ENVIRONMENTAL IMPACT ASSESSMENT PROCESS
FINAL EIA REPORT

PROPOSED PROJECT OFIR-ZX PHOTOVOLTAIC PLANT,
NEAR KEIMOES, NORTHERN CAPE

(DEA REF No: 12/12/20/2229)

FINAL FOR SUBMISSION TO DEA
January 2012

Prepared for
NetWorx S28 Energy (Pty) Ltd
18 Melrose Boulevard
2nd Floor, Melrose Arch
2076

Prepared by:

Savannah Environmental Pty Ltd

UNIT 606, 1410 EGLIN OFFICE PARK
14 EGLIN ROAD, SUNNINGHILL, GAUTENG
PO BOX 148, SUNNINGHILL, 2157
TEL: +27 (0)11 234 6621
FAX: +27 (0)86 684 0547
E-MAIL: INFO@SAVANNAHSA.COM
WWW.SAVANNAHSA.COM

Savannah
ENVIRONMENTAL (PTY) LTD

PROJECT DETAILS

DEA Reference No.	:	12/12/20/2229
Title	:	Environmental Impact Assessment Process: Final Environmental Impact Assessment Report Proposed Project Ofir-ZX Photovoltaic Plant, Northern Cape
Authors	:	Savannah Environmental (Pty) Ltd Tammy Kruger Jo-Anne Thomas
Sub-consultants	:	Tony Barbour Environmental Consulting and Research David Hoare Consulting cc Heritage Contracts Office TerraSoil Science MetroGIS (Pty) Ltd
Client	:	NetWorx S28 Energy (Pty) Ltd
Report Status	:	Final Environmental Impact Assessment Report for submission to DEA
Date	:	January 2012

When used as a reference this report should be cited as: Savannah Environmental (2011) Final Environmental Impact Assessment Report: Proposed Project Ofir-ZX Photovoltaic Plant, Northern Cape, for NetWorx S28 Energy (Pty) Ltd.

INVITATION TO COMMENT ON THE DRAFT EIA REPORT

The draft Environmental Impact Assessment (EIA) Report was available for review and comment by Interested and Affected Parties (I&APs) and stakeholders at the Keimoes Public Library, and the Keimoes Agrimart from 09 December 2011 – 25 January 2012.

The report was also available for download from:

» www.savannahSA.com

Comments were invited to be submitted as written submission via fax, post, or e-mail to:
Shawn Johnston of **Sustainable Futures ZA**
PO Box 749, Rondebosch, Cape Town, 7701
Tel: 083 325 9965
Fax: 086 510 2537
E-mail: swjohnston@mweb.co.za
The due date for comments on the draft EIA Report was 25 January 2012

EXECUTIVE SUMMARY

NetWorx S28 Energy (Pty) Ltd is proposing the establishment of a solar energy facility for the purpose of commercial electricity generation as part of the proposed Renewable Energy Independent Power Producers (IPP) Procurement Programme. Hereafter referred to as **Project Ofir-ZX**, the proposed development site is situated on the remaining extent of Farm 616, located approximately 5 km north- west of Keimoes in the Northern Cape.

The proposed PV plant is proposed to comprise numerous arrays of PV panels, which will be linked together to form individual strings. A maximum generating capacity of 200 MW is proposed which will be developed in three phases as follows:

» Phase 1 - 30 MW;
» Phase 2 – addition of 70 MW to increase the capacity to 100 MW;
» Phase 3 – addition of 100 MW to increase the capacity to 200 MW.

The following associated infrastructure is proposed.

» An inverter situated at the end of each "string" in order to switch the power from direct current (DC) to alternating current (AC).
» Underground cabling of 33 kV in order to distribute the power to a central on-site substation.
» A transformer together with the on-site substation to step–up the power from 33 kV to 132 kV, to be distributed between the plant and the Eskom grid.
» Connection of the PV plant to the power distribution grid. An existing 132 kV distribution line, which connects the Taaiputs Substation at Kakamas and the Oasis Substation at Keimoes crosses the site. It is proposed that a new 132 kV power line will be built from the on-site substation to connect with the existing power line.
» Internal access roads for construction and maintenance purposes.
» Maintenance, security buildings, and a workshop.
» Solar kiosk (education centre).

The following potentially significant environmental impacts have been identified through the EIA Phase.

» Local site specific impacts resulting from the physical modification/disturbance of the site primarily during the construction phase.
» Impacts associated with the power line.
» Impacts on the social environment.

The findings of the specialist studies undertaken within this EIA process to assess both the benefits and potential negative impacts anticipated from the proposed project conclude that there are **no environmental fatal flaws** that should prevent the proposed facility from proceeding. The majority of impacts identified are of moderate to

low significance and can be successfully mitigated to acceptable levels, provided the specifications as detailed within the Environmental Management Programme (EMP) for the project are implemented. With reference to the information available at this planning approval stage in the project cycle, the **confidence** in the environmental assessment undertaken is regarded as **acceptable**.

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ABBREVIATIONS AND ACRONYMS

BID	Background Information Document
DEA	National Department of Environmental Affairs
DENC	Department of Environment and Nature Conservation
DoE	Department of Energy
DWA	Department of Water Affairs
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EMP	Environmental Management Programme
EPC	Engineering, Procurement, and Construction
GDP	Gross Domestic Profit
GG	Government Gazette
GIS	Geographical Information System
GN	Government Notice
GWh	Giga Watt Hour
I&AP	Interested and Affected Party
IDP	Integrated Development Plan
IPP	Independent Power Producer
km^2	Square kilometres
km/hr	Kilometres per hour
kV	Kilovolt
MA	Million years before present
MAR	Mean Annual Rainfall
m^2	Square meters
m/s	Meters per second
MW	Mega Watt
NEMA	National Environmental Management Act (Act No. 107 of 1998)
NERSA	National Energy Regulator of South Africa
NGOs	Non-Governmental Organisations
NT	Not Threatened
NWA	National Water Act (Act No. 36 of 1998)
PV	Photovoltaic
SAHRA	South African Heritage Resources Agency
SANBI	South African National Biodiversity Institute
SANRAL	South African National Roads Agency Limited
VAC	Visual Absorption Capacity
VU	Vulnerable

DEFINITIONS AND TERMINOLOGY

Alternatives: Alternatives are different means of meeting the general purpose and need of a proposed activity. Alternatives may include location or site alternatives, activity alternatives, process or technology alternatives, temporal alternatives or the 'do nothing' alternative.

Archaeological material: Remains resulting from human activities which are in a state of disuse and are in or on land and which are older than 100 years, including artefacts, human and hominid remains and artificial features and structures.

Cumulative impacts: The impact of an activity that in itself may not be significant, but may become significant when added to the existing and potential impacts eventuating from similar or diverse activities or undertakings in the area.

Direct impacts: Impacts that are caused directly by the activity and generally occur at the same time and at the place of the activity (e.g. noise generated by blasting operations on the site of the activity). These impacts are usually associated with the construction, operation or maintenance of an activity and are generally obvious and quantifiable

'Do nothing' alternative: The 'do nothing' alternative is the option of not undertaking the proposed activity or any of its alternatives. The 'do nothing' alternative also provides the baseline against which the impacts of other alternatives should be compared.

Early stone age: A very early period of human development dating between 300 000 and 2.6 million years ago.

Endangered species: Taxa in danger of extinction and whose survival is unlikely if the causal factors continue operating. Included here are taxa whose numbers of individuals have been reduced to a critical level or whose habitats have been so drastically reduced that they are deemed to be in immediate danger of extinction.

Endemic: An "endemic" is a species that grows in a particular area (is endemic to that region) and has a restricted distribution. It is only found in a particular place. Whether something is endemic or not depends on the geographical boundaries of the area in question and the area can be defined at different scales.

Environment: the surroundings within which humans exist and that are made up of:

i. The land, water and atmosphere of the earth;
ii. Micro-organisms, plant and animal life;
iii. Any part or combination of (i) and (ii) and the interrelationships among and between them; and
iv. The physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being.

Environmental impact: An action or series of actions that have an effect on the environment.

Environmental impact assessment: Environmental Impact Assessment (EIA), as defined in the NEMA EIA Regulations and in relation to an application to which scoping must be applied, means the process of collecting, organising, analysing, interpreting and communicating information that is relevant to the consideration of that application.

Environmental management: Ensuring that environmental concerns are included in all stages of development, so that development is sustainable and does not exceed the carrying capacity of the environment.

Environmental management programme: An operational plan that organises and co-ordinates mitigation, rehabilitation and monitoring measures in order to guide the implementation of a proposal and its on-going maintenance after implementation.

Fossil: Mineralised bones of animals, shellfish, plants and marine animals. A trace fossil is the track or footprint of a fossil animal that is preserved in stone or consolidated sediment.

Heritage: That which is inherited and forms part of the National Estate (Historical places, objects, fossils as defined by the National Heritage Resources Act of 2000).

Indigenous: All biological organisms that occurred naturally within the study area prior to 1800

Indirect impacts: Indirect or induced changes that may occur as a result of the activity (e.g. the reduction of water in a stream that supply water to a reservoir that supply water to the activity). These types of impacts include all the potential impacts that do not manifest immediately when the activity is undertaken or which occur at a different place as a result of the activity.

Integrated energy plan: A plan commissioned by the DME in response to the requirements of the National Energy Policy, in order to provide a framework in which specific energy policies, development decisions and energy supply trade-offs can be made on a project-by-project basis. The framework is intended to create a balance between the energy demand and resource availability to provide low cost electricity for social and economic development, while taking into account health, safety and environmental parameters.

Integrated strategic electricity planning: Eskom's planning process which provides strategic projections of supply-side and demand-side options to be implemented to deal with the energy management issues and meet long-term load forecasts.

Interested and affected party: Individuals or groups concerned with or affected by an activity and its consequences. These include the authorities, local communities, investors, work force, consumers, environmental interest groups and the general public.

Late stone age: In South Africa this time period represents fully modern people who were the ancestors of southern African KhoeKhoen and San groups (40 000 – 300 years ago).

Middle stone age: An early period in human history characterised by the development of early human forms into modern humans capable of abstract though process and cognition 300 000 – 40 000 years ago.

National integrated resource plan: Commissioned by NERSA in response to the National Energy Policy's objective relating to affordable energy services, in order to provide a long-term, cost-effective resource plan for meeting electricity demand, which is consistent with reliable electricity supply and environmental, social and economic policies.

Photovoltaic effect: Electricity can be generated using photovoltaic panels (semiconductors) which are comprised of individual photovoltaic cells that absorb solar energy to produce electricity. The absorbed solar radiation excites the electrons inside the cells and produces what is referred to as the Photovoltaic Effect.

Rare species: Taxa with small world populations that are not at present Endangered or Vulnerable, but are at risk as some unexpected threat could easily cause a critical decline. These taxa are usually localised within restricted geographical areas or habitats or are thinly scattered over a more extensive range. This category was termed Critically Rare by Hall and Veldhuis (1985) to distinguish it from the more generally used word "rare".

Red data species: Species listed in terms of the International Union for Conservation of Nature and Natural Resources (IUCN) Red List of Threatened Species, and/or in terms of the South African Red Data list. In terms of the South African Red Data list, species are classified as being extinct, endangered, vulnerable, rare, indeterminate, insufficiently known or not threatened (see other definitions within this glossary).

Significant impact: An impact that by its magnitude, duration, intensity, or probability of occurrence may have a notable effect on one or more aspects of the environment.

INTRODUCTION CHAPTER 1

NetWorx S28 Energy (Pty) Ltd is proposing the establishment of a solar energy facility for the purpose of commercial electricity generation as part of the proposed Renewable Energy Independent Power Producers (IPP) Procurement Programme. Hereafter referred to as **Project Ofir-ZX**, the proposed development site is situated on the remaining extent of Farm 616, located approximately 5 km north- west of Keimoes in the Northern Cape (refer to Figure 1.1). From a regional perspective, the proposed development site is considered technically viable for the establishment of a photovoltaic (PV) plant by virtue of the following criteria:

» *Climate* - the economic viability is directly dependent on the annual direct solar irradiation values. Furthermore the PV cell performance is directly proportional to the solar intensity. Therefore the efficiency is affected by the intensity of the sunlight on an optimally oriented panel at a specific location, at a specific time. Cloud cover would cause a significant decrease in efficiency. The Northern Cape has been identified as having an optimum solar resource required for PV installations.
» *Orography* - an area with a flat terrain facilitates the construction and maintenance of these plants, and reduces the need for civil/earthworks. The southern half of the site and the immediate surrounding area is flat, sloping gently south towards the Orange River.
» *Site extent* - in general, fixed/tracking PV panels require approximately 1 – 3 ha per MW. Furthermore, the site must be large enough to avoid any identified geotechnical and/or environmental sensitivities. The identified site (i.e. the broader farm portion) covers an area of 45 km^2 (i.e. 4 500 ha). This area is larger than the developmental footprint expected to be required for the proposed development, which is estimated at approximately 4 km^2. The facility can therefore be appropriately placed within the larger site taking environmental sensitivities (i.e. drainage lines) and technical constraints (i.e. an area with a flat surface) into consideration.
» *Evacuation point* - a suitable point of connection to the Eskom grid is required. An existing 132 kV distribution power line crosses the southern portion of the site and connects the Taaiputs Substation at Kakamas and the Oasis Substation at Keimoes. A 132 kV power line will be built from an on-site substation within the solar facility to connect with this existing power line.

The proposed PV plant is proposed to comprise numerous arrays of PV panels, which will be linked together to form individual strings. A maximum generating capacity of 200 MW is proposed which will be developed in three phases as follows:

» Phase 1 - 30 MW;
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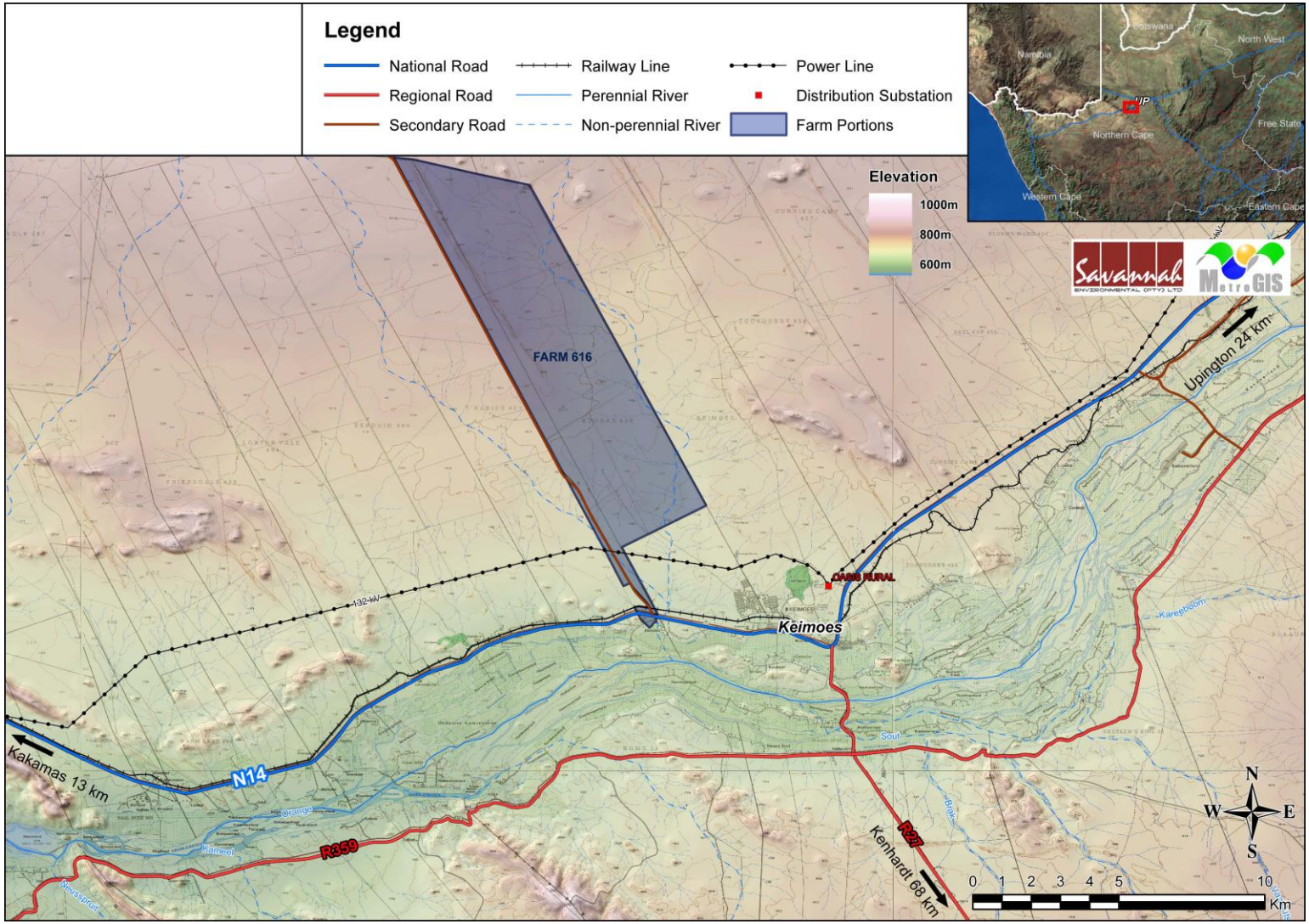

Figure 1.1: Locality map showing the broader development site

The nature and extent of this proposed facility is assessed further within this EIA Report which consists of the following sections:

» *Chapter 1: Introduction* - provides background to the proposed facility, the EIA process; and the environmental assessment practitioner (EAP).
» *Chapter 2: Technology description and project overview* - provides an overview of the proposed solar technology, the consideration of alternatives, and the proposed activities during the different phases in the project timeline.
» *Chapter 3: Regulatory and legal context* - provides an overview of the regulatory and legal context for electricity generation projects.
» *Chapter 4: EIA process* - outlines the process followed during the EIA Phase, including the public participation process.
» *Chapter 5: Description of the affected environment* - describes the baseline biophysical and socio-economic conditions.
» *Chapter 6: Impact assessment* - presents the assessment of impacts, positive, negative, direct, indirect, and cumulative associated with the facility and its associated infrastructure.
» *Chapter 7*: *Conclusions and recommendations* - presents the conclusions of the EIA Phase, as well as an impact statement (i.e. conclusions) and recommendations for the implementation of the proposed project.
» *Chapter 8: References* - provides a list of references and information sources used in compiling the EIA Report.

1.1 Conclusions from the Scoping Phase

Issues identified through the desk-top scoping study included impacts on ecology, flora and fauna; agricultural potential; erosion potential; heritage sites and fossils; visual quality and aesthetics and the social environment. The majority of potential impacts identified to be associated with the construction and operation of the proposed PV plant are anticipated to be localised and restricted to the proposed site. No environmental fatal flaws were identified at this stage of the process, and no absolute 'no-go' areas were identified for the broader site, although areas of relatively higher ecological sensitivity were identified in terms of the drainage systems on site (refer to Figure 1.2). The potentially sensitive areas identified through the scoping study include:

» *Drainage systems:* The dry river beds with their associated riparian zones are regarded as unique systems in this arid and are protected under the National Water Act (Act No. 36 of 1998). These drainage systems may possibly be important habitat for a number of species in the study area, including those with a restricted distribution.

» *Protected or threatened species:* The National Environmental Management: Biodiversity Act (Act No. 10 of 2004) states that"*A person may not carry out a*

restricted activity involving a specimen of a listed threatened or protected species without a permit issued in terms of Chapter 7". Furthermore the National Forests Act (Act No. 84 of 1998) states that the *'Minister may declare a tree, group of trees, woodland or a species of trees as protected. The prohibitions provide that 'no person may cut, damage, disturb, destroy or remove any protected tree, or collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, except under a licence granted by the Minister'*.

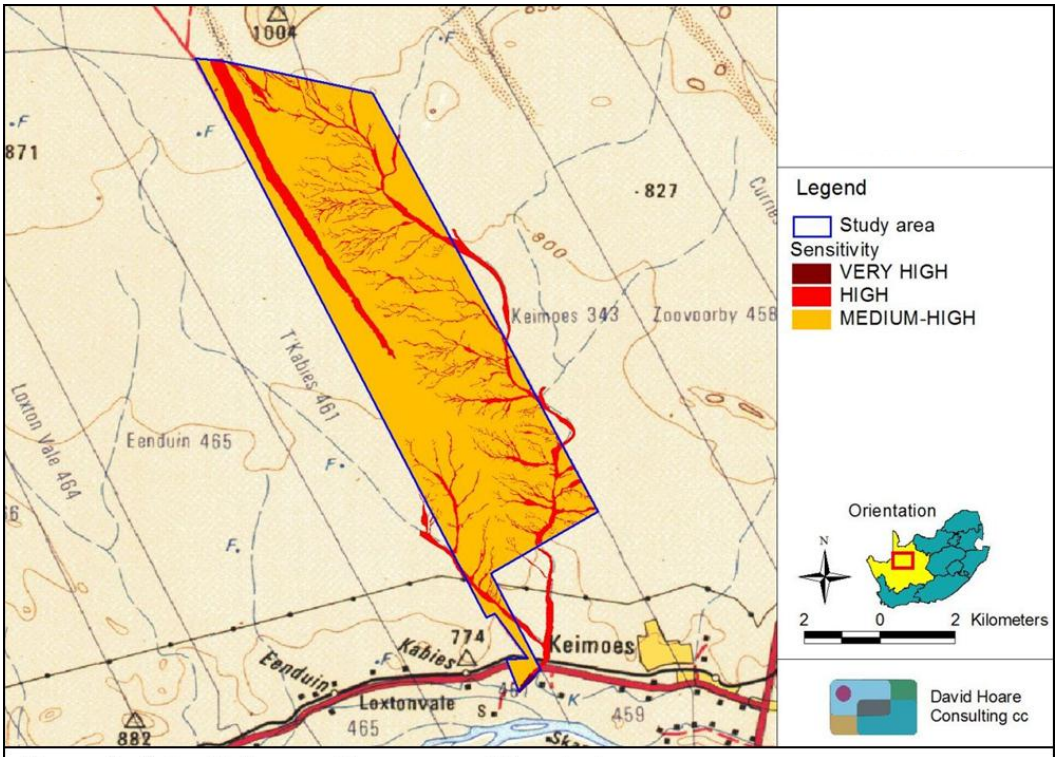

Figure 4: Potentially sensitive areas of the study area.

Figure 1.2: Sensitivity analysis produced during the Scoping Phase for the proposed study site

During the EIA Phase more detailed studies have been conducted, and sensitive areas have been confirmed. In order to reduce the potential for on-site impacts, the facility has been designed in such a manner as to avoid these sensitive areas as far as reasonably possible. This 'funnel-down approach' in the consideration of the larger site has served to focus the location of infrastructure to those areas within the broader site with reduced environmental sensitivities. With an understanding of which area/s within the broader site would be least sensitive to a development of this nature, NetWorx S28 Energy has prepared a preliminary infrastructure layout which has been considered within this EIA Report.

1.2 The Purpose of the Proposed Project

Globally there is increasing pressure on countries to increase their share of renewable energy generation due to concerns such as climate change and exploitation of non-renewable resources. South Africa currently relies on coal-powered energy to meet more than 90% of its energy needs. As a result South Africa is one of the highest per capita producers of carbon emissions in the world and Eskom, as an energy utility, has been identified as the world's second largest producer of carbon emissions. In order to meet the long-term goal of a sustainable renewable energy industry, a goal of 17.8 GW of renewables by 2030 has been set by the Department of Energy (DoE) within the Integrated Resource Plan (IRP) 2010. This energy will be produced mainly from wind, solar, biomass, and small-scale hydro (with wind and solar comprising the bulk of the power generation capacity). This amounts to ~42% of all new power generation being derived from renewable energy forms by 2030. This is, however, dependent on the assumed learning rates and associated cost reductions for renewable options.

In responding to the growing electricity demand within South Africa, as well as the country's targets for renewable energy, NetWorx S28 Energy proposes the establishment of the Ofir-ZX PV Plant to sell the electricity to Eskom as part of the Renewable Energy Independent Power Producers (IPP) Procurement Programme which has been introduced by the Department of Energy (DoE) to promote the development of renewable power generation facilities by IPPs. NetWorx S28 Energy will be required to apply for a generation license from the National Energy Regulator of South Africa (NERSA), as well as a power purchase agreement from Eskom (i.e. typically for a period of 20 - 25 years) in order to build and operate the proposed facility. As part of the agreement, NetWorx S28 Energy will be remunerated per kWh by Eskom who will be financially backed by government. Depending on the economic conditions following the lapse of this period, the facility can either be decommissioned or the power purchase agreement may be renegotiated and extended.

1.3 Requirements for an EIA Process

In terms of the EIA Regulations published in Section 24(5) of the National Environmental Management Act (NEMA, Act No. 107 of 1998), NetWorx S28 Energy requires authorisation from the National Department of Environmental Affairs (DEA)[1] (in consultation with the Northern Cape Department of Environment and Nature Conservation (DENC)), for the establishment of the proposed facility. An application for authorisation has been accepted by DEA under application reference number **12/12/20/2229**. This application included

[1] As this is a proposed electricity generation project and thereby considered to be of national importance, the National Department of Environmental Affairs is the **competent authority** for the proposed project.

the following listed activities which are triggered by the proposed solar energy facility and its associated infrastructure.

Notice:	Activity:	Description of Activity:	Relevant to:
GNR545, 18 June 2010	1	The construction of facilities or infrastructure for the generation of electricity where the electricity output is 20 MW or more.	The use of PV panels to generate up to 200 MW for integration into the Eskom grid.
GNR545, 18 June 2010	15	Physical alteration of undeveloped, vacant or derelict land for residential, retail, commercial, recreational, industrial or institutional use where the total area to be transformed is 20 ha or more; except where such physical alteration takes place for: (i) Linear development activities; or (ii) Agriculture or afforestation where activity 16 in this schedule will apply.	The establishment of the proposed facility within a broader development site of approximately 4 500 ha. The development footprint is expected to be in the region of 4 km^2.
GNR544, 18 June 2010	10	The construction of facilities or infrastructure for the transmission and distribution of electricity: (i) Outside urban areas or industrial complexes with a capacity of more than 33 kV but less than 275 kV; or (ii) Inside urban areas or industrial complexes with a capacity of 275 kV or more.	The development of a new overhead 132 kV power line feeding into an existing 132 kV distribution line that runs between the Taaiputs Substation at Kakamas and the Oasis Substation at Keimoes.
GNR544, 18 June 2010	13	The construction of facilities or infrastructure for the storage, or for the storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of 80 but not exceeding 500 m^3.	During the construction phase, the fuel required for the construction vehicles will need to be safely stored.
GNR544, 18	22	The construction of a road,	The development of internal

Notice:	Activity:	Description of Activity:	Relevant to:
June 2010		outside urban areas: (i) With a reserve wider than 13.5 m; or (ii) Where no road reserve exists where the road is wider than 8 m.	access roads of 6 m – 8 m wide.

