



**ORLIGHT SA (PTY) LTD**  
**DRAFT SCOPING REPORT**  
**PROPOSED DEVELOPMENT OF FIVE SOLAR**  
**PHOTOVOLTAIC POWER PLANTS IN THE NORTHERN**  
**CAPE AND WESTERN CAPE PROVINCES**

**APPLICANT:**

**ORLIGHT SA (PTY) LTD**



**JANUARY 2012**

<b>SITE</b>	<b>AFFECTED FARM</b>	<b>DEA REF. NO.</b>	<b>NEAS REF. NO.</b>
Aggeneys	Portion 1 of Aroams 57 RD	<b>12/12/20/2630</b>	<b>DEA/EIA/0000818/2011</b>
Kenhardt	Remaining Extent (RE) of Klein Zwart Bast 188 RD	<b>12/12/20/2631</b>	<b>DEA/EIA/0000813/2011</b>
Loeriesfontein	Portion 1 of Klein Rooiberg 227 RD	<b>12/12/20/2632</b>	<b>DEA/EIA/0000825/2011</b>
Vanrhynsdorp	Remaining Extent (RE) of Paddock 257 RD	<b>12/12/20/2633</b>	<b>DEA/EIA/0000822/2011</b>
Graafwater	Portion 1 of Graafwater 97 RD Remaining Extent (RE) of Bueroskraal 220 RD	<b>12/12/20/2636</b>	<b>DEA/EIA/0000828/2011</b>

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ENVIRONMENTAL

This document has been prepared by **Digby Wells Environmental**.

**Report title:** Draft Scoping Report for the proposed Orlight SA (Pty) Ltd – Solar PV Power Plants

**Project number:** BSG 1384

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**AVAILABILITY OF THE DRAFT SCOPING REPORT FOR  
ORLIGHT SA (PTY) LTD  
PROPOSED SOLAR PV POWER PLANTS IN THE NORTHERN CAPE AND WESTERN  
CAPE PROVINCES**

This draft Scoping Report will be made available to all Interested and Affected Parties (I&APs) for review over a period of 40 days from 26 January 2012 to 6 March 2012 at the following venues:

- Black Mountain Recreation Club, Aggeneys;
- Library, Khai !Garib Local Municipal offices, Kenhardt;
- Library, Hantam Local Municipal offices, Loeriesfontein;
- Matzikama Local Municipal offices, Vanrhynsdorp; and
- Community Library, Graafwater.

This report will also be available for download at [www.digbywells.com](http://www.digbywells.com)

**BESKIKBAARHEID VAN DIE VOORLOPIGE KONSEP OMGEWINGSBESTEKOPNAME VERSLAG  
ORLIGHT SA (EDMS) BPK  
VOORGESTELDE FOTOVOLTAIESE SONKRAG PROJEKTE IN DIE NOORD-KAAP EN WES-  
KAAP PROVINSIËS**

Die voorlopige Konsep Omgewingsbestekopname verslag sal aan alle Belanghebbende en Geaffekteerde Partye beskikbaar gestel word vir hersiening oor 'n tydperk van veertig dae vanaf 26 Januarie 2012 tot 6 Maart 2012 by die volgende openbare plekke:

- Black Mountain Ontspanningsentrum, Aggeneys;
- Biblioteek, Khai !Garib Plaaslike Munisipaliteit, Kenhardt;
- Biblioteek, Hantam Plaaslike Munisipaliteit, Loeriesfontein;
- Matzikama Plaaslike Munisipaliteit, Vanrhynsdorp; en
- Gemeenskapsbiblioteek, Graafwater.

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## EXECUTIVE SUMMARY

In line with the growing need for electricity supply and cleaner energy production in South Africa, the Orlight SA (Pty) Ltd (Orlight SA) Solar Photovoltaic (PV) Project was initiated by its holding company, BSG Resources Limited (BSGR). BSGR is an international renowned natural resources company that operates in the fields of mining, energy and engineering services. BSGR established a new company, Orlight SA, for the construction and operation of five new Solar PV Power Plants in the Western Cape and Northern Cape Provinces. This is in line with BSGR's vision and adaptation of clean energy developments for the next generation.

The proposed sites for development of the Orlight SA Solar PV Power Plants are located in the vicinity of the towns of Aggeneys, Kenhardt and Loeriesfontein (Northern Cape Province) and Vanrhynsdorp and Graafwater (Western Cape Province). These sites are located in low populated areas of high solar irradiation and in close proximity to existing Eskom substations and transmission lines, which allows for easy access to the national grid.

The preliminary generation capacities of the proposed Orlight SA Solar PV Power Plants are listed below. During the EIA Phase, studies will be undertaken to determine the optimal generation capacity that can be accommodated in each study area based on their ecological, cultural and socio-economic characteristics and other technical factors:

- Proposed 40 MW up to 150 MW generation capacity on Portion 1 of the farm Aroams 57 RD near Aggeneys in the Namakwa District Municipality, Northern Cape Province;
- Proposed 70 MW up to 100 MW generation capacity on the Remaining Extent (RE) of the farm Klein Zwart Bast 188 RD near Kenhardt in the Siyanda District Municipality, Northern Cape Province;
- Proposed 40 MW up to 150 MW generation capacity on Portion 1 of the farm Klein Rooiberg 227 RD near Loeriesfontein in the Namakwa District Municipality, Northern Cape Province;
- Proposed 20 MW up to 45 MW generation capacity on the RE of the farm Paddock 257 RD near Vanrhynsdorp in the West Coast District Municipality, Western Cape Province; and
- Proposed 35 MW up to 75 MW generation capacity on Portion 1 of the farm Graafwater 97 RD and the RE of the farm Bueroskraal 220 RD near Graafwater in the West Coast District Municipality, Western Cape Province.

Digby Wells Environmental (Digby Wells) was appointed as the independent Environmental Assessment Practitioner (EAP) to conduct the Environmental Impact Assessment (EIA) process for the proposed project and associated activities in accordance with the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA).

An environmental screening assessment was undertaken in December 2011 with the aim of determining the suitability of the proposed study areas for development, taking into consideration the sites' environmental sensitivities and the anticipated impacts of project activities on natural or cultural resources. No major fatal flaws were identified during the screening assessment.

The Scoping Phase commenced in December 2011 with the distribution of information sharing documents to identified stakeholders as part of the Public Participation Process (PPP). Information sharing meetings were held from 10 to 14 January 2012 in the towns nearest to the proposed project sites. The PPP is an on-going process and aims to ensure that all stakeholders stay informed and continue to be consulted throughout the EIA process.

This draft Scoping Report details the findings of the PPP and other environmental, social and cultural assessments undertaken for the proposed project thus far and recommends a Plan of Study for the EIA Phase of the project. A summary of the main social and environmental risks and the recommendations from environmental, social and cultural specialists are summarised in Table A-1. The main PPP findings related to the following aspects:

- Potential employment opportunities;
- Potential training and skills development;
- Water utilisation and management;
- Safety and security regarding potential sheep theft;
- Environmental sensitivity.

From the preliminary environmental, social and cultural assessments that have been undertaken, the proposed project is considered to be a clean, sustainable and potentially viable method of energy generation that will lead to opportunities for local socio-economic development.

The objective of this EIA process is to identify potential impacts associated with the project and thereafter, ensure that the development is undertaken in such a way as to promote the positive impacts (i.e. contribution to fulfilment of national electricity demand, training and skills development and creation of local employment opportunities) and to minimise the negative impacts (i.e. soil erosion, visual disturbance and ecological impacts) of the proposed project.

The impacts listed in Table A-1 are described in more detail in Chapter 7. The severity, duration and scale of these impacts will be evaluated in more detail in the EIA Phase.

Table A-1: Summary of the main environmental, social and cultural impacts and relevant specialist recommendations

ASPECT	POTENTIAL CUMULATIVE IMPACTS	WAY FORWARD / RECOMMENDATIONS
Topography and hydrology	During the construction phase, site clearance and the establishment of the construction lay-down yard and vehicle hard park may lead to a loss of seepage areas. Impacts to water quality may occur during the construction and operational phase as result of domestic waste and sewage management, vehicular activity and cleaning of the solar PV panels.	Suitable buffer zones around drainage lines must be established, within which no construction activities will be allowed. A water management plan must be implemented to ensure separation of dirty and clean water and the utilisation of biodegradable/organic soaps for cleaning must be used when the project commences. Construction infrastructure will be temporary, such as tented warehouses, and where possible exiting permanent infrastructure will be used, such as barns.
Visual	During construction, there may be a change in the aesthetic characteristics of the sites as result of site clearance and dust generation which affects visibility and the visual nature of the areas. Minor visual disturbances may be created due to construction activities, including the construction of a vehicle hard park. The main visual impacts are expected due to the introduction and establishment of large solar panels during the construction and operational phases. Minor visual impacts are expected due to the fencing of the sites.	A Visual Impact Assessment (VIA) must be conducted. The VIA will include the modelling of theoretical and practical viewsheds using Geographic Information Systems (GIS). Information on the visual sensitivity and characteristics of the proposed sites must be gathered. Potential receptors must be identified in an attempt to quantify the extent of the visual impacts on these receptors. The assessments will be used to determine, as accurately as possible, the full range of visual impacts that the Orlight SA Solar PV Power Plants and their respective construction and operational activities will have on the surrounding visual environments.
Fauna and flora	As result of construction activities, a number of negative impacts may occur on fauna and flora, such as: <ul style="list-style-type: none"> <li>• Vegetation removal and destruction;</li> <li>• Habitat destruction affecting mammals, reptiles,</li> </ul>	To mitigate or lessen the potential impacts of the construction and operational activities on fauna and flora, the baseline characterisation of the biological environment must be fully understood through comprehensive flora and fauna studies. It is recommended that two surveys are undertaken in April 2012 and

ASPECT	POTENTIAL CUMULATIVE IMPACTS	WAY FORWARD / RECOMMENDATIONS
	<p>amphibians, avifauna and invertebrates;</p> <ul style="list-style-type: none"> <li>• Increased run off during rain events;</li> <li>• Fencing of the site which will hinder migratory routes of remaining animals; and</li> <li>• Areas underneath of the solar PV panels will create a potential habitat where alien invasive plant species could establish.</li> </ul> <p>As result of the operational activities, such as the cleaning of solar PV panels, the contamination of soil may occur due to the cleaning agents and solvents. Fencing of the site may negatively affect the migratory routes of animals.</p>	<p>early September 2012 to correspond with the flowering season of dominant plant species in the area. Utilisation of biodegradable/organic soaps for cleaning must be used when the project commences.</p>
<p>Soil and agricultural potential</p>	<p>During the construction phase, site clearance and vehicular activity could result in soil erosion, soil compaction, loss of land capability. The land use will be changed, resulting in a loss of grazing land. In addition, potential soil pollution and loss of land capability may occur as result of the the vehicle hard park areas and hydrocarbon spills, as well as pollution through domestic waste, solvents and sewage.</p>	<p>A soil and land capability assessment must be undertaken to identify measures to prevent or mitigate soil erosion for different soil types. During construction and operation, the disturbance of soil profiles must be minimised by restricting vehicular activity to designated areas. A construction management plan must be compiled, including emergency spill response and waste management plans. Land use change can be minimised by restricting the project footprint. The land types present in the study area have restrictive soil properties and inherent low agricultural potential, it is, therefore, recommended that the soil and land capability assessment be undertaken on a reconnaissance level only.</p>

ASPECT	POTENTIAL CUMULATIVE IMPACTS	WAY FORWARD / RECOMMENDATIONS
Tourism and land use	<p>The proposed Orlight SA Solar PV Power Plants may result in a number of potential positive impacts on the tourism industry, such as increased demand for hospitality/accommodation and catering services during the construction phase. It may also create a number of potential negative impacts such as loss of sense of place (visual and noise impacts), change in land use (grazing and farming), loss of vegetation (site clearance for construction), and loss of tourism growth potential and sustainability of the tourism industry (due to industrial development).</p>	<p>The tourism industry in the Northern Cape and Western Cape Provinces are mainly dependent on natural and cultural resources such as seasonal flowers, vast open areas and outdoor activities such as hiking and 4x4 routes. A Tourism Screening Assessment will be undertaken as part of the EIA Phase to assess the potential impacts the project may have on the above tourist attractions.</p>
Socio-economic environment	<p>Positive impacts may be created as result of employment opportunities for local people, as well as the creation of support industries, such as transport and catering services or accommodation. Four direct job opportunities will be created per MW generation capacity during the construction phase and one direct employment opportunity per MW generation capacity will be created during the operational phase. During the construction and operational phase, accommodation of employees, contractors and consultants will be required. If feasible, accommodation will be provided in the town closest the project site. Negative impacts may be created as a result of the influx of job seekers and associated pressures on municipal services, the creation of informal settlements,</p>	<p>Benefits of the proposed project should be optimised and the negative impacts must be prevented or mitigated through the implementation of effective social management plans and programmes, including fair procurement policies.</p>



ASPECT	POTENTIAL CUMULATIVE IMPACTS	WAY FORWARD / RECOMMENDATIONS
	vandalism and poaching.	
Archaeology and heritage	<p>The following activities will result in potential impacts on sites of archaeological and heritage significance in the project areas:</p> <ul style="list-style-type: none"> <li>• Potential disturbance of physical heritage resources, mainly Stone Age and palaeontological artefacts or sites, as result of site clearance, access control and fencing of site, construction of lay-down yard and the anchoring and installation of solar PV panels during the construction phase;</li> <li>• Compaction of sites, damage to sites and artefacts as result of vehicular activities during the construction and operational phase;</li> <li>• Potential contamination by hydrocarbons on datable material on site and as runoff as result of vehicle hard park and hydrocarbon management (fuel, oil and waste oil); and</li> <li>• Increased human activity may increase the risk of site destruction, vandalism and looting.</li> </ul>	<p>As far as could be determined in the screening phase of the project, no significant heritage resources occur in the proposed project areas. Potential impacts may, furthermore, be considered negligible to low in all five project areas. Although evidence exists of past human occupation in the various landscapes, heritage resources most at risk are Stone Age material. Where necessary Phase 1 Archaeological Impact Assessments (AIA) and Phase 1 Paleontological Impact Assessments should address these sufficiently. Cumulative impacts on heritage resources can be addressed in the Phase 1 AIA studies and in the Environmental Management Programme (EMP).</p> <p>Exemption from conducting Heritage Impact Assessments for all the project sites is recommended as no historical buildings or landscapes, or intangible heritage was identified. Phase 1 AIAs should be conducted at the Graafwater Loeriesfontein, Kenhardt and Aggeneys project sites. A Phase 1 Paleontological Impact Assessment is recommended for the Loeriesfontein project site. It is requested that exemption from conducting an AIA on the Vanrhynsdorp project site be given as significant disturbance of the site by agricultural activities has already occurred.</p>

**INFORMATION REQUIRED TO BE INCLUDED IN A SCOPING REPORT IN TERMS OF  
 GN REGULATION 543 OF THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT,  
 1998 (ACT 107 OF 1998)**

CONTENT	REFERENCE
a) Details of – (i) the EAP who prepared the report; and (ii) the expertise of the EAP to carry out scoping procedures.	Chapter 3 & Appendix B
b) Description of the proposed activity	Chapter 4, Section 4.3 to Section 4.4
c) A description of any feasible and reasonable alternatives that have been identified	Chapter 4, Section 4.5
d) A description of the property on which the activity is to be undertaken and the location of the activity on the property, or if it is – (i) A linear activity, a description of the route of the activity; or (ii) An ocean-based activity, the coordinates where the activity is to be undertaken.	Chapter 4, Section 4.2
e) A description of the environment that may be affected by the activity and the manner in which the activity may affect the environment.	Chapter 5
f) An identification of all legislation and guidelines that have been considered in the preparation of the scoping report.	Chapter 2
g) A description of environmental issues and potential impacts, including cumulative impacts that have been identified.	Chapter 7
h) Details of the Public Participation Process conducted in terms of regulation 27(a), including –  (i) The steps that were taken to notify potentially interested and affected parties of the application  (ii) Proof that notice boards, advertisements and notices notifying potentially interested and affected parties of the application have been displayed, placed or given.  (iii) A list of all persons or organisations that were identified and registered in terms of Regulation 55 as interested and affected parties in relation to the application	Chapter 6 & Appendix C

CONTENT	REFERENCE
(iv) A summary of the issues raised by interested and affected parties, the date of receipt of and the response of the EAP to those issues	
i) A description of the need and desirability of the proposed activity.	Chapter 4, Section 4.1
j) A description of identified potential alternatives to the proposed activity, including advantages and disadvantages that the proposed activity or alternatives may have on the environment and the community that may be affected by the activity	Chapter 4, Section 4.5
k) Copies of any representations any comments received in connection with the application or the scoping report from interested and affected parties.	Chapter 6 & Appendix C
l) Copies of the minutes of any meetings held by the EAP with interested and affected parties and other role players which record the views of the participants.	Chapter 6 & Appendix C
m) Any responses by the EAP to those representations and comments and views.	Chapter 6 & Appendix C
n) A plan of study for the environmental impact assessment which sets out the proposed approach to the environmental impact assessment of the application, which must include –	Chapter 8 & Appendix D
(i) A description of the tasks that will be undertaken as part of the environmental impact assessment process, including any specialist reports or specialised processes and the manner in which such tasks will be undertaken	Chapter 8 & Appendix D
(ii) An indication of the stages at which the competent authority will be consulted	Chapter 8 & Appendix D Section 2.2.2
(iii) A description of the proposed method of assessing the environmental issues and alternatives, including the option of not proceeding with the activity; and	Chapter 8, Section 8.2
(iv) Particulars of the public participation process that will be conducted during the environmental impact assessment process.	Chapter 6 & Appendix D
o) Any specific information required by the competent authority.	Chapter 8

CONTENT	REFERENCE
p) Any other matters required in terms of Section 24(4)(a) and (b) of the Act.	Chapter 8
(2) In addition, a scoping report must take into account any guidelines applicable to the kind of activity which is the subject of the application.	Chapter 2

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## ABBREVIATIONS

ABBREVIATION	DESCRIPTION
AIA	Archaeological Impact Assessment
ASAPA	Association of Southern African Professional Archaeologists
BEE	Black Economic Empowerment
BID	Background Information Document
BSGR	BSG Resources Limited
CAA	Civil Aviation Authority
CARA	Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983)
CBA	Critical Biodiversity Area
CBO	Community Based Organisation
CFC	Cape Faunal Centre
CFR	Cape Floristic Region
CEPF	Critical Ecosystem Partnership Fund
CITES	Convention on International Trade in Endangered Species
COP15	15 <sup>th</sup> Conference of Parties
CRS	Cross Rope Suspension
DAFF	Department of Agriculture, Forestry and Fisheries
DEA	Department of Environmental Affairs
Digby Wells	Digby Wells Environmental
DoA	Department of Agriculture
DoE	Department of Energy
DWA	Department of Water Affairs
EAP	Environmental Assessment Practitioner

EIA	Environmental Impact Assessment
EIA Regulations	GN Regulations 543 to 546 (18 June 2010)
ELC	European Landscape Convention
ESA	Ecological Support Area
FEPA	Freshwater Ecological Priority Area
GHG	Greenhouse Gas
IDP	Integrated Development Plan
I&AP	Interested and Affected Party
IPP	Independent Power Producers
IRA	Initial Regional Assessment
IRP	Integrated Resources Plan
ISCW-ARC	Institute for Soil Climate and Water of the Agricultural Research Council
IUCN	International Union for Conservation of Nature and Natural Resources
LED	Local Economic Development
LUPO	Land Use Planning Ordinance, Ordinance 15 of 1985
NCDEANC	Northern Cape Department of Environmental Affairs and Nature Conservation
NEMA	National Environmental Management Act, 1998 (Act No. 107 of 1998)
NEMBA	National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)
NGO	Non-Governmental Organisation
NHRA	National Heritage Resources Act, 1999 (Act No. 25 of 1999)
NoID	Notice of Intent to Develop
NWA	National Water Act, 1998 (Act No. 36 of 1998)
Orlight SA	Orlight SA (Pty) Ltd

PPP	Public Participation Process
PV	Photovoltaic
RE	Remaining Extent
RoD	Record of Decision
SAHRA	South African Heritage Resources Agency
SANBI	South African National Biodiversity Institute
SANRAL	South African National Roads Agency Limited
SESSA	Sustainable Energy Society of Southern Africa
SKA	Square Kilometre Array
SKEP	Succulent Karoo Ecosystem Programme
ToR	Terms of Reference
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
VIA	Visual Impact Assessment
WCDEADP	Western Cape Department of Environmental Affairs and Development Planning
WMA	Water Management Area
WULA	Water Use License Application
WWF	World Wildlife Foundation

## 1 INTRODUCTION

In line with the growing need for electricity supply and cleaner energy production in South Africa, the Orlight SA (Pty) Ltd (Orlight SA) Solar Photovoltaic (PV) Project was initiated by its holding company, BSG Resources Limited (BSGR). BSGR is an international renowned natural resources company that operates in the fields of mining, energy and engineering services. BSGR established a new company, Orlight SA, for the construction and operation of five new Solar PV Power Plants in the Western Cape and Northern Cape Provinces.

Digby Wells Environmental (Digby Wells) has been appointed by Orlight SA as the independent Environmental Assessment Practitioner (EAP) responsible for undertaking the Environmental Impact Assessment (EIA) process for the proposed Solar PV Power Plants.

The EIA process for the proposed projects is divided into two phases, namely the Scoping Phase and the EIA Phase. The objectives of the Scoping Phase were:

- To consult with stakeholders during the first phases of the project to ensure that they are given an opportunity to comment on the proposed projects;
- To define the scope of the EIA process, based on the main issues identified during stakeholder engagement and a screening of potential impacts;
- To define the methodology for the EIA Phase; and
- To describe a Plan of Study for the EIA Phase.

This draft Scoping Report provides an overview of the project sites and proposed study areas and describes the main issues of concern identified during the Public Participation Process (PPP).

As illustrated in Plan 1 (Appendix A), the five proposed Solar PV Power Plants will be situated near the towns of Aggeneys, Kenhardt and Loeriesfontein in the Northern Cape Province and Vanrhynsdorp and Graafwater in the Western Cape Province. The sites under assessment will be referred to as the “study areas”. The study areas are situated on:

- Portion 1 of the farm Aroams 57 RD near Aggeneys in the Namakwa District Municipality, Northern Cape Province;
- The Remaining Extent (RE) of the farm Klein Zwart Bast 188 RD near Kenhardt in the Siyanda District Municipality, Northern Cape Province;
- Portion 1 of the farm Klein Rooiberg 227 RD near Loeriesfontein in the Namakwa District Municipality, Northern Cape Province;
- The RE of the farm Paddock 257 RD near Vanrhynsdorp in the West Coast District Municipality, Western Cape Province; and
- Portion 1 of the farm Graafwater 97 RD and the RE of the farm Bueroskraal 220 RD near Graafwater in the West Coast District Municipality, Western Cape Province.

The study areas are larger than the required footprint areas for the proposed Solar PV Power Plants, to provide adequate space for optimising site layout by avoiding ecological and archaeological sensitive areas.



## 2 LEGISLATIVE REQUIREMENTS AND PLANNING CONTEXT

### 2.1 Introduction

The world as we know it is under immense energy challenges. At the forefront are issues such as global warming, limited water resources and increased demand for electricity. Traditional fossil fuels reserves are under pressure, whilst the global community are demanding more clean methods of electricity generation. With regards to energy supply in South Africa, Eskom reported that there may be a 9 TWh shortfall in electricity supply during 2012, despite a significantly lower-than-expected recovery in electricity demand. This shortfall may be as result of the slowed recovery of the domestic economy. South Africa's energy demand growth is currently trending at 2007 levels, growing only 1.5% in 2010, however, demand will continue to increase and the shortfall anticipated in 2012 is a major concern.

South Africa is also attempting to move away from the utilisation of carbon intensive, non-renewable fossil fuels for energy production. The South African economy is, however, still highly dependent on fossil fuels and is considered one of the top 15 countries in terms of absolute greenhouse gas (GHG) emissions. On international level, the legally binding Kyoto Protocol agreement was established in 1997 soon after the inception of the United Nations Framework Convention on Climate Change (UNFCCC). According to the Kyoto Protocol, developed countries are committed to reducing their GHG emissions by 5.2% from 1990 levels by the year 2012.

Classified as a developing country under the Kyoto Protocol, South Africa is not legally bound to reduce its GHG emissions and, therefore, the country's contribution to climate change mitigation has not been framed as an absolute emission reduction target (DEAT, 2004).

The likelihood of GHG emission constraints playing a role in the medium and long-term future of South Africa's economy, whether invoked through the UNFCCC, trade barriers, or other measures not yet contemplated cannot, however, be dismissed. International pressure on industrialised developing countries to formalise their GHG emission reduction target and climate change mitigation strategy is increasing and it is within this context that the Government of South Africa pledged to reduce domestic GHG emissions by 34% by 2020 and 42% by 2025, when compared to business as usual. This pledge was made in agreement with the Copenhagen Accord, a non-binding agreement reached by parties at the 15th Conference of Parties (COP 15) of the UNFCCC held in December 2009 in Copenhagen.

As outlined by the objectives of the Sustainable Energy Society of Southern Africa (SESSA) and the National Climate Change Response Green Paper (2010), South Africa is subsequently aiming to increase the use of renewable energy and energy efficiency to ensure a sustainable energy future that is in line with the principles of sustainability. This includes the development of future opportunities for the use of renewable energy such as solar power in South Africa that is affordable, environmentally sound and socially acceptable. The Department of Energy (DoE) confirmed the procurement (Request for

Proposals) of allocated capacity across various renewables technologies, with 1 850 MW set aside for onshore wind, 200 MW for concentrated solar thermal and a further 1 450 MW for Solar PV solutions. Achievement of the GHG emission reduction target pledge by the South African Government will require a well-planned and co-ordinated response over the long-term.

