may be experienced by pilots.	EO	O
Undertake mitigation measures for glare impacts as necessary including adjusting the angle of PV panels.	EO	O
Remove all temporary works.	C, EO	D
Remove infrastructure not required for the post-decommissioning use of the site.	C, EO	D
Performance Indicators	Natural contours rather than rigid engineered land form. Vegetation presence and density. Visibility of the development from surrounding areas. Presence of unnecessary infrastructure. Pilots observing glare.	
Monitoring	Evaluate vegetation before, during and after construction. Evaluate vegetation growth and reinstatement during decommissioning and for a year thereafter. Monitor glare affecting the aerodrome through liaison with the operator.	

	Take regular time-line photographic evidence. Responsibility: EO and ELO. Prepare regular reports.