In terms of sections 24 and 24D of NEMA, as read with the EIA Regulations of GNR543, a Scoping and an EIA Phase are required to be undertaken as part of the EIA process which comprises the following four stages:

» *Notification Stage* - where the project is registered with DEA and the public participation process is initiated - this phase is complete.
» *Scoping Phase* - where the potential impacts of the facility are identified in preparation for the EIA Phase - this phase is complete.
» *EIA Phase* - where the potential impacts of the facility are assessed and evaluated in terms of their significance). The findings of this stage are detailed within this report - this is the current phase of the process.
» *Decision Making Phase* – where the competent authority (i.e. DEA) is provided with all the necessary information to compile an Environmental Authorisation (previously referred to as a Record of Decision). This phase will follow the submission of the final EIA Report.

1.4 Objectives of the EIA Process

The Scoping Phase was completed in October 2011 with the submission of a final report to DEA, and served to identify potential impacts associated with the proposed project and to define the extent of studies required within the EIA Phase. The Scoping Phase included input from the project proponent, specialists with experience in the study area and in EIAs for similar projects, as well as a public consultation process with key stakeholders that included both government authorities and interested and affected parties (I&APs).

The EIA Phase (i.e. the current phase) addresses identified environmental impacts (direct, indirect, and cumulative as well as positive and negative) associated with the different phases of the project (i.e. design, construction, operation, and decommissioning). The EIA Phase also recommends appropriate mitigation measures for potentially significant environmental impacts. The release of a draft EIA Report provided stakeholders with an opportunity to verify that issues they have raised through the EIA process have been captured and adequately considered. This final EIA Report incorporates all issues and responses raised during the public review of the draft report prior to submission to DEA.

1.5 Details of the Environmental Assessment Practitioner

Savannah Environmental was contracted by NetWorx S28 Energy as the independent environmental consultants to undertake the EIA process for the proposed project. Neither Savannah Environmental, nor any of its specialist sub-consultants on this project are subsidiaries of, or are affiliated to NetWorx S28 Energy. Furthermore, Savannah Environmental does not have any interests in secondary developments that may arise out of the authorisation of the proposed project.

Savannah Environmental is a specialist environmental consultancy which provides a holistic environmental management service, including environmental assessment and planning to ensure compliance with relevant environmental legislation. Savannah Environmental benefits from the pooled resources, diverse skills and experience in the environmental field held by its team that has been actively involved in undertaking environmental studies for a wide variety of projects throughout South Africa and neighbouring countries. Strong competencies have been developed in project management of environmental processes, as well as strategic environmental assessment and compliance advice, and the assessment of environmental impacts, the identification of environmental management solutions and mitigation/risk minimising measures. The proposed project team members include:

» *Jo-Anne Thomas* who will be the project manager responsible for planning, programming, and overseeing of the EIA process. Jo-Anne has considerable experience (more than 10 years) in conducting EIAs and in EIA project management.
» *Tammy Kruger* who will be the EAP responsible for preparation of the EIA reports and assessment of environmental aspects. Tammy has 5 years experience in the environmental field and has been involved with the EIA process for multiple solar energy facilities, particularly in the Northern Cape.

Savannah Environmental has gained extensive knowledge and experience on potential environmental impacts associated with electricity generation projects through their involvement in related EIA processes. Savannah Environmental has completed the EIA process and received environmental authorisations for several solar energy facilities, including:

» Khi CSP's Solar Thermal Plant near Upington, Northern Cape Province.
» KaXu CSP's Solar Thermal Plant near Pofadder, Northern Cape Province.
» ACSA PV's Installation at the Bloemfontein Airport, Free State Province.
» ACSA PV's Installation at the Kimberley Airport, Northern Cape Province.
» ACSA PV's Installation at the Upington Airport, Northern Cape Province.
» ACSA PV's Installation at the OR Tambo Airport, Gauteng Province.

- Thupela Energy's Waterberg Photovoltaic Plant, Limpopo Province.
- VentuSA Energy's Sishen Solar Energy Facility, Northern Cape Province.
- Renewable Energy Investment South Africa's Kathu Solar Energy Facility, Northern Cape Province.
- Ilanga Solar Thermal Power Plant, Northern Cape Province.
- Momentous Energy's RustMo1 and RustMo2 Photovoltaic Plants, North West Province.
- Solar Capital's De Aar Solar Energy Facility, Northern Cape Province.

Through our experience over the past several years in the renewable energy sector, Savannah Environmental has developed a valuable understanding of impacts associated with the construction and operation of renewable energy facilities.

In order to adequately identify and assess potential environmental impacts, Savannah Environmental has appointed several specialist consultants to conduct specialist studies, as required. Curricula vitae for the Savannah Environmental project team and its specialist sub-consultants are included in Appendix A.

OVERVIEW OF THE PROPOSED PROJECT CHAPTER 2

This chapter provides an overview of the proposed project including a description of the proposed technology, the description of alternatives considered in the EIA process, and the scope of works for the various project development phases (i.e. design, construction, operation, and decommissioning).

2.1 Description of the Proposed Solar Energy Facility

Project Ofir-ZX is proposed on the remaining extent of Farm 616, located approximately 5 km north-west of Keimoes in the Northern Cape. A maximum generating capacity of 200 MW is proposed which will be developed in three phases as follows:

» Phase 1 - 30 MW;
» Phase 2 – addition of 70 MW to increase the capacity to 100 MW;
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The following associated infrastructure is proposed:

» An inverter situated at the end of each "string" in order to switch the power from direct current (DC) to alternating current (AC).
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» Internal access roads for construction and maintenance purposes.
» Maintenance, security buildings, and a workshop.
» Solar kiosk (education centre).

A preliminary layout has been developed and is indicated in Figure 2.1. This preliminary layout indicates the proposed area of development within the site, and has taken cognisance of environmental sensitivities identified in the Scoping Phase of the process.

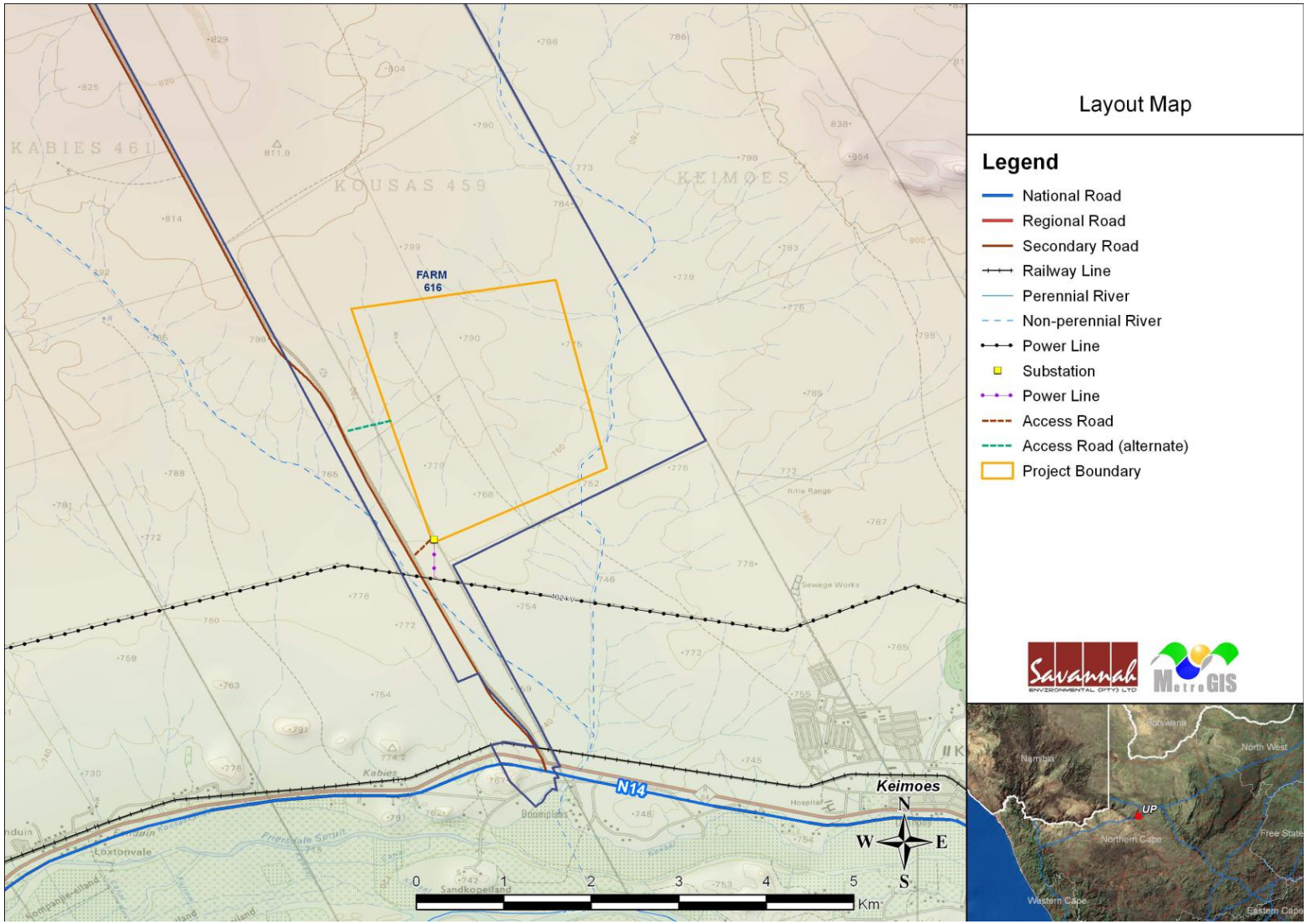

Figure 2.1: Preliminary layout for the proposed facility

2.2 Solar Energy as a Power Generation Technology

The generation of electricity can be easily explained as the conversion of energy from one form to another. Solar energy facilities operate by converting solar energy into a useful form (i.e. electricity). Solar technologies can be divided into two categories, i.e. a) those that use thermal energy from the sun, and b) those that use the light energy. The former uses water (i.e. solar thermal) whereas the latter does not (i.e. photovoltaic technology which is proposed for the Project Ofir-ZX Plant).

The use of solar energy for electricity generation is a non-consumptive use of a natural resource and consumes no fuel for continuing operation. Renewable energy is considered a 'clean source of energy' with the potential to contribute greatly to a more ecologically, socially, and economically sustainable future. The challenge now is ensuring solar energy projects are able to meet all economic, social, and environmental sustainability criteria.

2.2.1 Grid Connected PV Facility

PV facilities use the light energy from the sun to generate electricity through a process known as the *Photovoltaic Effect*. Individual PV cells are commonly constructed from silicon, are linked together, and placed behind a protective transparent sheet to operate in unison as a PV panel. A single PV cell is sufficient to power a small device such as an emergency telephone. However, to produce 200 MW, the proposed facility will require numerous cells arranged in multiples/arrays which will be fixed to support structures or mounts. In order to maximise the electricity generated, these mounts need to be angled in such a fashion so to receive the maximum amount of solar radiation throughout the year. The preferred angle of the panels (which is dependent on the latitude of the proposed facility) may be adjusted to optimise for summer or winter solar radiation characteristics.

Multiple inverters (each of which will be connected to a specific PV array), will convert the electricity, which is produced as direct current by the PV panels into alternating current, which can be used by individuals drawing power from the national electricity grid.

2.3 Project Alternatives

In accordance with the requirements of the EIA Regulations[2], alternatives are required to be considered within the EIA process, and may refer to any of the following:

» Site alternatives
» Activity alternatives
» Design or layout alternatives
» Technology alternatives
» Operating alternatives
» No-go alternative

2.3.1 Site Alternatives

A site alternative refers to the identification of more than one potential site which may be suitable for the establishment of a proposed facility. However, the nature of the site required for renewable energy generation projects often means that assessment of site alternatives is not possible. For example PV facilities require the following from an identified site in terms of suitability:

» *Solar resource* – a site needs to have a suitable annual average daily direct normal irradiation.
» *Site access* – the site will need to be accessible, particularly during the construction phase for the delivery of equipment and construction material.
» *Slope of the site* – those areas with a slope above a certain threshold are not deemed suitable due to potential shading issues from surrounding topography and ease of construction.
» *Access to the national electricity grid for power evacuation* – independent power producers are required to evacuate their electricity as per an Eskom approved manner into the grid, either directly into a substation, or via a loop-in/loop-out connection with an existing distribution line.

The identified site was deemed suitable with respect to the above-mentioned characteristics and no feasible alternatives were identified within this area. As such, no site alternatives have been evaluated as part of the EIA process.

[2] GNR543 27(e) calls for the applicant to identify feasible and reasonable alternatives for the proposed activity.

2.3.2 Activity Alternatives

The proposed activity is the generation of electricity using PV panels for evacuation into the National grid. No activity alternatives have been considered in this EIA process.

2.3.3 Technology Alternatives

PV technology is preferred for the proposed renewable energy project at the proposed development site (i.e. over wind and solar thermal). Wind technologies provide direct power only when the wind blows; therefore their momentary production follows the changes in weather (clouds and wind strength). PV is preferred in this regard to solar thermal due to the arid nature of the area and the existing pressure on water resources. PV is also relatively easier and quicker to construct as opposed to solar thermal.

2.3.4 Design or Layout Alternatives

Layout alternatives refer to the spatial configuration of an activity and its associated infrastructure on a proposed site. The developmental footprint for the proposed PV plant is smaller than the broader study site (i.e. 4 km^2 versus 45 km^2). Therefore the extent of the site allows for the identification and consideration of design alternatives. The PV plant and its associated infrastructure have been appropriately located while considering sensitive and no-go areas identified in the scoping study.

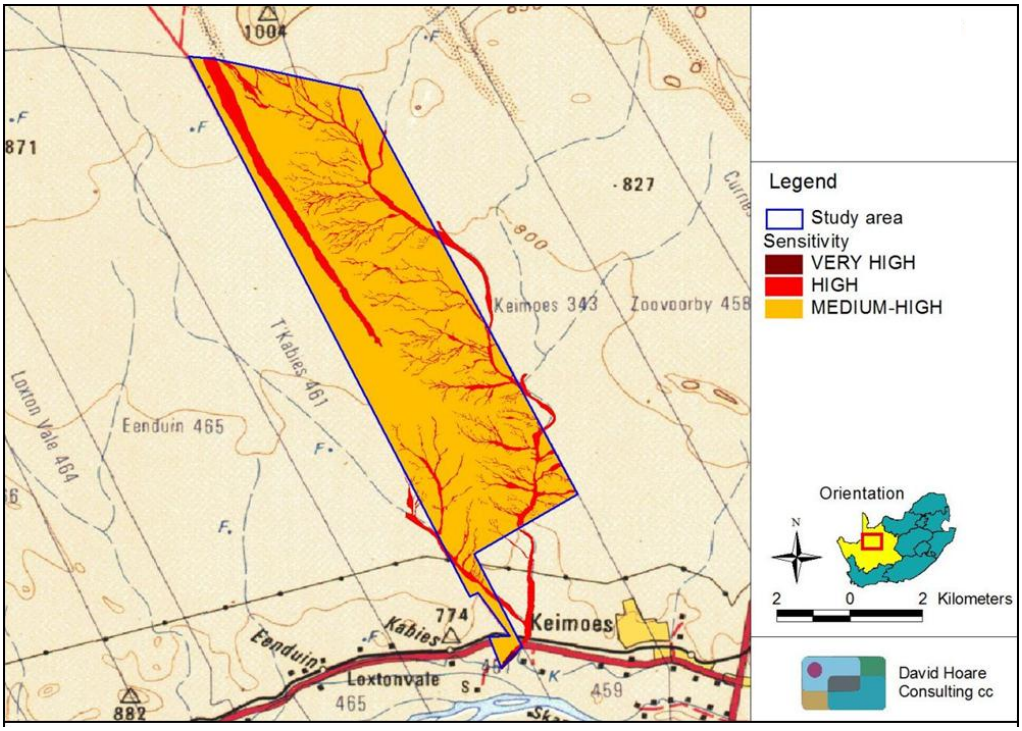

Figure 2.3: Sensitivity map produced during the scoping phase showing site sensitivities (i.e. drainage lines)

2.3.5 Operating Alternatives

Operating alternatives refers to the manner in which a proposed facility would function during the operational phase. For example, should a wind energy facility prove problematic for avifauna during migrating periods, an operating alternative of switching off certain turbines during those times could be proposed No operating alternatives would be applicable to the proposed solar energy facility as there are no means of alternative operation for a facility of this nature.

2.3.6 No-go Alternative

Also referred to as the 'Do-nothing' option, this refers to the developer not constructing the proposed Project Ofir-ZX PV Plant on the identified site north-west of Keimoes. In this scenario the potential positive and negative environmental and social impacts as described in this EIA Report will not occur and the status quo will be maintained. This alternative is assessed within Chapter 6 of this report.

2.4 Proposed Activities during the Project Development Stages

In order to construct the proposed facility and its associated infrastructure, a series of activities will need to be undertaken during the design, pre-construction construction, operation, and decommissioning phases. These are discussed in more detail below.

2.4.1 Construction Phase

The PV plant is proposed to have a maximum generating capacity of 200 MW, to be developed in three phases (i.e. 30 MW (phase 1); up to 100 MW (phase 2); up to 200 MW (phase 3). Approximately 50 - 100 people are expected to be employed during the construction phase, of which 10% will be low skilled positions, 20% semi-skilled, and 70% skilled. Low skilled and semi-skilled positions will ideally be filled by locals living in and around Kakamas and Keimoes. Workers not living in the area, including those for skilled positions, will not be housed on site. However, a 24-hour security team will be required on site.

The following construction activities are expected to form part of the project's scope of works.

Activity	Description
Pre-construction surveys	Prior to initiating construction, a number of detailed surveys will be required including, but not limited to: » *Geotechnical survey* – the geology and topography of the study area will be confirmed. The geotechnical study will look at flood potential, foundation conditions, potential for excavations, and the availability of natural construction materials. This study will serve to inform the type of foundations required to be built and the extent of earthworks and compaction required in the establishment of any internal access roads. » *Site survey* – this will be required to finalise the design layout of the PV field and other associated infrastructure. The finalisation will need to be confirmed in line with the Environmental Authorisation issued for the PV plant. » *Power line servitude survey* – once the placement of the towers for the power line has been finalised, a walk through survey will be undertaken for ecological, archaeology and heritage resources which may necessitate certain towers to be moved to avoid sensitivities.
Establishment of access roads	» The study site is accessible off the N14 from Keimoes to Kakamas, and then off the gravel Namibia – Lutputz road which joins with the N10. Therefore at this time the establishment of additional *external* access roads is not deemed necessary. » A gravel road traverses the periphery of the broader study site. However, additional roads may need to be established within the site for construction and maintenance purposes. The extent of earthworks and compaction required in the establishment of the access roads will be established through the detailed geotechnical study which will be undertaken as part of the design phase of the PV plant.
Undertake site preparation	» Site preparation activities will include clearance of vegetation at the footprint of the area infrastructure (i.e. sub-station, maintenance, security buildings, and a workshop), and linear components (i.e. internal access roads, power line towers). These activities will require the stripping of topsoil which will need to be stockpiled, backfilled and/or spread on site.
Transport of components	» The components for the proposed PV plant will be transported to site, in sections, by road. Some of the transformer may

Activity	Description
and equipment to site	be defined as abnormal loads in terms of the Road Traffic Act (Act No. 29 of 1989)[3] by virtue of the dimensional limitations (i.e. length and weight). The typical civil engineering construction equipment will need to be brought to the site (i.e. excavators, trucks, graders, compaction equipment, cement trucks, etc.) as well as components required for the establishment of the substation and power line. » In some instances, the dimensional requirements of the loads to be transported during the construction phase (i.e. the transformer of the substation) may require alterations to the existing road infrastructure (i.e. widening on corners), and protection of road-related structures (i.e. bridges, culverts, etc.) because of abnormal loading.
Establishment of construction camps and laydown areas	» Once the required construction equipment has been transported to site, dedicated equipment camp(s) and laydown area(s) will be required. » The construction camp(s) serve to confine activities and storage of equipment to designated area(s) to limit the potential ecological impacts associated with this phase of the project. The laydown area(s) will be used for assembly purposes and the general placement/storage of construction equipment. » Fuel required for the on-site construction vehicles and equipment will need to be secured in a temporary bunded area within the construction camp(s) to prevent leakages and soil contamination.
Establishment of the PV panels	» Holes for the PV panels will be mechanically excavated to a depth of approximately 2 m and the steel poles will be inserted using the "ramming technique."[4] » The installation of the underground cables between the PV panels and the inverters and between the inverters and the substation/transformer will require the excavation of trenches a maximum depth of 2 m within which they can then be laid.
Construction of the substation and power line.	» The substation will be constructed with a high-voltage (HV) yard footprint of a maximum size of 30 m x 50 m. The substation would be constructed in the following simplified sequence: » Step 1: Survey of the site » Step 2: Site clearing and levelling and construction of access road to substation site » Step 3: Construction of terraces and foundations » Step 4: Assembly, erection and installation of equipment (including transformers) » Step 5: Connection of conductors to equipment; and » Step 6: Rehabilitation of any disturbed areas and protection of erosion sensitive areas.

[3] A permit will be required for the transportation of these abnormal loads on public roads.

[4] No concrete will be required except where there is a need to drill into rock. Where required, ready mix concrete will be used.

Activity	Description
	» The new 132 kV power line will be built from the on-site substation to turn into and out of the existing power line. This means that two lines are actually required. A servitude of approximately 35 m in width for each power line will need to be established. Only the centre line of the servitude may need to be cleared for stringing purposes. The reminder of the servitude will not be cleared, except where trees higher than 4 m exist which could interfere with the operation of the power line.
Undertake site rehabilitation	» Once construction is complete and all construction equipment is removed, the site must be rehabilitated where practical and reasonable. On full commissioning of the PV plant, any access points to the site which are not required during the operational phase must be closed and prepared for rehabilitation.

2.4.2 Operation and Maintenance Phase

During operation approximately 15 - 30 members of staff will be required. Of this, 20% will be for skilled positions (i.e. electrical engineers and maintenance/plant engineers), and 80% for semi to low skilled positions (i.e. plant cleaning, security and maintenance). The PV plant is expected to be operational for 25+ years.

The following operation and maintenance activities are expected to form part of the project scope of works.

Activity	Description
Operation of the photovoltaic panels and the electrical infrastructure	» The PV panels will convert the light energy from the incoming radiation into electrical energy (i.e. as direct current). An inverter will service each loop of photovoltaic panels to change the power to alternating current. Thereafter the electricity will be conveyed to the on-site substation, the power line, and then to the existing 132 kV line in the southern portion of the site. » For the cleaning of the panels and for staff consumption/ablution facilties approximately 6 5000 l/MW/annum will be required.
Site operation and maintenance	» It is anticipated that a full-time security, maintenance, and control room staff will be required on site. » Each component within the PV plant will be operational except under circumstances of mechanical breakdown, unfavourable weather conditions, or routine maintenance activities.

2.4.3 Decommissioning Phase

The PV plant is expected to have a lifespan of 25+ years (i.e. with maintenance). The associated infrastructure would only be decommissioned once it has reached the end of its economic life. It is most likely that decommissioning activities of the infrastructure of the PV plant considered in this EIA process would comprise the disassembly and replacement of the individual components with more appropriate technology/infrastructure available at that time.

The following decommissioning activities will form part of the project scope.

Activity	Description
Site preparation	Site preparation activities will include confirming the integrity of the access to the site to accommodate the required equipment (e.g. lay down areas and decommissioning camp) and the mobilisation of decommissioning equipment.
Disassemble and replace existing components	The components would be disassembled, and reused and recycled (where possible), or disposed of in accordance with regulatory requirements.

REGULATORY AND LEGAL CONTEXT CHAPTER 3

3.1 National Policy and Planning Context

The need to expand electricity generation capacity in South Africa is based on national policy and informed by on-going strategic planning undertaken by the Department of Energy (DoE). The hierarchy of policy and planning documentation that support the development of renewable energy projects such as solar energy facilities is illustrated in Figure 3.1. These policies are discussed in more detail in the following sections, along with the provincial and local policies or plans that have relevance to the development of the proposed PV energy facility.

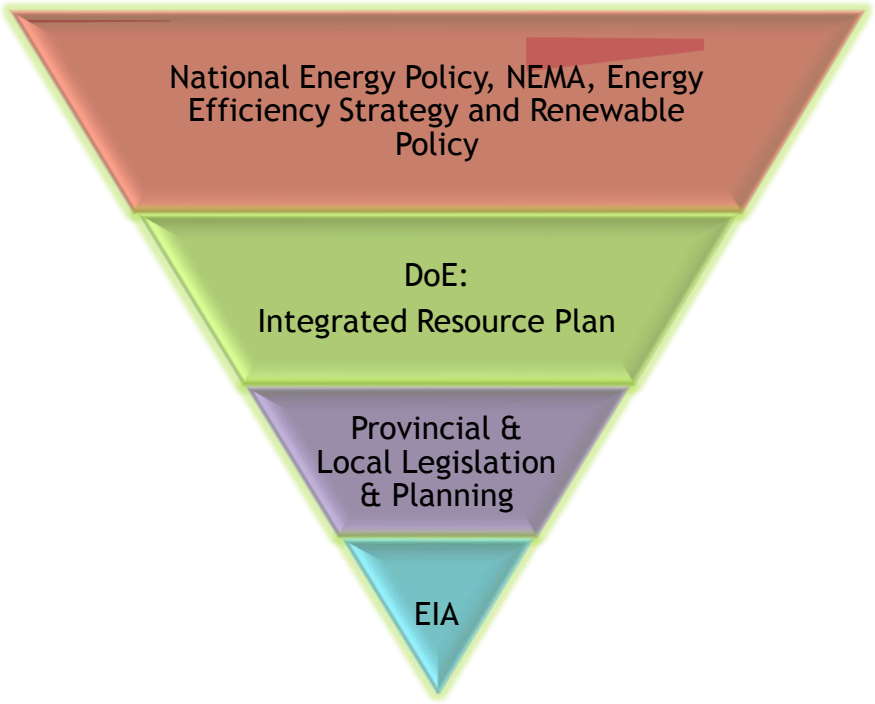

Figure 3.1: Hierarchy of electricity policy and planning documents

3.1.1 White Paper on the Energy Policy of South Africa, 1998

Development within the South African energy sector is governed by the White Paper on a National Energy Policy (DME, 1998). The White Paper identifies key objectives for energy supply, such as increasing access to affordable energy services, managing energy-related environmental impacts and securing energy supply through diversity.

As such, investment in renewable energy initiatives is supported, based on an understanding that renewable energy sources have significant medium - long-

term commercial potential and can increasingly contribute towards a long-term sustainable energy future.

3.1.2 Renewable Energy Policy in South Africa, 1998

The White Paper on Renewable Energy (DME, 2003) supplements the Energy Policy, and sets out Government's vision, policy principles, strategic goals, and objectives for promoting and implementing renewable energy in South Africa. The support for this policy is guided by a rationale that South Africa has an attractive range of renewable resources, particularly solar and wind, and that renewable applications are the least costly from a fuel resource perspective; more so when social and environmental costs are taken into account. Government policy on renewable energy is therefore concerned with meeting economic, technical, and other constraints on the development of the renewable industry.