In response to the above, Orlight SA is proposing to construct and operate the five new Solar PV Power Plants in the Northern Cape and Western Cape Provinces.

The following sections provides an analysis of the legislative and planning context of the proposed Orlight SA Solar PV Power Plants in an attempt to ensure that the project meets all regulatory requirements while aligning the design of the proposed project to the relevant national and regional planning policies.

## **2.2 Legislative framework**

The following legislation and guidelines will be considered during the EIA process for the proposed projects.

### *2.2.1 Constitution of the Republic of South Africa, 1996 (Act No. 108 of 1996)*

Section 24 of the Constitutional Act states that everyone has the right to an environment that is not harmful to their health or well-being and to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures, that -

- i. Prevents pollution and ecological degradation;
- ii. Promotes conservation; and
- iii. Secures ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.

In support of the above rights, the environmental management objectives of proposed projects are to protect ecologically sensitive areas and support sustainable development and the use of natural resources, whilst promoting justifiable socio-economic development in the towns nearest to the project sites.

### *2.2.2 National Environmental Management Act, 1998 (Act No. 107 of 1998)*

The National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) provides for cooperative environmental governance by establishing principles for decision making on matters affecting the environment, institutions that will promote cooperative governance and procedures for coordinating environmental functions exercised by organs of state.

NEMA also provides for matters related to sustainable development, which means the integration of social, economic and environmental factors into planning, implementation and decision-making so as to ensure that development serves present and future generations. To achieve the above objectives, the Act makes provision for the use of the EIA process as a tool for environmentally sound decision-making. The EIA process is regulated in terms of the GN Regulations 543 to 546 (18 June 2010) (“EIA Regulations”).

### 2.2.2.1 Application process

Five separate EIA applications were submitted for the proposed projects to the relevant competent authority, namely the Department of Environmental Affairs (DEA). Copies of the EIA application forms were also sent to the relevant provincial authorities, namely the Northern Cape Department of Environmental Affairs and Nature Conservation (NCDEANC) and the Western Cape Department of Environmental Affairs and Development Planning (WCDEADP). In view of the urgency of developing renewable energy projects in South Africa and to aid in fulfilling the country’s demand for electricity, as well as the stringent timeframes posed on parties intending to bid as Independent Power Producers (IPPs), a request was lodged with the departments that the responsibility for processing and evaluating the applications is succeeded to the DEA. The EAP will continue to involve the provincial departments as stakeholders during the EIA process and they will be provided with an opportunity to comment on all environmental documentation.

The relevant departmental reference numbers for the applications are listed in Table 2-1.

**Table 2-1: DEA and NEAS reference numbers**

SITE	AFFECTED FARM	DEA REF. NO.	NEAS REF. NO.
Aggeneys	Portion 1 of Aroams 57 RD	12/12/20/2630	DEA/EIA/0000818/2011
Kenhardt	RE of Klein Zwart Bast 188 RD	12/12/20/2631	DEA/EIA/0000813/2011
Loeriesfontein	Portion 1 of Klein Rooiberg 227 RD	12/12/20/2632	DEA/EIA/0000825/2011
Vanrhynsdorp	RE of Paddock 257 RD	12/12/20/2633	DEA/EIA/0000822/2011
Graafwater	Portion 1 of Graafwater 97 RD RE of Bueroskraal 220 RD	12/12/20/2636	DEA/EIA/0000828/2011

### 2.2.2.2 Listed activities

The applicable listed activities of the proposed projects in terms of the EIA Regulations are detailed in Table 2-2 below.

**Table 2-2: Listed activities applicable to the proposed projects**

SITE	GN. R	ACTIVITY	DESCRIPTION
Aggeneys	544	10	The construction of transmission lines to connect the proposed Solar PV Power Plant to the Eskom Aggeneys Substation [possibly not required].
	545	1	The construction of a Solar PV Power Plant. The power plant infrastructure will consist of a ground mounting system, solar PV panels, inverters, switchboards and transformer/s.
	545	15	The physical alteration an area greater than 20 ha agricultural land for the purposes of constructing a Solar PV Power Plant.
	546	12	The clearance of more than 300 m <sup>2</sup> of land consisting of 75% or more indigenous vegetation in a Critical Biodiversity Area (CBA) as identified in the CBA map for the Namakwa District Municipality.
	546	14	The clearance of approximately more than 5 ha land consisting of 75% or more indigenous vegetation.
Kenhardt	544	10	The construction of overhead transmission lines to connect the Solar PV Power Plant to the Eskom Aries Substation [possibly not required].
	545	1	The construction of a Solar PV Power Plant. The power plant infrastructure will consist of a ground mounting system, solar PV panels, inverters, switchboards and transformer.
	545	15	The physical alteration more than 20 ha of agricultural land for the purposes of constructing a Solar PV Power Plant.
	546	14	The clearance of more than 5 ha of land consisting of 75% or more of indigenous vegetation.
Loeriesfontein	544	10	The construction of overhead transmission lines to connect the proposed Solar PV Power Plant to the Eskom Helios Substation [possibly not required].
	545	1	The construction of a Solar PV Power Plant. The power plant infrastructure will consist of a ground mounting system, solar PV panels, inverters, switchboards and transformer.

SITE	GN. R	ACTIVITY	DESCRIPTION
	545	15	The physical alteration of more than 20 ha of agricultural land for the purposes of constructing a Solar PV Power Plant.
	546	14	The clearance of more than 5 ha of land consisting of 75% or more of indigenous vegetation.
Vanrhynsdorp	544	10	The construction of overhead transmission lines to connect the proposed Solar PV Power Plant to the Eskom Vanrhynsdorp Substation.
	545	1	The construction of a Solar PV Power Plant. The power plant infrastructure will consist of a ground mounting system, solar PV panels, inverters, switchboards and transformer.
	545	15	The physical alteration of more than 20 ha of agricultural land for the purposes of constructing a Solar PV Power Plant.
	546	14	The clearance of more than 5 ha of land consisting of 75% or more of indigenous vegetation.
Graafwater	544	10	The construction of overhead transmission lines to connect the proposed Solar PV Power Plant to the Eskom Graafwater Substation.
	545	1	The construction of a Solar PV Power Plant. The power plant infrastructure will consist of a ground mounting system, solar PV panels, inverters, switchboards and transformer.
	545	15	The physical alteration of more than 20 ha of agricultural land for the purposes of constructing a Solar PV Power Plant.
	546	12	The clearance of more than 300 m <sup>2</sup> of land consisting of 75% or more indigenous vegetation in a CBA as identified in the CBA map for the Cederberg Local Municipality.
	546	14	The clearance of more than 5 ha of land consisting of 75% or more of indigenous vegetation.

### 2.2.3 *The National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)*

The National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA) controls Indigenous Biological Resources. NEMBA provides for the consolidation of biodiversity legislation through establishing national norms and standards for the management of biodiversity across all sectors and by different management authorities.

Within the regional conservation context there are two conservation programmes which are underlain by NEMBA, namely the Succulent Karoo Ecosystem Programme (SKEP) and the Critical Biodiversity Areas (CBA). The aim of these programmes are to identify and conserve areas of high biodiversity and areas that are in support of these areas through defining conservation outcomes and working towards these. For this report, these programmes will be referred to as the basis for conservation planning across all five project sites.

#### 2.2.3.1 *Succulent Karoo Ecosystem Programme*

The Succulent Karoo Ecosystem Programme (SKEP) is a long-term, multi-stakeholder bioregional conservation and development programme, with four strategic areas:

- Increasing local and international awareness of the unique biodiversity of the Succulent Karoo;
- Expanding protected areas and improving conservation management;
- Supporting a matrix of harmonious land uses; and
- Improving institutional co-ordination.

The SKEP is a partnership programme with government and non-government partners. The first five years of implementation was funded by the Critical Ecosystem Partnership Fund (CEPF) and focused on catalysing and programme start-up. The next five years will focus on programme consolidation. This will entail integrating the SKEP objectives into national and regional government programmes, and thereby ensuring programme sustainability. As illustrated in Figure 2-1, the Succulent Karoo biodiversity hotspot extends from the southwest through the north-west areas of South Africa and into southern Namibia.

The data collected and collated by the SKEP for the five study areas, is summarised below in Table 2-3. The Graafwater and Kenhardt sites are of little significance if the SKEP data is seen in isolation, with Vanrhynsdorp and Aggeneys being of geographic priority, data on Loeriesfontein indicates that it is not a geographic priority area.

More information on the importance of these sites in terms of biodiversity is provided in Chapter 5 of this report.

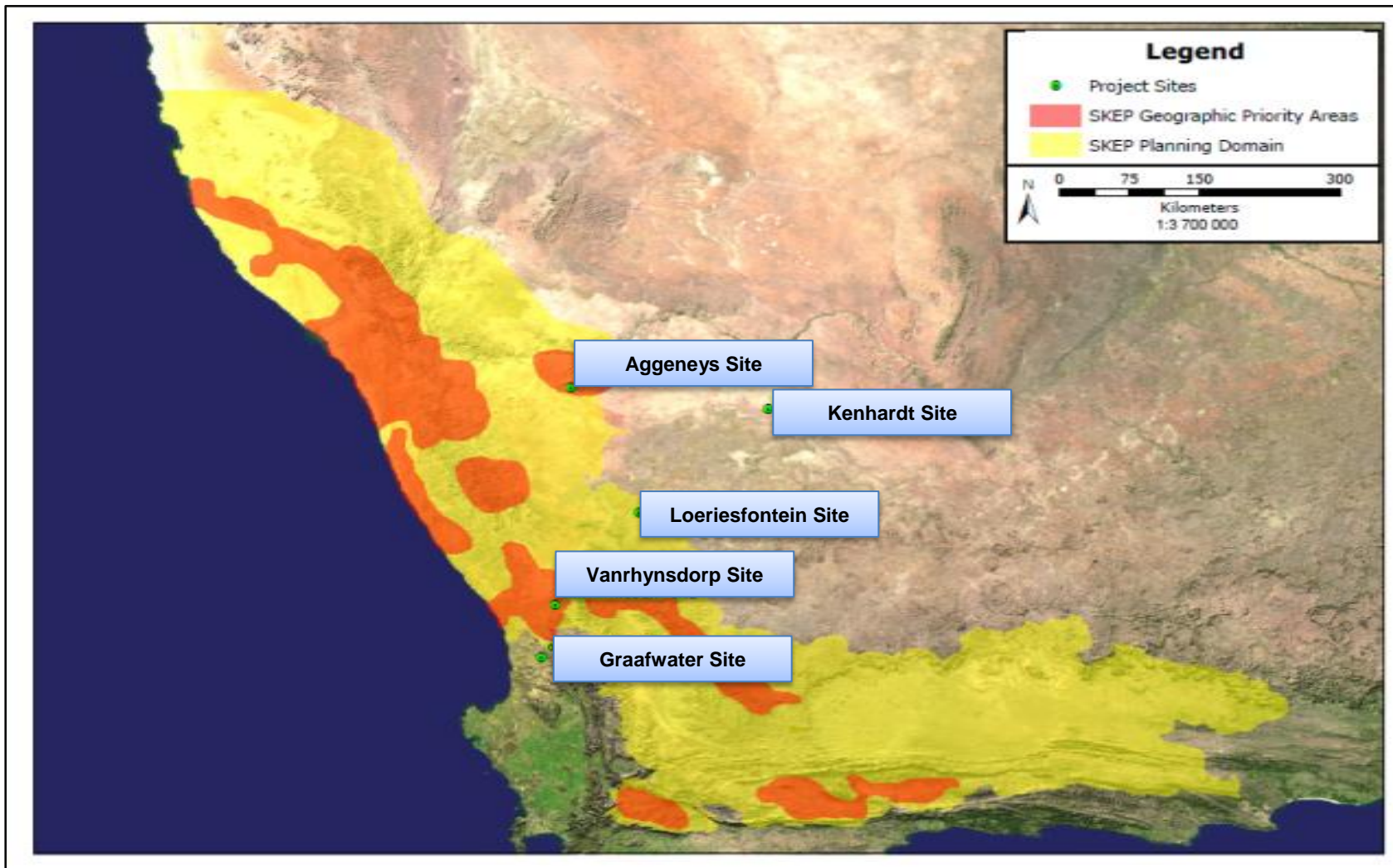


Figure 2-1: The SKEP areas of importance in relation to the project sites

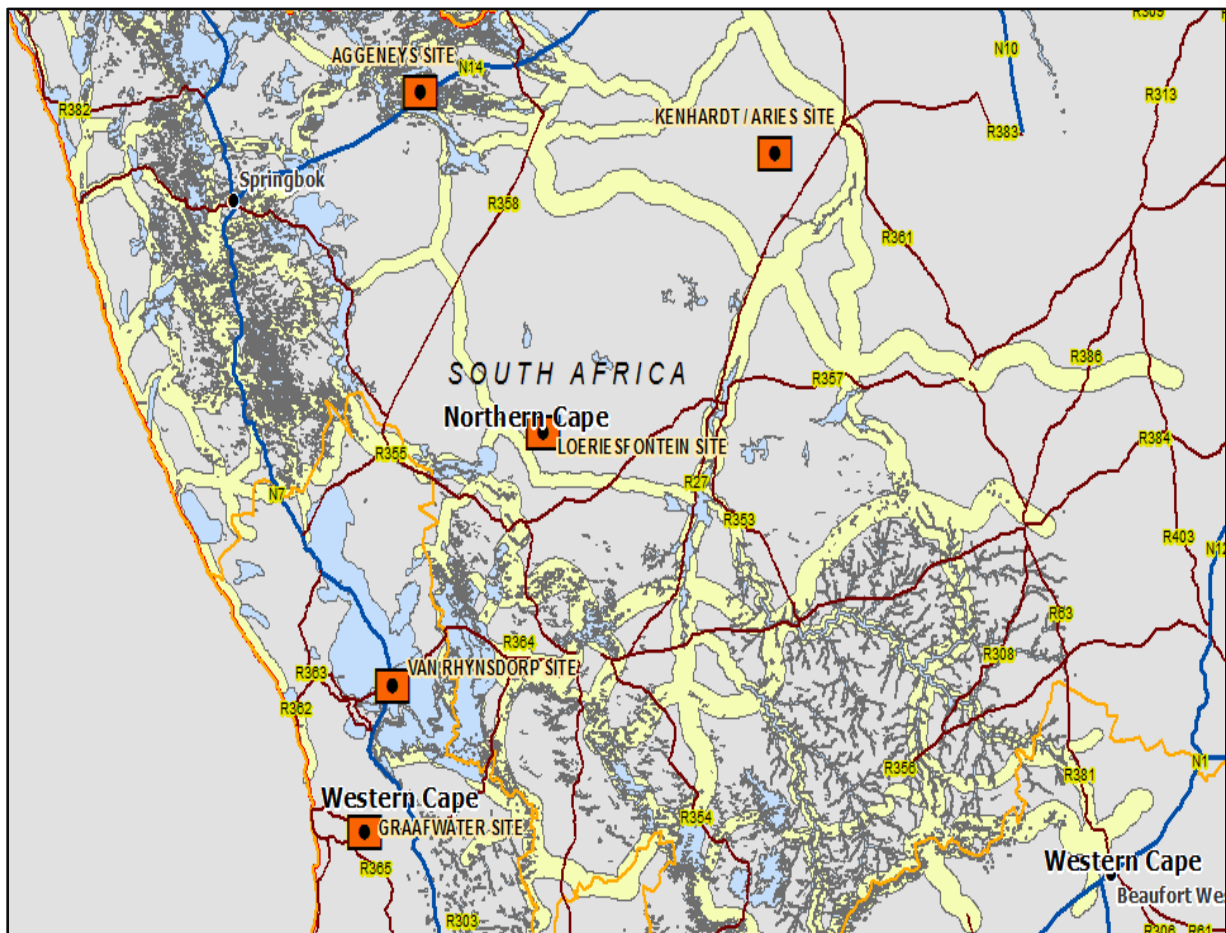
**Table 2-3: SKEP metadata summary (SKEP. 2010)**

SITE	GEOGRAPHIC PRIORITY	IRREPLACE-ABILITY	VEGETATION	MAMMALS	AMPHIBIANS	BIRDS	INSECTS	QUARTZ PATCHES
Aggeneys	Yes	1	KGPSK		X	X	X	X
Kenhardt	-							
Loeriesfontein	No	0.28	USK					
Vanrhynsdorp	Yes	0.96	LSK	X			X	
Graafwater	-						X	



### 2.2.3.2 Critical Biodiversity Areas

This discussion of CBAs is adapted from Marsh *et al.* (2009). CBAs are terrestrial and aquatic features in the landscape that are critical for retaining biodiversity and supporting continued ecosystem functioning and services. These form the key output of a systematic conservation assessment and are the biodiversity sectors inputs into multi-sectorial planning and decision making tools (Figure 2-2).



**Figure 2-2: Critical Biodiversity Areas (blue) and Ecological Support Areas (yellow) in relation to the proposed project sites**

CBAs are areas of the landscape that need to be maintained in a natural or near-natural state in order to ensure the continued existence and functioning of species and ecosystems and the delivery of ecosystem services. In other words, if these areas are not maintained in a natural or near-natural state then biodiversity conservation targets cannot be met. Maintaining an area in a natural state can include a variety of biodiversity-compatible land uses and resource uses.

Ecological support areas (ESAs) are areas that are not essential for meeting biodiversity representation targets/thresholds but which nevertheless play an important role in supporting the ecological functioning of critical biodiversity areas and/or in delivering ecosystem

services that support socio-economic development, such as water provision, flood mitigation or carbon sequestration. The degree of restriction on land use and resource use in these areas may be lower than that recommended for critical biodiversity areas.

The purpose of CBAs is simply to spatially indicate the location of critical or important areas for biodiversity in the landscape. The CBA, through the underlying land management objectives that define the CBA, prescribes the desired ecological state in which we would like to keep this biodiversity. Therefore, the desired ecological state or land management objective determines which land-use activities are compatible with each CBA category based on the perceived impact of each activity on biodiversity pattern and process.

### 2.2.3.3 Freshwater Ecological Priority Area Programme

For the aquatic and hydrological assessment of the proposed project, the Freshwater Ecological Priority Area (FEPA) Programme will be considered. This programme provides FEPA maps and supporting information which forms part of a comprehensive approach to sustainable and equitable development of South Africa's scarce water resources (WRC, 2011).

FEPA is a single, nationally consistent information source for incorporating freshwater ecosystem and biodiversity goals into planning and decision-making processes to support the water resource protection goals of the NWA (WRC, 2011). This programme is directly applicable to the NWA, informing Catchment Management Strategies, classification of water resources, reserve determination, and the setting and monitoring of resource quality objectives. FEPA maps are also directly relevant to the NEMBA, informing both the listing of threatened freshwater ecosystems and the process of bioregional planning provided for by this Act.

FEPA maps support the implementation of the National Environmental Management: Protected Areas Act, 2003 (Act No. 57 of 2003) by informing the expansion of the protected area network.

### 2.2.4 National Water Act, 1998 (Act No. 36 of 1998)

According to the National Water Act, 1998 (Act No. 36 of 1998) (NWA), a water resource is not only considered to be the water that can be extracted from a system and utilised but the entire water cycle. This includes evaporation, precipitation and entire aquatic ecosystem including the physical or structural aquatic habitats, the water, the aquatic biota and the physical, chemical and ecological processes that link water, habitats and biota. The entire ecosystem is acknowledged as a life support system by the NWA.

According to van Wyk et al. (2006) the "...resource is defined to include a water course, surface water, estuary and aquifer, on the understanding that a water course includes rivers and springs, the channels in which the water flows regularly or intermittently, wetlands, lakes and dams into or from which water flows, and where relevant, the banks and bed or the system."

In terms of the NWA, water courses that are identified in the project area will necessitate the establishment of suitable buffer zones around these drainage lines within which no

construction activities will be allowed. The EAP will consult with the Department of Water Affairs (DWA) to determine the suitable widths for these buffer zones, depending on the nature of drainage lines identified. In the event that construction within drainage lines cannot be prevented, a Water Use License Application (WULA) will be prepared and submitted to the DWA in terms of Section 21(d) and 21(i) of the Act.

In terms of abstracting water from underground water resources for potable use, an Initial Regional Assessment (IRA) is required to determine the amount of information necessary for a borehole license application. The construction phase and operational phase water requirements for the proposed projects will be determined during the EIA Phase and once this information is available, an IRA will be completed to determine the requirements of the application.

#### *2.2.5 Environment Conservation Act, 1989 (Act No. 73 of 1989)*

The aim of the Environment Conservation Act, 1989 (Act No. 73 of 1989) is to provide for cooperative environmental governance by establishing principles for decision-making on matters affecting the environment, institutions that will promote cooperative governance and procedures for coordinating environmental functions exercised by organs of state; and to provide for matters connected therewith. The Act also includes aspects related to the protection of freshwater systems stating that appropriate environmental investigations are mandatory before approval for the “...construction or upgrading of dams, levees or weirs affecting the flow of a river...” will be given by the relevant authority.

#### *2.2.6 Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983)*

The Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983) (CARA) provides for control and conservation of the utilisation of the natural agricultural resources of South Africa in order to promote the conservation of the soil, water sources and vegetation and the combating of weeds and invader plants; and for matters connected therewith. Land owners are obliged, by law, to eradicate alien vegetation on their properties.

For the purpose of the proposed Orlight SA Solar PV Power Plants, the relevant soil and agricultural assessments will be undertaken in order to minimise potential impacts on the agricultural potential or productivity of the proposed project sites. In addition, the use of agricultural land for energy generation will be communicated and motivated to the Department of Agriculture (DoA). Effective motivation and consultation would be important due to the need for efficient and productive agricultural land in South Africa.

#### *2.2.7 National Heritage Resources Act, 1999 (Act No. 25 of 1999)*

The National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA) devolves responsibility for the identification of local heritage resources and the inclusion of heritage areas to all municipalities in South Africa. Developers need to incorporate the NHRA and gain approval from the relevant heritage authorities or municipalities before construction may commence. For the purpose of this project, a cultural resource pre-assessment will be undertaken for the five study areas, which will incorporate the following:

- A Notice of Intent to Develop (NoID);
- Section 38 of the NHRA;
- The South African Heritage Resources Agency (SAHRA) Minimum Standards;
- Guidelines for involving Heritage Specialists in the EIA Process (Heritage Western Cape); and
- The Association of Southern African Professional Archaeologists (ASAPA) Constitution and Code of Ethics.

### 2.2.8 Land Use Planning Ordinance, Ordinance 15 of 1985

The purpose of the Land Use Planning Ordinance (LUPO), Ordinance 15 of 1985, is “to regulate land use and to provide for matters incidental thereto”. The consultation and rezoning process for the proposed project sites will be undertaken concurrently with the EIA process for the proposed projects.

## 2.3 Local economic planning context

The municipalities in which the study areas are located include the Hantam, Khai Ma and Khai !Garib Local Municipalities in the Northern Cape Province and the Cederberg and Matzikama Local Municipalities in the Western Cape Province.

During the EIA Phase of the proposed project, the local Integrated Development Plans (IDPs) and Economic Development Plans (EDPs) of the local municipalities will be integrated into the proposed projects, where possible.

The objectives of the IDPs and EDPs will be assessed and opportunities for the proposed projects to aid in the realisation of these objectives will be identified and integrated into project planning. As part of the IDP, key stakeholders in a municipality must come together to reach agreement and take decisions on how to stimulate economic growth and create income-generating opportunities for more people, especially in disadvantaged communities with low income.

## 2.4 Regional regulatory context

On a regional level, there are a number of legislative requirements, guidelines and programmes that need to be taken into consideration in the study areas. With reference to biodiversity, the following will be integrated:

- The regulations, laws and guidelines implemented by the Western Cape Province: Department of Environmental Affairs and Development Planning;
- The regulations, laws and guidelines implemented by the Northern Cape Department of Environment and Nature Conservation;

## 2.5 Policies, guidelines and conventions

In addition to the regulations and guidelines discussed in this chapter, the guidelines and policies of the following organisations will be taken into consideration during the EIA Phase:

- Guidelines implemented by the South African National Biodiversity Institute (SANBI), responsible for exploring, revealing, celebrating and championing biodiversity;

- Guidelines of the World Wildlife Foundation (WWF) South Africa, which aims to conserve the biodiversity assets (endangered wildlife, species, habitats and ecosystems) of South Africa and ensure natural ecosystems and their services are appropriately valued and integrated into sustainable development;
- The International Union for Conservation of Nature and Natural Resources (IUCN) Red List, which is based on information from a network of conservation organisations to rate which species are most endangered;
- Convention Concerning the Protection of the World Cultural and Natural Heritage initiated by the United Nations Educational, Scientific and Cultural Organization (UNESCO). The Convention aims to protect and conserve the world's natural and cultural heritage. As custodian of unique cultural and natural heritage, South Africa has the responsibility to ensure the identification, protection, conservation, presentation and transmission of cultural and natural heritage sites for future generations;
- The Convention on Biological Diversity that is dedicated to promoting sustainable development. Conceived as a practical tool for translating the principles of Agenda 21 into reality, the Convention recognises that biological diversity is not only centred around plants, animals and ecosystems, but includes people and their need for food security, medical care, fresh air and water, shelter and a clean and healthy environment in which to live;
- The Convention on International Trade in Endangered Species (CITES) which governs international trade in wild animals and plants ;
- The European Landscape Convention (ELC) of the Council of Europe which focuses exclusively on landscapes with the purpose of promoting effective management and planning of landscapes.

## 2.6 Equator Principles

The Equator Principles will be followed during the EIA Phase. The Equator Principles are a voluntary set of standards for determining, assessing and managing social and environmental risk in project financing. Once a bank or financial institution adopts the Equator Principles, they commit to refrain from financing projects that fail to follow the processes defined by the principles. The Equator Principles are modelled on the environmental standards of the World Bank and social policies of the International Finance Corporation (IFC).