In order to meet the long-term goal of a sustainable renewable energy industry, the South African Government has set the following 10-year target for renewable energy: "*10 000 GWh (0.8 Mtoe) renewable energy contribution to final energy consumption by 2013 to be produced mainly from biomass, wind, solar and small-scale hydro. The renewable energy is to be utilised for power generation and non-electric technologies such as solar water heating and bio-fuels. This is approximately 4% (1 667 MW) of the estimated electricity demand (41 539 MW) by 2013"* (DME, 2003).

The White Paper on Renewable Energy states "*It is imperative for South Africa to supplement its existing energy supply with renewable energies to combat Global Climate Change which is having profound impacts on our planet*."

3.1.3 Final Integrated Resource Plan, 2010 - 2030

The Energy Act of 2008 obligates the Minister of Energy to develop and publish an integrated resource plan for energy. Therefore, the Department of Energy (DoE), together with the National Energy Regulator of South Africa (NERSA) has compiled the Integrated Resource Plan (IRP) for the period 2010 to 2030. The objective of the IRP is to develop a sustainable electricity investment strategy for generation capacity and transmission infrastructure for South Africa over the next twenty years. The IRP is intended to:

» Improve the long term reliability of electricity supply through meeting adequacy criteria over and above keeping pace with economic growth and development;
» Ascertain South Africa's capacity investment needs for the medium term business planning environment;

» Consider environmental and other externality impacts and the effect of renewable energy technologies; and
» Provide the framework for Ministerial determination of new generation capacity (inclusive of the required feasibility studies).

The objective of the IRP is to evaluate the security of supply, and determine the least-cost supply option by considering various demand side management and supply-side options. The IRP also aims to provide information on the opportunities for investment into new power generating projects.

The outcome of the process confirmed that coal-fired options are still required over the next 20 years and that additional base load plants will be required from 2010. The first and interim IRP was developed in 2009 by the Department of Energy. The initial four years of this plan was promulgated by the Minister of Energy on 31 December 2009, and updated on 29 January 2010. The Department of Energy released the Final IRP in March 2011, which was accepted by Parliament at the end of March. This Policy-Adjusted IRP is recommended for adoption by Cabinet and subsequent promulgation as the final IRP. In addition to all existing and committed power plants (including 10 GW committed coal), the plan includes 9.6 GW of nuclear; 6.3 GW of coal; 17.8 GW of renewables (including 8.4 GW solar); and 8.9 GW of other generation sources.

3.1.4 Electricity Regulation Act, 2006

Under the National Energy Regulator Act, 2004 (Act No 40 of 2004), the Electricity Regulation Act, 2006 (Act No 4 of 2006) and all subsequent relevant Acts of Amendment, NERSA has the mandate to determine the prices at and conditions under which electricity may be supplied by licence to Independent Power Producers (IPPs). NERSA has recently published a request for qualification and proposals for new generation capacity under the IPP procurement programme, and is in the process of updating and developing its process in relation to the awarding of electricity generation licences.

3.2 Provincial Level Planning and Spatial Policy Context

3.2.1 Northern Cape Province Provincial Growth and Development Strategy

The Northern Cape Provincial Growth and Development Strategy (NCPGDS; 2004 - 2014) notes that the most significant challenge that the government and its partners in growth and development are confronted with is the ***reduction of poverty***. All other societal challenges that the province faces emanate predominantly from the effects of poverty. The strategy further notes that the only effective way to reduce poverty is through long-term sustainable economic

growth and development. The sectors where economic growth and development can be promoted include:

» Agriculture and agro-processing
» Fishing and mariculture
» Mining and mineral processing
» Transport
» Manufacturing
» Tourism

However, the NCPGDS also notes that economic development in these sectors also requires:

» Creating opportunities for lifelong learning.
» Improving the skills of the labour force to increase productivity.
» Increasing accessibility to knowledge and information.

The achievement of these primary development objectives depends on the achievement of a number of related objectives that, at a macro-level, describe necessary conditions for growth and development. These are:

» Developing requisite levels of human and social capital.
» Improving the efficiency and effectiveness of governance and other development institutions.
» Enhancing infrastructure for economic growth and social development.

The strategy references the need for inexpensive energy. In order to promote economic growth in the Northern Cape, the availability of electricity to key industrial users must be ensured. At the same time, the development of new sources of energy through the promotion of the adoption of energy applications that display a synergy with the province's natural resource endowments must be encouraged. In this regard the strategy notes "the development of energy sources such as ***solar energy***, the natural gas fields, bio-fuels, etc., could be some of the means by which new economic opportunity and activity is generated in the Northern Cape". The strategy also highlights the importance of close co-operation between the public and private sectors in order for the economic development potential of the Northern Cape to be realised.

The importance of enterprise development is highlighted, and the low levels of private sector development and investment in the Northern Cape are noted. In addition, the province also lags in the key policy priority areas of SMME Development and Black Economic Empowerment. The proposed solar energy facility therefore has the potential to create opportunities to promote private sector investment and the development of SMMEs in the Northern Cape Province.

However, care will need to be taken to ensure that the proposed PV Plant and other renewable energy facilities do not negatively impact on the region's natural environment. In this regard the strategy notes that the sustainable utilisation of the natural resource base on which agriculture depends is critical in the Northern Cape with its fragile eco-systems and vulnerability to climatic variation. The document also indicates that due to the provinces exceptional natural and cultural attributes, it has the potential to become the preferred adventure and ecotourism destination in South Africa. Care needs to be taken to ensure that the development of renewable energy projects does not affect the tourism potential of the province. However, it should also be noted that these facilties also have the potential to promote tourism in the area through the promotion of alternative energy.

3.3 District Level Planning and Spatial Policy Context

3.3.1 Siyanda District Municipality Integrated Development Plan (2007 - 2012)

The key priority issues listed in the Siyanda District Municipality Integrated Development Plan (IDP) include:

» Basic service delivery.
» Municipal institutional development and transformation.
» Local economic development.
» Municipal financial viability and management.
» Good governance and public participation.

The development goals listed in the IDP that are relevant to the proposed PV plant include:

» To deliver a positive contribution to the sustainable growth and development within its boundaries and the rest of the Northern Cape.
» The creation of a healthy and environmentally friendly environment within and outside of the Councils" district boundaries must be attempted.
» The promotion of a safe and tourism friendly environment should be furthered in order to promote tourism and investor interest in the region.
» The promotion of human resources within and outside the organisation through training and the implementation of new technological aids.

Linked to the developmental goals are a number of developmental objectives, of which the following are relevant to the proposed PV Plant:

» Promotion of SMMEs in order to strengthen the Local Economic Sector.

» Promote the development of the tourism sector, with specific emphasis on community based tourism.
» Promote the infrastructure development, including electricity.

3.4 Municipal Level Planning and Spatial Policy Context

3.4.1 Kai! Garib Local Municipality Integrated Development Plan (2009)

The Kai! Garib Local Municipality Integrated Development Plan identifies six Key Priority Areas (KPA) in line with the national standards to address the municipality's development objectives:

» KPA 1: Spatial Development
» KPA 2: Service Delivery
» KPA 3: Economic Development and Local Economic Development
» KPA 4: Financial Viability
» KPA 5: Institutional Arrangements
» KPA 6: Good Governance and Public Participation

With focus on these KPAs an analysis of the status quo across numerous sectors within the Municipality was undertaken highlighting certain priority issues and their related or contributing factors. Those priority issues relevant to the proposed PV plant include:

» Poverty alleviation and employment
» Health and HIV/AIDS
» Empowerment and capacity building across all sectors
» Infrastructure development (including electricity, water, and roads) and service delivery

3.4 Regulatory Hierarchy for Energy Generation Projects

The South African energy industry is evolving rapidly, with regular changes to legislation and industry role-players. The regulatory hierarchy for an energy generation project of this nature consists of three tiers of authority who exercise control through both statutory and non-statutory instruments.

At National Level, the main regulatory agencies are:

Department	Responsibilities
Department of Energy	This department is responsible for policy relating to all energy forms, including renewables. Solar energy is considered under the White Paper for Renewable Energy and the Department undertakes research in this regard. It is the controlling authority in terms of the Electricity Act (Act No. 41 of 1987).
National Energy Regulator of South Africa (NERSA)	This body is responsible for regulating the electricity sector, and will ultimately issue licenses for renewable energy developments to generate electricity.
National Department of Environmental Affairs (DEA)	This department is responsible for environmental policy and is the controlling authority in terms of NEMA and the EIA Regulations. The DEA is the competent authority for this project, and charged with granting the relevant environmental authorisation.
National Department of Agriculture, Forestry, and Fisheries (DAFF)	This department is responsible for protection of agricultural land and provides input pertaining to subdivision and rezoning of agricultural land together with the local municipalities and provincial agricultural department.
The South African Heritage Resources Agency (SAHRA)	The National Heritage Resources Act (Act No 25 of 1999) and the associated provincial regulations provides legislative protection for listed or proclaimed sites, such as urban conservation areas, nature reserves and proclaimed scenic routes.
South African National Roads Agency (SANRAL)	This department is responsible for all National routes.

At Provincial Level, the main regulatory agencies are:

Department	Responsibilities
Northern Cape Department of Environmental and Nature Conservation (DENC)	This department is responsible for environmental policy and is the provincial authority in terms of NEMA and the EIA Regulations. The DENC is the commenting authority for this project.
Department of Transport and Public Works	This department is responsible for roads and the granting of exemption permits for the conveyance of abnormal loads on public roads.
Northern Cape Department of Agriculture	This department's involvement relates specifically to sustainable management of the agricultural resources in the Province.

At a Local Level the municipal authorities (i.e. including the local and district municipalities) are the principal regulatory authorities responsible for planning,

land use, and the environment. The main regulatory agencies at a local level include:

» *The Kai! Garib Local Municipality* – this municipality is a principal regulatory authority responsible for planning, land use, and environmental management.
» *The Siyanda District Municipality* – this department is also a regulatory authority responsible for planning, land use, and environmental management.
» *Municipal Systems Act (Act No. 32 of 2000)* - it is compulsory for all municipalities to go through an Integrated Development Planning (IDP) process to prepare a five-year strategic development plan for the area under their control.

3.5 Relevant Legislation and Guidelines

The following legislation and guidelines have informed the scope and content of this EIA Report:

» National Environmental Management Act (Act No. 107 of 1998)
» EIA Regulations, published under Chapter 5 of the NEMA (GN R385, GN R386 and GN R387 in Government Gazette 28753 of 21 April 2006)
» Guidelines published in terms of the NEMA EIA Regulations, in particular:
  * Guideline 3: General Guide to Environmental Impact Assessment Regulations, 2006 (DEAT, June 2006)
  * Guideline 4: Public Participation in support of the Environmental Impact Assessment Regulations, 2006 (DEAT, May 2006)
  * Guideline 5: Assessment of alternatives and impacts in support of the Environmental Impact Assessment Regulations, 2006 (DEAT, June 2006)
  * Integrated Environmental Management Information Series (published by DEA)
» International guidelines, including the Equator Principles

Several other Acts, Standards, or Guidelines have also informed the project process and the scope of issues addressed and assessed in the EIA Report. A review of legislative requirements applicable to the proposed project is provided in Table 3.1.

Table 3.1: Relevant legislative permitting requirements applicable to the proposed PV plant

Legislation	*Applicable Requirements*	*Relevant Authority*	*Compliance requirements*
	National Legislation		
National Environmental Management Act (Act No. 107 of 1998)	» NEMA requires, inter alia, that: ∗ Development must be socially, environmentally, and economically sustainable." ∗ Disturbance of ecosystems and loss of biological diversity are avoided, or, where they cannot be altogether avoided, are minimised and remedied." ∗ A risk-averse and cautious approach is applied, which takes into account the limits of current knowledge about the consequences of decisions and actions." » EIA Regulations have been promulgated in terms of Chapter 5. Activities which may not commence without an environmental authorisation are identified within these Regulations. » In terms of S24(1) of NEMA, the potential impact on the environment associated with these listed activities must be considered, investigated, assessed and reported on to the competent authority	» National Department of Environmental Affairs » Northern Cape Department of Environment and Nature Conservation (DENC)	» This EIA Report is to be submitted to the DEA for review and decision making. » The DENC will act as the commenting authority.

	charged by NEMA with granting of the relevant environmental authorisation. » In terms of GNR 543 of 18 June 2010, a full Scoping and EIA Process is required to be undertaken for the proposed project.		
National Environmental Management Act (Act No. 107 of 1998)	» A project proponent is required to consider a project holistically and to consider the cumulative effect of potential impacts. » In terms of the Duty of Care provision in S28(1) the project proponent must ensure that reasonable measures are taken throughout the life cycle of this project to ensure that any pollution or degradation of the environment associated with a project is avoided, stopped or minimised.	» National Department of Environmental Affairs	» While no permitting or licensing requirements arise directly, the holistic consideration of the potential impacts of the proposed project has found application in the EIA Phase. » The implementation of mitigation measures are included as part of the Draft EMP and will continue to apply throughout the life cycle of the project.
National Environmental Management: Biodiversity Act (Act No. 10 of 2004)	» In terms of the Biodiversity Act, the developer has a responsibility for: * The conservation of endangered ecosystems and restriction of activities according to the categorisation of the area (not just by listed activity as specified in the EIA regulations). * The application of appropriate environmental management	» National Department of Environmental Affairs	» As the applicant will not carry on any restricted activity in terms of S57, no permit is required to be obtained in this regard. » In terms of GNR 152 specialist flora and fauna studies have been undertaken as part of the EIA process. » A permit may be required should any threatened or protected plant species on site be disturbed or

	tools to ensure integrated environmental management of activities. * Limit further loss of biodiversity and conserve endangered ecosystems. » In terms of S57, a person may not carry out a restricted activity involving a specimen of a listed threatened or protected species without a permit issued in terms of Chapter 4. In this regard the Minister of Environmental Affairs has published a list of critically endangered, endangered, vulnerable, and protected species in GNR 151 in Government Gazette 29657 of 23 February 2007 and the regulations associated therewith in GNR 152 in GG29657 of 23 February 2007, which came into effect on 1 June 2007. » In terms of S75, (1) The control and eradication of a listed invasive species must be carried out by means of methods that are appropriate for the species concerned and the environment in which it occurs. (2) Any action taken to control and eradicate a listed invasive species must be		destroyed as a result of the proposed development.

	executed with caution and in a manner that may cause the least possible harm to biodiversity and damage to the environment. (3) The methods employed to control and eradicate a listed invasive species must also be directed at the offspring, propagating material and re-growth of such invasive species in order to prevent such species from producing offspring, forming seed, regenerating, or re-establishing itself in any manner. » In terms of GNR 152 of 23 February 2007: regulations relating to listed threatened and protected species, the relevant specialists must be employed during the EIA Phase to incorporate the legal provisions as well as the regulations associated with listed threatened and protected species (GNR 152) into specialist reports in order to identify permitting requirements. » In terms of GNR 1477 of 2009: Draft National List of Threatened Ecosystems published under S52(1)(a) of the Act provides for the listing of threatened or protected ecosystems based on national criteria. The list of threatened		

	terrestrial ecosystems supersedes the information regarding terrestrial ecosystem status in the National Spatial Biodiversity Assessment (2004). » GNR1187 Amendment of Critically Endangered, Endangered, Vulnerable and Protected Species List published under S56(1)of the Act.		
National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008)	» The Minister may by notice in the Gazette publish a list of waste management activities that have, or are likely to have, a detrimental effect on the environment. » In terms of the regulations published in terms of this Act (GN 718), a Basic Assessment or Environmental Impact Assessment is required to be undertaken for identified listed activities. » Any person who stores waste must at least take steps, unless otherwise provided by this Act, to ensure that (a) The containers in which any waste is stored, are intact and not corroded or in any other way rendered unlit for the safe storage of waste; (b) Adequate measures are taken to prevent accidental spillage or	» National Department of Water and Environmental Affairs » Provincial Department of Environmental Affairs	» As no waste disposal site is to be associated with the proposed project, no permit is required in this regard. » Waste handling, storage and disposal during construction and operation is required to be undertaken in accordance with the requirements of this Act, as detailed in the EMP. » The volumes of waste to be generated and stored on the site during construction and operation of the facility will not require a waste license (provided these remain below the prescribed thresholds).

	leaking; (c) The waste cannot be blown away; (d) Nuisances such as odour, visual impacts and breeding of vectors do not arise; and (e) Pollution of the environment and harm to health are prevented.		
National Environmental Management: Air Quality Act (Act No. 39 of 2004)	» S18, S19 and S20 of the Act allow certain areas to be declared and managed as "priority areas" » Declaration of controlled emitters (Part 3 of Act) and controlled fuels (Part 4 of Act) with relevant emission standards » The Act provides that an air quality officer may require any person to submit an atmospheric impact report if there is reasonable suspicion that the person has failed to comply with the Act.	» National Department of Environmental Affairs » Provincial Department of Environmental Affairs	» While no permitting or licensing requirements arise from this legislation, this Act will find application during the construction phase of the project in terms of dust control requirements.
National Water Act (Act No. 36 of 1998)	» Under S21 of the act, water uses must be licensed unless such water use falls into one of the categories listed in S22 of the Act or falls under the general authorisation. » In terms of S19, the project proponent must ensure that reasonable measures are taken throughout the life cycle of this project to prevent and remedy the	» National Department of Water Affairs » Northern Cape Department of Water Affairs	» The use of water to clean the panels may require the obtaining of a water use license (as defined in terms of S21 of the NWA), depending on the source of water for this purpose. » S19 of the Act will apply throughout the life cycle of the project.

	effects of pollution to water resources from occurring, continuing, or recurring.		
Environment Conservation Act (Act No. 73 of 1989)	» National Noise Control Regulations (GN R154 dated 10 January 1992)	» National Department of Environmental Affairs » Northern Cape Department of Water Affairs » Local Authorities	» There is no requirement for a noise permit in terms of the legislation. » Any noisy activities carried out during the construction phase that could present an intrusion impact to the local community should be limited to 6:00am to 6:00pm Monday – Saturday (excluding public holidays). » Should these specific activities need to be undertaken outside of these times, the surrounding communities will need to be notified and appropriate approval will be obtained from the DEA and the Local Municipality.
Minerals and Petroleum Resources Development Act (Act No. 28 of 2002)	» A mining permit or mining right may be required where a mineral in question is to be mined (i.e. materials from a borrow pit) in accordance with the provisions of the Act. » Requirements for Environmental Management Programmes and Environmental Management Plans are set out in S39 of the Act.	» Department of Minerals and Energy	» As no borrow pits are expected to be required for the construction of the facility, no mining permit or mining right is required to be obtained.

National Heritage Resources Act (Act No. 25 of 1999)	» S38 states that Heritage Impact Assessments (HIAs) are required for certain kinds of development including » The construction of a road, power line, pipeline, canal or other similar linear development or barrier exceeding 300 m in length; » Any development or other activity which will change the character of a site exceeding 5 000 m^2 in extent. » The relevant Heritage Authority must be notified of developments such as linear developments (i.e. roads and power lines), bridges exceeding 50 m, or any development or other activity which will change the character of a site exceeding 5 000 m^2; or the re-zoning of a site exceeding 10 000 m^2 in extent. This notification must be provided in the early stages of initiating that development, and details regarding the location, nature and extent of the proposed development must be provided. » Stand alone HIAs are not required where an EIA is carried out as long	» South African Heritage Resources Agency	» As per S38 an HIA has been undertaken as part of the EIA Phase. » A permit may be required should identified cultural/heritage sites on site be required to be disturbed or destroyed as a result of the proposed development. » If concentrations of archaeological heritage material and human remains are uncovered during construction, all work must cease immediately. The find must be reported to a heritage specialist so that systematic and professional investigation/ excavation can be undertaken.

	as the EIA contains an adequate HIA component that fulfils the provisions of S38. In such cases only those components not addressed by the EIA should be covered by the heritage component.		
National Forests Act (Act No. 84 of 1998)	» In terms of S5(1) no person may cut, disturb, damage or destroy any protected tree or possess, collect, remove, transport, export, purchase, sell donate or in any other manner acquire or dispose of any protected tree or any forest product derived from a protected tree, except under a license granted by the Minister to an (applicant and subject to such period and conditions as may be stipulated". » GN 1042 provides a list of protected tree species.	» National Department of Forestry	» This Act has found application during the EIA Phase. In this regard, a permit would need to be obtained for any protected trees that are affected by the proposed development.
National Veld and Forest Fire Act (Act 101 of 1998)	» Provides requirements for veldfire prevention through firebreaks and required measures for fire-fighting. Chapter 4 places a duty on landowners to prepare and maintain firebreaks, and Chapter 5 places a duty on all landowners to acquire equipment and have available personnel to fight fires. » In terms of S21 the applicant would be obliged to burn firebreaks to	» National Department of Forestry	» While no permitting or licensing requirements arise from this legislation, this act will find application during the operational phase of the project in terms of fire prevention and management.

	ensure that should a veldfire occur on the property, that it does not spread to adjoining land. » In terms of S12 the firebreak would need to be wide and long enough to have a reasonable chance of preventing the fire from spreading, not causing erosion, and is reasonably free of inflammable material. » In terms of S17, the applicant must have such equipment, protective clothing, and trained personnel for extinguishing fires.		
Subdivision of Agricultural Land Act (Act No. 70 of 1970)	» Details land subdivision requirements and procedures. Applies for subdivision of all agricultural land in the province	» National Department of Agriculture	» Subdivision is required to be undertaken following the issuing of an environmental authorisation for the proposed project. This generally forms part of the rezoning application process.
Hazardous Substances Act (Act No. 15 of 1973)	» This Act regulates the control of substances that may cause injury, or ill health, or death due to their toxic, corrosive, irritant, strongly sensitising, or inflammable nature or the generation of pressure thereby in certain instances and for the control of certain electronic products. To provide for the rating of such substances or products in relation to the degree of danger; to	» Department of Health	» It is necessary to identify and list all the Group I, II, III, and IV hazardous substances that may be on the site and in what operational context they are used, stored or handled.

	provide for the prohibition and control of the importation, manufacture, sale, use, operation, modification, disposal or dumping of such substances and products. » Group I and II: Any substance or mixture of a substance that might by reason of its toxic, corrosive etc., nature or because it generates pressure through decomposition, heat or other means, cause extreme risk of injury etc., can be declared to be Group I or Group II hazardous substance; » Group IV: any electronic product; » Group V: any radioactive material. » The use, conveyance, or storage of any hazardous substance (such as distillate fuel) is prohibited without an appropriate license being in force.		
National Road Traffic Act (Act No 93 of 1996)	» The technical recommendations for highways (TRH 11): "Draft Guidelines for Granting of Exemption Permits for the Conveyance of Abnormal Loads and for other Events on Public Roads" outline the rules and conditions which apply to the transport of abnormal loads and vehicles on public roads and the detailed	» South African National Roads Agency Limited (national roads) » Provincial Department of Transport	» An abnormal load/vehicle permit may be required to transport the various components to site for construction. These include route clearances and permits will be required for vehicles carrying abnormally heavy or abnormally dimensioned loads. » Transport vehicles exceeding the dimensional limitations (length) of

	procedures to be followed in applying for exemption permits are described and discussed. » Legal axle load limits and the restrictions imposed on abnormally heavy loads are discussed in relation to the damaging effect on road pavements, bridges, and culverts. » The general conditions, limitations, and escort requirements for abnormally dimensioned loads and vehicles are also discussed and reference is made to speed restrictions, power/mass ratio, mass distribution, and general operating conditions for abnormal loads and vehicles. Provision is also made for the granting of permits for all other exemptions from the requirements of the National Road Traffic Act and the relevant Regulations.		22 m. » Depending on the trailer configuration and height when loaded, some of the power station components may not meet specified dimensional limitations (height and width).
Development Facilitation Act (Act No 67 of 1995)	» Provides for the overall framework and administrative structures for planning throughout the Republic » S2- 4 provides general principles for land development and conflict resolution.	» Local and District Municipality	» The applicant must submit a land development application in the prescribed manner and form as provided for in the Act. » A land development applicant who wishes to establish a land development area must comply with procedures set out in the Act.
Promotion of Access to	» All requests for access to	» National Department of	» No permitting or licensing

Information Act (Act No. 2 of 2000)	information held by state or private body are provided for in the Act under S11.	Environmental Affairs	requirements.
Promotion of Administrative Justice Act (Act No. 3 of 2000)	» In terms of S3 the government is required to act lawfully and take procedurally fair, reasonable, and rational decisions. » Interested and affected parties have right to be heard.	» National Department of Environmental Affairs	» No permitting or licensing requirements.
Provincial Legislation			
Cape Land Use Planning Ordinance (No 15 of 1985)	» Details land subdivision and rezoning requirements and procedures	» Local authority	Given that the wind energy development is proposed on land that is zoned for agricultural use, a rezoning application in terms of Section 17 of LUPO to an alternative appropriate zone will be required. » Rezoning is required to be undertaken following the issuing of an environmental Authorisation for the proposed project.
Nature Conservation Ordinance (Act No. 19 of 1974)	» Article 63 prohibits the picking of certain fauna (including cutting, chopping, taking, and gathering, uprooting, damaging, or destroying). » Schedule 3 lists endangered flora and Schedule 4 lists protected flora. » Articles 26 to 47 regulate the use of wild animals.	» Provincial Department of Environmental Affairs	» No permitting or licensing requirements arise from this legislation for the proposed activities to be undertaken for the proposed project.

Guideline Documents			
Draft Guidelines for Granting of Exemption Permits for the Conveyance of Abnormal Loads and for other Events on Public Roads	» Outlines the rules and conditions which apply to the transport of abnormal loads and vehicles on public roads and the detailed procedures to be followed in applying for exemption permits.	» Provincial Department of Transport	» An abnormal load/vehicle permit will be required to transport the various components to site.
Noise Standards	Four South African Bureau of Standards (SABS) scientific standards are considered relevant to noise from a Wind Energy Facility. They are: » SANS 10103:2008. 'The measurement and rating of environmental noise with respect to annoyance and to speech communication'. » SANS 10210:2004. 'Calculating and predicting road traffic noise'. » SANS 10328:2008. 'Methods for environmental noise impact assessments'. » SANS 10357:2004. 'The calculation of sound propagation by the Concave method'. » The relevant standards use the equivalent continuous rating level as a basis for determining what is acceptable. The levels may consider a single noise event, but that single event by itself does not determine	» Local Municipality	» The recommendations that the standards make are likely to inform decisions by authorities, but non-compliance with the standards will not necessarily render an activity unlawful per se.

	whether noise levels are acceptable for land use purposes.		
Policies and White Papers			
The White Paper on the Energy Policy of the Republic of South Africa (December 1998)	» Investment in renewable energy initiatives, such as the proposed PV plant, is supported by this white Paper.	» N/A	» N/A
The White Paper on Renewable Energy (November 2003)	» This Paper sets out Government's vision, policy principles, strategic goals, and objectives for promoting and implementing renewable energy in South Africa.	» N/A	» N/A
The White Paper on the Energy Policy of the Republic of South Africa (December 1998)	» Investment in renewable energy initiatives, such as the proposed PV plant, is supported by this white Paper.	N/A	N/A

APPROACH TO UNDERTAKING THE EIA PHASE CHAPTER 4

An EIA process is dictated by the EIA Regulations which involves the identification of and assessment of direct, indirect, and cumulative environmental impacts (both positive and negative) associated with a proposed project. The EIA process forms part of the feasibility studies for a project, and comprises a Scoping and EIA Phase which culminates in the submission of an EIA Report together with an Environmental Management Programme (EMP) to the competent authority for decision-making.

The phases of the EIA process are as follows:

The EIA Process for the proposed facility has been undertaken in accordance with the EIA Regulations in terms of Sections 24 and 24D of NEMA, as read with the EIA Regulations of GNR544; GNR545; and GNR546 of Section 24(5) of NEMA (Act No. 107 of 1998). The environmental studies for this proposed project were undertaken in two phases, in accordance with the EIA Regulations.

4.1 Phase 1: Scoping Phase

The Scoping Study served to identify potential issues associated with the project, and defined the extent of studies required within the EIA Phase. This was achieved through an evaluation of the proposed project, involving the project proponent, specialist consultants, and a consultation process with key stakeholders that included both relevant government authorities and interested and affected parties (I&APs).

I&APs were provided with the opportunity to receive information regarding the proposed project, to participate in the process and to raise issues or concerns. Furthermore, the draft Scoping Report was made available at the Keimoes Public Library, the Keimoes Agrimark and on the Savannah Environmental website for a 30-day period in order to provide I&APs with an opportunity for review and comment. All the comments, concerns, and suggestions received during the Scoping Phase and the review period were included in the final Scoping Report.

The final Scoping Report and Plan of Study for the EIA Phase were submitted to DEA in October 2011, and were accepted in November 2011.

4.2 Phase 2: Environmental Impact Assessment Phase

Through the Scoping Phase, a number of issues requiring further study were highlighted. These issues have been assessed in detail within the EIA Phase of the process (refer to Chapter 6). In terms of the requirements of the EIA Regulations, the EIA Phase aims to achieve the following:

» Provide a comprehensive assessment of the social and biophysical environments affected by the proposed alternatives put forward as part of the project.
» Assess potentially significant impacts (direct, indirect, and cumulative, where required) associated with the proposed facility.
» Identify and recommend appropriate mitigation measures for potentially significant environmental impacts.
» Undertake a fully inclusive public participation process to ensure that I&AP are afforded the opportunity to participate, and that their issues and concerns are recorded.

The EIA Report addresses potential direct, indirect, and cumulative impacts (both positive and negative) associated with all phases of the project including design, construction, operation and decommissioning. In this regard the aim is to provide the competent authorities with sufficient information to make an informed decision regarding the proposed project.

4.2.2. Tasks completed during the EIA Phase

The EIA Phase has been undertaken in accordance with the EIA Regulations published under Chapter 5 of the NEMA (GNR543, GNR544, GNR545, and GNR546 in Government Gazette 33306 of 18 June 2010). Key tasks undertaken within the EIA phase included:

» Consultation with relevant decision-making and regulating authorities (at a national, provincial, and local level).
» Undertaking a public participation process throughout the EIA process in accordance with Regulation 54 of Government Notice R543 of 2010 in order to identify any additional issues and concerns associated with the proposed project.
» Preparation of a Comments and Response Report detailing key issues raised by I&APs as part of the EIA Process, in accordance with Regulation 57 of Government Notice R543 of 2010.

» Undertaking of independent specialist studies in accordance with Regulation 32 of Government Notice R543 of 2010.
» Preparation of a draft EIA Report in accordance with the requirements of Regulation 31 Government Notice R543 of 2010.

4.2.2 Authority Consultation

Authority consultation has continued throughout the EIA process and has included the notification of the following relevant organs of state:

» National Department of Environmental Affairs
» National Department of Water Affairs
» National Department of Agriculture
» Northern Cape Department of Environment and Nature Conservation
» Northern Cape Department of Agriculture and Land Reform
» Northern Cape Department of Economic Development
» Northern Cape Department of Roads and Public Works
» Northern Cape Department of Water Affairs
» South African Heritage Resources Agency
» Northern Cape Heritage Authority /Ngwao Boswa Kapa Bokone.
» South African National Roads Agency Limited - Western Region
» Kai! Garib Local Municipality
» Siyanda District Municipality

A record of all authority consultation undertaken thus far in the EIA process is included within Appendix B.

4.2.3 Public Consultation

Public consultation was initiated at the start of the EIA process and has continued throughout the Scoping and EIA Phases. The aim of the public participation process was primarily to ensure that:

» Information containing all relevant facts in respect of the proposed project was made available to potential stakeholders and I&APs.
» Participation by potential I&APs was facilitated in such a manner that all potential stakeholders and I&APs were provided with a reasonable opportunity to comment on the proposed project.
» Comment received from stakeholders and I&APs was recorded, considered, and, where appropriate, incorporated into the EIA process.

Key public consultation that has taken place during the Notification and Scoping Phases is listed in the table below.

Notification and Scoping Phase	
Activity	**Date**
Placement of site notices	June 2011
Placement of an advert informing of the commencement of the EIA process in: » The Gemsbok » Die Volksblad	 10 June 2011 13 June 2011
Distribution of a background information document	June 2011 - present
Placement of an advert informing of the availability of the draft Scoping Report and the public meeting: » The Gemsbok » Die Volksblad	 August 2011 29 August 2011
Distribution of stakeholder letter to Organs of State and registered I&APs: » Notification of the EIA Process » Notification of the release of the draft Scoping Report	 05 July 2011 18 August 2011
Distribution of the draft Scoping Report for comment	18 August 2011 – 19 September 2011
Public meeting in Keimoes	15 September 2011

In order to accommodate the varying needs of stakeholders and I&APs, as well as ensure the relevant interactions between stakeholders and the EIA specialist team, the following opportunities have been provided for I&APs issues to be recorded and verified through the EIA Phase, including focus group meetings (pre-arranged and stakeholders invited to attend); public meetings (advertised in the local press), and written, faxed or e-mail correspondence. Key public consultation that has taken place during the EIA Phase is listed in the table below.

EIA Phase	
Activity	**Date**
Placement of an advert informing of the availability of the public meeting: » The Gemsbok » Die Volksblad	 23 November 2011 11 November 2011
Distribution of stakeholder letter to Organs of State and registered I&APs: » Notification of the release of the draft EIA Report	 09 December 2011
Distribution of the draft EIA Report	09 December 2011 – 25 January 2012
Public meeting in Keimoes	24 November 2011

4.2.4 Identification and Recording of Issues and Concerns

Issues and comments raised by I&APs over the duration of the EIA process have been synthesised into a Comments and Response Report (refer to Appendix E for the Comments and Response Reports compiled from both the Scoping and EIA Phases).

The Comments and Response Report includes comments received on the proposed project as well as responses from members of the EIA project team and/or the project proponent. Where issues are raised that the EIA team considers beyond the scope and purpose of this EIA process, clear reasoning for this view is provided.

4.2.5 Assessment of Issues Identified through the Scoping Process

Based on the findings of the Scoping Phase, the following issues were identified as not requiring further investigation within the EIA:

» *Agricultural potential* - due mainly to the low agricultural potential of the soils and the prevailing climatic limitations, a detailed soil investigation will not be necessary during the EIA Phase.

Issues which were determined to require further investigation within the EIA Phase, as well as the specialists involved in the assessment of these impacts are indicated in the table below.

Specialist	Area of Expertise	Appendix
David Hoare of David Hoare Consulting	Ecology	Appendix E
Johan van der Waals of Terrasoil Science	Geology and erosion potential	Appendix F
Jaco van der Walt of Heritage Contracts and Archaeological Consulting	Heritage	Appendix G
Lourens du Plessis of MetroGIS	Visual	Appendix H
Tony Barbour Environmental Consulting and Research	Social	Appendix I

The specialist studies considered direct and indirect environmental impacts associated with the development of all components of the proposed project. Issues were assessed in terms of the following criteria:

» The *nature*, a description of what causes the effect, what will be affected, and how it will be affected
» The *extent*, wherein it is indicated whether the impact will be local (limited to the immediate area or site of development), regional, national or

international. A score of between 1 and 5 is assigned as appropriate (with a score of 1 being low and a score of 5 being high)

- The *duration*, wherein it is 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
  - 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)
  - 10 is very high and results in complete destruction of patterns and permanent cessation of processes
- The *probability of occurrence*, which describes the likelihood of the impact actually occurring. Probability is 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)
  - Assigned a score of 5 is definite (impact will occur regardless of any prevention measures)
- The *significance*, which is determined through a synthesis of the characteristics described above (refer formula below) and can be assessed as low, medium or high
- The *status*, which is 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)

As the developer has the responsibility to avoid or minimise impacts and plan for their management (in terms of the EIA Regulations), the mitigation of significant impacts is discussed. Assessment of impacts with mitigation is made in order to demonstrate the effectiveness of the proposed mitigation measures. A draft Environmental Management Programme (EMP) for construction and operation of the facility is included as Appendix J.

4.2.6 Assumptions and Limitations

The following assumptions and limitations are applicable to the studies undertaken within this EIA Phase:

» All information provided by the developer and I&APs to the environmental team was correct and valid at the time it was provided.
» It is assumed that the development site represents a technically suitable site for the establishment of the proposed PV plant. No feasible sites have been identified for this proposed development.
» It is assumed that the point of connection with the Eskom grid is feasible and that the grid has capacity to accommodate the additional load.
» This report and its investigations are project-specific, and consequently the environmental team did not evaluate any other power generation alternatives.

DESCRIPTION OF THE AFFECTED ENVIRONMENT CHAPTER 5

This section of the EIA Report provides a description of the environment that may be affected by the proposed project. This information is provided in order to assist the reader and the competent authority in understanding the possible effects of the proposed project on the baseline environment. Aspects of the regional, local, and site-specific biophysical, social, and economic environment that could directly or indirectly be affected by, or could affect, the proposed development have been described. This information has been sourced from both existing information available for the area as well as collected field data, and aims to provide the context within which this EIA is being conducted. A more detailed description of each aspect of the affected environment is included within the specialist reports contained within Appendices E - I.

5.1 Regional Setting

The PV plant is proposed on the remaining extent of Farm 616, located approximately 5 km north-west of Keimoes in the Northern Cape.

The majority of the study area is sparsely populated (less than 10 people per km^2). Towns and urban areas include the main centres of Upington, Keimoes, and Kakamas, and the smaller centres of Marchand, Cillie, Lutzburg, Klippunt, Oranjevallei, and Rosedale. Homesteads and farmsteads are concentrated along the Orange River belt, and are found scattered, at a much lower density, throughout the remainder of the study area to the north and south of the river. The Orange River region is a known tourist[5] area with attractions such as the scenic river itself, ecotourism (such as hiking, 4x4 and canoeing), adventure tourism, cultural historic sites, and South Africa's largest wine producing region[6].

The N14 national road traverses the study area, roughly following alignment of the Orange River in an east – west direction. The N14 is an important tourist access route on a national level, and within the region, it functions as part of the wine route meander. Arterial roads include the R359 (also running roughly east – west) and the R27 extending to the south. Secondary roads give access to the outlying areas beyond the river.

[5] Tourist facilities have not been mapped, but it is expected that tourist accommodation and amenities are to be found within the small towns, urban centres and even some of the homesteads along the river valley and to a lesser extent within the natural, undeveloped area beyond.

[6] The Orange River Wine Route is centered around Upington. The Orange River Cellars comprise 6 wineries representing nearly 900 producers. http://www.tourismgrading.co.za

Rail infrastructure (for freight) follows the alignment of the N14 to Kakamas, bypassing the site on its southern boundary. Other industrial infrastructure includes major power line infrastructure which runs south of the river to the Taaiput Distribution Substation, crosses the river at Kakamas, and then continues on the northern side towards Upington. Other Distribution Substations include Oasis and Upington.

5.2 Land Use

The land uses on the site, which is owned by Mr. H Hanekom, include cattle and sheep farming (i.e. 140 head of cattle and 200 sheep (refer to Figure 5.1). The farm is however located within 3 km of the residential areas of Keimoes (to the south east) and stock theft is a problem, specifically theft of sheep. The land to the east of the site is hired out to small scale emerging farmers, while the farm to the west is owned by Mr. B Turner and Mr. van Niekerk. The property to the north is owned by Mr. Botha. A vineyard is located to the south-west of the property adjacent to the Namibia/ Lutzputs Road.

Figure 5.1: Cattle on Farm 616

5.3 Climatic Conditions

The climate can be described as arid to semi-arid with rainfall occurring from November to April.

5.4 Topography

The study area occurs on land that ranges in elevation from about 640 m above sea level (asl) in the west of the study area, along the Orange River, to 1000 m asl at the top of the hills in the north and south east of the study area.

The site and the immediate surrounding area are generally flat, sloping gently to the south towards the Orange River (refer to Figure 5.2). Higher lying terrain interspersed with dune hills and other mountainous landform is present in the north, west and east of the site.

The perennial Orange River is the dominant hydrological feature in the study area, and flows in a roughly westerly direction, bypassing the site about 5 km to the south. A number of non-perennial tributaries are present throughout the study area, all making their way towards the Orange River. One such tributary bisects the south eastern corner of the proposed site.

Figure 5.2: Topography of the site and immediate surrounds
Note the very flat terrain in the foreground and the parallel hills in the background

5.5 Geology and Agricultural Potential

The site falls into the Ag1 land type which has predominantly shallow to moderately deep eutrophic soils with extensive rock outcrops and rocky areas with occasional calcrete outcrops. Due to climatic and soil constraints this land

types is used extensively for extensive grazing, and additional feeding of cattle and proper grazing management (camps) are imperative for the sustainable production of the cattle. The agricultural potential is very low due to the low rainfall and shallow soils.

The soils on the site are very homogenous and distinct soil units could therefore not be delineated meaningfully. The soils are predominantly rocky with rock outcrops occurring throughout. Soils in drainage depressions are slightly deeper but the distribution is very limited.

There are no indicators of wetland conditions on the site even though it is characterised numerous drainage depressions. This is mainly due to the low rainfall as well as the distinct erosive pressures exerted by high intensity rainfall events, low to non-existent soil cohesion and lack of plants to stabilise soils with their roots.

5.6 Flora and Fauna

5.6.1 Vegetation Types

There are no formally protected or conservation areas within the study area.

5.6.2 Protected tree species

According to the National forests Act (Act No. 84 of 1998) the *'Minister may declare a tree, group of trees, woodland or a species of trees as protected. The prohibitions provide that 'no person may cut, damage, disturb, destroy or remove any protected tree, or collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, except under a licence granted by the Minister'*.

Acacia erioloba (Camel Thorn, Kameeldoring)*, Acacia haematoxylon* (Grey Camel Thorn, Vaalkameeldoring)*, Boscia albitrunca* (Shepherd's Tree / Witgatboom / !Xhi) and *Euclea pseudebenus* (Ebony Tree, Ebbeboom) have a geographical distribution that includes the study area.

Acacia erioloba occurs in dry woodland along watercourses in arid areas where underground water is present as well as on deep Kalahari sands. Fifty five individuals were found on site within the proposed footprint area of the solar array or power line route. They were associated primarily with drainage areas / watercourses, especially in the south-eastern part of the solar array area.

Acacia haematoxylon occurs on deep Kalahari sand between dunes or along dry watercourses. No individuals were found on site or nearby.

Boscia albitrunca occurs in semi-desert areas and bushveld, often on termitaria, but is common on sandy to loamy soils and calcrete soils. One individual of this species was found on site, within very close proximity to an ephemeral drainage line.

Euclea pseudobenus occurs in semi-desert and desert areas, usually along watercourses and in depressions. It could occur in hills or on flats. Its main distribution is closer to the Richtersveld and into Namibia. No individuals have been sighted close to Keimoes, but specimens have been recorded in the grid south and west of Kakamas. No individuals were recorded on site.

5.6.3 Red Data Plant Species

The National Environmental Management: Biodiversity Act (Act No. 10 of 2004) "*A person may not carry out a restricted activity involving a specimen of a listed threatened or protected species without a permit issued in terms of Chapter 7.*

There is one threatened species that could occur in habitats that are available in the study area, *Aloe dichotoma* subsp. *Dichotoma* (i.e. listed as Vulnerable). Eight individuals were found on the part of the site proposed for development or in close proximity to the boundary of these areas.

There are also two species listed as Near threatened (*Dinteranthus wilmotianus* and *Hoodia officinalis* subsp. *officinalis*) and two species listed as Declining (*Acacia erioloba* and *Hoodia gordonii*) that could occur on site. Fifty five individuals of *Acacia erioloba* were found on site, mostly concentrated in two areas associated with drainage lines.

5.6.4 Alien Invasive Plants

The Conservation of Agricultural Resources (Act No. 43 of 1983) as amended in 2001 states that declared weeds and invaders in South Africa are categorised according to one of the following categories:

» Category 1 plants which are prohibited and must be controlled.
» Category 2 plants (commercially used plants) which may be grown in demarcated areas providing that there is a permit and those steps are taken to prevent their spread.
» Category 3 plants (ornamentally used plants) which may no longer be planted; existing plants may remain, as long as all reasonable steps are taken to prevent the spreading thereof, except within the floodline of watercourses and wetlands.

Furthermore according to the Northern Cape Nature Conservation Act (Act No. 9 of 2009) the owner of land upon which an invasive species is found (plant or animal) must take the necessary steps to eradicate or destroy such species.

Potential weeds with a distribution centred on arid regions of the country include *Salsola kali*, *Atriplex lindleyi*, *Opuntia ficus-indica, Opuntia imbricata, Prosopis glandulosa, Prosopis velutina, Atriplex numularia,* and *Nicotiana glauca*. The shrub, *Prosopis glandulosa*, is potentially the most problematic. This species invades riverbeds, riverbanks, and drainage lines in semi-arid and arid regions and has been recorded near to the site. There is therefore the potential for alien plants to spread or invade following disturbance on site.

5.6.5 Red Data Animal Species

Also in line with the Biodiversity Act, those vertebrate species with a geographical distribution that includes the study area and habitat preference that includes habitats available in the study area are discussed further.

Three mammal species of low conservation concern could occur in available habitats in the study area. This includes three species classified nationally as Near Threatened, i.e. the Honey Badger, Littledale's Whistling Rat and Dent's Horseshoe Bat, all three of which are classified as Least Concern globally (according to the IUCN website, accessed on 2 August 2011).

Three threatened bird species (all classified as Vulnerable) and three Near Threatened bird species that have a medium probability of utilising available habitats in the study area, either for foraging or breeding. The two species most likely to use parts of the site for breeding are the Kori Bustard and Ludwig's Bustard, both listed in South Africa as Vulnerable. Kori's Bustard is listed globally as Least Concern and Ludwig's Bustard as Endangered (i.e. according to the IUCN). Sclater's Lark, listed as Near Threatened, could potentially use the site for breeding. These three species that could use the site for breeding are also the most likely to be affected by infrastructure on site and/or loss of habitat.

The species that may use the site only for foraging are the Martial Eagle, listed as Vulnerable, and the Secretarybird and Lanner Falcon, listed as Near Threatened in South Africa. The Secretarybird is listed globally as a species of Least Concern. All three of these species have wide ranges and the site is small in comparison and therefore unlikely to be critical habitat for any of these three species.

The Giant Bullfrog is the only amphibian species of conservation concern with a distribution that includes the study area and which could occur on site. This species is classified globally as a species of Least Concern Near threatened in South Africa. It is also protected under the National Environmental Management:

Biodiversity Act. If any individuals should be found on site, steps would need to be taken to protect them.

There are no reptile species of conservation concern that have a distribution that includes the study area.

5.7 Heritage Resources

One site of heritage concern was identified within the project development site (refer to Figure 5.3). Refer to Table 5.1 below which lists the site in question, the landscape in which they were found, the type of the site (i.e. middle stone age), the cultural markers, and the protection status / field rating. With respect to the latter, site significance classification standards prescribed by the South African Heritage Resources Agency (2006) and approved by the Association for Southern African Professional Archaeologists (ASAPA) were applied.

Table 5.1: Heritage resources found on the project development site (refer to Figure 5.15)

Site Number	Landscape	Type Site	Cultural Markers	Protection Status
Site 1	Archaeological and Cultural Heritage	Middle Stone Age	Stone tools with facets on the striking platform	Generally Protected B[7]

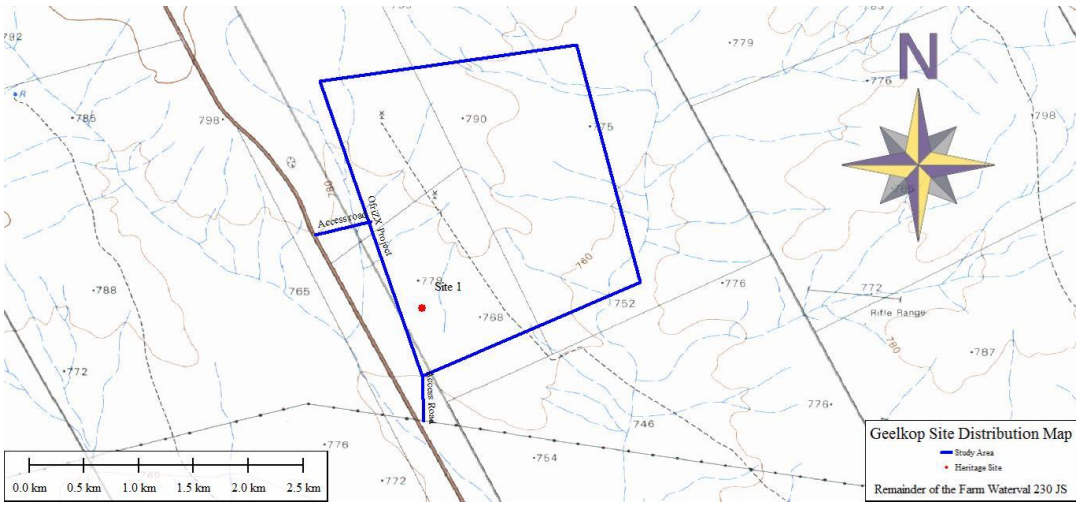

Figure 5.3: The distribution of heritage sites and the area that was surveyed

[7] Heritage resources with this classification are of medium heritage significance and are required to be recorded prior to mitigation.

Figure 5.4: Clockwise the photos show the remains of an old wagon road found at site 1, and the general site conditions

5.8 Social Characteristics of the Study Area

The proposed project development site is located within the Kai! Garib Local Municipality which forms part of the larger Siyanda District Municipality.

The Siyanda District Municipality consists of six local municipalities namely, Mier; !Kai !Garieb; //Khara Hais; Tsantsabane, !Kheis and Kgatelopele, and covers an area of more than 100 000 km^2 (almost 30% of the Northern Cape Province). Of this total, 65% (65 000 km^2) is made up of the Kalahari Desert, Kgalagadi Transfrontier Park and the former Bushman Land. The largest town in the region is Upington, which also functions as the district municipal capital. The total population of the Siyanda District Municipality is in in the region of 200 000 people with a density of about 1.7 people per km^2. The //Khara Hais and Kai !Gariep Local Municipalities are home to ~ 63 % of the Siyanda District Municipality population.

The Kai! Garib Municipality is located in the north-central portion of the Northern Cape, approximately 428 km west of the provincial capital of Kimberley. The population was estimated at 56 501 in 2007, which makes up approximately 10% of the Siyanda District Municipality. The average population growth for the local municipality (2001 - 2007) was estimated at ~1.4% (Community Survey, 2007).

Approximately 14.7% of the population has no formal education, while 42% have less than a Grade 7 (standard 5). When these totals are added to figures for people with no formal education they indicate that over half of people have less than a Grade 7 (standard 5) qualification. Only 11.1% of the population have a matric qualification, while less than 4% having a tertiary qualification.

Approximately 57.8% of the population between the economically active ages of 15 and 65 are employed in the formal sector and the unemployment rate is 12%. The agricultural sector provides ~28% of the formal employment, followed by the

community services, wholesale and retail sectors which employ ~6% and ~2% of the employed population in the area respectively. According to the 2001 Census data, the majority of employment is characterised as 'undetermined' (~62%). Approximately 48.8% of the population have no formal income and 93.7% of the population earn less than R 800 per month (i.e. the official breadline figure). The low-income levels reflect the limited formal employment opportunities. According to the Kai! Garib Local Municipality IDP (2009), 22% of the population is dependent on social grants, of which 52% are child support grants. A total of 2 706 households are subsidised by the services subsidy scheme.

ASSESSMENT OF POTENTIAL IMPACTS CHAPTER 6

This chapter serves to determine the significance of the positive and negative environmental impacts (direct, indirect, and cumulative) associated with the development of the Project Ofir-ZX PV Plant. This assessment is done for all the phases of the project's development and for all the facility's components which will comprise:

» Numerous arrays of PV panels, which will be linked together to form individual strings, with a maximum generating capacity of 200 MW.
» An inverter situated at the end of each "string" in order to switch the power from direct current (DC) to alternating current (AC).
» Underground cabling of 33 kV in order to distribute the power to a central on-site substation.
» A transformer together with the on-site substation to step–up the power from 33 kV to 132 kV, to be distributed between the plant and the Eskom grid.
» Connection of the PV plant to the power distribution grid. An existing 132 kV distribution line, which connects the Taaiputs Substation at Kakamas and the Oasis Substation at Keimoes, crosses the southern portion of the site. It is proposed that a new 132 kV power line will be built from the on-site substation to connect with the existing power line.
» Internal access roads for construction and maintenance purposes.
» Maintenance, security buildings, and a workshop.
» Solar kiosk (education centre).

The development of the proposed facility will comprise the following phases:

» *Pre-Construction and Construction* – will include pre-construction surveys; establishment of access roads within the site; site preparation; transportation of components and equipment to site; establishment of construction camps, workshops, and temporary laydown areas; establishment of PV panels, substations, power lines, and ancillary buildings; and site rehabilitation.
» *Operation* – will include operation of the PV panels and the associated electrical infrastructure, and the subsequent generation of electricity; and site operation/maintenance (including washing of the panels).
» *Decommissioning* – depending on the economic viability of the plant, the length of the operational phase may be extended. Alternatively decommissioning will include site preparation; disassembling of the components of the facility; clearance of the site and rehabilitation. Note that impacts associated with decommissioning are expected to be similar to those associated with construction. Therefore, these impacts are not considered separately within this chapter.

As discussed in Chapter 2, no feasible alternatives have been identified for this proposed project. Therefore, no alternatives are comparatively assessed within this report.

6.1 Areas of sensitivity identified across the broader site

The following potentially sensitive areas were identified through the EIA process (refer to Figure 6.1):

» *Drainage systems* – drainage lines that traverses the site, which are protected under the National Water Act and provide important habitat for a number of species in the study area, including those with a restricted distribution.
» *Potential occurrence of populations of red list organisms* - this includes terrestrial fauna and avifauna protected under the National Environmental Management: Biodiversity Act (Act No. 10 of 2004) that could occur within the study area.
» *Potential occurrence of populations of protected tree species* - this includes tree species protected under the National Forests Act (Act No. 84 of 1998) that has a geographical distribution that includes the study area.