Financing of the proposed Orlight SA Solar PV Power Plants will most likely require that the project applicant demonstrates that all potential environmental and social impacts associated with the project have been considered and that these will be managed and monitored in accordance with the Equator Principles. Table 2-4 lists the Equator Principles and the IFC performance standards that will be considered throughout the EIA process for the project.

**Table 2-4: The Equator Principles and IFC Standards applicable to the proposed Orlight SA Solar PV Power Plants**

EQUATOR PRINCIPLES	APPLICABLE IFC PERFORMANCE STANDARDS
<p><u>EP 1: Review and Categorisation</u></p> <p>A project should be categorised according to the magnitude of its potential impacts and risks in accordance with the environmental and social screening criteria of the IFC.</p> <p><i>The proposed project does not have the potential to bring about significant adverse social and environmental impacts and has thus been classified as a Category C project.</i></p>	<p><u>PS 1: Social and Environmental Sustainability</u></p> <p>Underscores the importance of managing social and environmental performance throughout the life of a project. The objectives of this standard are to:</p> <ul style="list-style-type: none"> <li>• Identify and assess social and environment impacts, both adverse and beneficial, in the project's area of influence;</li> <li>• To avoid, or where avoidance is not possible, minimise, mitigate, or compensate for adverse impacts on workers, affected communities and the environment;</li> <li>• To ensure that affected communities are appropriately engaged on issues that could potentially affect them; and</li> <li>• To promote improved social and environment performance of companies through the effective use of management systems.</li> </ul>
<p><u>EP 2: Social and Environmental Assessment</u></p> <p>An environmental and social assessment process should be conducted to assess the relevant impacts and risks of the proposed project. Mitigation and management measures relevant and appropriate to the nature and scale of the proposed project should be proposed.</p>	<p><u>PS 2: Labour and Working Conditions</u></p> <p>Recognises that the pursuit of economic growth through employment creation and income generation should be balanced with protection for basic rights of workers. The objectives of this standard are to:</p> <ul style="list-style-type: none"> <li>• Establish, maintain and improve the worker-management relationship;</li> <li>• Promote the fair treatment, non-discrimination and equal opportunity of workers and compliance with national labour and employment laws;</li> <li>• Protect the workforce by addressing child labour and forced labour; and</li> <li>• Promote safe and healthy working conditions, and to protect and promote the health of workers.</li> </ul>
<p><u>EP 3: Applicable Social and Environmental Standards</u></p> <p>The assessment should refer to the applicable IFC Performance Standards and the Industry Specific Environmental, Health and Safety (EHS) Guidelines and establish the project's overall compliance with, or justified deviation from, these standards and guidelines.</p> <p><i>The IFC Performance Standards applicable to the proposed project are listed in the right-hand column.</i></p>	<p><u>PS 3: Pollution Prevention and Abatement</u></p> <p>Outlines a project approach to pollution prevention and abatement in line with these internationally disseminated technologies and practices. The objectives of this standard are to:</p> <ul style="list-style-type: none"> <li>• Avoid or minimise adverse impacts on human health and the environment by avoiding or minimising pollution from project activities; and</li> <li>• Promote the reduction of emissions that contribute to climate change.</li> </ul>
<p><u>EP 4: Action Plan and Management System</u></p> <p>Action plans should be prepared that details the actions needed to implement mitigation measures, corrective actions and monitoring measures necessary to manage the impacts and risks of the project.</p> <p><i>The EMP for the proposed project should hereby be converted into action plans and implemented as part of an Environmental Management System (EMS) for the project.</i></p>	<p><u>PS 4: Community Health, Safety and Security</u></p> <p>Addresses the client's responsibility to avoid or minimise the risks and impacts to community health, safety and security that may arise from project activities. The objectives of this standard are to:</p> <ul style="list-style-type: none"> <li>• Avoid or minimise risks to and impacts on the health and safety of the local community during the</li> </ul>
<p><u>EP 5: Consultation and Disclosure</u></p> <p>Consultation with project affected communities should be undertaken in a structured and culturally appropriate manner.</p> <p><i>The Public Participation Process (PPP) for the proposed project will be undertaken in accordance with Government Notice R. No. 543 of the NEMA and the IFC Performance Standard 1.</i></p>	
<p><u>EP 6: Grievance Mechanism</u></p> <p>A grievance mechanism should be implemented to ensure that consultation, disclosure and community engagement continues throughout construction and operation of the proposed project.</p>	

EQUATOR PRINCIPLES	APPLICABLE IFC PERFORMANCE STANDARDS
<p><u>EP 7: Independent Review</u> An independent social or environmental expert not directly associated with the borrower should review the assessment, action plan and consultation process documentation.</p>	<p>project life cycle from both routine and non-routine circumstances; and</p> <ul style="list-style-type: none"> <li>• Ensure that the safeguarding of personnel and property is carried out in a legitimate manner that avoids or minimises risks to the community's safety and security.</li> </ul>
<p><u>EP 8: Covenants</u> Covenants to comply with all relevant host country social and environmental laws, regulations and permits and project action plans should be made.</p>	<p><u>PS 5: Land Acquisition &amp; Involuntary Resettlement</u> Seeks to protect sellers from a variety of risks of negotiated transactions that occur as a result of expropriation. The objective of this standard for the proposed Orlight SA Solar PV Power Plants is ensure land owners are satisfied with the lease agreements that are negotiated for use of the land to establish the proposed Orlight SA Solar PV Power Plants.</p>
<p><u>EP 9: Independent Monitoring and Reporting</u> An independent environmental and/or social expert should be requested to verify all monitoring information.</p>	<p><u>PS 6: Biodiversity Conservation &amp; Sustainable Natural Resource Management</u> Recognises that protecting and conserving biodiversity and its ability to change and evolve is fundamental to sustainable development. The objectives of this standard are to:</p> <ul style="list-style-type: none"> <li>• Protect and conserve biodiversity; and</li> <li>• Promote the sustainable management and use of natural resources through the adoption of practices that integrate conservation needs and development priorities.</li> </ul>
<p><u>EP 10: Equator Principles financial Institution Reporting</u> An annual report on the implementation processes and experience of the project should be supplied to the lender.</p>	<p><u>PS 8: Cultural Heritage</u> Aims to protect irreplaceable cultural heritage and to guide clients on protecting cultural heritage in the course of their business operations. The objectives of this standard are to:</p> <ul style="list-style-type: none"> <li>• Protect cultural heritage from the adverse impacts of project activities and support its preservation; and</li> <li>• Promote the equitable sharing of benefits from the use of cultural heritage in business activities.</li> </ul>

### 3 ENVIRONMENTAL IMPACT ASSESSMENT PRACTITIONERS

#### 3.1 Digby Wells Environmental

Digby Wells was appointed by Orlight SA as the independent EAP responsible for undertaking the EIA process for the proposed Solar PV Power Plants. Digby Wells is a South African company with international expertise in delivering comprehensive environmental and social solutions for clients in diverse sectors including the energy, minerals, and mining industries. A company profile has been attached to this report as Appendix B.

#### 3.2 Project team

A team of environmental and social specialists were commissioned to conduct the relevant environmental and social studies required for the Scoping Phase of the project. The specialist studies and the responsible individuals are listed below. Copies of their CVs have been attached to this report as Appendix B.

**Table 3-1: Digby Wells project team**

ASPECT	SPECIALIST	QUALIFICATIONS AND COMPETENCY
Project sponsor	Grant Beringer	2004 – 2006: MSc in Environmental Management – University of Johannesburg (UJ) 2002 – 2003: BSc Hons. Geography and Environmental Management (Cum Laude) – Rand Afrikaans University (RAU) 2000 – 2002: BSc Earth Sciences, Majoring in Geography & Environmental Management and Geology (RAU)
Project manager	Mia Ackermann	2008: M.Sc. Geography (UJ) 2006: B.Sc. Geography Honours (UJ) Cum Laude 2003 – 2005: B.Sc. Geography and Environmental Management (UJ)
Topography and hydrology	Alice McClure	2009 – 2010: M.Sc. Environmental Sciences: Proactive conservation planning with a strong social focus using GIS 2008: B.Sc (Hons) Environmental Sciences, Short course in statistics (Rhodes University) 2005 – 2007: B.Sc Environmental Sciences: Majored in Environmental Science and Entomology (Rhodes University)
Visual	Bradly Thornton	2008: Flood Hydrology (University of Stellenbosch) 2008: Advanced Analysis with ArcGIS (GIMS)



ASPECT	SPECIALIST	QUALIFICATIONS AND COMPETENCY
		2007: Introduction to ArcGIS (GIMS) 2003: B.Sc (Hons) Geography and Environmental Management: Strong focus on Geographic Information Systems (GIS), Environmental Management and Physical Geography (Rand Afrikaans University). 2000 – 2002: BSc Natural Sciences: Majored in Geology, Geography & Environmental Management (Rand Afrikaans University).
Fauna and flora	Rudi Greffrath	2005 B-tech Degree in Nature Conservation, UPE Saasveld Campus 2001 – 2004 Diploma in Nature Conservation, UPE Saasveld Campus
Soils and agricultural potential	Hendrik Smith	2005: PhD (Interdisciplinary), Commonwealth Open University. 1990: MSc (Agric) Soil Science, University of Pretoria. 1983: BSc (Agric) Hons. Soil Science, University of the Free State. 1978: BSc (Agric) Soil Science and Plant Nutrition, University of Pretoria.
Tourism and land use	Marike de Klerk	2008 – present PhD Environmental Management, UJ 2005 – 2006 M.A (Magister Artium) with focus on Sustainable Development at University of Johannesburg (UJ) 2003 – 2004 BhcS (Honours) Degree (Cum Laude) UP 2000 – 2002: BhcS. Degree (Cum Laude) University of Pretoria (UP)
Socio-economic environment	Sibongile Bambisa	2010: BA Honours (Anthropology) University of Johannesburg 2009: BA (Health Psychology) University of Johannesburg
Archaeology and heritage	Johan Nel	2012 – Current: MA Archaeology 2002: BA Honours Archaeology, University of Pretoria (UP) (2002) 2001: BA Anthropology & Archaeology, University of Pretoria (UP)

## 4 PROJECT DESCRIPTION

### 4.1 Need and desirability

The Northern Cape and Western Cape Provinces, with abundant solar irradiation and vast tracts of available land, have been attracting considerable interest from solar energy investors in recent times. The areas selected for the proposed Orlight SA Solar PV Power Plants are also located in areas where there is adequate space and established, existing infrastructure in the form of roads and transmission lines.

The proposed Orlight SA Solar PV Power Plants will have a number of advantages. These benefits form the foundation of the project motivation. The project motivation has been summarised in Table 4-1 below.

**Table 4-1: Project benefits**

MOTIVATION	DETAILS
Energy demand	The proposed Orlight SA Solar PV Power Plants will assist in addressing the growing need for increased electricity supply and cleaner energy production in South Africa.
Adherence to the Final Integrated Resources Plan (IRP) 2010 – 2030	The development of the proposed Orlight SA Solar PV Power Plants will ensure adherence to the Final Integrated Resources Plan (IRP) 2010 – 2030. The IRP is a living document promulgated by the Department of Energy (DoE) on 6 May 2011 (in consultation with Eskom) to guide decisions on the future energy mix in SA. This document allows for a certain MW capacity for Solar PV in SA and guides the programme development.
Grid accessibility	The proposed sites are all located in geographical proximity of existing Eskom Substations, thus, it will be easy for the solar plants to provide electricity to the nearest grid connection points.
Efficiency	Solar electric generation has the highest power density (global mean of 170 W/m <sup>2</sup> ) of renewable energies.
Environmentally sustainable	There are limited environmental impacts associated with the construction and operation of a Orlight SA Solar PV Power Plant. Solar power is pollution-free during use.
Affordability	PV installations require little maintenance or intervention after their initial set-up (after the initial capital cost of building any solar power plant, operating costs are extremely low compared to existing power technologies).

MOTIVATION	DETAILS
Future growth	Demand for energy will increase. Although renewable energy is currently still a capital intensive development, technologies will become more cost effective over time, while fossil fuels may become more expensive.
Socio-economic development	The proposed Orlight SA Solar PV Power Plants may stimulate job creation, local content and local manufacturing, rural development and community involvement, education and development of skills, enterprise development and socio-economic development of the Western and Northern Cape Provinces.
Emission reduction targets	The development of renewable energy projects such as solar plants may lead to the reduction in additional carbon intensive electricity demand, which may in turn reduce the overall GHG emission rates of South Africa and promote energy efficiency.

Based on the above motivations, it would be beneficial to pursue projects such as the Orlight SA Solar PV Power Plants that may assist in electricity supply and contribute towards more sustainable and renewable energy. This project also has the potential to provide much needed training and employment opportunities for local communities in the Northern Cape and Western Cape Provinces. The aspiration and desires to proceed with this sustainable project became apparent during public consultations and site visits to the study areas.

## 4.2 Project sites

The proposed Orlight SA Solar PV Power Plants will be located in geographical proximity of the towns Aggeneys, Kenhardt and Loeriesfontein (Northern Cape Province) and Vanrhynsdorp and Graafwater (Western Cape Province). More details on these provinces and the significant biodiversity, topography, landscape and hydrology associated with these areas are discussed in this section and in Chapter 5 of this study.

### 4.2.1 Study areas

On local scale, the broader study area was investigated for the proposed Orlight SA Solar PV Power Plants as part of the Scoping Phase. The assessment of these study areas will assist in the identification of the most appropriate site design and layout for the proposed Orlight SA Solar PV Power Plants. Designs and infrastructure layout will be done to avoid ecological sensitive areas, servitudes and difficult topographical areas. The “no-go” option (no development of the site) will also be considered during the EIA Phase.

#### 4.2.2 Land tenure

The land tenure of the study areas is described in Table 4-2 below. The land tenure maps for the five study areas and directly adjacent properties are illustrated in Plan 2a to Plan 2e (Appendix A).


**Table 4-2: Land tenure**


PROJECT SITE	FARM NAME	PORTION NUMBER	CONTACT PERSON/ NAME OF LANDOWNER
Aggeneys	Aroams 57 RD	Portion 1	Mr Abrie van Niekerk
Kenhardt	Klein Zwart Bast 188 RD	RE (Portion 0)	Mr Abrie Jordaan
Loeriesfontein	Klein Rooiberg 227 RD	Portion 1	Mr Herman van Heerden
Vanrhynsdorp	Paddock 257 RD	RE (Portion 0)	Mr Theunis van Zyl
Graafwater	Graafwater 97 RD	Portion 1	Mr Gert Genis (Trust)
	Bueroskraal 220 RD	RE	Mr Gert Genis (Trust)


#### 4.2.3 Existing infrastructure


In the study areas, existing infrastructure is limited and sites are generally undeveloped. There is some infrastructure in the study areas, such as transmission lines, reservoirs and roads. Existing infrastructure on the relevant study areas are described in Table 4-3.

**Table 4-3: Existing infrastructure in the study areas**


SITE	INFRASTRUCTURE	ILLUSTRATION
Aggeneys	<p>There are two existing transmission lines constructed on Aggeneys that divide the site in two. The site can be accessed directly from the N14 via the existing farm access road. There is a two track service road that follows the transmission lines, which can be used to access the deeper areas of the site. Farm fences are present on the property. No other significant infrastructure was identified in this study area.</p>	

SITE	INFRASTRUCTURE	ILLUSTRATION
Kenhardt	<p>The Aries Substation is located 1 km south of the study area on the opposite side of the Kenhardt – Bossiekom District Road. Existing Cross Rope Suspension (CRS) 400 kV transmission lines cross the SW corner of site and there is a two track service road that runs below the transmission line. The site can be accessed from the two track service road which is connected directly to the main road. Farm fences are established on the property. No other significant infrastructures were identified on site.</p>	

SITE	INFRASTRUCTURE	ILLUSTRATION
Loeriesfontein	<p>There are two transmission lines near the site, including a 66 kV transmission line that runs along the district road towards the substation and a 400 kV transmission line that runs towards the north of site in the direction of the Klein Rooiberg. A district road that runs through the project site is capable of accommodating large trucks.</p> <p>There is also a small concrete farm dam located on the property next to a windmill. This functional unit may be used to pump and store good quality groundwater. Farm fences have been erected on the property.</p>	

SITE	INFRASTRUCTURE	ILLUSTRATION
<p>Vanrhynsdorp</p>	<p>The Vanrhynsdorp Substation is located on the proposed project site. The site can be accessed via a road from the town. An existing transmission line cuts through the site in a north to south direction. There is an existing service road along this transmission line and other roads on the site can also be utilised to access the site during construction. Farm fences are present on the property. There is an accessible borehole next to the substation, which may be considered for utilisation during construction and operational phase. There are a number of footpaths through the area; however, no other infrastructure was identified on site.</p>	



SITE	INFRASTRUCTURE	ILLUSTRATION
Graafwater	<p>The substation for Graafwater is located adjacent to the study area. Access to the site is possible from the Graafwater – Sandberg dirt road which cuts through the study area. There are three existing transmission lines on the project site. There is also an operating sewerage treatment plant located in the study area. The sewerage treatment is currently fenced and this will be unaffected by the proposed project. Farm fences are situated on the property. No other infrastructures were identified in this study area.</p>	

## 4.3 Preliminary project layout and design

### 4.3.1 Design and preliminary site layout

Solar PV technology is used to generate electrical power to convert solar irradiation energy into a direct electrical current. The solar PV panels are composed of a number of solar cells containing two layers of a photovoltaic material. When sun (solar irradiation) shines on the panels, the electric field across the junction between these two layers causes electricity to flow. Two examples of solar PV power plants are illustrated in Figure 4-1.



Source: [www.papundits.wordpress.com](http://www.papundits.wordpress.com)



Source: [www.pv-power-plants.com](http://www.pv-power-plants.com)

**Figure 4-1: Examples of solar PV power plants**

The preliminary site layout for the proposed Orlight SA Solar PV Power Plants in Aggeneys, Kenhardt, Loeriesfontein, Vanrhynsdorp and Graafwater is illustrated in Plan 2a to Plan 2e (Appendix A). It should be noted that these plans are preliminary and the designs and layout of the proposed Orlight SA Solar PV Power Plants have not been finalised.

### 4.3.2 Power plant components

The solar PV panels will be mounted into metal frames which are anchored to the ground with either concrete or screw pile foundations. The panels may be either on a tracking system in order to capture the most sunlight or fixed (stationary). Generally, a power plant consists of the following components:

- PV solar panels/modules (arranged in arrays);
- PV module mountings;
- DC-AC current inverters;
- Electricity distribution boxes and cabling;
- Earthing systems;
- Ancillary infrastructure; and
- Electrical substation.

The proposed Orlight SA Solar PV Power Plants will be connected to the respective substations with either an overhead transmission line.

Where possible, the transmission line routes will be situated within, or parallel to, existing servitudes. Alternative transmission line routes will be identified and assessed as part of the EIA process. In addition to the power plant requirements listed above, the following associated infrastructure may be required:

- Temporary container homes and mobile toilets and bathroom facilities during the construction phase of certain power plants;
- Office and technical service buildings;
- Electricity distribution lines (from substation to Eskom power line);
- A perimeter high security fence will be erected around the development sections; and
- Roads within the development area.

During the construction phase, areas in close proximity to the sites will be allocated for temporary site offices, employee accommodation, workshop and a material lay-down yard.

#### 4.3.3 Capacity

The proposed project facilities will be developed in response to the growing need for more sustainable and reliable electricity supply in South Africa. These power plants will have different energy generating capacities and surface areas, as indicated in Table 4-4.

**Table 4-4: Proposed electricity generating capacities**

LOCATION	FARM NAMES	ESTIMATED CAPACITY
Aggeneys	Portion 1 of Aroams 57 RD	40 MW up to 150 MW generation capacity
Kenhardt	RE of Klein Zwart Bast 188 RD	70 MW up to 100 MW generation capacity
Loeriesfontein	Portion 1 of Klein Rooiberg 227 RD	40 MW up to 150 MW generation capacity
Graafwater	Portion 1 of Graafwater 97 RD RE of Bueroskraal 220 RD	35 MW up to 75 MW generation capacity
Vanrhynsdorp	RE of Paddock 257 RD	20 MW up to 45 MW generation capacity

#### 4.3.4 Site access

Access roads with a gravel surface from the nearest public roads onto the site will be required. Internal site road networks will also be required to provide access to the solar panels for maintenance purposes. Existing farm roads will be used where possible. The

Orlight SA Solar PV Power Plants will be fenced from the surrounding farms for security and safety purposes.

#### 4.3.5 Water requirements

Water will be used during the construction phase of the project for domestic use and possible for dust suppression, while small amounts of water will be required during the operational phase to clean the solar PV panels.

For these activities, Orlight SA will contract a water service provider to provide adequate water to the site. Where possible, boreholes will be utilised. The total water requirements for the project and the sources therefore will be confirmed during the EIA Phase.

#### 4.3.6 Employment opportunities

Approximately four direct job opportunities per MW generation capacity will be created during the construction phase of each Orlight SA Solar PV Power Plant. During the operational phase, approximately one person per MW generation capacity, mostly from the local community, will be employed for routine maintenance and to provide security services. Prospects for small business development and socio-economic initiatives may be created as result of the multiplier effect of the proposed project. Additional employment and training opportunities will be discussed in more detail in the social management plan, in consultation with local communities.

### 4.4 Project activities

The activities to be undertaken during the phases of the proposed projects and their estimated timeframes are briefly described in Table 4-5. The construction phase of the proposed projects is not anticipated to take longer than 12 months. The typical lifecycle of a PV power plant is generally 20 years; Therefore, the operation phase of the proposed project is also envisioned for 20 years, where after a decision will be made whether to refurbish or decommission the Solar PV Power Plants, depending on the prevalent political, economic and technological conditions of the time.

**Table 4-5: Project phases**

ACTIVITY	DESCRIPTION
Pre-construction	All contractors, sub-contractors and service providers will be made aware of the contents of the EMP.
Site clearance	Each site will be cleared by using a local civil contractor to clear the site for the construction of the solar panels and associated infrastructure. Site clearance will be conducted in the most ecologically sensitive and cost effective manner to minimise negative environmental impacts and maximise positive impacts during the construction phase.

ACTIVITY	DESCRIPTION
Vehicular activity	All vehicles and equipment shall be kept in good working order and serviced regularly. Leaking equipment shall be repaired immediately or removed from the site. Construction vehicles will travel on public roads and onsite. The increased traffic will be temporary. During the operational phase, vehicular activities and associated nuisances will be minimised.
Construction lay-down yard	The laydown yards will provide storage areas for the construction material. The footprint size of these areas will be minimised to ensure the least environmental impacts on soil and vegetation.
Vehicle hard park and hydrocarbon management (fuel, oil and waste oil)	During the construction and operational phase, it will be ensured that facilities for the collection of hydraulic and other vehicle oils are provided within the hard park area at each site. The applicable contractor will ensure that if plant maintenance occurs on site, that there is no contamination of the soil or vegetation. Any hydrocarbon spills will be remediated.
On site-accommodation of construction workers	During construction and operational phase, accommodation will be required. Where feasible, accommodation will be provided in the closest town or use existing farm houses.
Domestic waste and sewage management; and Removal of infrastructure and waste	<p>The relevant contractors will ensure that all waste material is removed from the site and appropriately disposed of. Disposal of all waste must be at an acceptable licensed waste disposal facility. No on-site burying or dumping of waste materials, vegetation, litter or refuse shall occur. All solid waste shall be disposed of at suitable licensed disposal sites. Waste shall be collected from site by a licensed contractor and removed to an appropriate waste disposal facility.</p> <p>Wherever possible, materials shall be recycled. Containers for glass, paper, metals, plastics, organic waste and hazardous wastes (e.g. oil rags or chemicals) shall be provided in sufficient quantity on the site. A contractor will be responsible for onsite sewerage management during construction and operation. The contractor shall ensure that no spillage occurs when the toilets are cleaned or emptied and that the contents are removed from site by a licensed service provider.</p>
Access control and fencing of site	Adequate systems and procedures will be in place to minimise the risk of unauthorised access to the site. Carefully consideration will also be given to the plant layout to ensure access for day-to-day

ACTIVITY	DESCRIPTION
	operations, emergency escape routes and maintenance of the plant and equipment.
Anchoring and installation of solar PV panels	The installation and anchoring of solar PV panels will be conducted in the most ecologically sensitive and cost effective manner to minimise negative environmental impacts and maximise positive impacts during the construction phase.
Operation of Orlight SA Solar PV Power Plants	The operation of the Orlight SA Solar PV Power Plants will be conducted in the most ecologically sensitive and cost effective manner to minimise negative environmental impacts and maximise positive impacts during the operational phase. Regular compliance reporting must be done.
Generation and transmission of electricity	Equipment will be grounded and constructed with the appropriate safety devices. Adequate systems and procedures will be in place to minimise the risk of unauthorised access to the site. Equipment will be regularly assessed for potential safety risks or concerns to ensure that equipment is safe and to minimise risks of endangering people or installations, or damaging the environment.
Cleaning of solar PV panels	Small amounts of water will be required during the operational phase to clean the solar PV panels. For these cleaning activities, Orlight SA will contract a water service provider to provide adequate water to the site. Where possible, boreholes will be utilised. The total water requirements for the project and the sources therefore will be confirmed during the EIA process.
Site rehabilitation	If and where applicable, sites will be rehabilitated. Rehabilitation is the process of returning the land in a given area to some degree of its former state, after some construction or operation activities may have resulted in its damage. The implementation of the EMP will be essential through the construction and operational phase.

#### 4.5 Project alternatives

Technological and site layout alternatives for each proposed Orlight SA Solar PV Power Plant were identified as part of the Scoping Phase. The “no-go” option (no development of the site) was also investigated.

#### *4.5.1 Technology alternatives*

Two main solar PV technologies were considered for the project, namely conventional solar PV and concentrated solar PV (CPV). At this stage, the use of specific technology alternatives is still under investigation by the Orlight SA, but at this stage, it is foreseen that the two technologies will have similar environmental impacts. It is anticipated that the final decision on preferred technology will depend on both generation efficiency and economic conditions.

#### *4.5.2 Site layout alternatives*

As discussed, the study areas for the proposed Solar PV Power Plants were delineated larger than the required footprint areas for the construction and operational activities, to provide adequate space for optimising site layout by avoiding ecological and archaeological sensitive areas.

Ecological, archaeological and integrated sensitivity maps will be produced during the EIA Phase and will be used by the project engineers, in consultation with the EAP, to design suitable locations for the various project components.

#### *4.5.3 Generation capacity alternatives*

Different Solar PV Power Plant generation capacities will be investigated during the EIA Phase. Studies will be undertaken to determine the optimal generation capacity that can be accommodated in each study area based on their ecological, cultural and socio-economic characteristics and other technical factors, as discussed above.

#### *4.5.4 No-go option*

The benefits of the project, as discussed in Chapter 4 of this study, will not be realised if this project does not proceed.

## 5 STATUS OF THE BASELINE ENVIRONMENT

This Chapter provides a description of the status of the baseline biophysical, socio-economic and cultural environment of the five proposed project sites.

Section 5.1 describes the regional socio-economic profile of the local municipalities within which the respective project sites are located in terms of population size, employment and unemployment, education levels and the composition of the local economies.

Section 5.2 provides baseline biophysical, socio-economic and cultural information for each of the five proposed project sites. During this phase of the EIA process, most information was based on desktop studies. Further assessments will be undertaken during the EIA Phase to deepen the understanding of the baseline environment and ensure all impacts are managed accordingly.

### 5.1 Regional socio-economic profile

The local municipalities in which the study areas are located include the Hantam, Khai Ma and Khai !Garib Local Municipalities in the Northern Cape Province and the Cederberg and Matzikama Local Municipalities in the Western Cape Province.

An overview of the socio-economic characteristics of these municipalities is provided in the following sections.

#### 5.1.1 *Khai Ma Local Municipality*

The proposed Aggeneys project site is located in the Khai Ma Local Municipality of the Namakwa District Municipality in the Northern Cape Province.

##### 5.1.1.1 Population

Similar to most local municipalities within the Northern Cape, the population in the Khai Ma Local Municipality is dominated by the Coloured ethnic group. The racial composition of the municipality consists of 85.96% Coloureds, 10.55% Whites followed by 3.3 % Black people. The least dominant group are Indians/Asians (Stats SA Community Survey, 2007). The dominant language spoken in this region is Afrikaans, followed by English and IsiXhosa, which are spoken to a lesser extent.

##### 5.1.1.2 Employment and unemployment

In 2007, half the population within Khai Ma Local Municipality was employed and 34.55% was regarded as not economically active. Only 13.6% was unemployed and a majority of the unemployed group is the youth. The total percentage of the unemployed group and those classified as economically inactive indicates a high dependency ratio.

##### 5.1.1.3 Education levels

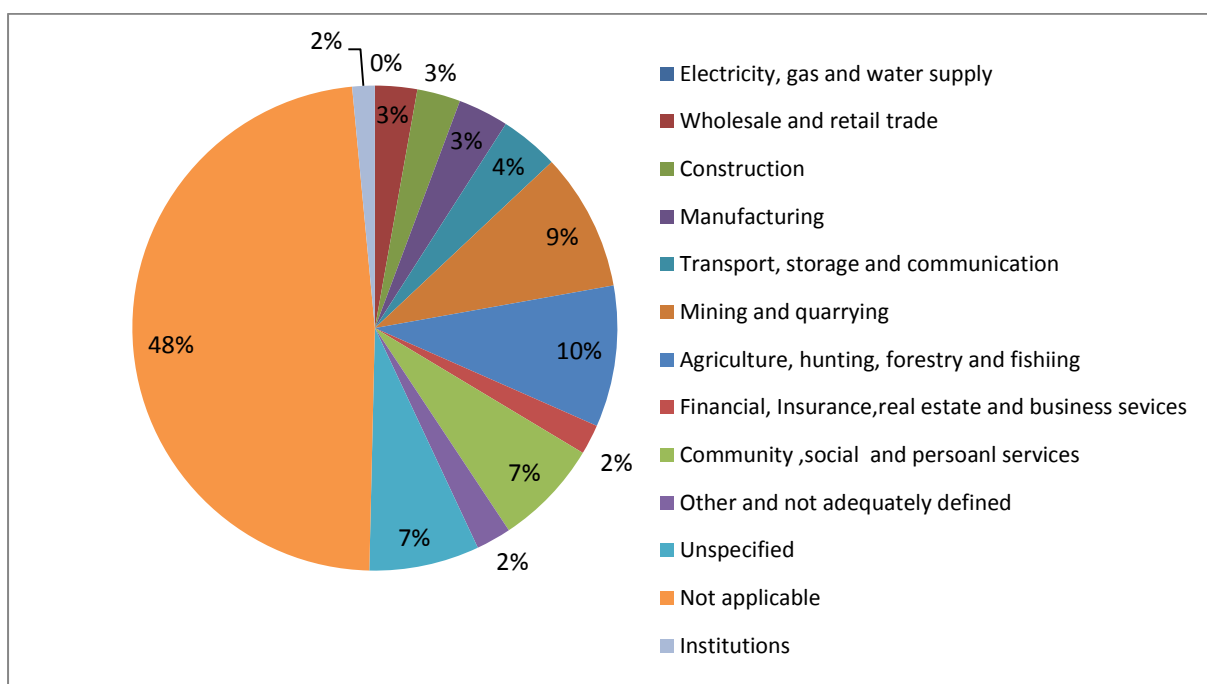
A greater portion of the population has a primary school education which indicates that most people are literate. However, most of the population does not have a matric certificate and even less a tertiary qualification.



The low education levels in the Khai Ma Local Municipality could indicate that the area is challenged by shortage of skills which creates a high unemployment rate. Due to shortage of skills, most people in the Khai Ma Local Municipality have elementary jobs as these jobs require a low skill levels.

5.1.1.4 Economic overview

Agriculture and mining are the main sectors that contribute to employment in the Khai Ma Local Municipality. Other sectors such as transport, manufacturing and construction do play a role in the economy of this region, although their contribution is minimal. This could be attributed to the low productivity in the area which is created by the shortage of skills. With reference to Figure 5-1, agriculture and mining are the main contributors towards the economy of the Khai Ma Local Municipality.



**Figure 5-1: Contributions of sectors to local employment in the Khai-Ma Local Municipality** (Source: Adapted Stats SA Community Survey, 2007)

5.1.2 *Khai !Garib Municipality*

The proposed Kenhardt project site is located in the Khai !Garib Local Municipality of the Siyanda District Municipality in the Northern Cape Province.

5.1.2.1 Population

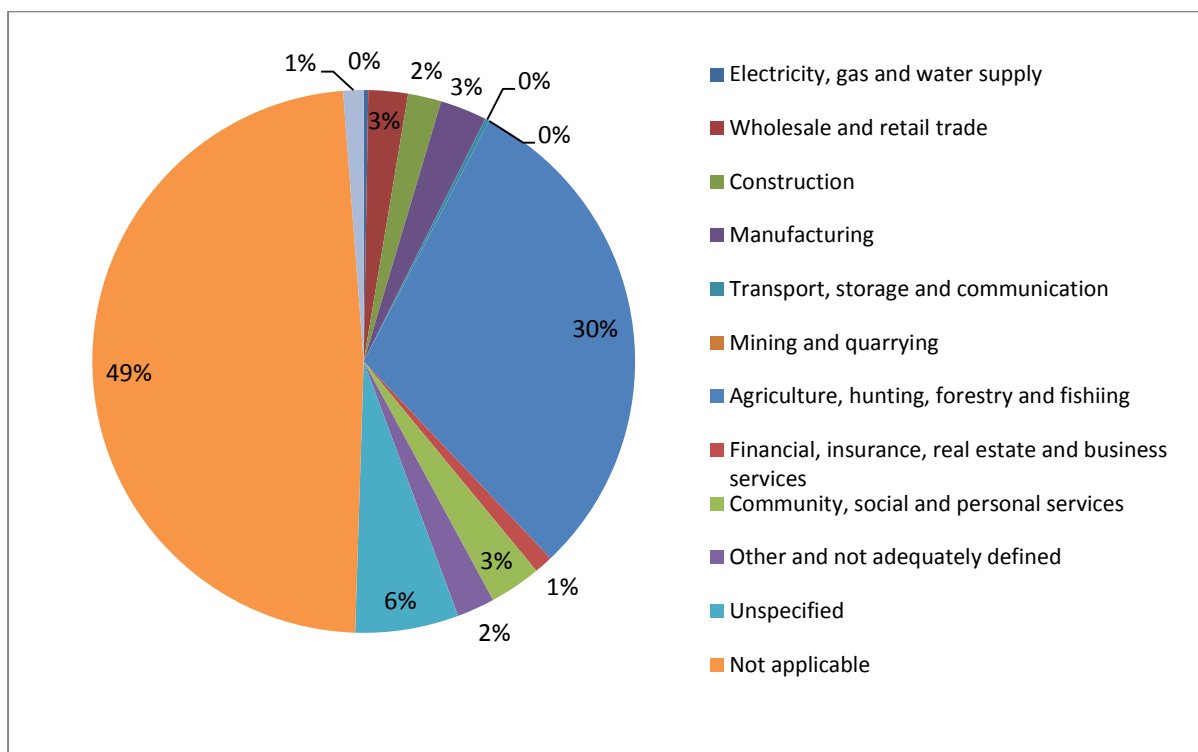
There are 56 502 people within this municipality and the Siyanda District Integrated Development Plan (IDP) (2004) indicates that the region is sparsely populated.

5.1.2.2 Employment and unemployment

According to Stats SA Community Survey 2007, the unemployment rate in Khai !Garib was 14.34%. Only 51.8 % of the population was employed and almost 34% was classified as economically inactive. The economically inactive percentage indicates that there is a high dependency ratio within this region.

5.1.2.3 Economic overview

As illustrated in Figure 5-2 the agricultural sector is the main sector in terms of employment in this region. Grape and sheep arming are the most predominant activities in Khai !Garib Local Municipality. Commercial farmers in this region export grapes to the international market and this generates revenue for the municipality as a whole. Tourism has been identified as a sector that has potential to contribute to the social and economic growth of the region.



**Figure 5-2: Contributions of sectors to local employment in the Khai !Garib Local Municipality** (Source: Adapted from Stats SA Community Survey)

5.1.2.4 Education levels

Khai !Garib has very low levels of education, the highest education level is Grade 9. Only 13% have studied until grade 9 and almost 8% have a matric certificate. A small percentage of the population has a tertiary qualification. The low education level in this region is indicative of a low skills level and as a result, people are more likely to have elementary occupations.

### *5.1.3 Hantam Local Municipality*

The proposed Loeriesfontein project site is located in the Hantam Local Municipality of the Namakwa District Municipality in the Northern Cape Province.

#### *5.1.3.1 Population*

According to Stats SA Community Survey (2007), the Coloured ethnic group is the dominant group in the municipality with a representation of 87.26%. Whites are the second largest group making up 11.06% of the population. Blacks and Asians are the minority ethnic groups with only 0.85% Blacks and 0.81% Asians/Indians.

#### *5.1.3.2 Employment and unemployment*

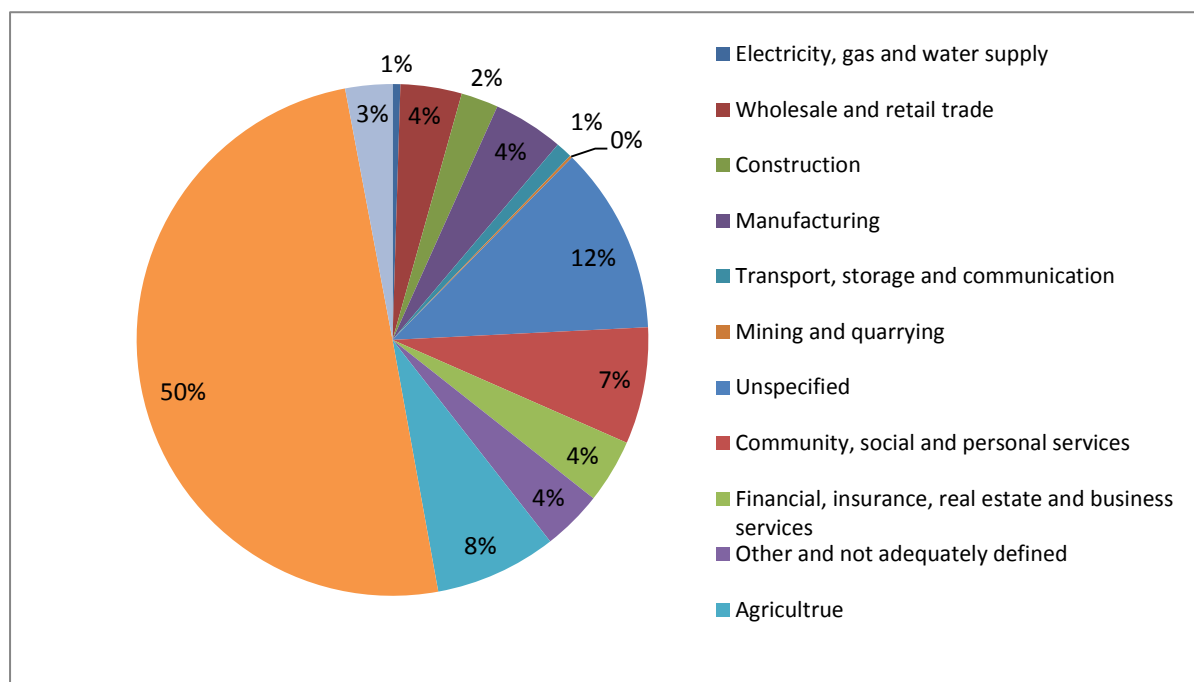
Stats SA Community Survey (2007) reveals that almost half of the population is employed within the Hantam Local Municipality. Only 15.43% are unemployed and 35.45% are classified as not economically active. A large number of people have elementary jobs which can be attributed to the low levels of education with this region.

#### *5.1.3.3 Education and skills level*

According to Stats SA Community Survey (2007), a majority of the population have some primary and high school education. Approximately 20% of the population have no schooling background. Minority of the population have tertiary qualifications which include Diplomas, Bachelor Degrees and Post Graduate Degrees.

#### *5.1.3.4 Economic overview*

According to Stats SA Community Survey (2007), the largest contributor to employment in the municipal area was the community, social and personal services sector, contributing 7.37%. The second largest contributor was manufacturing and financial and business services at 4.46% and 4.04%, respectively (Figure 5-3).



**Figure 5-3: Contributions of sectors to local employment in the Hantam Local Municipality** (Source: Adapted from Stats SA Community Survey)

#### 5.1.4 Matzikama Local Municipality

The proposed Vanrhynsdorp project site is located in the Matzikama Local Municipality of the Cederberg District Municipality in the Western Cape Province.

##### 5.1.4.1 Population

In 2007, the total population in Matzikama was 46 359 and the dominant ethnic group was Coloured. The Stats SA Community Survey (2007) indicates that other ethnic groups are in minority numbers, with only 4 184 Whites, 1 595 Black people and 38 Indians/Asians. The dominant languages are Afrikaans followed by English.

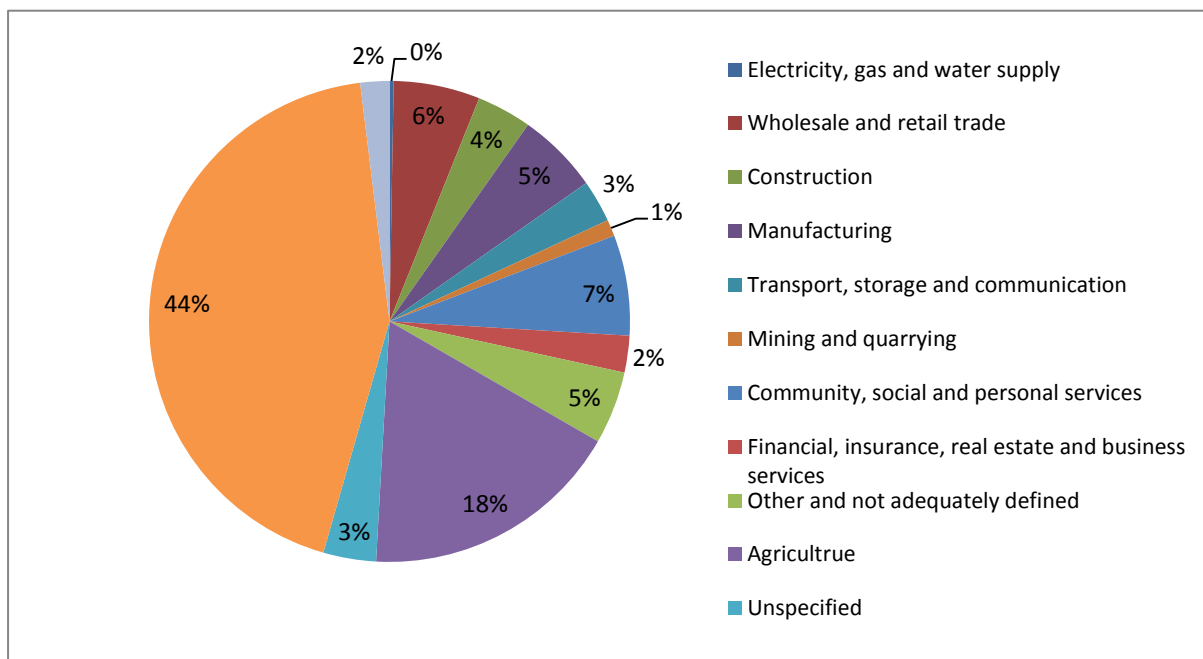
##### 5.1.4.2 Employment and unemployment

Stats SA Community Survey (2007) reveals that 56.3% of the population was employed while 14.17% of the population was unemployed. An estimated 29.3% of the population was classified as not economically active. The high percentage of the economically inactive group reveals that this group is dependent on those who are employed. The average income in this municipality is very low.

##### 5.1.4.3 Economic overview

In terms of the data from Stats SA Community Survey (2007), agriculture is the key contributor to the economy of the Matzikama Local Municipality. There are wine farms and cellars in the region which produce wine and brandy. Small-scale wheat and maize farming

is undertaken in the area, as well as sheep farming. The tourism sector in the area has developed over the last few years and it is the second largest sector that contributes to the economy. The main tourism attraction in the region is the Namaqualand Nature Reserve which is a seasonal attraction during the flower season in September/October.



**Figure 5-4: Contributions of sectors to local employment in the Matzikama Local Municipality** (Source: Adapted from Stats SA Community Survey)

### 5.1.5 Cederberg Local Municipality

The proposed Graafwater project site is located in the Cederberg Local Municipality is located within the West Coast District Municipality of the Western Cape Province.

#### 5.1.5.1 Population

In 2007, there were 31 943 people and 10 367 households in the local municipality. The Coloured ethnic group is the dominant group as they constitute 78.2% of the population. The second largest group are Whites making up 17.51% followed by Black people at 3.88%. Afrikaans is the most common spoken language followed by English and IsiXhosa.

#### 5.1.5.2 Education levels

Education levels in the Cederberg Local Municipality are extremely low as only a few people have a matric certificate and tertiary qualification. In 2007 it was estimated that almost 20% of the population have a primary and high school background.

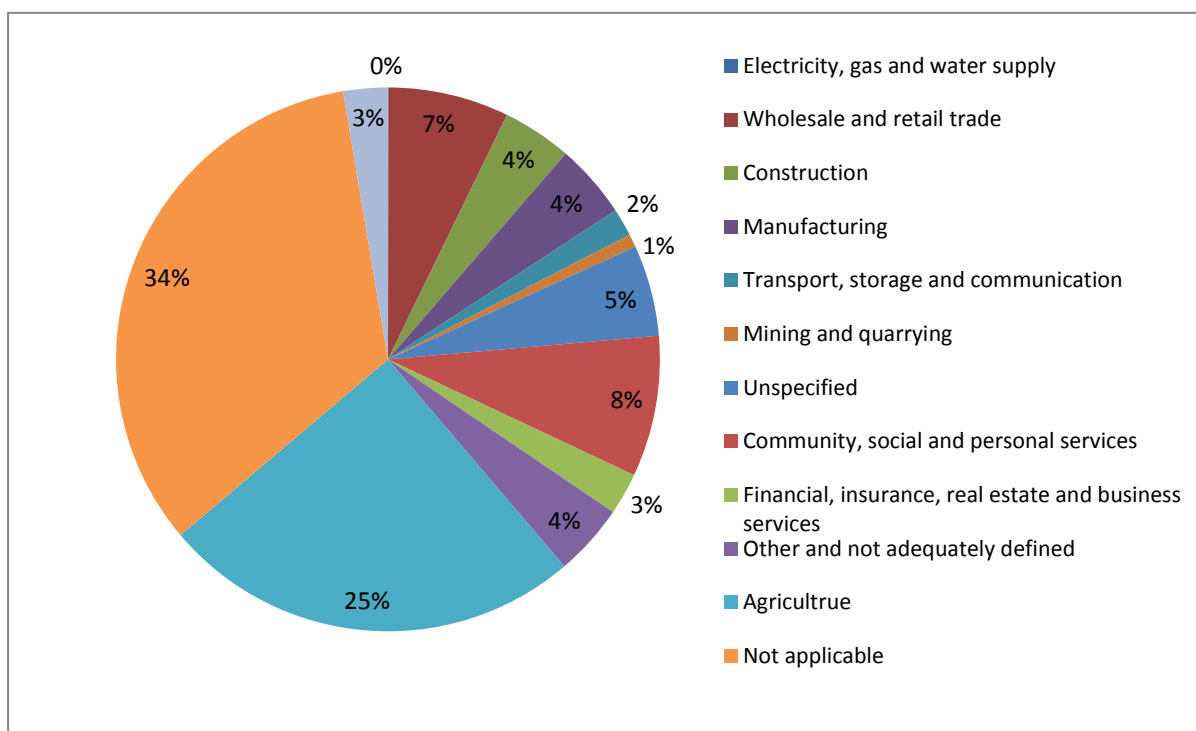
Almost 6% of the population have a matric certificate and approximately 3% of the population had a tertiary qualification (Stats SA Community Survey, 2007). The low education levels correlate to low skills level and thus results in people becoming less employable as they do not have the necessary skills and educational background.

### 5.1.5.3 Employment and unemployment

According to Stats SA Community (2007), 66% of the population was employed and 27% was not economically active. The unemployment rate is very low as only 6.7% of the population was unemployed. Although two thirds of the population is employed, poverty in the area is still rife with only 45.9% of the people earning between R 4 812 and R 9 600. The median annual income in this region is R 8 463.

### 5.1.5.4 Economic overview

Stats SA Community Survey (2007) indicates that agriculture is the main industry that contributes to employment in the Cederberg Local Municipality. Rooibos tea is grown in the area and citrus farming is also common. Rooibos tea and citrus are exported, which contributes to the Gross Domestic Product and employment of the area.




**Figure 5-5: Contributions of sectors to local employment in the Cederberg Local Municipality** (Source: Adapted from Stats SA Community Survey)

## 5.2 Local biophysical, socio-economic and cultural characteristics


This section provides information on the status and nature of the biophysical and cultural environments of the proposed project sites and surrounding areas.