As far as possible, the location of the proposed infrastructure has considered the identified environmental sensitivities (refer to Figure 6.2). This has been done be focusing the layout in the southern most section of the broader farm portion, thereby avoiding the majority of the drainage lines and elevated areas.

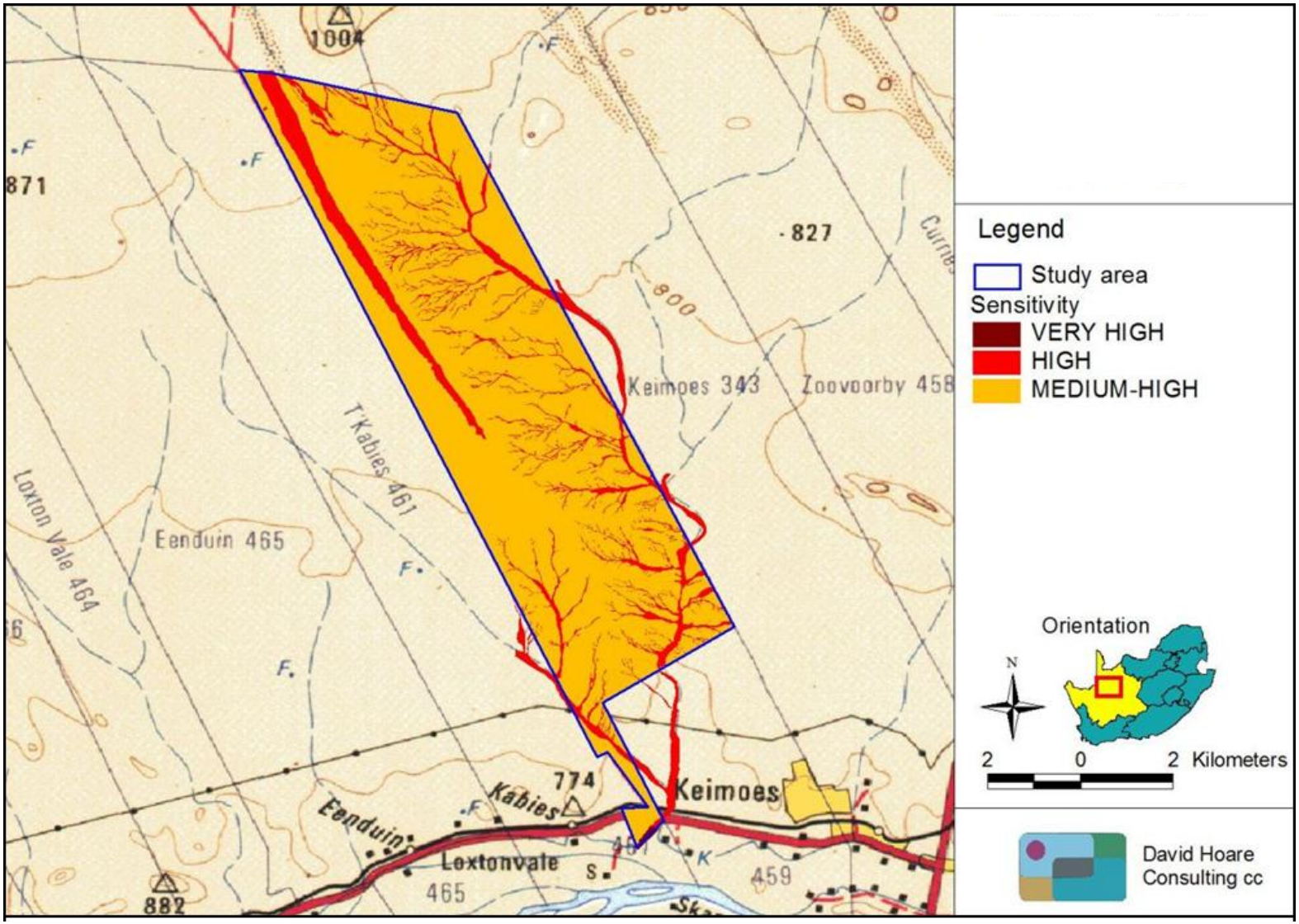

Figure 6.1: Sensitivities identified on the project development site

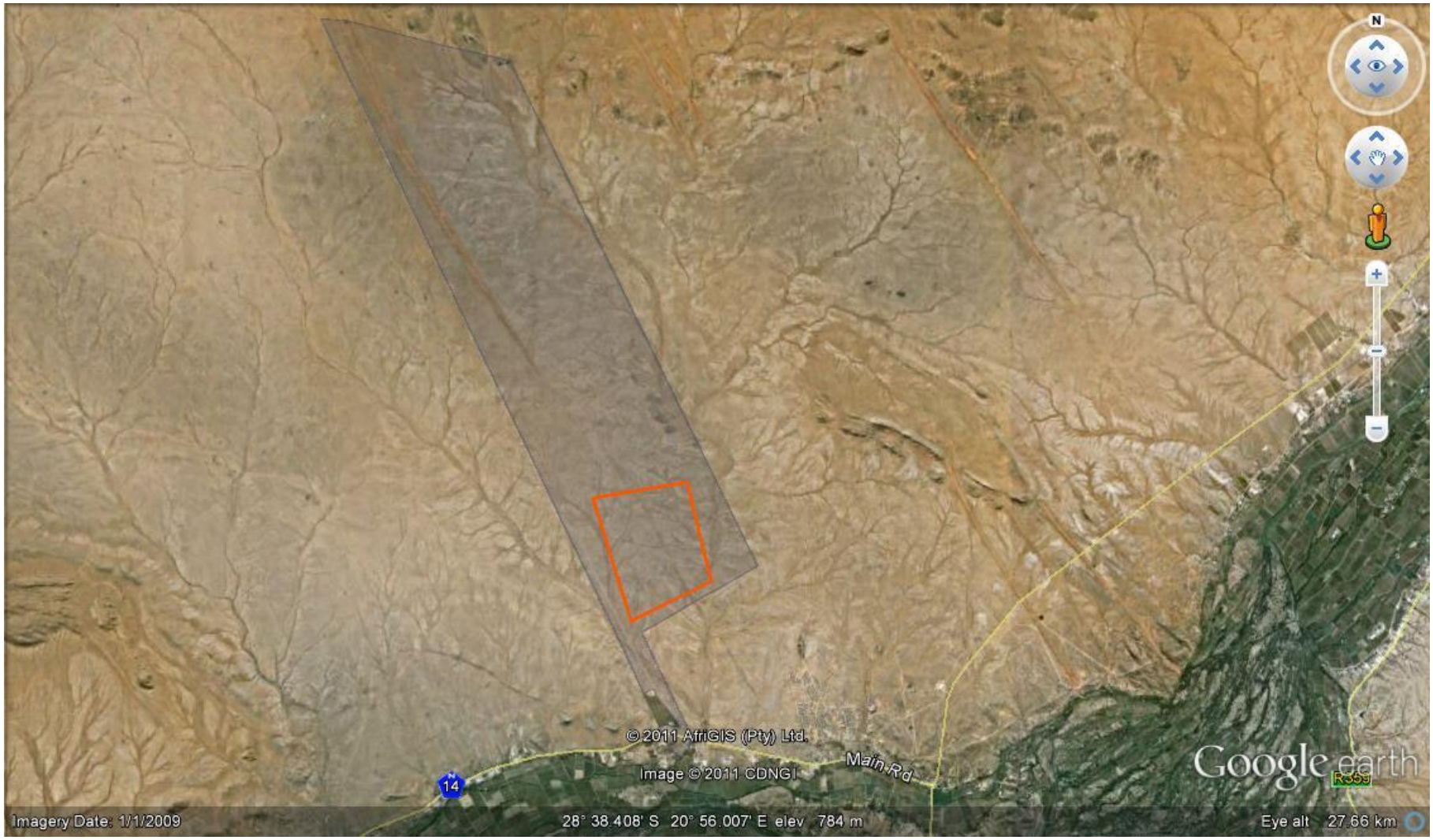

Figure 6.2: Location of the layout within the southern region of the broader farm portion

6.2 Extent expected to be affected by the proposed facility

A broader site of 4 500 ha was originally identified for the establishment of the proposed PV plant. Following the Scoping Phase of the EIA process, and a technical evaluation of the broader site, an area was identified as being preferred for the development of the proposed facility based on environmental and technical constraints (refer to Figure 6.2).

In order to assess the potential impacts associated with the proposed facility, it was necessary to quantify the extent of the permanently and temporarily affected areas (i.e. both area and linear infrastructure). This includes the area required for the PV panels, substations, ancillary buildings, access roads, and power lines.

In total, an area of approximately 385 ha would be affected by permanent infrastructure associated with the proposed PV facility. This amounts to approximately 8.5% of the total area under consideration. This includes the area required for the solar arrays (380 ha), the on-site substation (1 ha), ancillary buildings (2.5 ha) and associated access roads (1.5 ha, assuming a length of 5 km and a width of < 4 m). Not included in this calculation is the area to be affected by the proposed power line which would connect from the on-site substation to an existing 132 kV distribution line that runs between the Taaiputs Substation at Kakamas and the Oasis Substation at Keimoes south of the site. Approximately 5 ha are expected to be required, assuming a length of 1 km and a servitude width of 50 m. Also an area of 2 – 5 ha for the solar kiosk.

In terms of land that will be affected temporarily during the construction phase, this will include the construction equipment camp(s), the area required to be excavated for the underground cabling, and temporary laydown area which collectively will require an area of approximately 4.5 ha.

6.3 Assessment of Potential Impacts

The sections which follow provide a summary of the findings of the assessment undertaken of the potential impacts associated with the construction and operation of the proposed PV plant. Issues were assessed in terms of the criteria detailed in Chapter 4. The nature of each potential impact is discussed and the significance is calculated (i.e. with and without mitigation or enhancement[8]). Recommendations have been made regarding mitigation and management measures for potentially significant impacts and the possibility of residual and cumulative impacts[9] are noted. Recommended mitigation measures have been

[8] Where relevant for positive impacts.
[9] The impact of an activity that in itself may not be significant, but may become significant when added to the existing and potential impacts eventuating from similar or diverse activities or undertakings in the area.

included within the draft Environmental Management Programme (EMP) included within Appendix J.

6.3.1 Ecology

The type of construction activities required for the establishment of the proposed PV plant may lead to:

» Impacts on indigenous natural vegetation
» Impacts on protected tree species
» Impacts on threatened animal species
» Impacts on threatened plant species
» Impacts on drainage lines
» Establishment of alien invasive plant species

Impact table summarising the significance of impacts on ecology during the construction and operation phases

Nature: Impacts on indigenous natural terrestrial vegetation The loss of indigenous natural vegetation may lead to: » Negative change in the conservation status of habitat (Driver et al. 2005); » Increased vulnerability of remaining portions to future disturbance; » General loss of habitat for sensitive species; » Loss in variation within sensitive habitats; » General reduction in biodiversity; » Increased fragmentation (depending on location of impact); and » Disturbance to processes maintaining biodiversity and ecosystem goods and services; and loss of ecosystem goods and services.		
PV panels, substations, and roads		
	Without mitigation	***With mitigation***
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Moderate to low (5)	Low (4)
Probability	Definite (5)	Definite (5)
Significance	**Moderate (55)**	**Moderate (50)**
Power line		
Extent	Local (1)	Local (1)
Duration	Medium-term (3)	Medium-term (3)
Magnitude	Low (4)	Minor (2)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Moderate (32)**	**Low (24)**
Status (positive or negative)	Negative	
Reversibility	Not reversible	

Irreplaceable loss of resources	Yes
Can impacts be mitigated?	Yes, to a large extent for power lines and to a limited extent for the remaining infrastructure.
Mitigation: » Avoid unnecessary impacts on natural vegetation surrounding the PV panels and power line servitude. » Impacts should be contained, as far as possible, to the footprint of the proposed infrastructure. » Service roads must be properly maintained to avoid erosion impacts. » Use existing access roads as far as possible.	
Cumulative impacts: » Soil erosion and alien invasions may lead to additional loss of habitat that will exacerbate this impact. » Although other solar facilities are proposed in the Kakamas area, the overall cumulative impact on vegetation is considered small in comparison to the extent of affected vegetation types.	
Residual impacts: » Some permanent loss of this vegetation type will definitely occur.	

Nature: Impacts on plant species of conservation concern

Plant species are especially vulnerable to construction activities as they cannot move out of the path of impact. They are also affected by the overall loss of habitat. Threatened species include those classified as critically endangered, endangered, or vulnerable. The significance of impacts on threatened plant species is the same as mentioned above for threatened animal species.

PV panels, substations, and roads		
	Without mitigation	***With mitigation***
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Medium-term (3)
Magnitude	Low (4)	Minor (2)
Probability	Definite (5)	Probable (3)
Significance	**Moderate (50)**	**Low (18)**
Status (positive or negative)	Negative	
Reversibility	Not reversible	
Irreplaceable loss of resources	Yes	
Can impacts be mitigated?	Yes	

Mitigation:

» Position infrastructure to avoid plant species of conservation concern, especially the Vulnerable, *Aloe dichotoma*.

» In addition, habitat in which high densities of individuals of plant species of conservation concern are found should also be omitted from the development footprint. Educate personnel on the conservation value of the species and the need to prevent disturbance to any individuals.

» All efforts must be made to not damage trees that are outside the development footprint. If there is no option, but to destroy individuals of plant species of conservation concern, efforts must be made to rescue affected individuals and translocate them to a suitable locality, in collaboration with conservation authorities.
» Plants that occur on site should be rescued and planted at a suitable locality adjacent to the infrastructure, either in a natural area where it will not be disturbed further or as a horticultural subject somewhere within the development, for example, at the main entrance or in a garden. According to the National Environmental Management: Biodiversity Act, a permit will be required for any affected plants that are listed as threatened (in this case, *Aloe dichotoma*).

Cumulative impacts:

» Impacts that cause loss of habitat (e.g. soil erosion, alien invasions, damage to watercourses) may exacerbate this impact.
» Although other solar facilities are proposed in the Kakamas area, the overall cumulative impact on vegetation is considered small in comparison to the extent of affected vegetation types.

Residual impacts:

» None likely.

Nature: Impacts on protected tree species

There are a number of tree species that are protected according to the National Forests Act, 1998 (Act No. 84 of 1998). In terms of Section 1 5(1) "*No person may cut, disturb, damage or destroy any protected tree or possess, collect, remove, transport, export, purchase, sell donate or in any other manner acquire or dispose of any protected tree or any forest product derived from a protected tree, except under a license granted by the Minister*".

PV panels, substations, and roads		
	Without mitigation	***With mitigation***
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (4)	Minor (2)
Probability	Definite (5)	Improbable (2)
Significance	**Moderate (50)**	**Low (16)**
Status (positive or negative)	Negative	
Reversibility	Not reversible	
Irreplaceable loss of resources	Yes	
Can impacts be mitigated?	Yes	

Mitigation:

» If possible, infrastructure should be positioned to avoid protected trees. Although not considered a mitigation measure, a permit would need to be obtained for any protected trees that are affected. All efforts must be made to not damage trees that are outside the development footprint.

Cumulative impacts:

» Impacts that cause loss of habitat (e.g. soil erosion, alien invasions, damage to

watercourses) may exacerbate this impact.
» Although other solar facilities are proposed in the Kakamas area, the overall cumulative impact on vegetation is considered small in comparison to the extent of affected vegetation types.

Residual impacts:
» Not likely.

Nature: Loss of habitat for threatened animals

Threatened animal species are indirectly affected by the overall loss of habitat. Direct construction impacts can often be avoided due to the movement of individuals from the path of construction. The loss of individuals or localised populations is unlikely to lead to a change in the conservation status of the species, unless they are classified as threatened. In the case of threatened animal species, the loss of a population or individual could lead to a direct change in its conservation status. This may arise if the proposed infrastructure is located where it will affect such individuals or populations or the habitat that they depend on. Consequences may include fragmentation of populations of affected species; reduction in area of occupancy of affected species; and loss of genetic variation within affected species.

PV panels, substations, and roads		
	Without mitigation	***With mitigation***
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Small (1)	Small (1)
Probability	Improbable (2)	Improbable (2)
Significance	**Low (14)**	**Low (14)**
Power lines		
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Small (1)	Small (1)
Probability	Highly improbable (1)	Highly improbable (1)
Significance	**Low (6)**	**Low (6)**
Status (positive or negative)	Negative	
Reversibility	Not reversible	
Irreplaceable loss of resources	Yes	
Can impacts be mitigated	To some degree	

Mitigation:
» Ensure that construction impacts are contained within the footprint of the proposed infrastructure and do not spread into surrounding natural areas.
» Employ the use of devices to make lines more visible; these must be attached to the overhead power lines.

Cumulative impacts:
» Impacts that cause loss of habitat (e.g. soil erosion, alien invasions, damage to watercourses) may exacerbate this impact.
» Although other solar facilities are proposed in the Kakamas area, the overall cumulative impact on vegetation is considered small in comparison to the extent of

affected vegetation types.

Residual impacts:

» Unlikely to be residual impacts.

Nature: Establishment and spread of declared weeds and alien invaders

Major factors contributing to invasion by alien invader plants include high disturbance activities and negative grazing practices (Zachariades et al. 2005). Consequences of this may include:

* Loss of indigenous vegetation;
* Change in vegetation structure leading to change in various habitat characteristics;
* Change in plant species composition;
* Change in soil chemical properties;
* Loss of sensitive habitats;
* Loss or disturbance to individuals of rare, endangered, endemic, and/or protected species;
* Fragmentation of sensitive habitats;
* Change in flammability of vegetation, depending on alien species;
* Hydrological impacts due to increased transpiration and runoff; and
* Impairment of wetland function.

PV panels, substations, and roads		
	Without mitigation	***With mitigation***
Extent	Site & surroundings (2)	Site & surroundings (2)
Duration	Long term (4)	Long term (4)
Magnitude	Medium (6)	Minor (2)
Probability	Highly probable (4)	Improbable (2)
Significance	**Moderate (48)**	**Low (16)**
Power lines		
Extent	local (1)	Site & surroundings (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (4)	Small (2)
Probability	Probable (3)	Highly improbable (1)
Significance	**Low (27)**	**Low (8)**

Status (positive or negative)	Negative
Reversibility	Reversible
Irreplaceable loss of resources	Yes
Can impacts be mitigated	Yes

Mitigation:

» Keep disturbance of indigenous vegetation to a minimum.
» Rehabilitate disturbed areas as quickly as possible following completion of construction activities in an area.
» Do not translocate soil stockpiles from areas with alien plants.
» Control any alien plants immediately to avoid establishment of a soil seed bank that would take decades to remove.
» Establish an on-going monitoring programme to detect and quantify any aliens that

may become established.
Cumulative impacts:
» Other disturbance to parts of the site could lead to similar impacts.
Residual impacts:
» Will probably be very low if control measures are effectively applied.

Nature: Impacts on watercourses Wetlands, riparian zones, and watercourses are defined in the National Water Act (Act No. 36 of 1998) as a water resource. These systems (i.e. including dry river beds and drainage lines) provide important habitat for a number of species, especially in arid environments, including those with a restricted distribution or species with an elevated conservation status. Any activities that are contemplated that could affect the wetlands requires authorisation in terms of the Act. Construction may lead to direct or indirect loss of or damage to some of these areas or changes to their catchment, which may in turn affect the hydrology of the landscape.		
PV panels, substations, and roads		
	Without mitigation	***With mitigation***
Extent	local and surroundings (2)	local and surroundings (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	Moderate (6)	Low (4)
Probability	Definite (5)	Highly probable (4)
Significance	**Moderate (60)**	**Moderate (40)**
Power lines		
Extent	Local and surroundings (2)	Local and surroundings (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	Moderate (6)	Low (4)
Probability	Probable (3)	Improbable (2)
Significance	**Moderate (36)**	**Low (20)**
Status (positive or negative)	Negative	
Reversibility	Reversible with effective rehabilitation	
Irreplaceable loss of resources	Yes	
Can impacts be mitigated	To some degree	
Mitigation: » Ground surfaces within the solar array must be properly maintained to avoid erosion impacts. » A comprehensive storm-water management plan must be compiled for the solar array. This must indicate how water velocities will be reduced before storm water is allowed to enter natural channels and how natural processes for water infiltration of the affected landscape will be accommodated. » There is a legal obligation to apply for a Water Use Licence for any wetlands that may be affected, since they are classified in the National Water Act as a water resource. Any activity within 500 m of a wetland or watercourse boundary may require a WUL, depending on the activity.		

» Pylons must be positioned a minimum of 50 m outside of watercourse boundaries. » Existing roads must be used as service roads, where possible.
Cumulative impacts: » Other disturbance to parts of the site could lead to similar impacts.
Residual impacts: » Will probably be very low if control measures are effectively applied.

Implications for Project Implementation

» Permits are required to be obtained for any protected trees that may be affected.
» A permit is required from the Department of Water Affairs if there are expected impacts on any water resources (i.e. the drainage lines).

6.3.2 Geology, Soils and Agricultural Potential

The construction activities associated with the proposed development will include excavation, loosening, displacement, and/or burial of soil, stockpiling, mixing, wetting, filling, and compaction. These activities may negatively affect the soil profile, contributing to soil degradation and possibly accelerated erosion. These activities could also cause negative indirect impacts such as increased siltation in other areas away from the site affecting water sources and agriculture with potential socio-economic repercussions.

Impact tables summarising the significance of impacts on Geology, Soil, and Erosion Potential

Nature: Disturbance of soils and land use Construction activities associated with the establishment of the solar panels, roads, buildings, and other infrastructure.		
	Without mitigation	***With mitigation***
Extent	Local (1)	N/A
Duration	Permanent (5)	N/A
Magnitude	Minor (2)	N/A
Probability	Highly probable (4)	N/A
Significance	**Moderate (32)**	N/A
Status (positive or negative)	Negative	
Reversibility	No	
Irreplaceable loss of resources	No	
Can impacts be mitigated	No	
Mitigation: » None possible.		
Cumulative impacts: » Despite the proposed establishment of other solar facilities in the region, the cumulative impact will be small as it is to be constructed on land with low agricultural		

potential.
Residual impacts:
» None expected.

Nature: Soil degradation through the use of vehicles and machinery on-site During construction soil degradation may occur due to pollution of soil by contaminants used on site during construction (e.g. fuel, oil, chemicals, cement). It is assumed that vehicle movement will be restricted to the construction site and established roads. Vehicle impacts in this sense are restricted to spillages of lubricants and petroleum products.		
	Without mitigation	***With mitigation***
Extent	Local (1)	Local (1)
Duration	Short term (2)	Short term (2)
Magnitude	Minor (2)	Minor (2)
Probability	Highly probable (4)	Improbable (2)
Significance	**Low (20)**	**Low (10)**
Status	Negative	
Reversibility	Partially reversible	
Irreplaceable loss of resources	Yes	
Can impacts be mitigated	Yes, to a certain extent	
Mitigation: » Control use and disposal of potential contaminants or hazardous materials. » Remove contaminants and contaminated topsoil and replace topsoil in affected areas.		
Cumulative impacts: » The cumulative impact of soil pollution is considered low at present due to the undeveloped nature of the study area, but further development may have an increasing impact.		
Residual impacts: » Minor negative residual impacts are expected due to the slow regeneration of soil processes in and under the topsoil		

Nature: Impact on agricultural potential Loss of agricultural potential and land capability owing to the development.		
	Without mitigation	***With mitigation***
Extent	Local (1)	N/A
Duration	Permanent (5)	N/A
Magnitude	Low (2)	N/A
Probability	Highly probable (4)	N/A
Significance	**Moderate (32)**	N/A
Status (positive or negative)	Negative	
Reversibility	Irreversible	
Irreplaceable loss of resources	Yes, minor	
Can impacts be mitigated	No	

Mitigation:
» The loss of agricultural land is a long term loss and there are no mitigation measures that can be put in place to combat this loss.
Cumulative impacts:
» Soil erosion may arise owing to increased surface water runoff. Adequate management and erosion control measures should be implemented.
Residual impacts:
» The loss of agricultural land is a long term loss. This loss extends to the post-construction phase.

Nature: Dust pollution Increased dust pollution from construction sites may affect surrounding receptors.		
	Without mitigation	***With mitigation***
Extent	Local (2)	Local (2)
Duration	Short term (2)	Short term (2)
Magnitude	Low (2)	Minor (2)
Probability	Highly probable (4)	Improbable (2)
Significance	**Low (24)**	**Low (12)**
Status	Negative	
Reversibility	Yes	
Irreplaceable loss of resources	No	
Can impacts be mitigated?	Yes	
Mitigation: » Apply appropriate dust control measures such as straw bales or dampen dusty denuded areas. » Limit vehicle movement to absolute minimum, construct proper roads for access.		
Cumulative impacts: » The cumulative impact of this activity will be small if managed but can have widespread impacts if ignored.		
Residual impacts: » Minor localised dust pollution.		

Implications for Project Implementation

» Impacts on agricultural potential are expected to be low due to the low agricultural potential of the soils on site.
» Adequate storm water management measures must be put in place as the soils on the site have no cohesion due to inherent soil properties as well as lack of plant roots. Erosion must be controlled through adequate mitigation and control structures.
» The potential positive impacts on the geological environment are considered to have a moderate significance on a local scale but the cumulative impact of a reduction in demand and extraction/mining of non-renewable energy sources on a national scale is very significant.

6.3.3 Heritage Resources

Acts or activities resulting in disturbance of surfaces and/or sub-surfaces containing artefacts (causes) resulting in the destruction, damage, excavation, alteration, removal or collection from its original position (consequences), of any archaeological material or object (what affected). Impacts on heritage resources within the project area are largely expected during the construction phase of the facility. Construction activities including clearance or excavation activities could alter or destroy the context of heritage resources or the resources themselves in the event of such archaeological materials being present.

One Stone Age site was identified, however it is of Low - Medium Significance, with a field rating of "Generally Protected B".

Impact tables summarising the significance of impacts on heritage resources

Nature: Impact on heritage resources at identified sites During the construction phase activities resulting in disturbance of surfaces and/or sub-surfaces may destroy, damage, alter, or remove the last remains of the historical marker.		
	Without mitigation	***With mitigation***
Extent	Local (2)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	High (7)	Low (2)
Probability	Probable (3)	Probable (3)
Significance	**Moderate (42)**	**Low (24)**
Status	Negative	
Reversibility	Not reversible	
Irreplaceable loss of resources	Yes	
Can impacts be mitigated	Yes	
Mitigation: » If impact on the site is definite surface sampling should be conducted and the site should be monitored during construction. Alternatively the site should be demarcated to avoid impact on the site.		
Cumulative impacts: » Archaeological sites are non-renewable and impact on any archaeological context or material will be permanent and destructive.		
Residual impacts: » Depletion of the historical/archaeological record of the area.		

Implications for Project Implementation

» Permits will be required from the heritage authorities prior to the disturbance or destruction of any heritage sites.