5.2.1 Aggeneys

ASPECT	DESCRIPTION
5.2.1.1 <u>Climate</u>	<p>Aggeneys normally receives about 75 mm of rain per year, with most rainfall occurring mainly during autumn. It receives the lowest rainfall (0 mm) in January and the highest (15 mm) in March and April. The monthly distribution of average daily maximum temperatures shows that the average midday temperatures for Aggeneys range from 14°C in June and July to 29°C in January. The region is the coldest during July when the temperature drops to 4°C on average during the night. The climatic conditions of this region of the Northern Cape are typical of conditions characteristics of a semi-desert and the southern Kalahari. Springbok, which is about 110 km West South-West, is generally regarded as one of the hottest towns in South Africa, with summer temperatures varying between 30°C and 40°C. The region is characterised by fluctuating temperatures, low and unpredictable rainfall and high evaporation rates.</p> <p>The low annual rainfall (average of 170 mm to 240 mm in central and western parts of Northern Cape Province) is significantly lower than the evaporation rate which creates the dry and arid environment. The area experiences high temperatures especially in the summer months, where daily maximums of &gt;42°C are experienced. The annual evaporation in the area is high at average 2 200 mm. Winter temperatures can drop to below 4°C. Frost is rare, but occurs occasionally, although not severe.</p>

ASPECT	DESCRIPTION	
<p>5.2.1.2 <u>Topography and hydrology</u></p>	<p>The topography and landscape of the Aggeneys study area is fairly uniform. The area displays an elevation of 880 metres above mean sea level (mamsl) to 900 mamsl and the landscape is north facing. It is flat with a slope rise of between 0 and 2%.</p> <p>The study site is bordered by steep outcrops in the northern part. The study area is covered by sandy and rocky sections and low-lying vegetation. In terms of human elements, it includes fences, and a telecommunications tower is visible when standing on site.</p> <p>The Aggeneys study area contains one major drainage line running in a south-westerly direction from the north-eastern corner to the south-western corner. This drainage line spans up to about 50 metres wide. A smaller drainage line, which is about 25 metres wide, flows in a south-south-westerly direction to meet up with the larger drainage line in the study area. The topography is illustrated in Plan 4a (Appendix A).</p>	 <p><u>Overview of landscape characteristics of the project site</u></p>
<p>5.2.1.3 <u>Surface water and aquatics</u></p>	<p>The project area is situated in the Lower Orange Water Management Area (WMA 14). The major rivers associated with this WMA are the Ongers, Hartbees and Orange rivers. The project site is situated in the quaternary catchments D81G, D82A, D82A and D82C. An ephemeral river system and associated drainage lines were identified and delineated for the project area. The project area is not recognised as a FEPA and this sub-catchment is not considered to be an upper management area.</p> <p>This ephemeral system and associated drainage lines may be recognised by the NWA as a watercourse and as a result may be protected from the associated activities. Should these drainage lines be recognised by the</p>	



ASPECT	DESCRIPTION	
	<p>authorities as water resources, a WULA would need to be submitted to the DWA for authorisation of any activity that could potentially impact on the water course. It is recommended to avoid these drainage lines, owing to the sensitivity of the benefiting ephemeral river systems and the largely natural state of these systems. In addition to this, a buffer zone of 100 m would negate the need to compile a WULA. The delineation of the drainage lines as well as considering the 100 m buffer zone will result in a decrease in available surface area for infrastructure.</p>	
<p>5.2.1.4 <i>Visual</i></p>	<p>The receptors that have been identified and need to be surveyed for the Aggeneys study area are the N14 road that runs through the study area and Aggeneys mining town, which is no more than 5 km from the site itself. This town is occupied predominantly by mine workers due to the mining venture that is currently in operation to obtain lead and copper resources. It must be noted that there is already infrastructure in the Aggeneys area because of the mining operations and the town; structures such as transmission lines and telephone reception towers are visible. The visual sensitivity is reduced by these structures since the area is not pristine or 'untouched'.</p>	 <p><i>Fences and view of Aggeneys town from the study area</i></p>
<p>5.2.1.5 <i>Flora</i></p>	<p>The proposed project site is located in the Nama Karoo biome which makes up 25% of the land surface of South Africa. Climatically and biologically the Nama Karoo is a heterogenous and ecotonal region. A wide variety of life-forms co-exist in the Nama Karoo. Small trees occur along drainage lines and on rocky hillsides. Plains are dominated by low shrubs (generally less than 1 m in height) intermixed with grasses, succulents, geophytes and annual forbs (Azef, 2010). The amount of grass present within the vegetation differs over time, increasing in</p>	


ASPECT	DESCRIPTION
	<p>periods of above average summer rainfall and decreasing in periods when summers are drier than winters (Azef, 2010).</p> <p>The vegetation of the study area can be classified as Bushmanland Sandy Grassland (NKb 4) (85%) and Bushmanland Arid Grassland (NKb 3) (15%) as described by Mucina and Rutherford (2006).</p> <p>The <b><u>Bushmanland Sandy Grassland</u></b> consists of dense, sandy grassland plains with dominating white grasses (<i>Stipagrostis</i>, <i>Schmidtia</i>) and abundant drought-resistant shrubs. After rainy winters, rich displays of ephemeral spring flora (<i>Grielum humifusum</i>, <i>Gazania lichtensteinii</i>) can occur. This vegetation type is least threatened, with no species conserved in statutory conservation areas. Very little transformation has occurred in the area. The Alien shrub <i>Prosopis</i> spp. can be seen as a threat.</p> <p>The <b><u>Bushmanland Arid Grassland</u></b> vegetation occurs in irregular plains on a slightly sloping plateau sparsely vegetated by grassland dominated by white grasses (<i>Stipagrostis</i> sp.) giving this vegetation type the character of semi-desert ‘steppe’. In places low shrubs of <i>Salsola</i> change the vegetation structure. In years of abundant rainfall, rich displays of annual herbs can be expected. This vegetation type is least threatened, with only small patches statutorily conserved in Augrabies Falls National Park and Goegab Nature Reserve. Very little of the area has been transformed and erosion is very low.</p>
<p>5.2.1.6 <u>Fauna</u></p>	<p>The Karoo region, because of its aridity and low shrubby vegetation, never supported the diversity of herbivorous large mammals found in the African savannas (Azef, 2010). Plant eating animals of the Karoo are either small or confined to protected habitats, or are very mobile. Springbok and smaller herbivorous mammals including hares, rabbits, the rock hyrax, and rodents are common. Much of the nutrient cycling in the Nama Karoo is done by Termites these also form the staple food of many other species. Specialized insectivorous mammals include aardwolf, armadillo, bat-eared fox, and a variety of long-nosed elephant shrews (Azef, 2010). Birds include some of the smallest and largest species in South Africa, and the reptile fauna is rich, including snakes, geckos, lizards and tortoises. There is a high diversity of invertebrates. The brown locust and Karoo caterpillar appear under favourable, local rainfall events.</p>



ASPECT	DESCRIPTION
	<p>Small stock (sheep and goats) is farmed throughout the Karoo region. Ranches are generally large (4 000 to 15 000 ha) because it takes 2 to 7 ha of natural veld to support one small-stock unit in this region (Azef, 2010).</p> <p>There is a mining industry in the north west of the region and growing of citrus, olives, deciduous fruit and wine grapes in the major river valleys. Threats to the fauna include overgrazing (desertification) and land transformation by mining, agriculture and development. Less than 1% of the biome is conserved in formal areas.</p>
<p>5.2.1.7 <u>Biodiversity importance</u></p>	<p>The proposed site is situated in a CBA 2 area, which indicates that the ecosystems and species are largely intact and undisturbed. The area has intermediate irreplaceability or some flexibility in terms of area required to meet biodiversity targets. There are options for loss of some components of biodiversity in these landscapes without compromising our ability to achieve targets. The landscapes are approaching but have not passed their limits of acceptable change.</p> <p>In terms of the CBA, the vegetation in the study area is classified as quartz gravel patch succulent Karoo.</p> <p>The site falls within an area that is a local centre of biodiversity for amphibians, as well as within a unique habitat of biotic amphibian community types. Furthermore, it occurs within an area that is imperative for maintenance of ecological processes that support amphibian biodiversity. The area is described as a threatened (in terms of amphibian habitat). Only one endemic amphibian species occurs in the area. In close proximity, approximately 3 km away, to an area that is described as a unique habitat for birds. With respect to insects, the site occurs within an area that is a centre of endemism, a local centre of biodiversity and a unique habitat for insects. This site is found within an area where eastern Bushmanland Quartz and Gravel patches are found.</p>


ASPECT	DESCRIPTION									
<p>5.2.1.8 <u>Soil and agricultural potential</u></p>	<p>Soil information was obtained from the National Land Type Survey published at 1:250 000 scale. The Land Type Survey is a reconnaissance survey carried out by the Institute for Soil Climate and Water of the Agricultural Research Council (ISCW-ARC). The aim was to establish the broad soil patterns occurring in South Africa. The dominant soil types in the Aggeneys study area is listed in the following table:</p> <table border="1" data-bbox="495 678 1281 884"> <thead> <tr> <th>Study area</th> <th>Dominant land type</th> <th>Dominant soil properties</th> </tr> </thead> <tbody> <tr> <td rowspan="2">Aggeneys</td> <td>Ag</td> <td>Shallow red and yellow</td> </tr> <tr> <td>Af (dunes present)</td> <td>Deeper red and yellow</td> </tr> </tbody> </table> <p>According to the land type data (Plan 5a), the dominant soils of the dominating land type soil is yellow and red, well-drained soil, but can be shallow and stony. The soils are predominantly sandy and are apedal (non-structured) in both the A and B horizons. Rooting depth is limited by parent rock occurring below the B soil horizon in the Fc land type only. The natural fertility status of the soil is expected to be low. Fertility is mainly determined by the clay and organic carbon content of soils. The fertility status is therefore deemed to be low because the both clay and carbon content is expected to be in the order of 8% to 10% and less than 1%, respectively in the A horizon. The A horizon is also</p>		Study area	Dominant land type	Dominant soil properties	Aggeneys	Ag	Shallow red and yellow	Af (dunes present)	Deeper red and yellow
Study area	Dominant land type	Dominant soil properties								
Aggeneys	Ag	Shallow red and yellow								
	Af (dunes present)	Deeper red and yellow								



*Disturbed soil on Aggeneys*

ASPECT	DESCRIPTION	
	<p>considered to be the horizon containing most of the plant roots and nutrients. Soil pH is expected to be high due to the occurrence of lime in the landscape.</p> <p>The land types are illustrated in Plan 5a (Appendix A).</p>	
<p>5.2.1.9 <u>Land use</u></p>	<p>The town Aggeneys (place of water) is located approximately 65 km west of Pofadder, on the N14 highway to Springbok in the Hantam Local Municipality of the Namakwa District Municipality, in the Northern Cape Province. Aggeneys is a small town, with most of the town's facilities within walking distance of each other. The town consists of two communal sections, the Northern Village and Southern Village. Aggeneys is well-maintained and has a small population. Community infrastructure and facilities include shops, a post office, a clinic, a pharmacy, butchery, recreational facilities, schools and a police station. Aggeneys is known for its copper, zinc, silver and lead mining. The town was established around 1976 to facilitate the Black Mountain Mine, which is an underground base-metal operation that employed over 600 permanent staff in 2011. The surrounding area is semi-desert, with generally arid conditions.</p>	 <p><i>Main land use of the Aggeneys site is grazing</i></p>


ASPECT	DESCRIPTION	
<p>5.2.1.10 <u>Tourism</u></p>	<p>As illustrated in Plan 7 (Appendix A), Aggeneys falls into the Namakwa tourist district. The surrounding mountains, rivers, valleys and coastline are criss-crossed by hiking, biking, canoe and 4x4 trails. The Aggeneys town itself is not a major tourist attraction, as it mainly accommodates the employees of the mining industry in the area. The main tourist attraction in the regional area is the unique natural and cultural resources found in this area. Beyond the edges of town the arid conditions and the unique ecologies on the various inselbergs, peaks, hills and plains, with their varied rocky and shallow soil substrate, support a wide range of plants, animals, birds and insects, including rare and endemic species.</p>	 <p><i>Quiver trees and unique landscapes</i></p>
<p>5.2.1.11 <u>Social environment</u></p>	<p>The area is sparsely populated, with a population of approximately 850 000 people. The Coloured ethnic group is the most dominant group in the area. Afrikaans is the most spoken language followed by English, Nama, SeTswana and IsiXhosa. Mining and agriculture are the main sectors that contribute to the economic growth of the area. The education levels in the area are very low and lot people have elementary jobs.</p>	 <p><i>Mining town of Aggeneys</i></p>


ASPECT	DESCRIPTION	
<p>5.2.1.12 <u>Archaeology and heritage</u></p>	<p>Low granite rocky outcrops and ridges occur on the property. Quartz lithics were found scattered throughout the area, but were mainly flakes with some formal scrapers noted. The outcrops were briefly surveyed for rock art, but no evidence of this was found. This site may be exempted from a Heritage Impact Assessment, as no significant heritage resources occur or were noted in the Cultural Resources Pre-assessment (CRP) research, apart from Stone Age material. The type of development is furthermore considered to be extremely low-impact</p>	 <p><i>Rocky outcrops in the Aggeneys study area</i></p>


5.2.2 Kenhardt

ASPECT	DESCRIPTION
<p>5.2.2.1 <u>Climate</u></p>	<p>Kenhardt normally receives about 70 mm of rain per year, with most rainfall occurring mainly during autumn. It receives the lowest rainfall (1 mm) in August and the highest (61 mm) in March. The monthly distribution of average daily maximum temperature shows that the average midday temperatures for Kenhardt range from 23°C in July to 37°C in December, January and February. The region is the coldest during June and July when the temperature drops to 4°C on average during the night.</p> <p>Augrabies is situated in a semi-arid region, which implies low annual rainfall and extreme variations of temperatures. In the peak summer months (December, January, February) the average daytime temperature is 37°C, but highs of over 40°C have been recorded. Summer nights are usually more pleasant, but temperatures will remain high, at around 25°C.</p> <p>During winter months the average daytime temperature often hovers around 20°C, but lower temperatures are a possibility. Winter nights average around 0°C although the temperature drops to -5° occasionally. Autumn and spring are characterized by pleasant, moderate temperatures. The average annual rainfall in the area is 170 mm, with most rains occurring between November and April. Summer rain usually falls in short, heavy bursts, accompanied by spectacular thunderstorms and strong winds. Winter rains are gentle and last 1-3 days.</p> <p>The climatic conditions of this region of the Northern Cape are typical of conditions characteristics of a semi-desert and the southern Kalahari. Augrabies Falls, which is about 110 km North-Northwest, is generally regarded as one of the hottest areas in South Africa, with summer temperatures varying between 30°C and 40°C. The region is characterised by fluctuating temperatures, low and unpredictable rainfall and high evaporation rates. The low annual rainfall (average of 170 – 240 mm in central and western parts of Northern Cape Province) is significantly lower than the evaporation rate which creates the dry and arid environment. The area experiences high temperatures especially in the summer months, where daily maximums of &gt;42°C are experienced. The annual evaporation in the area is high at average 2,200 mm. Winter temperatures can drop to below 4°C. Frost is rare, but occurs occasionally, although</p>



ASPECT	DESCRIPTION	
	usually it is not severe.	
<p>5.2.2.2 <u>Topography and hydrology</u></p>	<p>The Kenhardt study area displays an elevation between 910 and 940 mamsl. The study area can be described as flat since, for the most part, it has a slope rise of between 0 and 3%. The area is north facing. Low-lying grassy and shrubby vegetation covers the landscape, which is fairly uniform within and around the study area; flat surfaces (sometimes very mildly undulating) with steeper outcrops are visible at intervals (figure right). There are fences around the perimeter of the study area and transmission lines pass through it to connect with the Kenhardt substation, which is about a kilometre away from the study area itself but is visible from the site. Kenhardt town is not visible from the proposed site since it is approximately 40 km away. The topography is illustrated in Plan 4b (Appendix A).</p>	 <p style="text-align: center;"><i>Kenhardt landscape</i></p>
<p>5.2.2.3 <u>Surface water and aquatics</u></p>	<p>The project area is situated in the Lower Orange Water Management Area (WMA 14). The major rivers associated with this WMA are the Ongers, Hartbees and Orange rivers. The project site is situated in the quaternary catchment D53D. According to the FEPA described for the catchment area, the project area is situated in a recognised upper management area (sub-catchment 4022). Impacts to the water quantity and quality of the catchment may thus impact on downstream FEPAs. No ephemeral river system was identified for the site, but drainage lines in the catchment area have been identified and delineated. These drainage lines may be recognised by the NWA as a watercourse and as a result may be protected from the associated activities. Should these drainage lines be recognised by the authorities as water resources, a WULA would need to be submitted to the DWA for authorisation of any activity that could potentially impact on the water course. It is recommended to avoid these drainage lines, owing to the sensitivity of the benefiting ephemeral river systems and the largely natural state of these systems. In addition to this, a buffer zone of 100 m</p>	

ASPECT	DESCRIPTION	
	would negate the need to compile a WULA. The delineation of the drainage lines as well as considering the 100 m buffer zone will result in a decrease in available surface area for infrastructure.	
5.2.2.4 <i>Visual</i>	<p>A small dirt road runs just south of the Kenhardt study area – it is important to determine the distances from the road that the potential structure will be visible from. Apart from this road, it is predicted that the solar structures will not experience any other receptors. It is important to note that the Aries substation exists on the other side of the road that runs south of the study area (approximately 1 km from site). This is ultimately where the potential power supply created by the solar plant will be directed to for distribution. There are transmission lines running through the study area itself. The landscape is, therefore, already altered by these man-made structures and the construction of the plant will not alter the landscape character drastically.</p>	 <p><i>Aries substation – 1 km from Kenhardt study area</i></p>



ASPECT	DESCRIPTION
<p>5.2.2.5 <u>Flora</u></p>	<p>The proposed project site is located in the Nama Karoo biome which makes up 25% of the land surface of South Africa.</p> <p>Climatically and biologically the Nama Karoo is a heterogenous and ecotonal region. A wide variety of life-forms co-exist in the Nama Karoo. Small trees occur along drainage lines and on rocky hillsides. Plains are dominated by low shrubs (generally less than 1 m in height) intermixed with grasses, succulents, geophytes and annual forbs (Azef, 2010). The amount of grass present within the vegetation differs over time, increasing in periods of above average summer rainfall and decreasing in periods when summers are drier than winters (Azef, 2010).</p> <p>The vegetation of the study area can be classified as Bushmanland Basin Shrubland (NKb6) as defined by Mucina and Rutherford (2006). Vegetation and landscape features include slightly irregular plains with dwarf shrubland dominated by a mixture of low sturdy and spiny (and sometimes also succulent) shrubs (Rhigozum, Salsola, Pentzia, Erioccephalus), white grasses (Stipagrostis) and in years of high rainfall also abundant annuals such as Gazania and Leysera species. The vegetation type is least threatened, with none of the unit is conserved in statutory conservation areas. There are no signs of serious transformation, but scattered individuals of Prosopis sp. occur in some areas. Some localised dense infestations form closed woodlands along the eastern border of the unit with Northern Upper Karoo.</p> <div data-bbox="1397 339 2029 799" data-label="Image">  </div> <p data-bbox="1536 826 1906 855"><i>Vegetation and burrow of fauna</i></p>



ASPECT	DESCRIPTION
<p>5.2.2.6 <u>Fauna</u></p>	<p>The Karoo region, because of its aridity and low shrubby vegetation, never supported the diversity of herbivorous large mammals found in the African savannas (Azef, 2010). Plant eating animals of the Karoo are either small or confined to protected habitats, or are very mobile. Springbok and smaller herbivorous mammals including hares, rabbits, the rock hyrax, and rodents are common. Much of the nutrient cycling in the Nama Karoo is done by Termites these also form the staple food of many other species. Specialized insectivorous mammals include aardwolf, armadillo, bat-eared fox, and a variety of long-nosed elephant shrews (Azef, 2010). Birds include some of the smallest and largest species in South Africa, and the reptile fauna is rich, including snakes, geckos, lizards and tortoises. There is a high diversity of invertebrates. The brown locust and Karoo caterpillar appear under favourable, local rainfall events.</p> <p>Small stock (sheep and goats) is farmed throughout the Karoo region. Ranches are generally large (4 000 to 15 000 ha) because it takes 2 to 7 ha of natural veld to support one small-stock unit in this region (Azef, 2010).</p> <p>There is a mining industry in the north west of the region and growing of citrus, olives, deciduous fruit and wine grapes in the major river valleys. Threats to the fauna include overgrazing (desertification) and land transformation by mining, agriculture and development. Less than 1% of the biome is conserved in formal areas.</p>
<p>5.2.2.7 <u>Biodiversity importance</u></p>	<p>The project site falls outside CBA. In terms of the CBA, vegetation is classified as Bushmanland Basin Shrubland. Neither mammalian nor insect life is considered important.</p>


ASPECT	DESCRIPTION							
<p>5.2.2.8 <u>Soil and agricultural potential</u></p>	<p>Soil information was obtained from the National Land Type Survey published at 1:250 000 scale. The Land Type Survey is a reconnaissance survey carried out by the ISCW-ARC. The aim was to establish the broad soil patterns occurring in South Africa. The soil maps have been included in Appendix A of this report. The dominant soil types in the Kenhardt study area is listed in the following table:</p> <table border="1" data-bbox="508 639 1361 762"> <thead> <tr> <th>Study area</th> <th>Dominant land type</th> <th>Dominant soil properties</th> </tr> </thead> <tbody> <tr> <td>Kenhardt</td> <td>Ah</td> <td>Red and yellow sandy soil</td> </tr> </tbody> </table> <p>According to the land type data, the dominant soils of the dominating land type soil is yellow and red, well-drained soil, but can be shallow and stony. The soils are predominantly sandy and are apedal (non-structured) in both the A and B horizons. Rooting depth is limited by parent rock occurring below the B soil horizon in the Fc land type only. The natural fertility status of the soil is expected to be low. Fertility is mainly determined by the clay and organic carbon content of soils. The fertility status is therefore deemed to be low because the both clay and carbon content is expected to be in the order of 8% to 10% and less than 1%, respectively in the A horizon. The A horizon is also considered to be the horizon containing most of the plant roots and nutrients. Soil pH is expected to be high due to the occurrence of lime in the landscape. The land types are illustrated in Plan 5b (Appendix A).</p>		Study area	Dominant land type	Dominant soil properties	Kenhardt	Ah	Red and yellow sandy soil
Study area	Dominant land type	Dominant soil properties						
Kenhardt	Ah	Red and yellow sandy soil						



*Soil and rocky terrain found in the Kenhardt study area*

ASPECT	DESCRIPTION	
<p>5.2.2.9 <u>Land use</u></p>	<p>The town of Kenhardt is situated approximately 115 km south of Upington on the R27 in the Northern Cape Province. The landscape surrounding Kenhardt is vast and dry. Small-scale stock farming is commonly practiced in the region. The main economic activity in the study area is Dorper sheep-farming, while some farms are stocked with springbok and gemsbok. The Aries Substation is located 1 km south of the proposed project site.</p>	 <p><i>Land use of the Kenhardt site is limited grazing</i></p>
<p>5.2.2.10 <u>Tourism</u></p>	<p>The study area is located in the Kai !Garib Local Municipality, which falls within the Siyanda District Municipality. The district municipality covers a surface area of 7 449 km<sup>2</sup>. The municipal area consists of three main towns, namely Kakamas, Keimoes and Kenhardt. From a tourism perspective, Kenhardt falls within the renowned 'Green Kalahari Tourism Region'. Tourism attractions in this region include San artwork, salt pans and interesting vegetation, such as quiver trees and seasonal flowers. The vegetation on site forms part of the Northern Cape's Nama-Karoo. This comprises dwarf bushes, grasses and seasonal flowering annuals on gravel soils. During the rainy seasons, birds flock to the surrounding pans. There are numerous Quiver Trees (Kokerbome) found in the region, including a Quiver Tree forest</p>	


ASPECT	DESCRIPTION	
	<p>close to Kenhardt. In the town of Kenhardt, tourists can visit the first library, which was built in 1897 and used as a library until 1977. The 500 to 600 year old Camel Thorn tree, under which Kenhardt was founded, can also be visited. There are also numerous architectural attractions, as well as outdoor activities such off-road trails for 4x4 and hiking.</p>	 <p data-bbox="1473 783 1957 810"><i>Natural tourist attractions near Kenhardt</i></p>
<p>5.2.2.11 <u>Social environment</u></p>	<p>The municipal area has a population of over 56 502 people. The dominant ethnic groups are Coloureds followed by Whites and the least dominant groups are Blacks and Indians. The agricultural sector is the main sector in terms of economic growth and employment in this region. Grape and sheep farming are the most predominant activities that contribute to the economy and employment rate. Kenhardt has low levels of education, the highest with and a small percentage of the population has a tertiary qualification.</p>	 <p data-bbox="1518 1313 1912 1340"><i>A local Church in Kenhardt town</i></p>


ASPECT	DESCRIPTION	
<p>5.2.2.12 <u>Archaeology and heritage</u></p>	<p>There are reports of rock art within the area such geometric designs and crude human figures in faded red underneath dirty-white human figures with associated Later Stone Age material (Rudner 1965). In terms of intangible heritage, it is noted that many of the informants that Lucy Lloyd and Wilhelm Bleek interviewed for the compendium of San ethnography (Bleek and Lloyd Collection), originated from Kenhardt or were interviewed in Kenhardt (Van Der Merwe, 1987; Jolly, 2006). An informant by the name of //Kabbo told Dr Bleek that the hills, now known as the Strandberg, are important to the San of the area. His son-in-law, /Han#kass'o, said that they are part of the story of The Death of the Lizard. It tells the story of how a lizard tried to squeeze through the mountains, but broke them apart as it tried, creating the separate hills as we see them today (Deacon, 1988).</p> <p>There were many skirmishes between the Boers and the San people in the area around Kenhardt. Thousands of San individuals were killed by the Boers and they were hunted down and killed for trophies (Skotnes, 2002). Two Cape Afrikaaner Rebels were executed in Kenhardt and the memorial for this event can be found in the Main Cemetery in Kenhardt (Green Kalahari Accommodation Kenhardt).</p> <p>This study area was characterised by drainage lines converging into a basin-like depression. Stone Age lithics were consistently noted along the drainage lines and the rim of the depression. Although no source material was found, both formal and informal</p>	 <p><i>Flat and rocky terrain on Kenhardt</i></p>





ASPECT	DESCRIPTION	
	tools were found, however, these were as surface find spots with little context. No other physical heritage resources were noted in the project area. Reference to Anglo-Boer War and episodes of Griqua history have been found in the literature	

5.2.3 *Loeriesfontein*

ASPECT	DESCRIPTION
<p>5.2.3.1 <u>Climate</u></p>	<p>Loeriesfontein normally receives about 147 mm of rain per year. It receives the lowest rainfall (1mm) in February and the highest (27mm) in June. The monthly distribution of average daily maximum temperatures shows that the average midday temperatures for Loeriesfontein range from 17°C in June and July to 29 °C in January and February. The region is the coldest during July when the temperature drops to 2.4°C on average during the night. Brandvlei normally receives about 130mm of rain per year (five year average), with most rainfall occurring mainly during late summer and autumn. It receives the lowest rainfall in July and the highest in March. The monthly distribution of average daily maximum temperatures shows that the average midday temperatures for Brandvlei range from 18°C in June and July to 35°C in January. The region is the coldest during July when the mercury drops to 1°C on average during the night.</p>
<p>5.2.3.2 <u>Topography and hydrology</u></p>	<p>The Loeriesfontein study area is elevated at 815 to 840 mamsl. The landscape is flat for the most part since there is a mild slope rise of between 0 to 2%. The farm on which the proposed solar park will be positioned is named “Klein Rooiberg” since the northern border of the study area is dominated by outcropping regions (“koppies”) which are reddish in colour, where the slope rise is much higher (figure 2). The southern border of the study area also displays these koppies that are much steeper. These regions can be described as elevated. The landscape is north facing. The site is covered by low lying vegetation and rocky areas. There is a fence surrounding the western, eastern and southern boundaries of the study area and transmission lines are visible north-east of it. The Helios substation is situated approximately 8 km north of the Loeriesfontein study area and it</p> 

ASPECT	DESCRIPTION	
	<p>is not visible from the study area. A number of drainage lines were identified throughout the Loeriesfontein study area; there are various sizes, the widest of them being about 50 m (within the eastern region of the study area). The general flow direction of the smaller drainage lines is easterly, until they meet at the major drainage line within the study area which has a southerly flow direction. The topography of the study area is shown in Plan 4c (Appendix A).</p>	 <p><i>Loeriesfontein study area Landscape and Rooiberge; a view down one of the Loeriesfontein drainage lines</i></p>
<p>5.2.3.3 <u>Surface water and aquatics</u></p>	<p>The project area is situated in the Olifants/Doring Water Management Area (WMA 17). The major rivers associated with this WMA are the Olifants, Doring, Krom, Sand and Sout rivers. The project site is situated in the quaternary catchments E31B and E31C. A few ephemeral river systems and associated drainage lines were identified for the project area. These systems are associated with the Volstruisnesholte River catchment which is recognised by the FEPA as an upper management area in support of the downstream FEPAs (sub-catchment 5338). The catchment area is considered to be largely natural and as a result, any impacts to the systems may be severe. These ephemeral systems and associated drainage lines will be recognised by the NWA as a watercourse and as a result will be protected from the associated activities. In the event that these systems will be impacted upon, management strategies will need to be provided in support of the downstream FEPAs. In addition to this, a WULA would need to</p>	

ASPECT	DESCRIPTION	
	<p>be submitted to the DWA for authorisation of any activity that could potentially impact on the watercourse. It is recommended to avoid these systems owing to the ecological importance of the benefiting ephemeral river system. In addition to this, a buffer zone of 100 m would result in the exemption of a water use licence application. The delineation of the drainage lines as well as considering the 100 m buffer zone will result in a decrease in available surface area for infrastructure. <i>Stakeholder engagement with the authorities will result in better clarity on the uncertainties pertaining to the watercourses and described buffer zones.</i></p>	
<p>5.2.3.4 <u>Visual</u></p>	<p>The Loeriesfontein study area has very few man-made structures on or around its immediate radius which increases the visual sensitivity of the area. There are, however, transmission lines running through it towards the Aries substation. The study area is 40 km outside of the town and the only access road from where the study area is visible is a dirt road (figure right) that is not utilised by many people besides the landowners in the area. Tourists that might pass through Loeriesfontein town itself will therefore not be able to see the solar park. There are, therefore, hardly any visual receptors that will be affected by the potential Loeriesfontein solar power plant. There is also a “koppie” on the right hand side of the road (when driving in a northerly direction) in the study area that could provide excellent screening if the plant were to be placed behind it.</p>	 <p data-bbox="1406 1094 1975 1166"><i>Gravel road running through Loeriesfontein study area</i></p>


ASPECT	DESCRIPTION	
<p>5.2.3.5 <i>Flora</i></p>	<p>The proposed Loeriesfontein project site is located in the Succulent Karoo Biome. This region and in particular Namaqualand, which is strongly influenced by winter rainfall and fog, is a desert that harbours a range of succulent plants beyond compare. It has a bulb flora richer than any other arid region and produces a springtime display of annual flowers. Some 5000 plant species exist in this region (Azef, 2010).</p> <p>The terrain varies from coastal sandy flats to mountain ranges of diverse geological formations. The rainfall in Namaqualand is for the most part reliable and this is the defining explanation for its unparalleled diversity of leaf succulents, bulbs, high numbers of minute succulents and the regular displays of spring flowers.</p> <p>In this dwarf succulent shrubland, leaf succulents dominate, and most of these species are in the Mesembryanthemaceae (&gt; 2 000 species) and Crassulaceae families (Azef, 2010). Most of the succulents are small and compact, and as a result there is a lot of space and habitat available in which to develop, this is why succulent species have such high diversity in this biome. The high floral diversity of this region and the fact that 50% of the species are strictly endemic, means Namaqualand is the only desert hotspot of biodiversity in the world (Azef, 2010).</p> <p>Annual plants, mostly of the daisy family, can be seen in colourful displays during the spring months. However, these annuals constitute only 8% of the flora of the Succulent Karoo</p>	 <p><i>Shrubs and vegetation on the Loeriesfontein study area</i></p>

ASPECT	DESCRIPTION
	<p>(Azef, 2010). The annuals are a result of human interference with the environment: they reclaim the ploughed wheat fields.</p> <p>The project site consists of Hantam Karoo (SKt2) vegetation type as described by Mucina and Rutherford (2006). Vegetation features include Dwarf Karoo Shrubland with nearly equal proportions of succulent elements and low microphyllous karroid shrubs, particularly of the family Asteraceae. There are rich displays of spring annuals and Geophytes.</p> <p>The vegetation type is least threatened, with only a small patch statutorily conserved in Akkerdam Nature Reserve near Calvinia.</p>
<p>5.2.3.6 <u>Fauna</u></p>	<p>In addition to the species rich plant life, this area has a diversity of tortoises, lizards, molerats, monkey beetles, bee flies, bees, wasps and scorpions. Mammals such as bat-eared fox, aardwolf, steenbok and duiker, as well as reptiles are abundant. Brant’s whistling rat is responsible for the burrow systems in sandy areas, which provide ideal conditions for seed germination. Of importance in the area are heuweltjies, raised mounds of calcium-rich soil, which support distinctive plant communities (Azef, 2010). It is thought that these were created by termites.</p> <p>Small stock farming (sheep and goats) is practiced in the Succulent Karoo. Mining for limestone, gypsum, diamonds and zinc, although contributing to the economy, results in destruction of the vegetation and heaps of un-vegetated spoil (Azef, 2010). Fruit is grown along the river valleys and Ostrich farming is practiced in the south of the Biome. Less than 0.5% of the area of the Succulent Karoo Biome is conserved (Azef, 2010). Ecotourism might be a viable option for a conservative means of land-use, as long as there is careful management.</p>
<p>5.2.3.7 <u>Biodiversity importance</u></p>	<p>The project site falls outside CBA. In terms of the CBA, the vegetation is classified as Upland Succulent Karoo. Neither mammalian nor insect life is considered important.</p>



ASPECT	DESCRIPTION							
<p>5.2.3.8 <u>Soil and agricultural potential</u></p>	<p>Soil information was obtained from the National Land Type Survey published at 1:250 000 scale. The Land Type Survey is a reconnaissance survey carried out by the ISCW-ARC. The aim was to establish the broad soil patterns occurring in South Africa. The dominant soil types in the Loeriesfontein study area is:</p> <table border="1" data-bbox="508 600 1350 759"> <thead> <tr> <th>Study area</th> <th>Dominant land type</th> <th>Dominant soil properties</th> </tr> </thead> <tbody> <tr> <td>Loeriesfontein</td> <td>Fc</td> <td>Shallow soil containing stones and rocks</td> </tr> </tbody> </table> <p>According to the land type data, the dominant soils of the dominating land type soil is yellow and red, well-drained soil, but can be shallow and stony. The soils are predominantly sandy and are apedal (non-structured) in both the A and B horizons. Rooting depth is limited by parent rock occurring below the B soil horizon in the Fc land type only. The natural fertility status of the soil is expected to be low. Fertility is mainly determined by the clay and organic carbon content of soils. The fertility status is therefore deemed to be low because the both clay and carbon content is expected to be in the order of 8% to 10% and less than 1%, respectively in the A horizon. The A horizon is also considered to be the horizon containing most of the plant roots and nutrients. Soil pH is expected to be high due to the occurrence of lime in the landscape. The land types are illustrated in Plan 5c (Appendix A).</p>		Study area	Dominant land type	Dominant soil properties	Loeriesfontein	Fc	Shallow soil containing stones and rocks
Study area	Dominant land type	Dominant soil properties						
Loeriesfontein	Fc	Shallow soil containing stones and rocks						




*General soils and terrain at Loeriesfontein*


ASPECT	DESCRIPTION	
<p>5.2.3.9 <u>Land use</u></p>	<p>The town of Loeriesfontein is within a basin surrounded by mountains, and it is accessed from the N7 highway. Loeriesfontein is in the heart of Namaqualand, which is home to more than 4 000 species of plants, and is world-famous for its carpets of spring flowers in Spring (August-September). The proposed project site is located approximately 40 km outside of town and falls within the boundaries of the Hantam Local Municipality of the Namakwa District Municipality. ‘Hantam’ is a Khoi name that means "mountains where the bulbs grow". The municipality is named after the Hantam Mountains found in the area. Land use is focussed on agriculture (sheep) and mining (salt). The study area is considered to be fairly natural succulent Karoo shrubland with low intensity sheep grazing on the site. The sheep grazing forms part of an extensive rotational farming system.</p>	





ASPECT	DESCRIPTION	
<p>5.2.3.10 <u>Tourism</u></p>	<p>As illustrated in Plan 7 (Appendix A), Loeriesfontein falls into the Namakwa tourist district. The surrounding mountains, rivers, valleys and coastline are criss-crossed by hiking, biking, canoe and 4x4 trails. Loeriesfontein town has a vibrant community with a growing tourism industry. Various annual events are held each year, such as the flowering festival and the annual agricultural show. South-western Loeriesfontein forms part of the wider region known as Namaqualand, an area well known for its spring flowers (August and September) and its variety of different plants. Gezina Louw who has lived in Loeriesfontein for 57 years, founded South Africa's only Windmill Museum in the 1970s. Loeriesfontein is the windmill capital of South Africa. This is one of the prime tourist attractions in the area. There are a number of accommodation options offered in Loeriesfontein for the traveller, including farmstays, guesthouses and the Loeriesfontein Hotel.</p>	
<p>5.2.3.11 <u>Social environment</u></p>	<p>The area falls under the Hantam Local Municipality which covers 30 000 square kilometres of land in the Northern Cape. Like most areas in the Northern Cape, Coloureds are the dominant group and Afrikaans is the most spoken language in the area. According to Stats SA Community Survey (2007), a majority of the population have some primary and high school education. The largest contributor to the economy is community and social services.</p>	

ASPECT	DESCRIPTION	
<p>5.2.3.12 <u>Archaeology and heritage</u></p>	<p>At a site between Loeriesfontein and Brandvlei, engravings on boulders are present. Some of the engravings seem quite old, while some seem to be contemporary. The older engravings were achieved by using the scratching technique, while the others were pecked. The pecked engravings include figures of eland and other antelope. Between the boulders, there is evidence of dwellings in the form of stone hut circles and some stone tools. Artefacts include quartz microliths (probably Wilton), possible herder pottery shards and ostrich eggshell beads (Rudner and Rudner, 1968). The area that was surveyed included low hills and shale outcrops, as well as large dry river bed with evidence of occasional flooding. MSA and LSA lithics were found in the drainage lines and river bed, with possible source material traced to some of the outcrops. The possible fossilised fish-imprint (S30.57302 E19.54537) was found just below the top of an outcrop.</p>	 <p><i>Fossilised fish imprint found at the Loeriesfontein site, scale: 10 cm</i></p>

5.2.4 Vanrhynsdorp


ASPECT	DESCRIPTION	
5.2.4.1 <u>Climate</u>	<p>Vanrhynsdorp normally receives about 133 mm of rain per year and it has a Mediterranean climate. It receives the lowest rainfall (0mm) in January and February and the highest (29mm) in June. The monthly distribution of average daily maximum temperatures shows that the average midday temperatures for Vanrhynsdorp range from 20°C in July to 30°C in February. The region is the coldest during July, when the temperature drops to 7°C on average during the night. Vanrhynsdorp is located about 25 km east of Vredendal SAWS Weather Station. Vredendal has a temperate Mediterranean climate, being 25 km from the Atlantic Ocean and lying in the Olifants River Valley. Summer nights are cool. Rainfall is low, but the river provides enough water for irrigation.</p>	
5.2.4.2 <u>Topography and hydrology</u>	<p>The Vanrhynsdorp study area itself exhibits an elevation of 120 to 145 mamsl. Most of the study area is flat with a slope rise of between 0 and 3%. There are, however, some areas that are slightly elevated with a slope rise of between 3 and 6% and large mountains are visible from the study area. The study area is north facing and the landscape is covered by low-lying, grassy vegetation. The N7 runs adjacent to the western section of the study area and the southern and eastern sides are defined by fences. The outskirts of Vanrhynsdorp town are visible from some positions of the study area and the Vanrhynsdorp substation, which is adjacently south of it, is visible from the southern area of the study area. No drainage lines were identified within the Vanrhynsdorp study area but the analyses indicate the flow direction in the surrounding area to be north-west. The topography</p>	 <p style="text-align: center;"><i>Vanrhynsdorp landscape</i></p>

ASPECT	DESCRIPTION	
	of the study area is illustrated in Plan 4d (Appendix A).	
5.2.4.3 <u>Surface water and aquatics</u>	<p>The project area is situated in the Olifants/Doring Water Management Area (WMA 17). The major rivers associated with this WMA are the Olifants, Doring, Krom, Sand and Sout rivers. The project site is situated in the quaternary catchments E33C, E33E, E33F and E33G. The project area is associated with two sub-catchments (6648 and 6652) recognised by the FEPA as fish support catchments. However, the project area is in excess of 1 km from the Troe-Troe and Droë rivers and no impacts to these systems and the receiving sub-catchments are anticipated for the project. The project area is considered to be flat and as a result no drainage lines were identified for the project area. In light of this, no impacts to any water resources are anticipated for this project area.</p>	
5.2.4.4 <u>Visual</u>	<p>The Vanrhynsdorp study area is just north of the town itself. The structure is likely to be visible from the town and from the roads near its western, southern and eastern borders. There is already a fair amount of infrastructure in the region because of the town and the Vanrhynsdorp substation is just south of the study area. At a scoping level phase, it seems that the environment is less visually sensitive than some of the more remote areas.</p>	 <p data-bbox="1503 1281 1827 1313"><i>Vanrhynsdorp substation</i></p>


ASPECT	DESCRIPTION	
<p>5.2.4.5 <u>Flora</u></p>	<p>The proposed Vanrhynsdorp project site is located in the Succulent Karoo Biome. This region and in particular Namaqualand, which is strongly influenced by winter rainfall and fog, is a desert that harbours a range of succulent plants beyond compare. It has a bulb flora richer than any other arid region and produces a springtime display of annual flowers. Some 5000 plant species exist in this region (Azef, 2010). The terrain varies from coastal sandy flats to mountain ranges of diverse geological formations. The rainfall in Namaqualand is for the most part reliable and this is the defining explanation for its unparalleled diversity of leaf succulents, bulbs, high numbers of minute succulents and the regular displays of spring flowers.</p> <p>In this dwarf succulent shrubland, leaf succulents dominate, and most of these species are in the Mesembryanthemaceae (&gt; 2 000 species) and Crassulaceae families (Azef, 2010). Most of the succulents are small and compact, and as a result there is a lot of space and habitat available in which to develop, this is why succulent species have such high diversity in this biome. The high floral diversity of this region and the fact that 50% of the species are strictly endemic, means Namaqualand is the only desert hotspot of biodiversity in the world (Azef, 2010).</p>	 <p><i>Vegetation in the Vanrhynsdorp study area</i></p>


ASPECT	DESCRIPTION
	<p>Annual plants, mostly of the daisy family, can be seen in colourful displays during the spring months. However, these annuals constitute only 8% of the flora of the Succulent Karoo (Azef, 2010). The annuals are a result of human interference with the environment: they reclaim the ploughed wheat fields.</p> <p>The project site consists of Hantam Karoo (SKt2) vegetation type as described by Mucina and Rutherford (2006). Vegetation features include Dwarf Karoo Shrubland with nearly equal proportions of succulent elements and low microphyllous karroid shrubs, particularly of the family Asteraceae. There are rich displays of spring annuals and Geophytes.</p> <p>The vegetation type is least threatened, with only a small patch statutorily conserved in Akkerdam Nature Reserve near Calvinia.</p> <p>The proposed Vanrhynsdorp project site consists of the Vanrhynsdorp Gannabosveld (SKk5) vegetation type as described by Mucina and Rutherford (2006).</p> <p>Vegetation and landscape features include mainly flat or only slightly undulating landscape, supporting succulent shrubland dominated by Salsola, Drosanthemum, Ruschia and some disturbance indicators such as Aizoaceae. In the south the shale plains can acquire a</p>


ASPECT	DESCRIPTION
	<p>grassland appearance through seasonal dominance of <i>Bromus pectinatus</i> and <i>Stipa capensis</i>. Spectacular annual and geophyte flora can appear in spring after good winter rains.</p> <p>This vegetation type is a vulnerable region due to transformation pressure, with none of it being conserved in statutory conservation areas. So far 20 % is transformed into cultivated land and open-cast gypsum mining. Rehabilitation after opencast operations remains minimal due to the lack of viable topsoil. Aliens (<i>Atriplex</i>, <i>Bromus</i>) have invaded large areas. Increased cover of <i>Stipa capensis</i> diminishes grazing potential for sheep. Erosion is moderate to high</p>
<p>5.2.4.6 <u>Fauna</u></p>	<p>In addition to the species rich plant life, this area has a diversity of tortoises, lizards, molerats, monkey beetles, bee flies, bees, wasps and scorpions. Mammals such as bat-eared fox, aardwolf, steenbok and duiker, as well as reptiles are abundant. Brant’s whistling rat is responsible for the burrow systems in sandy areas, which provide ideal conditions for seed germination. Of importance in the area are heuweltjies, raised mounds of calcium-rich soil, which support distinctive plant communities (Azef, 2010). It is thought that these were created by termites.</p> <p>Small stock farming (sheep and goats) is practiced in the Succulent Karoo. Mining for limestone, gypsum, diamonds and zinc, although contributing to the economy, results in destruction of the vegetation and heaps of un-vegetated spoil (Azef, 2010). Fruit is grown along the river valleys and Ostrich farming is practiced in the south of the Biome. Less than 0.5% of the area of the Succulent Karoo Biome is conserved (Azef, 2010). Ecotourism might be a viable option for a conservative means of land-use, as long as there is careful</p>



ASPECT	DESCRIPTION							
	management.							
5.2.4.7 <u>Biodiversity importance</u>	<p>The project site falls within a CBA 2. In terms of the CBA, vegetation is classified as Lowland Succulent Karoo. The site is location approximately 3 km away from a mapped distribution of the endemic Grant's golden mole.</p> <p>In terms of insect live, the area is described as an area of endemism, a local centre of biodiversity, a unique habitat, is imperative for ecological processes and is a threatened habitat for insects.</p>							
5.2.4.8 <u>Soil and agricultural potential</u>	<p>Soil information was obtained from the National Land Type Survey published at 1:250 000 scale. The Land Type Survey is a reconnaissance survey carried out by the ISCW-ARC. The aim was to establish the broad soil patterns occurring in South Africa. The dominant soil types in the Vanrhynsdorp study area is listed in the following table:</p> <table border="1" data-bbox="557 906 1294 1083"> <thead> <tr> <th data-bbox="557 906 770 1010">Study area</th> <th data-bbox="770 906 943 1010">Dominant land type</th> <th data-bbox="943 906 1294 1010">Dominant soil properties</th> </tr> </thead> <tbody> <tr> <td data-bbox="557 1010 770 1083">Vanrhynsdorp</td> <td data-bbox="770 1010 943 1083">Ag</td> <td data-bbox="943 1010 1294 1083">Shallow red and yellow</td> </tr> </tbody> </table> <p>According to the land type data, the dominant soils of the dominating land type soil is yellow and red, well-drained soil, but can be shallow and stony. The soils are predominantly sandy and are apedal (non-structured) in both the A and B horizons. Rooting depth is limited by parent rock occurring below the B soil horizon in the Fc</p>	Study area	Dominant land type	Dominant soil properties	Vanrhynsdorp	Ag	Shallow red and yellow	
Study area	Dominant land type	Dominant soil properties						
Vanrhynsdorp	Ag	Shallow red and yellow						



ASPECT	DESCRIPTION	
	<p>land type only.</p> <p>The natural fertility status of the soil is expected to be low. Fertility is mainly determined by the clay and organic carbon content of soils. The fertility status is therefore deemed to be low because the both clay and carbon content is expected to be in the order of 8% to 10% and less than 1%, respectively in the A horizon. The A horizon is also considered to be the horizon containing most of the plant roots and nutrients. Soil pH is expected to be high due to the occurrence of lime in the landscape. The land types are illustrated in Plan 5d (Appendix A).</p>	 <p><i>General soil and topography on Vanrhynsdorp</i></p>


ASPECT	DESCRIPTION	
<p>5.2.4.9 <u>Land use</u></p>	<p>Vanrhynsdorp is situated in the centre of the Nama Karoo and forms part of the Matzikama Local Municipality of the West Coast District Municipality. The town is at the outskirts of the immense, semi-desert Nama-Karoo with its vegetation of succulents and semi-arid climate. Vanrhynsdorp has a prominent tourism sector and surrounding socio-economic development is supported by this industry. Generally, industrial land differs radically from commercial land. Due to the availability of land, it has been reported that industrial land near Vanrhynsdorp is intended for power generation, manufacturing, industrial plants, distribution hubs, or major infrastructural facilities. Such developments require sizeable capital investment and often generate consequential economic growth in terms of labour and peripheral industries. The proposed project site is located in geographical proximity of the town. The main land use of the study area is grazing, and there is transmission lines located on the property.</p>	 <p><i>Transmission lines located on the Vanrhynsdorp study area</i></p>


ASPECT	DESCRIPTION	
<p>5.2.4.10 <u>Tourism</u></p>	<p>Vanrhynsdorp is a growing tourism destination and is actively involved in marketing and tourism development. The town has a distinct Victorian character and offers a wide range of tourist experiences, from culture historical to several eco-experiences. Vanrhynsdorp has one of the largest succulent nurseries in the world, which has become the centre of preservation of a variety of indigenous succulents. Vanrhynsdorp consist of the world’s only quartz succulent trail, as well as adventure routes and hiking trails, waterfalls and unique water features. Three botanical kingdoms converge in the Vanrhynsdorp area, namely the Nama-Karoo vegetation, succulents in the Knersvlakte (as illustrated on the right, below) and Cape Fynbos in the mountains. Other tourist attractions in and around Vanrhynsdorp include Latsky Radio Museum, Victorian architecture, bird watching, 4 x 4 drives, hiking trails, Olifants River wine route/wine tasting, salt mining at Papendorp and the Vanrhyns Pass built in (circa) 1881 by Thomas Bain. The study area for this project is not specifically used for tourism, but often used by locals for leisure activities such as taking their dogs for a walk.</p>	 <p><i>General site vegetation and seasonal flowers in the surrounding region</i></p>



ASPECT	DESCRIPTION	
<p>5.2.4.11 <u>Social environment</u></p>	<p>The area falls under the Matzikama local Municipality. Coloureds are still leading in terms of population numbers followed by Whites. There are few Blacks and Indians are a minority. Agriculture is the key contributor to the economy of the Matzikama Local Municipality. There are wine farms and cellars in the region which produce wine and brandy. Small-scale wheat and maize farming is undertaken in the area, as well as sheep farming.</p>	
<p>5.2.4.12 <u>Archaeology and heritage</u></p>	<p>Rock art is present at Gifberg on the Gifberg Holiday Farm, about 17 km south of Vanrhynsdorp. The rock art is that of human figures (females) holding digging sticks painted in red ochre, as well as a large group performing a possible trance dance, painted in red and yellow ochre (Gifberg Holiday Farm; Gifberg Holiday Farm- Photos   Facebook; Deacon, J. August 1990) Excavated sites within the area include Reception Shelter and Buzz Shelter, approximately 14 km north-west of the Vanrhynsdorp project site. These are Stone Age Shelters that contain within the excavations; Later Stone Age lithics ostrich eggshell beads, decorated pottery, marine shell, bone, wooden pegs, wood shavings, historical material (bone button, mirror fragment), string</p>	 <p data-bbox="1406 1278 1928 1353"><i>Example of Stone Age lithic found at the Vanrhynsdorp site, scale: 10 cm.</i></p>

ASPECT	DESCRIPTION	
	<p>or rope fragments and worked bone (Orton et al 2011).</p> <p>The project area is located immediately north of the town, bordered by the N7 in the west. The area has been cultivated and used as grazing in the past (pers. comm. Mr Van Zyl). Illegal dumping of building rubble was also evident. A single MSA blade was found on the surface. No other heritage resources were noted, nor any reference to the property found in terms of historical significance.</p>	

5.2.5 Graafwater

ASPECT	DESCRIPTION	
5.2.5.1 <u>Climate</u>	<p>Graafwater normally receives about 189 mm of rain per year and it has a Mediterranean climate. It receives the lowest rainfall (1mm) in January and the highest (36mm) in June. The monthly distribution of average daily maximum temperatures shows that the average midday temperatures for Graafwater range from 17.8°C in July to 30.6°C in February. The region is the coldest during July when the temperature drops to 6.5°C on average during the night. Graafwater is located about 25 km west of Clanwilliam SAWS Weather Station. Clanwilliam falls within a Mediterranean climatic zone, with a large temperature variance between the summer maximums and the winter minimums. January and February are regarded as the hottest months of the year with an average maximum of 29.9°C measured during February, whilst the average minimum of 2.4°C is measured during July.</p>	
5.2.5.2 <u>Topography and hydrology</u>	<p>The Graafwater study area displays an elevation of 175 mamsl to 200 mamsl. The landscape can be described as flat to slightly elevated since there is a mild slope rise of between 0 to 2%. The landscape is north facing. The town of Graafwater is visible from the study area from some positions since the vegetation comprises of shrubby Fynbos and grows to a height of approximately 2 metres high; in some places the vegetation acts as a screen. There are fences in and around the study area and a road intersecting it. The Graafwater substation is adjacently north of the study area. No drainage lines were identified within the study area for Graafwater; however, the GIS analyses show that drainage lines in the surrounding areas are likely to flow in a north-westerly direction. The topography of the study area is illustrated in Plan 4e (Appendix A).</p>	 <p><i>Shrubs and Fynbos vegetation on Graafwater site</i></p>
5.2.5.3 <u>Surface</u>	<p>The project area is situated in the Olifants/Doring Water Management Area (WMA 17). The major rivers associated</p>	