6.3.4 Visual Aesthetics

The potential visual impact of the proposed facility was calculated by determining the following:

The potential visual exposure

A viewshed analysis was undertaken which indicates those areas from which the proposed PV plant would likely be visible, but also indicates the potential frequency of visibility (refer to Figure 6.3). The analysis was undertaken from a number of indicative vantage points within the site at an offset of 4 m (i.e. the maximum height of the PV panels) above average ground level.

It must be noted that the viewshed analyses do not include the potential shielding effect of vegetation cover or existing structures on the exposure of the proposed PV plant, and it does not take into consideration the limitations of the human eye, therefore signifying a worst-case scenario.

Based on this visual exposure, the following is observed:

» The analysis indicates that the PV plant is likely to be visually exposed within a core area on and immediately surrounding the site for a distance of about 3 km to the north and west, 4 km to the east and 1 km to the south.
» Beyond the core area, visual exposure to the west and east is limited by higher lying, hilly terrain. These hills effectively screen areas beyond from potential visual exposure, but the slopes of these hills themselves, specifically those facing the site, are exposed to potential visual impact.
» The river valley to the south west and south east of the site is also visually screened, but by virtue of the low lying incised topography. Parts of the river valley to the direct south will be exposed to potential visual impact, however.
» To the north, the zone of potential visual exposure is relatively far reaching, but interrupted by the hilly, high lying topography.
» Further afield, the zone of potential visual exposure spreads primarily to the south and south-east of the site. Within these areas, visual exposure is patchy, due to the undulating topography and hills. On the southern bank of the river, the orientation of the slope of the land effectively elevates receptors situated to the south of the river. They will have an elevated vantage over the proposed site, albeit from a distance.

» Limited areas of visual exposure occur to the far west, north east and north of the site. These are mostly slopes of hills and mountains orientated towards the site.
» In terms of towns, only some outskirts of Keimoes fall within the zone of potential visual exposure.

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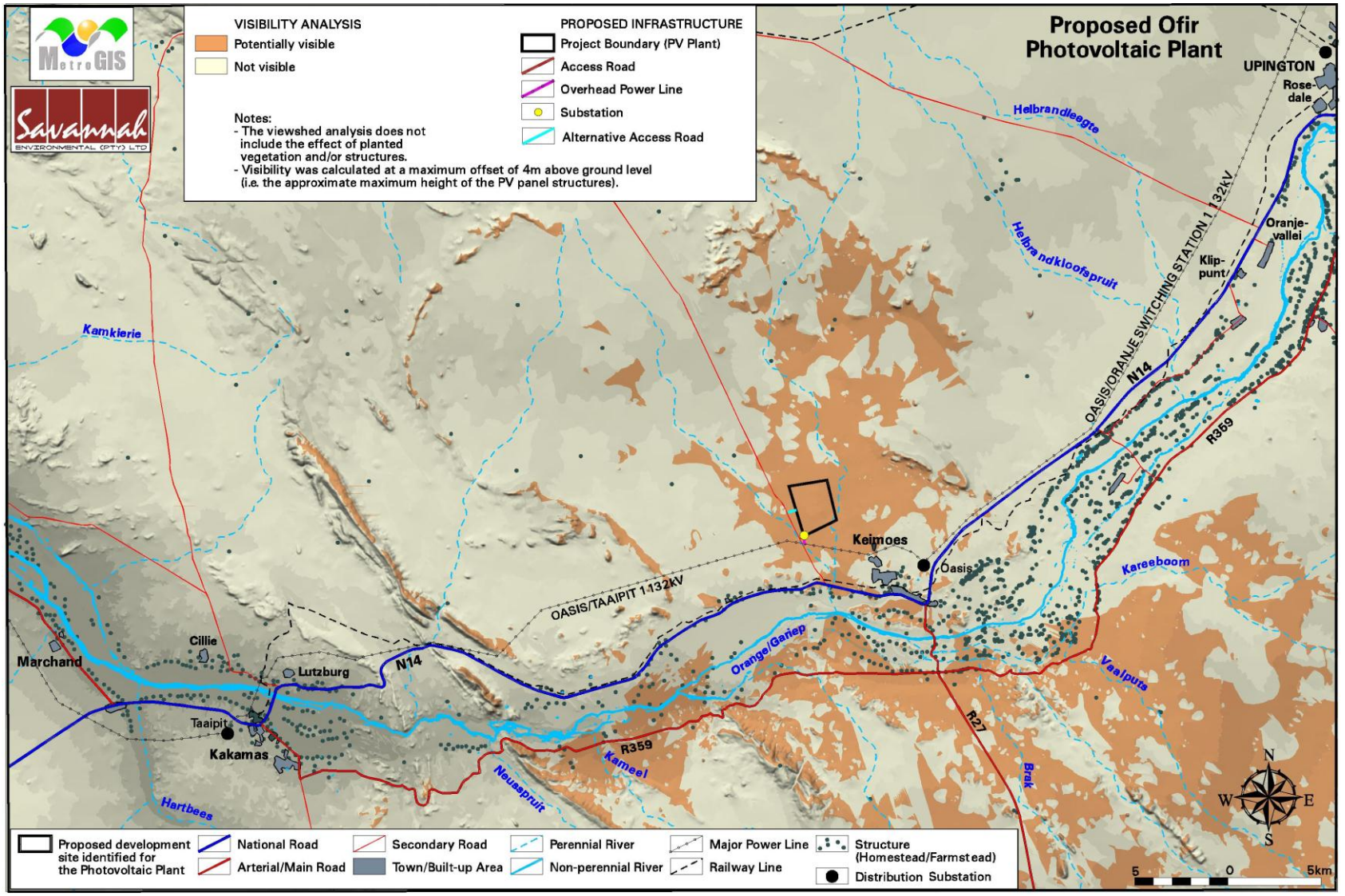

Figure 6.3: Potential visual exposure of the proposed PV facility

The visual absorption capacity of the landscape

The visual absorption capacity (VAC) of the natural areas, where the thicket and bushland is intact, is moderate to low, but where the land cover is primarily shrubland, the VAC drops to low. Near homesteads and settlements, trees and other vegetation may contribute to the screening of the proposed PV plant, thus elevating the VAC. This is not a given however, and must therefore be discounted in an effort to accommodate an overall worst case scenario. VAC within urban and built up areas (i.e. Upington, Keimoes, Kakamas, etc.) is higher due to the presence of buildings, structures and visual clutter. VAC was therefore not taken into account for the visual impact assessment, except within urban areas, where these are of relevance.

The visual distance and observer proximity to the facility

For a PV facility, the horizontal extent is of most significance. Despite being made up of smaller components (i.e. the individual PV panels), a PV facility will manifest as a single visual entity. It follows that the larger the facility, the larger will be the anticipated visual impact at any given distance, and the more visible the facility will be over larger distances. The proximity radii are as follows:

» 0 – 4 km - short distance view where the PV plant would dominate the frame of vision and constitute a very high visual prominence.
» 4 – 8 km - medium distance views where the PV plant would be easily and comfortably visible and constitute a high visual prominence.
» 8 – 16 km - medium to longer distance view where the PV plant would become part of the visual environment, but would still be visible and recognisable and would constitute a medium visual prominence.
» Greater than 16 km - long distance view where the PV plant would still be visible though not as easily recognisable and would constitute a low visual prominence.

The viewer incidence and viewer perception

Viewer incidence is calculated to be the highest along the National, arterial and secondary roads (highlighted as yellow strips) within the study area (refer to Figure 6.4). Commuters and tourists using these roads could be negatively impacted upon by visual exposure to the PV plant. Other than along the above roads, viewer incidence is concentrated in the small towns and urban areas and within the homesteads and settlements (highlighted as yellow dots) along the river and further afield within the study area.

The sensitivity of visual receptors is considered lower within urban areas than within rural homesteads and farmsteads beyond the urban zone. This is due to the more visually impacted environment within urban areas due to buildings, structures, and visual clutter. The severity of the visual impact on visual receptors decreases with increased distance from the proposed PV plant.

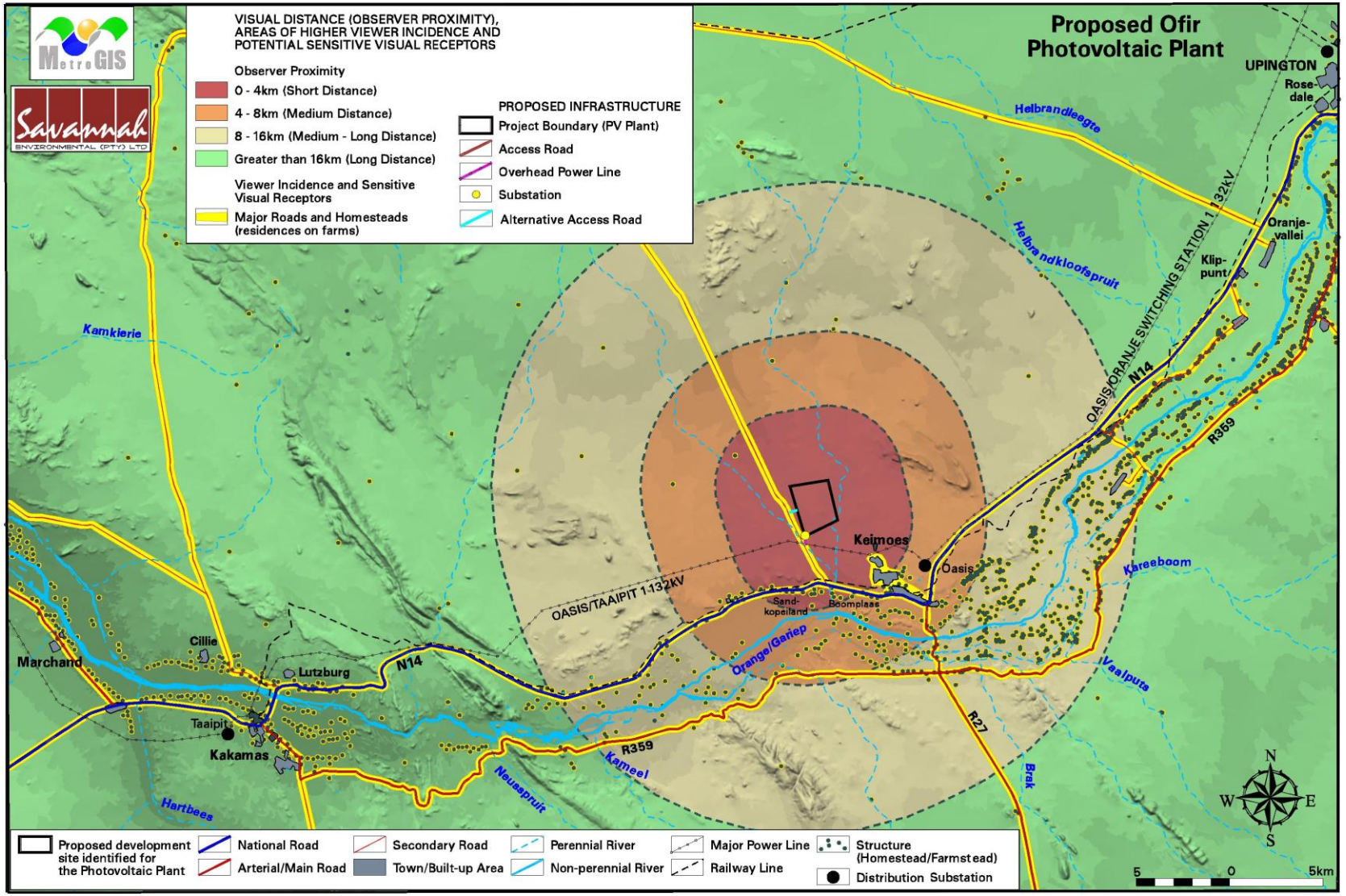

Figure 6.4: Observer proximity to the proposed facility and areas of high viewer incidence

The visual impact index and the subsequent impact significance

The combined results of the visual exposure, viewer incidence, and visual distance of the proposed facility were calculated. Here the weighted impact and the likely areas of impact have been indicated as a visual impact index (refer to Figure 6.5). Values have been assigned for each potential visual impact per data category and merged in order to calculate the visual impact index. An area with short distance, high frequency of visual exposure to the proposed facility, a high viewer incidence, and a predominantly negative perception would therefore have a higher value (greater impact) on the index. This helps in focusing the attention to the critical areas of potential impact when evaluating the issues related to the visual impact. The following is of relevance:

» On the site itself and within a 4 km radius - Areas of potentially moderate visual impact are indicated on the site itself and within a 4 km radius of the proposed PV plant. These areas extend primarily to the north and east, and to a lesser extent to the west and south. The extent of potential visual impact is constrained by the high lying hilly terrain located to the west of the proposed site. Areas of potentially high visual impact include a stretch of the N14 south of the site, the secondary road to the immediate west a few homesteads and settlements immediately south of the N14.
» Between 4 km and 8 km - the area of potential visual impact is concentrated in the north and south. These areas are likely to be exposed to low visual impact. Within this zone, a very short stretch of the N14 and stretches of the R359 and the R27 will be exposed to a moderate visual impact. A number of homesteads will also be exposed to moderate visual impact. These lie mostly on the southern bank of the river oriented towards the proposed site, but some are located on the northern bank as well. Limited outskirts of Keimoes also fall within this zone.
» Between 8 km and 16 km - the magnitude of visual impact is reduced to very low. Visually exposed spread to the south-east and south-west. Some visually exposed areas also lie to the north. Stretches of the R359 and R27 are likely to be exposed to low visual impact, as will a number of settlements and homesteads on the southern bank of the river. Areas to the west and east are mostly screened from potential visual impact.
» Beyond 16 km - visual impacts are considered negligible as it is unlikely that the PV plant will be visible from this distance.

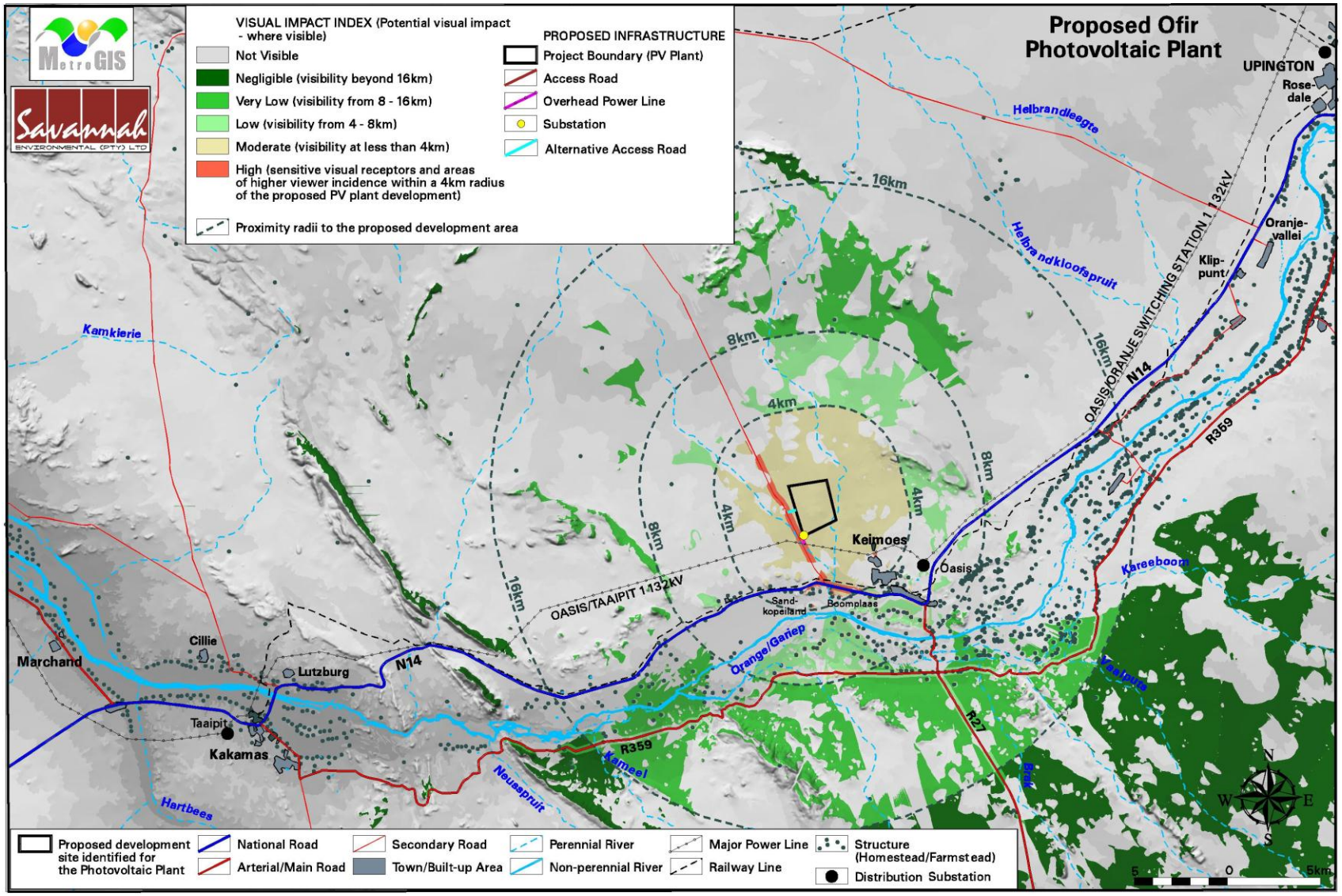

Figure 6.5: Visual impact index

Impact table summarising the significance of visual impacts

Nature: Impact of the construction phase on observers in close proximity to the proposed PV plant During the construction phase, there will be a noticeable increase in heavy vehicles utilising the roads to the development site. This may cause, at the very least, a visual nuisance to other road users and land owners in the area.		
	Without Mitigation	***With mitigation***
Extent	Local (4)	Local (4)
Duration	Very short term (1)	Very short term (1)
Magnitude	Moderate (6)	Moderate (6)
Probability	Probable (3)	Improbable (2)
Significance	**Moderate (33)**	**Low (22)**
Status (positive or negative)	Negative	
Reversibility	Recoverable (3)	
Irreplaceable loss of resources?	No	
Can impacts be mitigated	Yes	
Mitigation: <u>Planning:</u> » Retain a buffer (approximately 100 m wide) of intact natural vegetation along the perimeter of the development site. » Supplement buffer with additional vegetation to increase visual absorption capacity. Consult an ecologist with respect to appropriate species and placement. » Retain and maintain natural vegetation in all areas outside of the development footprint. <u>Construction:</u> » Ensure that vegetation is not unnecessarily cleared or removed during the construction period. » Reduce the construction period through careful logistical planning and productive implementation of resources. » Plan the placement of lay-down areas and temporary construction equipment camps in order to minimise vegetation clearing (i.e. in already disturbed areas) wherever possible. » Restrict the activities and movement of construction workers and vehicles to the immediate construction site and existing access roads. » Ensure that rubble, litter, and disused construction materials are appropriately stored (if not removed daily) and then disposed regularly at licensed waste facilities. » Reduce and control construction dust using approved dust suppression techniques as and when required (i.e. whenever dust becomes apparent). » Restrict construction activities to daylight hours in order to negate or reduce the visual impacts associated with lighting. » Rehabilitate all disturbed areas, construction areas, roads, slopes etc immediately after the completion of construction works.		
Cumulative impacts: » None.		
Residual impacts: » None.		

Nature: Impact on residents of farms and homesteads in close proximity to the proposed PV plant

The 4 m high PV panels will be visible to a very limited number of residents of agricultural homesteads and settlements within a 4km radius of the proposed PV plant. The PV structures are built forms within an otherwise natural context, and vegetation will need to be removed for the structures to be built. Visual impacts on these receptors are expected to be of moderate significance, and may be mitigated to low. The very limited number of receptors reduces the probability of this impact occurring.

	Without mitigation	***With mitigation***
Extent	Local (4)	Local (4)
Duration	Long term (4)	Long term (4)
Magnitude	High (8)	High (8)
Probability	Very improbable (1)	Very improbable (1)
Significance	**Low (16)**	**Low (16)**

Status (positive or negative)	Negative
Reversibility	Recoverable (3)
Irreplaceable loss of resources	No
Can impacts be mitigated	Yes

Mitigation:

Planning:

» Retain a buffer (approximately 100 m wide) of intact natural vegetation along the perimeter of the development site.
» Supplement buffer with additional vegetation to increase visual absorption capacity. Consult an ecologist with respect to appropriate species and placement.
» Retain and maintain natural vegetation in all areas outside of the development footprint.

Operations:

» Maintain the general appearance of the PV plant as a whole, including buffer areas.

Decommissioning:

» Remove infrastructure not required for the post-decommissioning use of the site. This may include the PV panels, maintenance buildings, security buildings, workshop, access roads etc.
» Rehabilitate all areas - consult an ecologist regarding rehabilitation specifications.
» Monitor rehabilitated areas post-decommissioning and implement remedial actions.

Cumulative impacts:

» The construction of the PV plant and ancillary infrastructure will increase the cumulative visual impact of electrical infrastructure within the region. This is relevant in light of the major distribution power lines and Taaiputs Substation near to the site as well as the approved Eskom and Khi CSP plants, both located west of Upington. Other solar facilities are also proposed in the area, but have not yet been approved.

Residual impacts:

» The visual impact will be removed after decommissioning, provided the PV plant and ancillary infrastructure is removed. Failing this, the visual impact will remain.

Nature: Impact of the access roads on users of main and secondary roads in close proximity to the proposed PV plant

The 4 m high PV panels will present a visual impact as these structures are built forms within an otherwise natural context. In addition, vegetation will need to be removed for these structures to be built. Visual impacts on the N14 as it bypasses the site and on the secondary road to the immediate west of the site are expected to be of moderate significance, and may be mitigated to low. The low order of the secondary road and the very limited extent of this anticipated impact on the N14 reduces the probability off this impact occurring.

	Without mitigation	***With mitigation***
Extent	Local (4)	Local (4)
Duration	Long term (4)	Long term (4)
Magnitude	High (8)	High (8)
Probability	Improbable (2)	Very improbable (1)
Significance	**Moderate (32)**	**Low (16)**
Status (positive or negative)	Negative	
Reversibility	Recoverable (3)	
Irreplaceable loss of resources	No	
Can impacts be mitigated	Yes	

Mitigation:

Planning:

» Retain a buffer (approximately 100 m wide) of intact natural vegetation along the perimeter of the development site.
» Supplement buffer with additional vegetation to increase visual absorption capacity. Consult an ecologist with respect to appropriate species and placement.
» Retain and maintain natural vegetation in all areas outside of the development footprint.
» Layout and construction of roads with due cognisance of the existing vegetation.

Construction:

» Rehabilitation of construction roads.

Operation:

» Maintenance of roads to avoid erosion and suppress dust.

Decommissioning:

» Rip and rehabilitate roads and servitudes not required for post decommissioning use. Consult an ecologist regarding appropriate species.
» Monitor rehabilitated areas post-decommissioning and implement remedial actions.

Cumulative impacts:

» The construction of access roads will contribute to the cumulative visual impact of road infrastructure within the region.

Residual impacts:

» The visual impact will be removed after decommissioning, provided the access roads and denuded areas are rehabilitated. Failing this, the visual impact will remain.

Nature: Impact of the transformer, substation, and other ancillary buildings on observers in close proximity to the proposed PV plant

The transformer and substation, the maintenance buildings, security buildings, workshop and educational kiosk could present a visual impact as these structures are built forms within a natural context. In addition, vegetation will need to be removed for these structures to be built. No dedicated viewshed has been generated for the above infrastructure, but the infrastructure will be located within the PV plant footprint. They are furthermore likely to be single storey, not exceeding 3 m in height, thus falling within the viewshed of the PV structures. This anticipated impact is likely to be of moderate significance and may be mitigated to low.

	Without mitigation	***With mitigation***
Extent	Local (4)	Local (4)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (6)	Moderate (6)
Probability	Probable (3)	Improbable (2)
Significance	**Moderate (42)**	**Low (28)**

Status (positive or negative)	Negative
Reversibility	Recoverable (3)
Irreplaceable loss of resources?	No
Can impacts be mitigated	Yes

Mitigation:

Planning:

» Retain a buffer (approximately 100 m wide) of intact natural vegetation along the perimeter of the development site.
» Supplement buffer with additional vegetation to increase visual absorption capacity. Consult an ecologist with respect to appropriate species and placement.
» Retain and maintain natural vegetation in all areas outside of the development footprint.
» Layout and construction of buildings and structures with due cognisance of the existing vegetation.

Construction:

» Rehabilitation of construction areas.

Operations:

» Maintain the general appearance of the PV plant as a whole, including buffer areas.

Decommissioning:

» Remove infrastructure not required for the post-decommissioning use of the site. This may include the PV panels, maintenance buildings, security buildings, workshop, access roads etc.
» Rehabilitate all areas, consult an ecologist regarding rehabilitation specifications.
» Monitor rehabilitated areas post-decommissioning and implement remedial actions.

Cumulative impacts:

» The construction of the on-site substation and ancillary buildings will contribute to the cumulative visual impact of built infrastructure within the region.

Residual impacts:

» The visual impact will be removed after decommissioning, provided the PV plant and ancillary infrastructure is removed. Failing this, the visual impact will remain.

Nature: Impact of the power line on observers in close proximity thereto

The potential visual impact of the power line connection and the on-site substation will occur as a result of the power line itself, as well as the associated servitude that will need to be cleared. No dedicated viewshed has been generated for this power line which less than 1 km in length. Despite its limited length, this new line will be visible within a 2 km distance on either side of the alignment. Visual receptors are, however, limited, and the presence of the existing power line will 'absorb' the potential visual impact on sensitive visual receptors. This will reduce the probability of this impact occurring. In this respect, the anticipated impact of the power line is likely to be of low significance. No mitigation is possible.

	Without Mitigation	***After Mitigation***
Extent	Local (4)	N/a
Duration	Long term (4)	N/a
Magnitude	High (8)	N/a
Probability	V Improbable (1)	N/a
Significance	**Low (16)**	N/a
Status (positive or negative)	Negative	
Reversibility	Recoverable (3)	
Irreplaceable loss of resources?	No	
Can impacts be mitigated	No	

Mitigation:

» None.

Cumulative impacts:

» The construction of the new power line will increase the cumulative visual impact of electrical infrastructure within the region.

Residual impacts:

» The visual impact will be removed after decommissioning, if the power line is also removed. Failing this, the visual impact will remain.

Nature: Impact of lighting at night on observers in close proximity to the proposed PV plant

The area immediately surrounding the proposed PV plant has a low incidence of visual receptors. In this respect, any light trespass and glare from the security lighting for the PV plant infrastructure is likely to impact on residents in the area, especially those orientated towards the proposed PV plant, and in close proximity.

Another potential lighting impact is that known as sky glow, which is the condition where the night sky is illuminated when light reflects off particles in the atmosphere such as moisture, dust, or smog. The sky glow intensifies with the increase in light sources.

	Without Mitigation	***With mitigation***
Extent	Local (4)	Local (4)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (6)	Moderate (6)
Probability	Probable (3)	Improbable (2)
Significance	**Moderate (42)**	**Low (28)**

Status (positive or negative)	Negative
Reversibility	Recoverable (3)
Irreplaceable loss of resources?	No
Can impacts be mitigated	Yes

Mitigation:

Planning & operation:

» Shielding the sources of light by physical barriers (walls, vegetation, or the structure itself).
» Limiting mounting heights of lighting fixtures, or alternatively using foot-lights or bollard level lights.
» Making use of minimum lumen or wattage in fixtures.
» Making use of down-lighters, or shielded fixtures.
» Making use of Low Pressure Sodium lighting or other types of low impact lighting.
» Making use of motion detectors on security lighting. This will allow the site to remain in relative darkness, until lighting is required for security or maintenance purposes.

Cumulative impacts:

» The construction of the PV plant and ancillary infrastructure will increase the cumulative visual impact of lighting at night within the region. This is relevant in light of the populated places of Lutzburg, Cillie and Kakamas as well as the approved Eskom and Khi CSP facilties, both located west of Upington. Other solar facilities are also proposed in the area, but have not yet been approved.

Residual impacts:

» None. The visual impact will be removed after decommissioning.

Nature: Impact of the proposed PV plant on tourist access routes and tourist destinations within the region

The study area is located within the Orange River region, which is a known tourist area . The N14 is an important tourist access routes on a national level, and within the region, it functions as part of the wine route meander. It is also expected that tourist accommodation and amenities are to be found within the small towns, urban centres and even some of the homesteads along the river valley and to a lesser extent within the natural, undeveloped area beyond. The visual impact on tourist access routes and tourist destinations within the region is likely to be of low significance both before and after mitigation.

	Without Mitigation	***With mitigation***
Extent	Regional (3)	Regional (3)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (6)	Moderate (6)
Probability	Improbable (2)	Very improbable (1)
Significance	**Low (26)**	**Low (13)**
Status (positive or negative)	Negative	
Reversibility	Recoverable (3)	
Irreplaceable loss of resources?	No	
Can impacts be mitigated	Yes	

Mitigation:

Planning:

» Retain a buffer (approximately 100 m wide) of intact natural vegetation along the perimeter of the development site.
» Supplement buffer with additional vegetation to increase visual absorption capacity. Consult an ecologist with respect to appropriate species and placement.
» Retain and maintain natural vegetation in all areas outside of the development footprint.

Operations:

» Maintain the general appearance of the PV plant as a whole, including buffer areas.

Decommissioning:

» Remove infrastructure not required for the post-decommissioning use of the site. This may include the PV panels, maintenance buildings, security buildings, workshop, access roads etc.
» Rehabilitate all areas. Consult an ecologist regarding rehabilitation specifications.
» Monitor rehabilitated areas post-decommissioning and implement remedial actions.

Cumulative impacts:

» The construction of the PV plant and ancillary infrastructure will increase the cumulative visual impact of electrical infrastructure within the region. This is relevant in light of the major distribution power lines and Taaiputs Substation near to the site as well as the approved Eskom and Khi CSP facilities, both located west of Upington. Other solar facilities are also proposed in the area, but have not yet been approved.

Residual impacts:

» The visual impact will be removed after decommissioning, provided the PV plant and ancillary infrastructure is removed. Failing this, the visual impact will remain.

Nature: Impact of the proposed PV plant on the visual character of the landscape and the sense of place of the region

Sense of place refers to a unique experience of an environment by a user, based on his or her cognitive experience of the place. Visual criteria and specifically the visual character of an area (informed by a combination of aspects such as topography, level of development, vegetation, noteworthy features, cultural / historical features, etc.) play a significant role. A visual impact on the sense of place is one that alters the visual landscape to such an extent that the user experiences the environment differently, and more specifically, in a less appealing or less positive light.

The most noteworthy aspect contributing to the sense of place of this region is dramatic contrast between the arid shrubland and the lush vineyards growing on the edge of the Orange River. The visual landscape is one of wide-open spaces and little development, with the parallel dune hills and the Orange River belt representing the most visually apparent natural features. Farming along the river lends a rural and agricultural flavour to the visual environment. Beyond the farming belt, however, development is sparse and very small in scale and the landscape character is one of undeveloped wide open space.

	Without Mitigation	***With mitigation***
Extent	Regional (3)	Regional (3)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (6)	Moderate (6)

Probability	Improbable (2)	Vey improbable (1)
Significance	**Low (26)**	**Low (13)**
Status (positive or negative)	Negative	
Reversibility	Recoverable (3)	
Irreplaceable loss of resources?	No	
Can impacts be mitigated	Yes	

Mitigation:

Planning:

» Retain a buffer (approximately 100 m wide) of intact natural vegetation along the perimeter of the development site.
» Supplement buffer with additional vegetation to increase visual absorption capacity. Consult an ecologist with respect to appropriate species and placement.
» Retain and maintain natural vegetation in all areas outside of the development footprint.

Operation:

» Maintain the general appearance of the PV plant as a whole, including buffer areas.

Decommissioning:

» Remove infrastructure not required for the post-decommissioning use of the site. This may include the PV panels, maintenance buildings, security buildings, workshop, access roads etc.
» Rehabilitate all areas. Consult an ecologist regarding rehabilitation specifications.
» Monitor rehabilitated areas post-decommissioning and implement remedial actions.

Cumulative impacts:

» The construction of the PV plant and ancillary infrastructure will increase the cumulative visual impact of electrical infrastructure within the region. This is relevant in light of the major distribution power lines and Taaiputs Substation near to the site as well as the approved Eskom and Khi CSP facilities, both located west of Upington. Other solar facilities are also proposed in the area, but have not yet been approved.

Residual impacts:

» The visual impact will be removed after decommissioning, provided the PV plant and ancillary infrastructure is removed. Failing this, the visual impact will remain.

Implications for Project Implementation

» The visual environment surrounding the site, especially within a 2.5 km radius, will be visually impacted upon for the anticipated operational lifespan of the facility (i.e. 20 - 30 years).
» In terms of screening, a 100 m buffer of intact natural vegetation may be retained along the perimeter of the development site. This measure will give some distance between the facility footprint and the visual receptors. Of relevance is that the PV panels will remain visible within this landscape. However, with a buffer in place, the facility will remain evident, but will not dominate the visual landscape to such a degree.

6.3.5 Social Environment

Impacts on the social environment are expected to be associated with both the construction and operational phases of the proposed facility.

During the construction phase of the project potential positive impacts may include creation of employment and business opportunities and opportunity for skills development and on-site training. Negative impacts may include the presence of construction workers on site; influx of job seekers to the area; loss of farm labour to the construction phase; increased risk of stock theft, poaching and damage to farm infrastructure; increased risk of veld fires; threat to safety and security of farmers; impact of heavy vehicles, including damage to roads, safety, noise and dust; and potential loss of grazing land associated with construction-related activities.

Positive impacts that may materialise during the operational phase include creation of employment and business opportunities; skills development and training; and the establishment of renewable energy infrastructure. Negative impacts may include influx of job seekers to the area; loss of farm workers to jobs associated with the operational phase; visual impacts and associated impact on sense of place; and potential impact on tourism.

Impact tables summarising the significance of social impacts associated with the construction phase

Nature: Employment / business opportunities and skills development during construction

Approximately 50 - 100 people are expected to be employed during the construction phase, of which 10% will be low skilled positions, 20% semi-skilled, and 70% skilled. Low skilled and semi-skilled positions will ideally be filled by locals living in and around Kakamas and Keimoes.

People from the local communities are likely to be in a position to qualify for the majority of the low skilled and some of the semi-skilled employment opportunities. The majority of these employment opportunities are also likely to accrue to Historically Disadvantaged (HD) members from the local community, specifically residents of Keimoes and Kakamas. Given the high local unemployment levels and limited job opportunities in the area, this will represent a significant, if localised, social benefit.

Given the technical nature of the project and high import content, the opportunities for the local economy and the towns of Keimoes and Kakamas are likely to be limited. However, opportunities are likely to exist for local contractors and engineering companies in Upington. A percentage of the wage bill will be spent in the local economy and will create opportunities for local businesses in Keimoes, Kakamas, and Upington. The sector of the local economy that is most likely to benefit from the proposed development is the local

service industry. The potential opportunities for the local service sector would be linked to accommodation, catering, cleaning, transport and security, etc. associated with the construction workers on the site.

The hospitality industry in the local towns of Keimoes, Kakamas and Upington is also likely to benefit from the provision of accommodation and meals for professionals (engineers, quantity surveyors, project managers, product representatives etc.) and other (non-construction) personnel involved on the project.

The developer has indicated that training and skills development will be provided by the contractors appointed to manage the construction phase. However, the majority of benefits are likely to accrue to personnel employed by the relevant contractors.

The construction phase will also support a number of key strategies listed in the Kai! Garib IDP aimed at addressing poverty and unemployment in the region. These include, skills development and capacity building programmes especially amongst the youth, promotion of private sector and business partnerships as well as community partnerships, and promotion of BBBEE and support for small business.

	Without enhancement	***With enhancement***
Extent	Local – Regional (2)	Local – Regional (4)
Duration	Short term (2)	Short term (2)
Magnitude	Moderate (6)	High (8)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Moderate (40)**	**High (64)**
Status (positive or negative)	Positive	
Reversibility	N/A	
Irreplaceable loss of resources	N/A	
Can impacts be mitigated	Yes	

Enhancement:

Employment

» Appoint local contractors as far as possible and implement a 'locals first' policy, especially for semi and low-skilled job categories.

» Employ local contactors that are compliant with Black Economic Empowerment (BEE) criteria.

» Establish the existence of a skills database for the area.

» Where feasible, training and skills development programmes for locals should be initiated prior to the initiation of the construction phase.

» The recruitment selection process should seek to promote gender equality and the employment of women wherever possible.

Business

» Establish a database of local companies, specifically BEE companies, which qualify as potential service providers (e.g. construction companies, catering companies, waste collection companies, security companies etc.) prior to the commencement of the tender process for construction contractors.

Cumulative impacts:

» Opportunity to up-grade and improve skills levels together with other proposed

development in the area.

Residual impacts:

» Skills gained during the construction phase could be used in other employment opportunities once the construction activities are completed.

Nature: Employment / business opportunities and skills development during operation

The creation of sustainable employment opportunities has been identified as key priorities in the IDP. Current unemployment in the area is high and is exacerbated by seasonal unemployment in the agricultural sector, which is the main source of employment in the area. Remittances and social grants therefore represent important sources of income for local communities. The Kai! Garib IDP also lists a number of strategies aimed at addressing poverty and unemployment in the region. These include, skills development and capacity building programmes especially amongst the youth, promotion of private sector and business partnerships as well as community partnerships, and promotion of BBBEE and support for small business. The establishment of the proposed facility has the potential to support a number of key strategies listed in the IDP.

During operation approximately 15 - 30 members of staff will be required. Of this, 20% will be for skilled positions (i.e. electrical engineers and maintenance/plant engineers), and 80% for semi to low skilled positions (i.e. plant cleaning, security and maintenance). The PV plant is expected to be operational for 25+ years.

The majority of the employment opportunities associated with the operational phase is likely to benefit HD members of the community. However, given that the solar energy sector in South Africa is relatively new, the skilled positions may need to be filled by people from other parts of South Africa or even overseas.

Given the location of the proposed facility the majority of permanent staff is likely to reside in the towns of Keimoes and Kakamas. A percentage of the non-local permanent employees may purchase houses in one of these towns, while others may decide to rent. Both options would represent a positive economic benefit for the region. In addition, a percentage of the monthly wage bill earned by permanent staff would be spent in the regional and local economy, which will benefit local businesses in these towns.

The local hospitality industry in Keimoes and Kakamas is also likely to benefit from the operational phase. These benefits are associated with site visits by company staff members and other professionals (engineers, technicians etc.) who are involved in the company and the project but who are not linked to the day-to-day operations.

	Without enhancement	***With enhancement***
Extent	Local and regional (2)	Local and regional (3)
Duration	Long term (4)	Long term (4)
Magnitude	Low (2)	Moderate (6)
Probability	Highly probable (4)	Definite (5)
Significance	**Moderate (32)**	**High (65)**
Status (positive or negative)	Positive	

Reversibility	N/A
Irreplaceable loss of resources	N/A
Can impacts be mitigated	Yes
Enhancement: » Implement a training and skills development programme for locals during the first 5 years of the operational phase. The aim of the programme should be to maximise the number of South African's and locals employed during the operational phase of the project.	
Cumulative impacts: » Opportunity to up-grade and improve skills levels together with other proposed development in the area.	
Residual impacts: » Skills gained could be used in other employment opportunities.	

Nature: Presence of construction workers

While the presence of construction workers does not in itself constitute a social impact, the manner in which construction workers conduct themselves can affect the local community. In this regard the most significant negative impact is associated with the disruption of existing family structures and social networks.

In terms of potentially impacts, local farm workers and residents of Keimoes, Kakamas and smaller settlements along the N14, such as Friersdale, Curries Camp, Bloemsmond and Lutzburg, are potentially at risk. It is estimated that approximately 50% of the construction workers will be non-local and will need to be accommodated during the construction phase. However, there is limited rental housing stock available in the area. A number of non-local construction workers will therefore need to be accommodated in Upington. This will also reduce the potential risk to local communities in the area.

	Without mitigation	***With mitigation***
Extent	Local (3)	Local (2)
Duration	Short term (2) (community) Long term - permanent (5) (people affected by STDs)	Short term (2) (community) Long term –permanent (5) (people affected by STDs)
Magnitude	Low for the community as a whole (4) High - very high (10) (people affected by STDs)	Low for community as a whole (4) High - very high (10) (people affected by STDs)
Probability	Probable (3)	Probable (3)
Significance	**Low (28) (community) Moderate - high (54) (people affected by STDs)**	**Low (24) (community) Moderate - high (51) (people affected by STDs)**
Status (positive or negative)	Negative	

Reversibility	No in case of HIV and AIDS
Irreplaceable loss of resources	Yes, if people contract HIV/AIDS. Human capital plays a critical role in communities that rely on farming for their livelihoods.
Can impacts be mitigated	Yes, to some degree; the risk cannot be eliminated.

Mitigation:

» Implement a 'locals first' policy for construction jobs, specifically for semi and low-skilled job categories;

» Implement an HIV/AIDS awareness programme for all construction workers at the outset of the construction phase.

» The movement of construction workers on and off the site should be closely managed and monitored by the contractors. In this regard the contractors should be responsible for making the necessary arrangements for transporting workers to and from site over weekends or after hours.

» No construction workers, with the exception of security personnel, should be permitted to stay over-night on the site.

Cumulative impacts:

» Impacts on family and community relations that may, in some cases, persist for a long period. Also in cases where unplanned / unwanted pregnancies occur or members of the community are infected by an STD, specifically HIV and or AIDS, the impacts may be permanent and have long term to permanent cumulative impacts on the affected individuals and/or their families and the community. The development of other solar energy projects in the area may exacerbate these impacts.

Residual impacts:

» Impacts on family and community relations are likely to persist for a long period after construction is complete in an area.

Nature: Influx of jobseekers to the area

Large construction projects tend to attract people to the area in the hope that they will secure a job, even if it is a temporary job. These job seekers can in turn become "economically stranded" in the area or decide to stay on irrespective of finding a job or not. Areas of concern are associated with the influx of job seekers include:

» Impacts on existing social networks and community structures
» Competition for housing, specifically low cost housing
» Competition for scarce jobs
» Increase in incidences of crime

These issues are similar to the concerns associated with the presence of construction workers. However, in some instances the potential impact on the community may be greater given that they are unlikely to have accommodation and may decide to stay on in the area. In addition, they will not have a reliable source of income. The risk of crime associated with the influx of job seekers it therefore likely to be greater. The influx of job-seekers will also place pressure on existing services in the area, specifically housing, education, and medical facilities.

While the proposed facility on its own is unlikely to result in an influx of job seekers during the operational phase, the proposed establishment of a number of solar energy projects in the Kai! Garib area is likely to attract job seekers to the area. These issues are similar to the concerns associated with the influx of jobs seekers during the construction phase and include:

» Impacts on existing social networks and community structures
» Competition for housing, specifically low cost housing
» Pressure on local services, such as schools, clinics etc.
» Competition for scarce jobs
» Increase in incidences of crime

The influx of job seekers will also place pressure on community services, such as housing, schools and clinics.

	Without mitigation	***With mitigation***
	Construction	
Extent	Local (3)	Local (2)
Duration	Permanent (5) (job seekers that stay in the town)	Permanent (5) (job seekers that stay in the town)
Magnitude	Low (4) (community) High - very high (10) (individuals affected by STDs)	Minor (2) (community) High - very high (10) (individuals affected by STDs)
Probability	Probable (3)	Probable (3)
Significance	**Moderate (36) (community)** **Moderate - high (54) (individuals affected by STDs)**	**Low (27) (community)** **Moderate - high (51) (individuals affected by STDs)**
	Operation	
Extent	Local (3)	Local (2)
Duration	Permanent (5) (job seekers that stay in the town)	Permanent (5) (job seekers that stay in the town)
Magnitude	Low (4) (community) High - very high (10) (individuals affected by STDs)	Minor (2) (community) High - very high (10) (individuals affected by STDs)
Probability	Probable (3)	Probable (3)
Significance	**Moderate (24) (community)** **Moderate - high (54) (individuals affected by STDs)**	**Low (27) (community)** **Moderate - high (51) (individuals affected by STDs)**
Status (positive or negative)	Negative	
Reversibility	No in case of HIV and AIDS	

Irreplaceable loss of resources	Yes, if people contract HIV/AIDS. Human capital plays a critical role in communities that rely on farming for their livelihoods.
Can impacts be mitigated	Yes, to some degree; the risk cannot be eliminated.

Mitigation:

» Investigate the option of establishing a Local Community Forum to monitor and identify potential problems that may arise due to the influx of job seekers to the area. The Forum should also include the other proponents of solar energy projects in the area.

» Implement a policy that no employment will be available at the gate.

Cumulative impacts:

» While the proposed facility on its own does not necessarily constitute a large construction project, the proposed establishment of a number of other solar energy projects in the Kai! Garib Municipality is likely to attract job seekers to the area. As in the case of construction workers employed on the project, the actual presence of job seekers in the area does not in itself constitute a social impact. However, the manner in which they conduct themselves can affect the local community.

Residual impacts:

» Impacts on family and community relations may persist for a long period after construction is complete in an area.

Nature: Loss of farm labour during construction

Local farmers are unlikely to be in a position to compete with the salaries offered by the solar energy companies during the construction phase. As a result farm labourers may be tempted to resign from their current positions on farms. The loss of skilled and experienced farm labour would have a negative impact on local farmers.

While the proposed facility on its own is unlikely to result in a significant loss of farm labour, the establishment of a number of other solar energy projects in the Kai! Garib Municipality has the potential to impact on the farming sector. The local farmers interviewed during the social impact assessment indicated that they did not regard the potential loss of farm labour as key issue of concern.

The potential impacts for the affected farmers associated with the loss of permanent farm labour to the construction phase are exacerbated by the security of tenure that permanent farm labourers enjoy in terms of the Extension of Security and Tenure Act (ESTA). Those farm labourers which are eligible under ESTA and who take up jobs during the construction phase will be entitled stay on in their houses on the farms in question. The net effect is that the farmer may have to incur the costs associated with the construction of new dwellings for new labour appointed to replace the labour lost to the construction phase. The farmer may also have to continue subsidizing services such as potable water to people who are no longer in his employ.

The farm workers that take up jobs during the construction phase are also at risk. While some farm workers may be re-employed once the construction has been completed, others may not be so fortunate. The low education levels associated with the farm worker

community would effectively mean that alternative employment opportunities outside the agricultural sector will not be accessible to them. These farm workers and their families therefore stand to be negatively impacted upon in the medium to long term.

	Without mitigation	***With mitigation***
Extent	Local and regional (3)	Local and regional (3)
Duration	Short term (2)	Short term (2)
Magnitude	Low (4)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	**Low (27)**	**Low (27)**
Status (positive or negative)	Negative	
Reversibility	Yes, if farm workers return of are replaced	
Irreplaceable loss of resources	No	
Can impacts be mitigated	Yes, to some degree; the risk cannot be eliminated.	

Mitigation:

» While the proponent could liaise with local farmers in the area and take steps not to employ farm worker were possible, it is not possible to prevent farm workers from applying for work in other sectors. There are therefore no recommended mitigation measures. Also it is assumed that farm labour can be replaced. The impacts would therefore be temporary.

» Farm workers who apply for construction related work should also be informed that the nature of the work is temporary. In addition they should be informed of the potential negative consequences of their actions, which include the potential loss of their permanent farm job.

Cumulative impacts:

» While the proposed PV facility on its own is unlikely to result in a significant loss of farm labour, the proposed establishment of a number of solar energy projects near Kakamas has the potential to impact on the farming sector.

Residual impacts:

» Some farm workers may not be able to find employment once the construction has been completed. These farm workers and their families therefore stand to be negatively impacted upon in the medium to long term.

Nature: Stock theft, and or poaching, and damage to farm infrastructure

The potential risk applies to local farms located adjacent to the site. The presence on and movement of construction workers on and off the site poses a potential threat to farm infrastructure, such as fences and gates, which may be damaged. Stock losses may also result from gates being left open and/or fences being damaged. Plastic waste also poses a risk to livestock if ingested.

	Without mitigation	***With mitigation***
Extent	Local (3)	Local (2)
Duration	Very short term (1)	Very short term (1)
Magnitude	Low (4)	Low (4)
Probability	Probable (3)	Probable (3)

Significance	**Low (24)**	**Low (21)**
Status (positive or negative)	Negative	
Reversibility	Yes, compensation paid for proven stock and crop losses etc.	
Irreplaceable loss of resources	No	
Can impacts be mitigated	Yes	

Mitigation:

- The developer should enter into an agreement with the local farmers in the area whereby proven damages to farm property etc. during the construction phase will be compensated for. The agreement should be signed before the construction phase commences.
- The developer should hold contractors liable for compensating farmers and communities in full for any proven stock losses and/or damage to farm infrastructure that can be linked to construction workers.
- Contractors must ensure that all workers are informed at the outset of the construction phase of the conditions contained on the Code of Conduct, specifically consequences of stock theft and trespassing on adjacent farms.
- The housing of construction workers on the site should be strictly limited to security personnel.

Cumulative impacts:

- Cumulative impacts may occur as a result of multiple solar energy developments in the area.

Residual impacts:

- Residual impacts may occur where stock theft, and or poaching, and damage to farm infrastructure financially affected the landowner post the construction phase.

Nature: Increased risk of veld fires

The presence of construction workers and construction-related activities on the site poses an increased risk of veld fires that in turn pose a threat to the livestock, wildlife, and farmsteads in the area. In the process, farm infrastructure may also be damaged or destroyed and human lives threatened.

- The potential risk of veld fires is heightened by windy conditions in the area, specifically during the dry, winter months.
- The dominant agricultural activity in the area is stock farming (beef cattle and sheep). As such, the livelihoods of the farmers in the area are dependent on grazing on their farms. Any loss of grazing due to a fire would therefore impact negatively on the affected farmers livelihoods.
- The risk of fire related damage is exacerbated by the distance to fire-fighting vehicles located in the nearest town of Keimoes and Kakamas.

	Without mitigation	***With mitigation***
Extent	Local (3)	Local (2)
Duration	Short term (2)	Very short term (1)
Magnitude	Moderate (6)	Low (4)

Probability	Probable (3)	Probable (3)
Significance	**Moderate (33)**	**Low (21)**
Status (positive or negative)	Negative	
Reversibility	Yes, compensation paid for proven stock and crop losses etc.	
Irreplaceable loss of resources	No	
Can impacts be mitigated	Yes	

Mitigation:

» No open fires on the site for cooking or heating except in designated areas.

» Construction related activities that pose a potential fire risk (i.e. welding), are properly managed, and confined to areas where the risk of fires has been reduced.

» Measures to reduce the risk of fires include clearing working areas and avoiding working in high wind conditions when the risk of fires is greater.

» In this regard special care should be taken during the high risk dry, windy winter months.

» Provide adequate fire fighting equipment on-site.

» Provide fire-fighting training to selected construction staff.

» As per the conditions of the Code of Good Conduct, in the advent of a fire being caused by construction workers and or construction activities, the appointed contractors must compensate farmers for any damage caused to their farms. The contractor should also compensate the fire fighting costs borne by farmers and local authorities.

Cumulative impacts:

» With multiple proposed solar facility and renewable energy development proposed for the area, the risk of veld fires increases.

Residual impacts:

» No residual impacts are expected provided losses proved to be caused by construction activities are compensated.

Nature: Impact of construction vehicles

The movement of heavy construction vehicles during the construction phase has the potential to damage roads and create noise, dust, and safety impacts for other road users and local communities in the area. Access to the site will be via the N14.

The N14 is heavily utilised, specifically during the grape harvesting season (December to January). However, unlike wind energy projects, the transportation requirements for solar facilities do not involve typically large, abnormal loads. The potential impacts associated with the movement of construction related vehicles are therefore likely to be low with mitigation.

	Without mitigation	***With mitigation***
Extent	Local (2)	Local (1)
Duration	Short term (2)	Short term (2)
Magnitude	Low (4)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	**Low (24)**	**Low (15)**

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

Mitigation:

» Damage caused to roads by the construction related activities, including heavy vehicles, should be repaired before the completion of the construction phase. The costs associated with the repair must be borne by the contractor.

» Dust suppression measures must be implemented for heavy vehicles such as wetting of gravel roads on a regular basis and ensuring that vehicles used to transport sand and building materials are fitted with tarpaulins or covers.

» All vehicles must be road-worthy and drivers must be qualified, made aware of the potential road safety issues, and need for strict speed limits.

Cumulative impacts:

» If damage to roads is not repaired then this will affect the farming activities in the area and result in higher maintenance costs for vehicles of local farmers and other road users. The costs will be borne by road users who were no responsible for the damage.

Residual impacts:

» As per the cumulative impacts.

Nature: Loss of farmland

The farm covers an area of 4 500 ha and the current farming activities consist of 140 beef cattle and 200 sheep. A total area of 400 ha is required for the facility. The loss of land to the PV plant is not expected to affect the current farming activities. In addition the rental income from the 20 year lease agreement with the developer will compensate for any loss in farming related income.

	Without mitigation	***With mitigation***
Extent	Local (1)	Local (1)
Duration	Long term - permanent (5)	Short term (2)
Magnitude	Minor (2)	Minor (2)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Moderate (32)**	**Low (20)**
Status (positive or negative)	Negative	
Reversibility	Yes	
Irreplaceable loss of resources	Yes	
Can impacts be mitigated	Yes	

Mitigation:

» All areas disturbed by construction related activities, such as access roads on the site, construction platforms, workshop area etc., should be rehabilitated at the end of the construction phase;

» The implementation of a rehabilitation programme should be included in the terms of reference for the contractor/s appointed. The specifications for the rehabilitation programme should be drawn up a suitably qualified ecologist.

Cumulative impacts:

» Overall loss of farmland could affect the livelihoods of the affected farmer, and the workers on the farm and their families. However, areas to be affected by development are not currently used for cultivation, and can be rehabilitated.