ASPECT	DESCRIPTION	
<u>water and aquatics</u>	<p>with this WMA are the Olifants, Doring, Krom, Sand and Sout rivers. The project site is situated in the quaternary catchments G30F and G30G. The project site is situated approximately 2 km south of the Jakkals River which is considered to be in a moderately modified state. In addition to this, the project area is associated within a sub-catchment (72350) recognised by the FEPA as fish support catchment. However, surrounding land-uses have imposed stress onto the system and as a result, the Jakkals River system is endangered. No additional threats to the system are anticipated for the project. In addition to this, no drainage lines were identified on site.</p>	
5.2.5.4 <u>Visual</u>	<p>The Graafwater study area is also situated close to the town (south of Graafwater). The land in and around the town is more intensely utilised than any of the other study areas in an agricultural sense. The situation at Graafwater is similar to that at Vanrhynsdorp since there are comparatively more potential visual receptors than at those study areas that fall within more remote places (Aggeneys, Kenhardt and Loeriesfontein). The land use, however, differs from that practised in and around the Vanrhynsdorp study area (due to the more intense agriculture) and the sense of place, therefore, has the potential to differ quite substantially. There is a road running north of the Graafwater study area that needs to be assessed in terms of the distances along the road that the potential infrastructure will be seen from.</p>	 <p><i>View of Graafwater town from the study area</i></p>



ASPECT	DESCRIPTION	
<p>5.2.5.5 <u>Flora</u></p>	<p>The proposed Graafwater project site is situated in the Cape Floristic Region (CFR), which is one of the most biologically diverse regions on earth. Considered the Fifth Floral Kingdom, this relatively small region at the southwestern tip of Africa is home to about 9 000 vascular plant species, 69 % of which are endemic. The Lowland Fynbos and Renosterveld ecoregion, found roughly below 300 m elevation within the CFR, is a fire-prone ecosystem characterized by its small-leafed, evergreen shrubs, and predominantly winter rainfall. The infertile, sandy soils have supported a spectacular and massive diversification of plant taxa. This ecoregion also boasts unusual fauna, with high levels of endemism among reptiles, amphibians, insects, and freshwater fish. The loss of biodiversity continues today, and less than 4% of this lowland ecoregion is formally conserved. Invasive plants, new systems of agriculture that allow the cultivation of marginal soil, and rapidly escalating urbanization, pose the greatest threats to the biodiversity of the ecoregion.</p> <p>The vegetation of the study area can be classified as Leipoldtville Sand Fynbos (FFd2) as described by Mucina and Rutherford (2006). Vegetation and landscape features include plains, slightly rolling in places, covered with shrubland with an upper open stratum of emergent, 2 m to 3 m tall shrubs in clumps. The vegetation matrix is formed by fairly dense, 1 m to 1.2 m tall restiolands, with numerous medium tall to low shrubs scattered in between. Under-storey with a conspicuous winter to spring herbaceous complement of annuals and geophytes occurs in years of good rain. Structurally these are mainly</p>	  <p style="text-align: center;"><i>Flora in the Graafwater study area</i></p>







ASPECT	DESCRIPTION
	<p>restioid and asteraceous fynbos types, with localised patches of proteoid fynbos also present. This is a dry form of sand fynbos, lacking Ericaceae and with Proteoid elements relatively rare. Sward communities associated with grazing, are dominated by <i>Aizoon canariense</i> and <i>Tribolium echinatum</i>. At its northern (arid) boundary the sandfynbos structure becomes very diffuse and is progressively replaced by strandveld.</p> <p>The vegetation type is endangered, with a target of 29 % not achieved and none of the unit being statutorily conserved. Already 55 % has undergone transformation, including cultivation (potatoes and rooibos) with central pivot irrigation and pastures. Water extraction for central pivot irrigation and other agricultural uses is reputedly drying out this vegetation type. Alien <i>Acacia saligna</i> and <i>A. Cyclops</i> are problem plants.</p>
<p>5.2.5.6 <u>Fauna</u></p>	<p>The fynbos and renosterveld ecoregions are more-or-less coincident with the Cape Faunal Center (CFC), a distinct zoogeographic zone characterized by the phylogenetic antiquity of much of its invertebrate fauna (Struckenberg, 1962).</p> <p>The vertebrate fauna of the CFC is neither especially rich nor distinctive (e.g. Crowe, 1990; Branch, 1990). However, the region is a major zone of endemic species richness for freshwater fish, especially the drainage systems of the Olifants, Berg, Breede, and Gouritz rivers (Skelton et al., 1995). Barbine fish account for 81% of the fauna with 30 species: total endemism is 50% with 45% of endemics occurring in a single drainage system.</p> <p>The CFC is home to 109 reptile species, 19 (17.4 %) of which are endemic (Cowling and Pierce, 1999). Tortoise diversity is especially impressive and the Cape Floristic Center makes a major contribution to South Africa's position as a world leader for this group of terrestrial chelonians. Amphibians, although low in overall diversity, exhibit high</p>

ASPECT	DESCRIPTION
	<p>endemism. In all, there are 38 species of amphibians, 19 of them endemic.</p> <p>Bird diversity is not particularly high, owing to the structural uniformity of the vegetation and the shortage of food. Only 288 (excluding seabirds) species have been recorded from the region and just seven of these are endemic or near-endemic. Among the endemic species, most are found in both the Lowland and Montane Fynbos and Renosterveld ecoregions: Victorin’s warbler (<i>Bradipterus victorini</i>), Cape rock-jumper (<i>Chaetops frenatus</i>), orange-breasted sunbird (<i>Nectarina violacea</i>), Cape sugarbird (<i>Promerops cafer</i>), Cape siskin (<i>Serinus totta</i>) and the Cape francolin (<i>Francolinus capensis</i>).</p> <p>Among the ecoregion’s approximately 100 mammal species, only five endemic or near endemic species remain. A charismatic flagship mammal is the strictly endemic bontebok (<i>Damaliscus dorcas dorcas</i>) which once grazed the extensive renosterveld plains of the South Coastal Forelands and is now mainly found in protected sanctuaries. Other strict endemics include the Cape spiny mouse (<i>Acomys subspinosus</i>), the Cape dune molerat (<i>Bathyergus suillis</i>), and Duthie’s golden mole (<i>Chlorotelpa duthiae</i>). Verraux’s mouse (<i>Myomyscus verreauxii</i>) is also considered near-endemic to this ecoregion.</p>
<p>5.2.5.7 <u>Biodiversity importance</u></p>	<p>The project site falls outside CBAs. In terms of the CBA the vegetation is classified as Strandfynbos and mammals are not important. However, the site falls within an area that is identified as being important in terms of insect biodiversity but minimal information is available.</p>

ASPECT	DESCRIPTION								
<p>5.2.5.8 <u>Soil and agricultural potential</u></p>	<p>Soil information was obtained from the National Land Type Survey published at 1:250 000 scale. The Land Type Survey is a reconnaissance survey carried out by the ISCW-ARC. The aim was to establish the broad soil patterns occurring in South Africa. The dominant soil types in the Graafwater study area is listed in the following table:</p> <table border="1" data-bbox="510 598 1411 774"> <thead> <tr> <th data-bbox="510 598 689 699">Study area</th> <th data-bbox="689 598 945 699">Dominant land type</th> <th data-bbox="945 598 1411 699">Dominant soil properties</th> </tr> </thead> <tbody> <tr> <td data-bbox="510 699 689 774">Graafwater</td> <td data-bbox="689 699 945 774">Ai</td> <td data-bbox="945 699 1411 774">Red and yellow sandy soil</td> </tr> </tbody> </table> <p>According to the land type data, the dominant soils of the dominating land type soil is yellow and red, well-drained soil, but can be shallow and stony. The soils are predominantly sandy and are apedal (non-structured) in both the A and B horizons. Rooting depth is limited by parent rock occurring below the B soil horizon in the Fc land type only.</p> <p>The natural fertility status of the soil is expected to be low. Fertility is mainly determined by the clay and organic carbon content of soils. The fertility status is therefore deemed to be low because the both clay and carbon content is expected to be in the order of 8% to 10% and less than 1%, respectively in the A horizon. The A horizon is also considered to be the horizon containing most of the plant roots and nutrients. Soil pH is expected to be high due to the occurrence of lime in the landscape.</p>		Study area	Dominant land type	Dominant soil properties	Graafwater	Ai	Red and yellow sandy soil	  <p data-bbox="1458 1278 2027 1348"><i>Variety of soils found in the Graafwater study area</i></p>
Study area	Dominant land type	Dominant soil properties							
Graafwater	Ai	Red and yellow sandy soil							

ASPECT	DESCRIPTION	
	<p>The distribution of land types are illustrated in Plan 5e (Appendix A).</p>	
<p>5.2.5.9 <u>Land use</u></p>	<p>Graafwater is a small town in the Sandveld in the Western Cape Province that form part of the Cederberg Local Municipality. Graafwater is situated approximately 300 km from Cape Town, halfway between Clanwilliam and Lamberts Bay. In 1910, Graafwater was built as a railway junction to serve the transportation of agricultural products of the Clanwilliam area and the seafood products of Lambert’s Bay, and to support transportation between Cape Town and Bitterfontein. The local church congregation developed the town into a community orientated settlement. The Graafwater region consists mostly of farmland and mixed agriculture including extensive rooibos tea plantations. Most of the people living in Graafwater are seasonal workers on the surrounding farms. This Sandveld town serves only as a service point for the most basic needs of the immediately surrounding farms. Rooibos tea and potatoes are the most important agricultural products.</p> <p>The proposed Graafwater study area is located next to the railway. During the site visit, it was noted that the land use is based on grazing and there is an established sewage/water treatment works on site. There are also a number of transmission lines on this site. The general condition of the proposed Graafwater project areas is sandy with dispersed shrubs and rooibos. Old cultivated lands cover the majority of study area.</p>	  <p><i>Transmission lines and sewerage treatment plant located in the study area</i></p>

ASPECT	DESCRIPTION	
<p>5.2.5.10 <u>Tourism</u></p>	<p>The tourism industry in Graafwater is not well-developed. Tourism generally depends on visitors to the surrounding area who pass through the region, or visit the area for the flowering season. Wild-flowers bloom in the area from late July to September. During the site visit, it was noted that Coastal fynbos and succulents are found in the northern part of proposed project site. The type of fynbos vegetation found in this region is described as low scrub with scattered tall shrubs. Although wildlife in this region is scarce, many species fauna and indigenous flora still add to the unique character of this region. Graafwater has the potential to improve and develop its tourism industry.</p>	
<p>5.2.5.11 <u>Social environment</u></p>	<p>Coloureds are also in majority numbers and Afrikaans is the most spoken language. Education levels in the Cederberg Local Municipality are extremely low as only a few people have a matric certificate and tertiary qualification. In 2007 it was estimated that almost 20% of the population have a primary and high school background. Stats SA Community Survey (2007) indicates that agriculture is the main industry that contributes to the economy of the Cederberg Local Municipality. Rooibos tea is grown in the area and citrus farming is also common (<a href="http://www.cederberg.com">http://www.cederberg.com</a>).</p>	 <p style="text-align: center;"><i>Graafwater primary school</i></p>

ASPECT	DESCRIPTION	
<p>5.2.5.12 <u>Archaeology and heritage</u></p>	<p>A rock shelter (Faraoskop Rock Shelter) on the farms Hoekfontein and Melkbosfontein was first excavated in 1987, and is situated approximately 4.5 km NNE from the Graafwater project area. The shelter contained lithics, ochre, pottery, worked bone, ostrich eggshell beads, decorated ostrich eggshell pieces, worked and unworked marine shell, shell pendants, worked wood, twine, leather bundle, arrow (one complete arrow), fauna, plant remains and 12 human burials. While these finds are not unique in the region, what makes them significant is that they are mostly intact, with minor damage (Manhire, 1993). Two heritage resources were noted in this proposed project area as a result of the cultural resource pre-assessment.</p> <p>These include the Anglo-Boer War Blockhouse and Dovecote. As the exact position of the structures could not be verified, this must be established during a Phase 1 Archaeological Impact Assessment. More than 90% showed evidence of extensive rooibos cultivation. A railway line and accompanying servitude furthermore bisected the project area, with evidence of previous disturbances and impact. The only structures noted in the project area property were a large sewage treatment plant and a stone water trough, located in the only 'pristine' section in terms of vegetation cover. However, the construction of the plant would invariably have altered the surrounding landscape.</p>	  <p><i>General site conditions and rocky outcrops found in the study area</i></p>

## 6 PUBLIC PARTICIPATION PROCESS

A concise Public Participation Process (PPP) report was compiled during the Scoping Phase of the environmental authorisation process for the proposed Orlight SA Solar PV Power Plants. This PPP report (Appendix C) documents the activities undertaken and the findings of the process undertaken during the Scoping Phase of the EIA process. The PPP is one of the most important aspects of any environmental authorisation process. It involves communication and disclosure of relevant project information and provides those interested in, or affected by, a proposed development an opportunity to provide input into the decision making process. It is a legislative requirement to undertake PPP for any development that requires environmental authorisation. Failure to undertake public participation may create significant risks to the project as members of the public could mobilise against the project if they have not been given the opportunity to participate

The PPP for the proposed project was undertaken in an effort to ensure that all Interested and Affected Parties (I&APs) were given a platform to raise their issues and comments regarding the proposed project. Most I&APs raised concerns about employment and project timeframes. Issues raised by I&APs will be addressed in detail during the EIA Phase. Overall I&APs had no objections regarding the proposed Orlight SA Solar PV Power Plants and feel that the proposed project will benefit them. In compliance with the NEMA regulations, this chapter details the PPP approach and methodology that has been implemented for the scoping phase and outlines future activities to be followed during the EIA Phase.

### 6.1 Objectives

The objectives of the PPP for the Scoping Phase were to:

- Identify and register all I&APs for the project;
- Inform I&APs of the proposed project and the PPP to be followed;
- Ensure that stakeholders receive accurate and sufficient project information;
- Provide I&APs with an opportunity to raise issues of concern and suggest project alternatives; and
- Document all I&APs concerns and ensure that these concerns are included in the ToR for specialist studies to be undertaken during the EIA Phase.

### 6.2 Approach

The following approach to the PPP was taken for the scoping phase:

- Develop a PPP appropriate to the scope of the proposed Orlight SA Solar PV Power Plants to guide the consultation process;
- Facilitate a PPP which is transparent and open; and
- Record all issues raised by I&APs.

### 6.3 Methodology

The following activities were undertaken to facilitate involvement from stakeholders and I&APs:

- I&APs were identified (including government authorities, farmers, local communities and interested groups); and
- Information documentation was developed and distributed to all I&APs on the database.

#### **6.4 Identification of I&APs**

I&APs were identified at the beginning of the project by means of Windeed and land surveyor searches. Identification of I&APs also took place through responses to newspaper advertisements and site notices. Persons and organisations identified as possible I&APs were registered in an electronic database. I&APs who responded to notices and advertisements were also registered, to ensure that they are included in the consultation process. Contact information of all registered I&APs were recorded. The I&AP database will be updated throughout the environmental authorisation process. Two groups of I&APs have been identified, namely regulatory authorities and the public.

##### *6.4.1 Authorities*

Authorities responsible for governing all aspects of the proposed project and forming part of the decision-making process were identified. The authorities were identified through liaison with different government officials, by consulting the I&AP databases for similar projects and by considering published government databases. Authorities have been divided into the following categories:

##### National

- Department of Environmental Affairs (DEA);
- Department of Water Affairs (DWA);
- South African National Roads Agency Limited (SANRAL);
- Department of Agriculture, Forestry and Fisheries (DAFF);
- Civil Aviation Authority (CAA); and
- South African Heritage Resources Agency (SAHRA).

##### Provincial: Western and Northern Cape

- Department of Agriculture;
- Northern Cape Department of Economic Development and Tourism;
- Western Cape Department of Environmental Affairs and Development Planning;
- Department of Transport and Public Works;
- Department of Water Affairs;
- Department of Environmental and Spatial Planning;
- Department of Water Affairs;
- Economic Development Agency;
- Northern Cape Economic Development Agency; and
- Northern Cape Department of Economic Development and Tourism

##### District and Local Municipalities

- Siyanda District Municipality;



- Khai Garib Local Municipality;
- Namakwa District Municipality;
  - Khai Ma Local Municipality;
  - Hantam Local Municipality;
- West Coast District Municipality:
  - Matzikama Local Municipality; and
  - Cederberg Local Municipality.
- Ward councillors.

#### Parastatals

- Eskom; and
- Transnet.

#### 6.4.2 Public

The general public includes the following groups of stakeholders:

- Adjacent land owners;
- Directly affected land owners;
- Surrounding land owners;
- Environmental groups;
- Non-Governmental Organisations (NGOs); and
- Community Based Organisations (CBOs).

The land tenure of the directly affected properties was described in Chapter 4, Table 4-2. The land tenure of affected and directly surrounding properties is illustrated in Plan 2a to Plan 2e (Appendix A).

### 6.5 Documentation developed

I&APs were invited to participate in the PPP and information sharing documents compiled and distributed to all I&APs. The documentation that has been developed for the PPP is described below (Appendix C).

#### 6.5.1 Background Information Document

A Background Information Document (BID) and I&AP registration form were developed as part of the PPP. BIDs were distributed to various stakeholders and I&APs from 07 December 2011. Additional BIDs were made available at the local municipal offices and libraries. The BIDs included information regarding the following:

- Description of the project;
- Legal framework to be adhered to;
- Locality and extent of the proposed project;
- Specialist studies to be undertaken;
- Approach to the EIA;

- PPP that will be followed;
- Invitation to an information sharing meeting; and I&AP registration form.

### 6.5.2 Newspaper adverts

In compliance with the local environmental regulations, newspaper advertisements were published in English and Afrikaans. Table 6-3 indicates the publication dates and the newspapers used to advertise the proposed project. Proof of placement of the newspaper advertisements are provided in (Appendix C).

**Table 6-1: Newspaper adverts**

NEWSPAPER	DATE OF PUBLICATION
Cape Argus	09 December 2011
Diamond Filed Advertiser	09 December 2011
Ons Kontrei	14 December 2011
Gemsbok	15 December 2011

### 6.5.3 Site notices

Site notices were compiled in English and Afrikaans and placed in the vicinity of the study areas and within local towns. The site notices provided I&APs with similar information as contained in the BIDs. Please refer to Appendix C for photographs of site notice placements.

## 6.6 Pre-consultation meeting

A pre-consultation meeting was held with DEA on 18 November 2011 at the DEA offices in Pretoria. The purpose of this meeting was to discuss the requirements for the Scoping and EIA process for the proposed projects. The main points raised at the pre-consultation meeting are highlighted in Table 6-2. A copy of the minutes is included in Appendix C.

**Table 6-2: Main points raised at the pre-consultation meeting**

ASPECT	NAME AND ORGANISATION	ISSUES/COMMENT	RESPONDER	RESPONSE
Scoping and EIA Reports	Mia Ackermann Digby Wells	Will the DEA require separate Scoping reports and EIA reports for each specific site?	Coenraad Agenbach DEA	All sites can be combined into one comprehensive report, but there must be separate chapters dedicated to each site. Common chapters can be combined, but maps, descriptions of the site and property, applicable listed activities, impacts and mitigation measures must be in separate chapters.  The cumulative impacts of the project and other projects in the vicinity must be assessed. There are a significant number of applications for renewable energy projects in the project area.
PPP report	Mia Ackermann Digby Wells	Enquired if the Issues and Response report can be combined for all sites.	Coenraad Agenbach DEA	There might be site specific issues and therefore, it is best to have a separate Issues and Responses reports and tables for each site.
Submission of reports	Mia Ackermann Digby Wells	Enquired on the process to follow when to submitting draft and final reports.	Coenraad Agenbach DEA	Draft reports must be sent to commenting authorities and Interested and Affected Parties (I&APs) on the same day. Final reports should be sent to DEA after the 40 day commenting period. Prior to the lapsing of the DEA's commenting period, the DEA will follow up with the commenting authorities to find out if they have any comments regarding the proposed project. In order

ASPECT	NAME AND ORGANISATION	ISSUES/COMMENT	RESPONDER	RESPONSE
				<p>to avoid delays in the project, the consultant must ensure that the commenting authorities respond to the draft reports.</p> <p>Suggests that the following organisations should be added as key stakeholders and commenting authorities for the proposed project:</p> <ul style="list-style-type: none"> <li>• Department of Agriculture, Forestry and Fisheries;</li> <li>• Weather South Africa (SA);</li> <li>• Square Kilometre Array (SKA) project;</li> <li>• Eskom;</li> <li>• Department of Energy;</li> <li>• South African Biodiversity Institute;</li> <li>• Civil Aviation Authority;</li> </ul>
Screening phase	Mia Ackermann Digby Wells	<p>During the screening phase three alternatives sites will be considered for each Orlight SA Solar PV Power Plant.</p> <p>Heritage, Visual and Ecological studies will be undertaken during this phase to assess potential impacts.</p>	Coenraad Agenbach DEA	<p>Indicated that he fully supports the undertaking of a screening phase. The proposed project area is characterised by Succulents, Camel Thorns and Kokerbome, so it important that a Flora and Fauna study is undertaken. Information collected during the screening phase and the determination of preferred site options should be included in the Scoping and EIA reports.</p>

ASPECT	NAME AND ORGANISATION	ISSUES/COMMENT	RESPONDER	RESPONSE
				<p>Suggested that an environmental sensitivity map indicating no-go areas, alternative sites and buffer areas should be developed. The project infrastructure and project information should be overlaid on the sensitivity map in order to determine the impacts the proposed development will have on the environment.</p>

## 6.7 Information sharing meetings

An information sharing meeting was held at each of the five study areas. The meetings were conducted in Afrikaans and attendees were encouraged to ask questions in the language of their choice. Details of the information sharing meetings are listed in Table 6-3 below.

**Table 6-3: Details of the Information Sharing Meetings**

LOCATION	VENUE	DATE	TIME
Aggeneys	Aggeneys Community Hall	10 January 2012	14h00
Kenhardt	Kenhardt Community Hall	11 January 2012	14h00
Loeriesfontein	Loeriesfontein Community Hall	12 January 2012	14h00
Vanrhynsdorp	Vanrhynsdorp Community Hall	13 January 2012	14h00
Graafwater	Graafwater Community Library	14 January 2012	09h00

The purpose of these meetings was to present I&APs with information regarding the proposed project, the process to undertaken and to provide I&APs with a platform to raise their issues and comments regarding the proposed project. Minutes from the information sharing meetings are included in Appendix C. The draft Scoping Report will be made available to all I&APs for review over a period of 40 days from 26 January 2012 to 06 March 2012 at the following venues:

- Black Mountain Recreation Club Black (Boliden Road; Aggeneys);
- Khai Garib Library Local Municipal offices;
- Hantam Library Local Municipal offices;
- Matzikama Local Municipal offices; and
- Graafwater Community Library.

An information letter will be sent to I&APs to inform them about the availability of the draft report. This letter will be sent by e-mail, fax and registered post from 26 January 2012.

In accordance with Section 56(7) of GN Regulation 543 of NEMA, this draft Scoping Report will be sent to all identified regulating authorities for comment. Proof of notification of the availability of the draft Scoping Report for review by authorities will be forwarded to the DEA upon commencement of the public review period.

The report will also be available for download at [www.digbywells.com](http://www.digbywells.com). Hard copies of the report can be made available on request.

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## 6.8 Identification issues and comments

Issues and comments raised by I&APs during the Scoping Phase have been recorded and addressed in the Issues and Response Tables for each project site (Table 6-4 to Table 6-8). These issues have been extracted from written submissions of I&AP registration forms and comments made during the information sharing meetings. The tables will be updated throughout the environmental authorisation process to capture all issues identified through on-going consultation and review of public documents and reports.

6.8.1 Aggeneys

**Table 6-4: Aggeneys Issues and response table**

ASPECT	REFERENCE	NAME AND FARM/ ORGANISATION	ISSUE	RESPONDER	RESPONSE
<b>Water provision and management</b>	Information sharing meeting (10 January 2012)	Mr Pieter Venter: Black Mountain Mining (Environmental Manager)	Water is a scarce resource in the area. Aggeneys relies on only one source of water from Pella, which has already been exhausted. Requested that a study be undertaken to investigate alternative water sources in the area.	Kevin Anderson	For the proposed Orlight SA Solar PV Power Plants, water will be required for general use by employees during construction and operation, as well as for washing the panels twice a year. Orlight SA will utilise a water service provider to bring water to the site during the operational phase for washing the panels.
			Indicated that there are proposed mine developments to be undertaken in the area. This will increase the water demand in the area.	Kevin Anderson	Reiterated that Orlight SA will use its own water service provider for water provision.
	Information sharing meeting (10 January 2012)	Mr France: Farm Aroams 57 RD	Storm water management must be undertaken.	Kevin Anderson	No berms will be created. The natural topography of the sites will be maintained.
			Where will Orlight SA source water from?	Kevin Anderson	A water service provider will be used to supply with water during the construction and the operational phases.
<b>Servitudes</b>	Information sharing meeting (10 January 2012)	Mr Pieter Venter: Black Mountain Mining (Environmental Manager)	Concerned that the servitudes of the pipelines are running through the project area.	Kevin Anderson	Noted. All servitudes will remain accessible throughout the project.
<b>Grazing land</b>	Information sharing meeting (10 January)	Mr France: Aroams 57 RD	Enquired if the land will still be available for grazing.	Frank Eagar	The project site will be fenced and therefore, no land will be available for grazing.
<b>Visual Impact Assessment</b>	Information sharing meeting (10 January)	Mr Pieter Venter: Black Mountain Mining (Environmental Manager)	The mine does not foresee any visual impact	Kevin Anderson	Noted.
<b>Socio-economic issues</b>	Information sharing meeting (10 January 2012)	Kevin Anderson: Orlight SA (Applicant)	What are the socio-economic needs of the project area?	Pieter Venter	There is a need for a solar power projects in the area, as result of increasing electricity demands. The mine is planning to expand in the near future, adding to the electricity demand. Housing is a problem, as the Black Mountain Mine will be expanding. Indicated that Pieter Clark, the social development consultant from Black Mountain Mine, could assist in the identification of community needs.
<b>General</b>	Information sharing meeting (10 January 2012)	Mr Pieter Venter: Black Mountain Mining Mr France and Mr Arrol: Aroams 57 RD farm	Indicated that they have no objections regarding the proposed project	Kevin Anderson and Frank Eagar	Noted.