Residual impacts:

» None.

Nature: Development of clean, renewable energy

South Africa currently relies on coal-powered energy to meet more than 90% of its energy needs. As a result South Africa is one of the highest per capita producers of carbon emissions in the. The establishment of a clean, renewable energy facility will therefore reduce, albeit minimally, South Africa's reliance on coal-generated energy and the generation of carbon emissions into the atmosphere.

The overall contribution to South Africa's total energy requirements of the proposed PV facility is relatively small. However, the 200 MW produced from the facility will help to offset the total carbon emissions associated with energy generation in South Africa. Given South Africa's reliance on Eskom as a power utility, the benefits associated with an IPP based on renewable energy are regarded as an important contribution.

	Without enhancement	***With enhancement***
Extent	Local, regional and national (4)	Local, regional and national (4)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Moderate (6)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Moderate (48)**	**Moderate (56)**
Status (positive or negative)	Positive	
Reversibility	N/A	
Irreplaceable loss of resources	N/A	
Can impacts be enhanced	Yes	

Enhancement:

» Use the project to promote and increase the contribution of renewable energy to the national energy supply.

» Maximise the public's exposure to the project via an extensive communication and advertising programme.

Cumulative impacts:

» The reduction of carbon emissions via the use of renewable energy and associated benefits in terms of global warming and climate change. .

Residual impacts:

» As per the cumulative impacts.

Implications for Project Implementation

» The creation of employment and business opportunities and the opportunity for skills development and on-site training for previously disadvantaged individuals is expected to represent a significant positive social benefit in an area with limited employment opportunities.
» The proposed development also represents an investment in clean, renewable energy infrastructure, which, given the challenges created by climate change, represents a positive social benefit for society as a whole.

6.4 Summary of Impacts

As a summary of the potential impacts identified and assessed through the EIA process, the following provide a tabular representation of the significance ratings for the potential biophysical and social impacts.

As a summary of the potential impacts identified and assessed through the EIA process, the following table provides a summary of the impact rating.

Nature	***Without mitigation***	***With mitigation***
Potential impacts on Flora, Fauna, and Ecology		
Impacts on indigenous natural terrestrial vegetation	Moderate	Moderate
Impacts on plant species of conservation concern	Moderate	Low
Impacts on protected tree species	Moderate	Low
Loss of habitat for threatened animals	Low	Low
Establishment and spread of declared weeds and alien invader plants	Moderate	Low
Impacts on watercourses	Moderate	Moderate
Potential impacts on Geology, Soil, and Erosion Potential		
Disturbance of soils and land use	Moderate	N/A
Soil degradation through the use of vehicles and machinery on-site	Low	Moderate
Impact on agricultural potential	Moderate	N/A
Dust pollution	Low	Low
Potential impacts on Heritage Sites		
Impact on heritage resources at identified site 1	Moderate	Low
Potential Visual Impacts		
Construction phase on observers in close proximity to the proposed PV plant	Moderate	Low

Nature	***Without mitigation***	***With mitigation***
Residents of farms and homesteads in close proximity to the proposed PV plant	Low	Low
Access roads on users of main and secondary roads in close proximity to the proposed PV plant	Moderate	Low
Transformer, substation, and other ancillary buildings on observers in close proximity to the proposed PV plant	Moderate	Low
Power line on observers in close proximity thereto	Low	N/A
Lighting at night on observers in close proximity to the proposed PV plant	Moderate	Low
Tourist access routes and tourist destinations within the region	Low	Low
Visual character of the landscape and the sense of place of the region	Low	Low

Potential Social Impacts (mitigation or enhancement measures may apply)		
Employment / business opportunities (construction)	Moderate	High (positive)
Employment / business opportunities (operation)	Moderate	High (positive)
Influx of jobseekers (construction) (worst case scenario)	Moderate	High (negative)
Influx of jobseekers (operation) (worst case scenario)	Moderate	High (negative)
Presence of construction workers (worst case scenario)	Moderate	High (negative)
Loss of farm labour during construction	Low	Low
Stock theft, poaching, and damage to farm infrastructure	Low	Low
Increased risk of veld fires	Moderate	Low
Impact of construction vehicles	Low	Low
Loss of farmland	Moderate	Low
Development of clean, renewable energy	Moderate	Moderate

From the table above, it is clear that the majority of impacts associated with the proposed development are of moderate to low significance and that all impacts can be mitigated to acceptable levels. In addition, positive impacts have been identified for the social environment at a local and regional scale. These can be of high significance with the implementation of recommended enhancement measures.

6.5 Assessment of Potential Cumulative Impacts

A cumulative impact, in relation to an activity, refers to the impact of an activity that in itself may not be significant, but may become significant when added to the existing and potential impacts eventuating from similar or diverse undertakings in the area[10]. The cumulative impacts associated with the proposed facility primarily refer to those impacts associated with ecology, visual and social impacts, and are mainly associated with the agricultural activities in the area as well as with other developments of a similar nature proposed within the broader region.

» *Ecology* – impacts as a result of loss of natural vegetation to agricultural activities and development of natural land. As facilities such as that proposed result in the loss of vegetation and habitats within the footprint of the development site, numerous developments of a similar nature within one area could result in cumulative impacts on sensitive species of conservation concern as well as on protected species. Although other solar facilities are proposed in the Upington, Keimoes, Kakamas areas, the overall cumulative impact on vegetation is expected to be limited in comparison to the extent of affected vegetation types in the area.

» *Agricultural Potential* – future proposed development in the study area may lead to an impact on the agricultural potential of the region. However, with respect to this facility the cumulative impact will be small as the site has low agricultural potential.

» *Heritage* – impacts on heritage resources relate to the loss of heritage sites as well as a change in the sense of place of an area. Numerous developments within an area could therefore result in a significant impact in this regard if appropriate mitigation measures are not implemented. This may be the case since several heritage sites have already been identified within this project development site which have a medium to high significance. Residual impacts because of numerous proposed developments may lead to Depletion of Archaeological record of the area. However, this potential impact can be easily mitigated through the avoidance of such sites or, where this is not possible, through the excavation and recording of the sites prior to disturbance or destruction.

» *Visual* – The establishment of a number of large solar facilities in the area (including three proposed by NetWorx S28 Energy) has the potential to have a negative cumulative impact on the area's sense of place and the landscape. The construction of the facility and its associated infrastructure will increase

[10] Definition as provided in the EIA Regulations, 2010 (GNR 543).

the cumulative visual impact of electricity related infrastructure within the region. However, significant impacts are expected to be restricted to within 2.5 - 4 km of the facility due to the limited height of the structures (i.e. 4 m) and can be further mitigated through the retention of a vegetation buffer around the perimeter of the site.

» *Social* – The development of the facility will have a cumulative impact on several existing issues within the area, predominately within rural settlements associated with the potential influx of workers and job seekers. With the increased population density, this may lead to a cumulative impact on housing requirements, services (i.e. water, electricity and sanitation), health issues, safety and security New informal townships are unlikely to have the required infrastructure and services,. With the existing rural settlements in the area this will have a cumulative impact on the environment and health (i.e. in terms of ablution facilities). This will be impacted on even further with respect to other proposed solar facilities in the area.

» *Positive impacts* - Cumulative positive impacts are, however, also anticipated should a number of similar solar developments be developed in the area, largely due to job creation opportunities, business opportunities for local companies, skills development, and training. The development of renewable energy facilities will have a positive impact at a national and international level through the generation of "green energy" which would lessen South Africa's dependency on coal generated energy and the impact of such energy sources on the bio-physical environment. The proposed project would fit in with the government's aim to implement a significant amount of renewable energy projects as part of the country's energy generation mix over the next 20 years as detailed in the Integrated Resource Plan (IRP).

Cumulative effects have been considered within the detailed specialist studies, where applicable (Refer to Appendices E – I).

6.6 Assessment of the No-Go Alternative

Also referred to as the 'Do-nothing' option, this refers to NetWorx S28 Energy not constructing the proposed Project Ofir-ZX Photovoltaic Plant on the identified site. In this scenario the potential positive and negative environmental and social impacts as described in this EIA will not occur and the status quo will be maintained.

Should the project not proceed, the contribution of up to 200 MW from this project towards the Government target for renewable energy will not be realised. As a result the potential local and regional socio-economic and environmental

benefits expected to be associated with the proposed project would not be realised. These include:

» *Increased energy security:* The current electricity crisis in South Africa highlights the significant role that renewable energy can play in terms of power supplementation. In addition, given that renewables can often be deployed in a decentralised manner close to consumers, they offer the opportunity for improving grid strength and supply quality, while reducing expensive transmission and distribution losses. In the case of the proposed facility, the evacuation of the power will strengthen the local Northern Cape grid.

» *Exploitation of our significant renewable energy resource:* At present, valuable national resources including biomass by-products, solar radiation and wind power remain largely unexploited. The use of these energy flows will strengthen energy security through the development of a diverse energy portfolio.

» *Pollution reduction:* The releases of by-products through the burning of fossil fuels for electricity generation have a particularly hazardous impact on human health and contribute to ecosystem degradation.

» *Support for international agreements:* The effective deployment of renewable energy provides a tangible means for South Africa to demonstrate its commitment to its international agreements under the Kyoto Protocol, and for cementing its status as a leading player within the international community.

» *Employment creation:* The sale, development, installation, maintenance, and management of renewable energy facilities have significant potential for job creation in South Africa.

» *Acceptability to society:* Renewable energy offers a number of tangible benefits to society including reduced pollution concerns, improved human, and ecosystem health.

» *Support to a new industry sector:* The development of renewable energy offers the opportunity to establish a new industry within the South African economy.

Within a policy framework, the development of renewable energy in South Africa is supported by the White Paper on Renewable Energy (November 2003), which has set a target of 10 000 GWh renewable energy contributions to final energy consumption by 2013. The target is to be achieved primarily through the development of solar, biomass, solar and small-scale hydro.

The 'Do-nothing' alternative will not assist the South African government in addressing climate change, in reaching the set targets for renewable energy, nor will it assist in supplying the increasing electricity demand within the country. In addition the Northern Cape power supply will be deprived of an opportunity to benefit from the additional generated power being evacuated directly into the Province's grid. The 'Do-nothing alternative is, therefore, not a preferred alternative.

CONCLUSIONS AND RECOMMENDATIONS CHAPTER 7

In order to be able to adequately provide for the growing electricity demand within South Africa, the addition of new generation capacity is required. The Department of Energy has in its Integrated Resource Plan (IRP) determined that 42% of this new capacity should be produced through renewable energy, mainly solar and wind. This will be achieved through the installation of ~17.8 GW by 2030 of renewable energy technologies as part of the power generation mix. Much of this power generation is expected to be derived from projects planned and developed by independent power producers (IPPs).

As such NetWorx S28 Energy, as an IPP, is investigating the establishment of a 200 MW solar energy facility and associated infrastructure for the purpose of commercial electricity generation. The broader site comprises on the remaining extent of Farm 616, located approximately 5 km north- west of Keimoes in the Northern Cape. The proposed farm portion covers an area 4 500 ha (refer to Figure 7.1). The proposed facility will be comprised of the following primary elements (refer to Chapter 2 for more details):

» Numerous arrays of PV panels, which will be linked together to form individual strings, with a maximum generating capacity of 200 MW.
» An inverter situated at the end of each "string" in order to switch the power from direct current (DC) to alternating current (AC).
» Underground cabling of 33 kV in order to distribute the power to a central on-site substation.
» A transformer together with the on-site substation to step–up the power from 33 kV to 132 kV, to be distributed between the plant and the Eskom grid.
» Connection of the PV plant to the power distribution grid. An existing 132 kV distribution line, which connects the Taaiputs Substation at Kakamas and the Oasis Substation at Keimoes crosses the southern portion of the site. It is proposed that a new 132 kV power line will be built from the on-site substation to connect with the existing power line.
» Internal access roads for construction and maintenance purposes.
» Maintenance, security buildings, and a workshop.
» Solar kiosk (education centre).

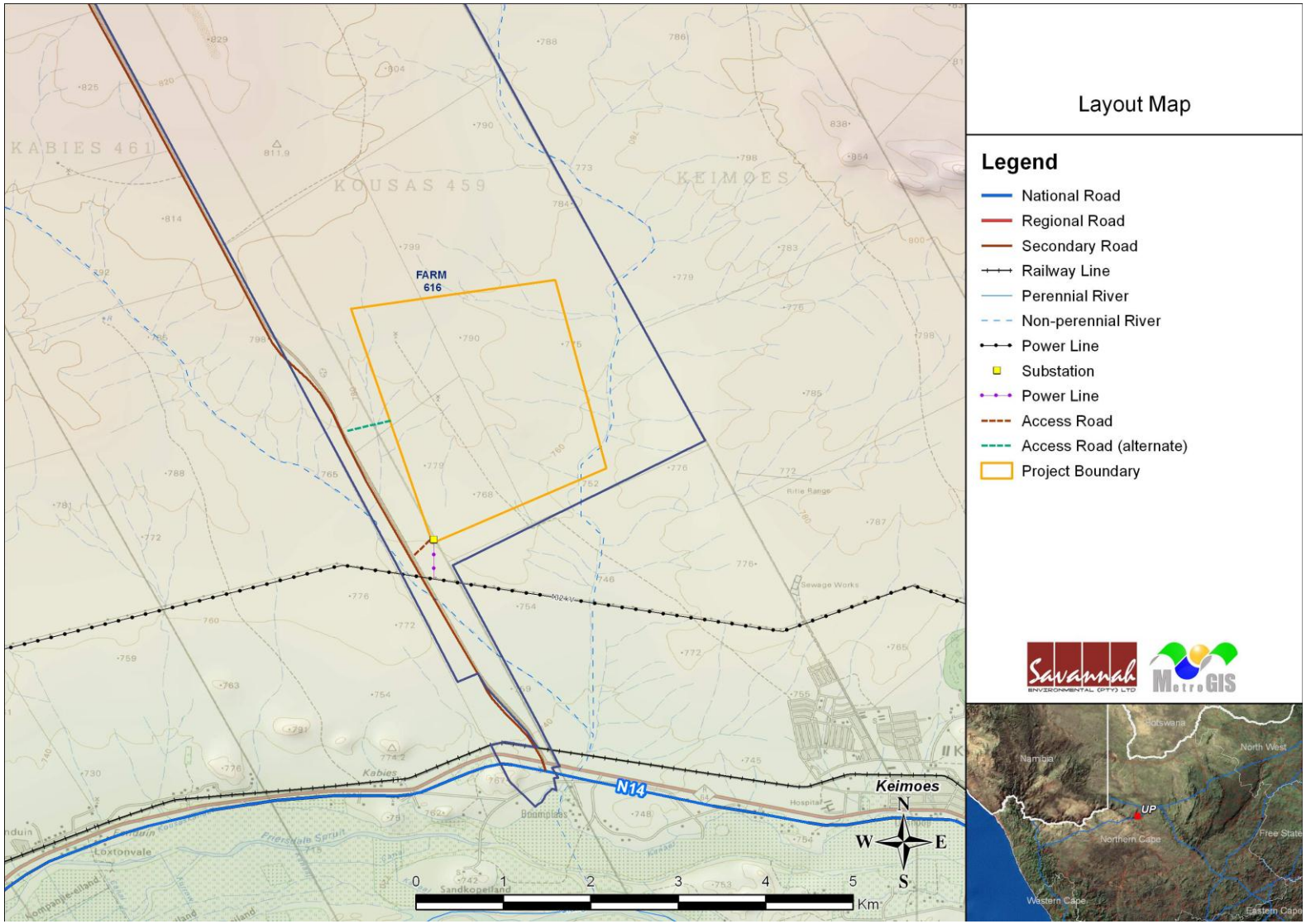

Figure 7.1: The identified development site showing the proposed infrastructure

7.1 Requirements of the EIA Process

An EIA process, as defined in the NEMA EIA Regulations, is a systematic process of identifying, assessing, and reporting environmental impacts associated with an activity. The EIA process forms part of the feasibility phase of a project and informs the final design of a development. In terms of the EIA Regulations published in terms of Section 24(5) of the National Environmental Management Act (NEMA, Act No. 107 of 1998), NetWorx S28 Energy requires authorisation from the National Department of Environmental Affairs (DEA) (in consultation with the Northern Cape Department of Environment and Nature Conservation (DENC)), for the establishment of the proposed facility.

In terms of sections 24 and 24D of NEMA, as read with the EIA Regulations of GNR543, GNR544, GNR545; and GNR546, a Scoping and an EIA Phase have been undertaken for the proposed project. As part of this EIA process comprehensive, independent environmental studies have been undertaken in accordance with the EIA Regulations. The following key phases have been involved thus far in the EIA Process.

» *Notification Phase* - organs of state, stakeholders, and interested and affected parties (I&APs) were notified of the proposed project using adverts, site notices, background information documents, and stakeholder letters. Details of registered parties have been included within an I&AP database for the project.
» *Scoping Phase* – potential issues associated with the proposed project and environmental sensitivities (i.e. over the broader project development site), as well as the extent of studies required within the EIA Phase were identified.
» *EIA Phase* – potentially significant biophysical and social impacts[11] and identified feasible alternatives put forward as parts of the project have been comprehensively assessed. Appropriate mitigation measures have been recommended as part of a draft Environmental Management Programme (EMP).

7.2 Assessment of Alternatives

As discussed in Chapter 2, no feasible alternatives have been identified for this proposed project. Therefore, no alternatives are comparatively assessed within this report.

[11] Direct, indirect, cumulative that may be either positive or negative.

7.2.1 No-go alternative

Also referred to as the 'Do-nothing' option, this refers to NetWorx S28 Energy not constructing the proposed Project Ofir-ZX PV Plant on the identified site north-west of Keimoes. Should the project not proceed, the contribution of up to 200 MW towards the Government target for renewable energy. As a result the potential local and regional socio-economic and environmental benefits expected to be associated with the proposed project would not be realised. These include the following (as discussed in Chapter 6).

» Increased energy security;
» Exploitation of our significant renewable energy resource;
» Pollution reduction;
» Support for international agreements;
» Employment creation;
» Acceptability to society; and
» Support to a new industry sector.

Within a policy framework, the development of renewable energy in South Africa is supported by the White Paper on Renewable Energy (November 2003), which has set a target of 10 000 GWh renewable energy contributions to final energy consumption by 2013. The target is to be achieved primarily through the development of solar, biomass, solar and small-scale hydro. Subsequently, the Department of Energy has in its Integrated Resource Plan (IRP) determined that 42% of this new capacity should be produced through renewable energy. This will be achieved through the installation of ~17.8 GW by 2030 of renewable energy technologies as part of the power generation mix.

The 'Do-nothing' alternative will not assist the South African government in addressing climate change, in reaching the set targets for renewable energy, nor will it assist in supplying the increasing electricity demand within the country. In addition the Northern Cape power supply will be deprived of an opportunity to benefit from the additional generated power being evacuated directly into the Provinces' grids. The 'Do-nothing alternative is, therefore, not a preferred alternative.

7.3 Nomination of the Project Development Site

The Northern Cape was nominated for the establishment of the proposed facility primarily due to the solar resource. The broader project development site was selected based on several key factors including site access, proximity to an evacuation point, and land availability. From an environmental perspective, the broader development site is preferred due to the following.

» The site does not fall within a Critical Biodiversity Area or Biosphere Reserve.
» The site does not fall within a World Heritage Site.
» No wetland areas protected according to international conventions occur near the site.

The area proposed for the placement of the PV panels within the broader site is preferred as it avoids the identified environmental sensitivities (i.e. the majority of the drainage lines) and elevated areas (i.e. the site and the immediate surrounding area is generally flat, sloping gently to the south towards the Orange River.

7.4 Evaluation of the Proposed Project

The preceding chapters of this report together with the specialist studies contained within Appendices E - I provide a detailed assessment of the potential impacts on the social and biophysical environment that may result from the proposed project. This chapter concludes the EIA Report by providing conclusions of the assessment of the proposed facility. In doing so, it draws on the information gathered as part of the EIA Process and the knowledge gained by the environmental consultants and presents an informed opinion of the potential environmental impacts.

No environmental fatal flaws were identified to be associated with the proposed facility. However the following potentially significant environmental impacts have been identified through the EIA Phase.

» Local site specific impacts resulting from the physical modification/disturbance of the site primarily during the construction phase.
» Impacts associated with the power lines.
» Impacts on the social environment.

7.4.1 Local Site-Specific Impacts

PV technology typically requires a large area for the establishment of the panels (i.e. in this scenario a minimum of 395 ha of the broader 4 500 ha site will be permanently utilised by the panels and associated infrastructure, including the servitude required for the power line). During the construction phase local site-specific impacts may occur because of physical disturbance/modification to the site; these include:

» Impacts on biodiversity which includes any impacts on protected / threatened trees, plant or animal species
» Impacts on sensitive habitats (i.e. drainage lines located across the site), that leads to direct or indirect loss of such habitat.

» Soil degradation, wind/water erosion and subsequent sedimentation of drainage lines.

These impacts will be associated with the establishment of project infrastructure and along the linear infrastructure (i.e. power lines and access road servitudes). These impacts are expected to be of moderate to low significance and can be mitigated to acceptable levels through the implementation of appropriate management measures. From the assessment undertaken, it was concluded that the impacts on ecology associated with the proposed facility would be acceptable with the implementation of mitigation measures.

7.4.2 Impacts associated with the Power Line

It is proposed to connect the PV plant to an existing 132 kV distribution line, which connects the Taaiputs Substation at Kakamas and the Oasis Substation at Keimoes. The new 132 kV power line will be built from the on-site substation to turn into and out of the existing power line. This means that two lines are actually required. A servitude of approximately 35 m in width for each power line will need to be established. Only the centre line of the servitude may need to be cleared for stringing purposes. The reminder of the servitude will not be cleared, except where trees higher than 4 m exist which could interfere with the operation of the power line. Where no access to the servitude exists, new access roads would need to be constructed. Construction work associated with the power line will be undertaken by an Eskom approved contractor.
Impacts which may result from the proposed power lines include the potential ecological impact due to:

» *Visual impact* - potential visual impacts associated with the proposed power lines are not possible to mitigate. Visual receptors are, however, limited, and the presence of the existing power line that will be turned into/out of will 'absorb' the potential visual impact on users of the N14 to the south. This will reduce the probability of this impact occurring.
» *Impacts on avifauna* – bird species with a larger wingspan may be susceptible to collisions with the earth wire of the new power line, as well as to electrocution. Large species are particularly prone to collisions as they typically collide with the earth wire as they cannot divert their flight path in time (i.e. Bustards). It is therefore critical that bird-friendly designs are used for the power line towers.

7.4.3 Impacts on the Social Environment

The development of the proposed PV plant will create employment and business opportunities for locals during both the construction and operational phase of the project. In doing so the establishment of the proposed PV plant will support a

number of key strategies listed in the IDP aimed at addressing poverty and unemployment. The establishment of a number of solar energy facilities in the area also has the potential to create significant socio-economic opportunities for the Kai! Garib Municipality. It is therefore recommended that the facility as proposed be supported, subject to the implementation of the recommended mitigation measures and management actions contained in this report.

7.5 Overall Conclusion (Impact Statement)

Global climate change is widely recognised as being one of the greatest environmental challenges facing the world today. How a country sources its energy plays a big part in tackling climate change. As a net off-setter of carbon, renewable energy technologies can assist in reducing carbon emissions, and can play a big part in ensuring security of energy supply, as other sources of energy are depleted or become less accessible. South Africa currently relies on coal-powered energy to meet more than 90% of its energy needs. As a result South Africa is one of the highest per capita producers of carbon emissions in the world and Eskom, as an energy utility, has been identified as the world's second largest producer carbon emissions. With the aim of reducing South Africa's dependency on coal generated energy, and to address climate change concerns, the South African Government has set a target, through the Integrated Resource Plan (IRP) for electricity to develop 17.8 GW of renewables (including 8,4GW solar) within the period 2010 – 2030.

The technical viability of establishing a solar energy facility with a generating capacity of 200 MW on a site near Keimoes has been established. The positive implications of establishing a solar energy facility on the identified site within the Northern Cape include the following:

» The potential to harness and utilise solar energy resources within the Northern Cape.
» The project would assist the South African government in reaching their set targets for renewable energy.
» The project would assist the South African government on the implementation of its green growth strategy and job creation targets.
» The National electricity grid in the Northern Cape would benefit from the additional generated power.
» Promotion of clean, renewable energy in South Africa.
» Creation of local employment, business opportunities and skills development for the area

The findings of the specialist studies undertaken within this EIA to assess both the benefits and potential negative impacts anticipated from the proposed project conclude that there are **no environmental fatal flaws** that should prevent the

proposed facility from proceeding. The majority of impacts identified are of moderate to low significance and can be successfully mitigated to acceptable levels, provided the specifications as detailed within the Environmental Management Programme (EMP) for the project are implemented. With reference to the information available at this planning approval stage in the project cycle, the **confidence** in the environmental assessment undertaken is regarded as **acceptable**.

7.6 Overall Recommendation

Based on the nature and extent of the proposed project, the local level of disturbance predicted as a result of the construction and operation of the facility and associated infrastructure, the findings of the EIA, and the understanding of the significance level of potential environmental impacts, it is the opinion of the EIA project team that the application for the proposed NetWorx S28 Energy Solar Energy Facility can be mitigated to an acceptable level, and therefore that the application for the proposed solar energy facility and associated infrastructure as detailed within this EIA Report be authorised by DEA. The following conditions of this recommendation must be included within the authorisation issued:

» As far as possible, any component of the facility which could potentially affect sensitive areas (i.e. drainage lines) should be shifted in order to avoid these areas of high sensitivity (i.e. best practice is impact avoidance). Where this is not possible, alternative mitigation measures as detailed in this report must be implemented.
» Following the final design of the facility, a revised layout must be submitted to DEA for review and approval prior to commencing with construction.
» Use of existing roads should be made as far as possible.
» An independent Environmental Control Officer (ECO) should be appointed to monitor compliance with the specifications of the EMP for the duration of the construction period.
» The EMP as contained within Appendix J of this report should form part of the contract with the EPC Contractor appointed to construct the proposed solar energy facility, and must be used to ensure compliance with environmental specifications and management measures. The implementation of this EMP for all life cycle phases of the proposed project is considered key in achieving the appropriate environmental management standards as detailed in this report.
» All relevant practical and reasonable mitigation measures detailed within this report and the specialist reports contained within Appendices E to I must be implemented.
» During construction, unnecessary disturbance to habitats should be strictly controlled and the footprint of the impact should be kept to a minimum.

» Disturbed areas should be rehabilitated as quickly as possible once construction is completed in an area, and an on-going monitoring programme should be established to detect, quantify, and manage any alien species.
» A comprehensive stormwater management plan should be compiled and implemented for the developmental footprint prior to construction.
» Applications for all other relevant and required permits required to be obtained by NetWorx S28 Energy must be submitted to the relevant regulating authorities. This includes permits for the transporting of all components (abnormal loads) to site, disturbance to heritage sites, disturbance of protected vegetation, and disturbance to any drainage lines.

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