6.8.2 Kenhardt

**Table 6-5: Kenhardt Issues and response table**

ASPECT	REFERENCE	FARM/ ORGANISATION	ISSUE	RESPONDER	RESPONSE
<b>Project timeframes</b>	Information sharing meeting (12 January 2012)	Ms Carin Nel: Kenhardt community member	How long will it take to construct the solar power plant?	Kevin Anderson	It will take approximately two years to construct the solar power plant.
	Registration form (13 January 2012)	Ms Carin Nel: Kenhardt community member	Indicated that the proposed Kenhardt Orlight SA Solar PV Power Plant is viable it just needs to be implemented sooner.	Digby Wells	Noted.
<b>Employment</b>	Information sharing meeting (12 January 2012)	Ms Carin Nel: Kenhardt, community member	How many permanent people will be employed?	Kevin Anderson	Approximately 30 people will be permanently employed, during the operational phase, post construction. The proposed project will have a multiplier effect, which may encourage local entrepreneurs to establish support business such as transport, accommodation or catering. The procurement of local goods will be preferred.
	Registration form (13 January 2012)	Kenhardt community member	Concerned that the proposed project is delaying to employ local people. Enquired on what the salary / package entails.	Digby Wells	Noted.
	Information sharing meeting (12 January 2012)	Ms Maria Daniels: Kenhardt Community Member	Requested that Orlight SA will employ local people and provide skills training for them as the area has many people with matric and tertiary qualifications who are still unemployed.	Kevin Anderson	It is one of the requirements from the government that an area in which the project is situated should be developed and supported in terms of local employment and training opportunities. The proposed solar power project will develop the local area by enhancing local procurement.
	Information sharing meeting (12 January 2012)	Steve Zenani Kenhardt Community Member	Will local people be employed?	Kevin Anderson	Yes, there will be employment opportunities for some local people.
	Information sharing meeting (12 January 2012)	Willie Kooso Kenhardt Community Member	What kind of skills development will Orlight SA offer?	Kevin Anderson	Engineers will provide a list of the required skills for the proposed project. These requirements will be made public to the community and the Interested and Affected parties (I&APs) will then have the opportunity to form part of the skills development programmes and employment opportunities.
	Information sharing meeting (12 January 2012)	Local Community Member	When should the community expect the first employment opportunities to arise?	Kevin Anderson	Employment opportunities will be available during the construction phase, which may only commence in 2013. Encouraged local community members to send CVs and skills to Orlight SA to create a database of available skills and employment opportunities.
	Registration Form (13 January 2012)	Mr Jasper Snyders: Kenhardt Community Member	Indicated that local people should be employed as soon as possible. Requested that the project must be undertaken with integrity.	Digby Wells	Orlight SA intends to employ local people. The process of employing people will start once the environmental authorisation has been approved by DEA.
<b>Health</b>	Information sharing	Ms Maria Daniels:	Enquired if there are any health risks	Kevin	Confirmed that there are no major health risks associated with Orlight SA

ASPECT	REFERENCE	FARM/ ORGANISATION	ISSUE	RESPONDER	RESPONSE
	meeting (12 January)	Kenhardt Community Member	associated with solar power plants.	Anderson	Solar PV Power Plants.
<b>Environmental studies</b>	Information sharing meeting (12 January)	Ms Carin Nel: Kenhardt Community Member	What kind of environmental studies will be undertaken?	Kevin Anderson	A Visual Impact Assessment, Fauna and Flora assessment, Archaeological and Wetland studies will be undertaken for the proposed project.
<b>Project location</b>	Information sharing meeting (12 January 2012)	Ms Carin Nel: Kenhardt Community Member	Where is the project located?	Frank Eagar	The project site is located near the Aries substation, on the Remaining Extent (RE) of the farm Klein Zwart Bast 188 RD.

6.8.3 Loeriesfontein

**Table 6-6: Loeriesfontein issues and response table**

ASPECT	REFERENCE	FARM/ ORGANISATION	ISSUE	RESPONDER	RESPONSE
<b>Water availability</b>	Information sharing meeting (12 January 2012)	Mr Herman van Heerden: Farm owner (Portion 1 of Klein Rooiberg 227 RD)	Indicated that the groundwater at the farm Klein Rooiberg is of good quality. He recommended that a water reservoir should be constructed in the area to store surface water which can later be used for various activities.	Kevin Anderson	Noted.
<b>Employment</b>	Information sharing meeting (12 January 2012)	Ms Sophia Waterboer: Loeriesfontein Community Member	Enquired if there is a guarantee that local people will be employed.	Kevin Anderson	Confirmed that Orlight intends to employ a certain number of local people. Reiterated that it is a requirement of the government requirement to employ local people and Orlight SA supports this policy.  Indicated that the project will cover three aspects and this includes education, small business development and skills development.
				Frank Eagar	If the authorities approve this application, the project will create employment opportunities for local people. One direct employment opportunity per MW generation capacity will be created during the operational phase and four direct job opportunities will be created per MW generation capacity during the construction phase.  During construction and operational phase, accommodation will be required. If feasible, accommodation will be provided in the closest town, namely Loeriesfontein.
	Information sharing meeting (12 January 2012)	Ms Sophia Waterboer: Loeriesfontein Community Member	Will candidates who have undergone skills training with Orlight SA receive certificates?	Kevin Anderson	Yes they will receive certificates.
<b>Stock theft</b>	Information sharing meeting (12 January 2012)	Mr Herman van Heerden Farm owner (Portion 1 of Klein Rooiberg 227 RD)	Concerned that sheep theft will be common as there will be contractors on site. Previous problems regarding sheep thefts have been experienced with contractors, e.g. contractors responsible for road and transmission construction.	Kevin Anderson	Noted.
<b>Project consultation</b>	Information sharing meeting (12 January 2012)	Mr David Okhuis: Loeriesfontein Community Member	Suggested that a community representative should be elected.	Frank Eagar and Kevin Anderson	Noted.

ASPECT	REFERENCE	FARM/ ORGANISATION	ISSUE	RESPONDER	RESPONSE
<b>Project timeframes</b>	Information sharing meeting (12 January 2012)	Mr Wilhelm Stout: Loeriesfontein Community Member	Enquired what the lifespan of the project	Kevin Anderson	The project has a lifetime of approximately 20 to 22 years, including the construction phase. The contract with the government is for 20 years.
<b>General</b>	Information sharing meeting (12 January 2012)	Mr Herman van Heerden: Farm owner (Portion 1 of Klein Rooiberg 227 RD)	Indicated that there are developers in the area interested in the same project. Enquired on how will Orlight handle competition in the area?	Marike de Klerk Digby Wells	Noted. Indicated that the question will be directed to the applicant.
				Kevin Anderson	Indicated that Orlight SA is aware of other companies in the area. Explained that the process is part of a national tender for alternative and renewable energy. Various companies are applying in the Northern and Western Cape.
	Registration Form (16 January 2012)	Mr Willem Beukes; Loeriesfontein Community member	Indicated that the proposed project will benefit the whole of South Africa	Digby Wells	Noted

6.8.4 Vanrhynsdorp

**Table 6-7: Vanrhynsdorp issues and response table**

ASPECT	REFERENCE	FARM/ORGANISATION	ISSUE	RESPONDER	RESPONSE
<b>Employment</b>	Information sharing meeting (13 January 2012)	Cllr. Andreas Siyamba: Ward Councillor	Indicated that the area has a many poor people. It is a privilege to have a solar power project in the area as it will benefit local people. Enquired when will the proposed project be implemented?	Kevin Anderson	Noted. If the project is approved by the Department of Environmental Affairs, it is anticipated that a Record of Decision (RoD) will be received towards the end of 2012 and construction will commence in 2013. The project may be operational in 2013 or 2014.
			How many people will be employed?	Kevin Anderson	Only few people will be employed in the area as the solar power plant to be constructed in Vanrhynsdorp will only be 20 MW. One direct employment opportunity per MW generation capacity will be created during the operational phase and four direct job opportunities will be created per MW generation capacity during the construction phase.  During construction and operational phase, accommodation will be required. If feasible, accommodation will be provided in Vanrhynsdorp. Confirmed that it is a requirement of the government to employ local people and Orlight SA supports this policy. Orlight SA will also supports small and medium businesses that may be established as a result of the proposed project.
<b>Town development</b>	Information sharing meeting (13 January 2012)	Mr Johan: Vanrhynsdorp Community member	The Matzikama Local Municipality intends to expand the town in Vanrhynsdorp. Recommended that Orlight SA leave some space for the municipality for the expansion of the town.	Kevin Anderson	Noted.
<b>Rezoning</b>	Information sharing meeting (13 January 2012)	Mr Johan: Vanrhynsdorp Community member	Indicated that the project will be rezoned from an agricultural to an industrial area, therefore all the relevant stakeholders should be involved in the rezoning of the project area.	Kevin Anderson	Noted. Confirmed this process is underway as part of the project.
<b>General</b>	Information sharing meeting (13 January 2012)	Cllr Siyamba: Ward Councillor	On 31 January 2012, there will be council meeting which will be held in Vredendal Hall. It might be worthwhile for Orlight SA to attend the meeting.	Kevin Anderson	Noted. Orlight SA may attend this meeting and appreciates the invitation.

6.8.5 Graafwater

**Table 6-8: Graafwater issues and response table**

ASPECT	REFERENCE	FARM/ORGANISATION	ISSUE	RESPONDER	RESPONSE
<b>Public consultation</b>	Information Sharing Meeting (14 January 2012)	(Cllr) Jimmy Barnard: Ward Councillor	Enquired how the landowners were contacted as part of the Public Participation Process (PPP) and to discuss the use of their land for the project.	Kevin Anderson	Landowners were contacted prior the submission of the EIA applications. In consultation with Eskom, the most preferred sites were identified and the relevant land owners were consulted. All interested and affected parties will be consulted during the PPP, which is an on-going process.
	Information Sharing Meeting (14 January 2012)	Mr Boetie Kotze: Local business owner	Requested to be updated on any developments regarding the proposed project	Kevin Anderson	Noted.
<b>Fauna and flora</b>	Information Sharing Meeting (14 January 2012)	Mr van Zyl: Graafwater Community Member	Will site clearance be undertaken prior construction of the solar power plant?	Marike de Klerk	Certain areas will be cleared during the construction phase. Certain plants will have to be removed if it is determined that they might affect the efficiency of the solar panels. However, physical disturbance will be minimised and undertaken in accordance with a Fauna and Flora Management Plan. and mitigation measures will be implemented. Should protected plant species be found in the study area, they be relocated to another area where they will not be affected.
<b>Avifauna</b>	Registration Form (12 December 2011)	Mrs Tania Anderson: Wildlife and Environment Society of South Africa	Concerned about the impacts the proposed project will have on the birds. A concern was also raised about the loss of endangered species.	Digby Wells	A Fauna and Flora assessment will be undertaken during the EIA Phase to assess the potential impact of the projects on biodiversity and to develop suitable management plans.
<b>Employment</b>	Information Sharing Meeting (14 January 2012)	Cllr Jimmy Barnard: Ward Councillor	Will there be employment opportunities for local people?	Kevin Anderson	Yes, employment opportunities will be available to local people. Indicated that Orlight SA intends to employ a certain number of employees from local communities and supports the governments' on-going initiative to enhance local employment and Black Economic Empowerment (BEE). One direct employment opportunity per MW generation capacity will be created during the operational phase and four direct job opportunities will be created per MW generation capacity during the construction phase. During the construction and operational phases, employee accommodation will be required. If feasible, accommodation will be provided in the closest town, which is Graafwater.  Orlight SA will also support local businesses that may result from the multiplier effect from this development, such as transport services or hospitality and catering.
<b>Tourism</b>	Information Sharing Meeting (14 January 2012)	Mr Boetie Kotze; Local business owner	The proposed project will be a tourist attraction.	Kevin Anderson	Noted.
<b>Safety and security</b>	Information Sharing Meeting (14 January 2012)	Mr Neethling: Community member	Indicated that safety and security of the project is of concern.	Kevin Anderson	Orlight SA will have security guards on site and the site will be fenced-off.

ASPECT	REFERENCE	FARM/ORGANISATION	ISSUE	RESPONDER	RESPONSE
	January 2012)				
	Information Sharing Meeting (14 January 2012)	Cllr Jimmy Barnard: Ward Councillor	Indicated that a number of local people have been injured/died on the railway line that is located adjacent to the project site. Recommended that safety be taken into consideration.	Kevin Anderson	Noted.
<b>General</b>	Registration form (17 January 2012)	Mrs Retha Coetzee: Graafwater Community member	Concerned about high temperatures	Digby Wells	The impact of the proposed Orlight SA Solar PV Power Plant on the micro-climate will be investigated during the EIA Phase.

## **6.9 Way forward for PPP**

### *6.9.1 Scope of work and methodology for EIA Phase*

The PPP for the EIA Phase aims to be transparent and inclusive of all I&APs. Secondly, the PPP for the EIA Phase will ensure that I&APs are afforded an opportunity to comment on the draft EIA report. The following is a summary of the activities to be undertaken as part of the PPP for the EIA Phase of the project:

#### *6.9.1.1 On-going consultation*

During the EIA Phase, on-going consultation will be undertaken with all I&APs to provide them with updated project information. It is anticipated that no public feedback meetings will take place during this phase. I&APs are encouraged to continue to raise their issues and comments regarding the proposed project.

#### *6.9.1.2 Public review of the draft EIA Report*

The draft EIA report, including the specialist studies, will be made available for public review at various public locations, such as libraries within the study area and on the Digby Wells website. All registered I&APs will be notified via email, fax or registered post of the availability of the report for comment. The report will be made available for the required 40 day review period. This will present I&APs with a further opportunity to provide input into the environmental authorisation processes and an opportunity to ensure that their issues, comments and concerns have been documented and addressed in the Issues and Response Table. All concerns and issues raised will be documented and included in the PPP report for the EIA. The final EIA report will be submitted to DEA for consideration prior to a decision being reached.

#### *6.9.1.3 Notification of decision*

Once a decision has been made by the DEA on whether to grant environmental authorisation for the proposed projects, all registered I&APs will be notified by email, fax and registered post of the decision and appeal procedures.



## 7 IMPACT IDENTIFICATION AND PRELIMINARY ASSESSMENT

The proposed Orlight SA Solar PV Power Plants may have potential impacts on the social and biophysical environments. These impacts may result from the construction and operational activities planned for the proposed project, with reference to the NEMA listed activities discussed in Chapter 2 (Table 2-2).

The following tables were compiled to summarise the aspects, potential impacts, I&AP concerns and way forward for each study area. Based on these findings, preliminary environmental sensitivity maps were compiled for each study area (Plan 6a to Plan 6e).

### 7.1 Aggeneys

#### 7.1.1 Topography and hydrology

SITE	AGGENEYS
<i>Aspect</i>	Topography and hydrology
<i>Potential impact</i>	During the construction phase, site clearance and the establishment of the construction lay-down yard and vehicle hard park may lead to a loss of seepage areas. Impacts to water quality may occur during the construction and operational phase as result of domestic waste and sewage management, vehicular activity and cleaning of the solar PV panels.
<i>I&amp;AP concern</i>	Yes, during the information sharing meeting, the I&APs highlighted the importance of surface water management and storm water management. It was reiterated that water is a scarce resource in the region; therefore, water availability is a concern.
<i>Way forward</i>	Suitable buffer zones around drainage lines must be established, within which no construction activities will be allowed. A water management plan must be implemented to ensure separation of dirty and clean water and the utilisation of biodegradable/organic soaps for cleaning must be used when the project commences. Construction infrastructure will be temporary, such as tented warehouses, and where possible exiting permanent infrastructure will be used, such as barns.

#### 7.1.2 Visual

SITE	AGGENEYS
<i>Aspect</i>	Visual
<i>Potential impact</i>	During construction, there may be a change in the aesthetic characteristics of the sites as result of site clearance and dust generation which affects visibility and the visual nature of the areas. Minor visual disturbances may be created due to construction activities, including the construction of a vehicle hard park. The main visual impacts are expected due to the introduction and

SITE	AGGENEYS
	establishment of large solar panels during the construction and operational phases. Minor visual impacts are expected due to the fencing of the sites.
<i>I&amp;AP concern</i>	No. It has been established, after carrying out all of the PPP meetings, that the landowners and locals in all of the areas are enthusiastic about the potential solar projects and the visual impact that the panels will introduce was not raised as a concern amongst the attendees at the meetings.
<i>Way forward</i>	A Visual Impact Assessment (VIA) must be conducted. The VIA will include the modelling of theoretical and practical viewsheds using Geographic Information Systems (GIS). Information on the visual sensitivity and characteristics of the proposed sites must be gathered. Potential receptors must be identified in an attempt to quantify the extent of the visual impacts on these receptors. The assessments will be used to determine, as accurately as possible, the full range of visual impacts that the Orlight SA Solar PV Power Plants and their respective construction and operational activities will have on the surrounding visual environments.

### 7.1.3 Fauna and flora

SITE	AGGENEYS
<i>Aspect</i>	Fauna and flora
<i>Potential impact</i>	<p>As result of construction activities, a number of negative impacts may occur on fauna and flora, such as:</p> <ul style="list-style-type: none"> <li>• Vegetation removal and destruction;</li> <li>• Habitat destruction affecting mammals, reptiles, amphibians, avifauna and invertebrates;</li> <li>• Increased run off during rain events;</li> <li>• Fencing of the site which will hinder migratory routes of remaining animals; and</li> <li>• Areas underneath of the solar PV panels will create a potential habitat where alien invasive plant species could establish.</li> </ul> <p>As result of the operational activities, such as the cleaning of solar PV panels, the contamination of soil may occur due to the cleaning agents and solvents. Fencing of the site may negatively affect the migratory routes of animals.</p>
<i>I&amp;AP concern</i>	Yes, during the information sharing meetings, community members and interested and affected parties enquired about the ecological sensitivity of the proposed project. Other stakeholders suggested that offset areas be created where plants (and animals) can be re-established or reintroduced.
<i>Way forward</i>	To mitigate or lessen the potential impacts of the construction and

	operational activities on fauna and flora, the baseline characterisation of the biological environment must be fully understood through comprehensive flora and fauna studies. It is recommended that two surveys are undertaken in April 2012 and early September 2012 to correspond with the flowering season of dominant plant species in the area. Utilisation of biodegradable/organic soaps for cleaning must be used when the project commences.
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#### 7.1.4 Soil and agricultural potential

SITE	AGGENEYS
<i>Aspect</i>	Soil and agricultural potential
<i>Potential impact</i>	During the construction phase, site clearance and vehicular activity could result in soil erosion, soil compaction, loss of land capability. The land use will be changed, resulting in a loss of grazing land. In addition, potential soil pollution and loss of land capability may occur as result of the the vehicle hard park areas and hydrocarbon spills, as well as pollution through domestic waste, solvents and sewage.
<i>I&amp;AP concern</i>	No, the current land use of the area is mainly for grazing purposes.
<i>Way forward</i>	A soil and land capability assessment must be undertaken to identify measures to prevent or mitigate soil erosion for different soil types. During construction and operation, the disturbance of soil profiles must be minimised by restricting vehicular activity to designated areas. A construction management plan must be compiled, including emergency spill response and waste management plans. Land use change can be minimised by restricting the project footprint. The land types present in the study area have restrictive soil properties and inherent low agricultural potential, it is, therefore, recommended that the soil and land capability assessment be undertaken on a reconnaissance level only.

#### 7.1.5 Tourism and land use

SITE	AGGENEYS
<i>Aspect</i>	Tourism and land use
<i>Potential impact</i>	The proposed Orlight SA Solar PV Power Plant may result in a number of potential positive impacts such as increased demand for hospitality and catering, as well as negative impacts such as: <ul style="list-style-type: none"> <li>• Loss of sense of place (visual and noise impacts);</li> <li>• Loss of land use (grazing and farming opportunities);</li> <li>• Loss of vegetation (surface clearing for construction); and</li> </ul>

SITE	AGGENEYS
	<ul style="list-style-type: none"> <li>Loss of tourism growth potential and sustainability of the tourism industry (due to industrial development).</li> </ul>
<i>I&amp;AP concern</i>	No. During the information sharing meetings, a local I&AP suggested it may create a positive tourism impact by creating a tourist attraction for the town.
<i>Way forward</i>	The tourism industry in the Northern and Western Cape Provinces area mainly dependent on natural and cultural resources such as seasonal flowers, vast open areas and outdoor activities such as hiking and 4x4-ing. A Tourism Screening Assessment will be undertaken as part of the EIA Phase.

#### 7.1.6 Socio-economic environment

SITE	AGGENEYS
<i>Aspect</i>	Socio-economics
<i>Potential impact</i>	Positive impacts may be created as result of employment opportunities for local people, as well as the creation of support industries, such as transport and catering services or accommodation. Four direct job opportunities will be created per MW generation capacity during the construction phase and one direct employment opportunity per MW generation capacity will be created during the operational phase. During the construction and operational phase, accommodation of employees, contractors and consultants will be required. If feasible, accommodation will be provided in the town closest the project site. Negative impacts may be created as a result of the influx of job seekers and associated pressures on municipal services, the creation of informal settlements, vandalism and poaching.
<i>I&amp;AP concern</i>	No. The town of Aggeneys is primarily focussed on mining. Most of the inhabitants are employed by the mine, or in a support service for the mine. During the information sharing meetings, social impacts were not seen as a main concern. It was mentioned that accommodation may be an issue, as there is limited accommodation available in the town of Aggeneys. There is a need for a solar power projects in the area, as result of increasing electricity demands; thus, the proposed Orlight SA Solar PV Power Plant was welcomed.
<i>Way forward</i>	The benefits of the proposed project should be optimised and the negative impacts must be minimised. Potential negative impacts should be prevented or mitigated through the implementation of effective social management plans and programmes. Orlight SA will consult social specialists to work closely with the relevant communities and manage the administrative process for local employment. A number of relevant local businesses will also be supported.

### 7.1.7 Archaeology and heritage

SITE	AGGENEYS
<i>Aspect</i>	Archaeology and heritage
<i>Potential impact</i>	<p>The following activities may cause potential impacts on sites of archaeological and heritage significance:</p> <ul style="list-style-type: none"> <li>• Potential damage, destruction or disturbance of physical heritage resources, mainly Stone Age and palaeontological artefacts or sites, as result of site clearance, access control and fencing of site, construction of lay-down yard and the anchoring and installation of solar PV panels during the construction phase;</li> <li>• Compaction of sites, damage to sites and artefacts as result of vehicular activities during the construction and operational phase;</li> <li>• Potential contamination by hydrocarbons on datable material on site and as runoff as result of vehicle hard park and hydrocarbon management (fuel, oil and waste oil); and</li> <li>• Increased human activity may increase risk of site destruction, vandalism and looting as result of employment and potential accommodation of construction workers.</li> </ul>
<i>I&amp;AP concern</i>	No. No issues were raised during the information sharing meetings or during other consultation with interested and affected parties.
<i>Way forward</i>	This site may be exempted from a Heritage Impact Assessment, as no significant heritage resources occur or were noted in the CRP research, apart from Stone Age material. The type of development is furthermore considered to be extremely low-impact, and should not damage or affect any heritage resources. A Phase 1 Archaeological Impact Assessment could be undertaken to establish age and industry of lithics in the project area, as well as record frequency and distribution. This may be important given the fact that the cumulative impact of solar power stations on the archaeology is unknown. Effect of hydrocarbon spills not known on archaeological dating, but young/old carbon known to contaminate material; therefore, effective containment and management of hydrocarbons would be required.

## 7.2 Kenhardt

### 7.2.1 Topography and hydrology

SITE	KENHARDT
<i>Aspect</i>	Topography and hydrology
<i>Potential impact</i>	During the construction phase, site clearance and the establishment of the construction lay-down yard and vehicle hard park may lead to a loss of seepage areas. Impacts to water quality may occur during the construction

SITE	KENHARDT
	and operational phase as result of domestic waste and sewage management, vehicular activity and cleaning of the solar PV panels.
<i>I&amp;AP concern</i>	Yes, during the information sharing meeting, the I&APs highlighted the importance of surface water management and storm water management. It was reiterated that water is a scarce resource in the region.
<i>Way forward</i>	Suitable buffer zones around drainage lines must be established, within which no construction activities will be allowed. A water management plan must be implemented to ensure separation of dirty and clean water and the utilisation of biodegradable/organic soaps for cleaning must be used when the project commences. Construction infrastructure will be temporary, such as tented warehouses, and where possible existing permanent infrastructure will be used, such as barns.

### 7.2.2 Visual

SITE	KENHARDT
<i>Aspect</i>	Visual
<i>Potential impact</i>	During construction, there may be a change in the aesthetic characteristics of the sites as result of site clearance and dust generation which affects visibility and the visual nature of the areas. Minor visual disturbances may be created due to construction activities, including the construction of a vehicle hard park. The main visual impacts are expected due to the introduction and establishment of large solar panels during the construction and operational phases. Minor visual impacts are expected due to the fencing of the sites.
<i>I&amp;AP concern</i>	No. It has been established, after carrying out all of the PPP meetings, that the landowners and locals in all of the areas are excited about the potential solar projects and the visual impact that the panels will introduce was not raised as a concern amongst the attendees as the meetings.
<i>Way forward</i>	A Visual Impact Assessment (VIA) must be conducted. The VIA will include the modelling of theoretical and practical viewsheds using Geographic Information Systems (GIS). Information on the visual sensitivity and characteristics of the proposed sites must be gathered. Potential receptors must be identified in an attempt to quantify the extent of the visual impacts on these receptors. The assessments will be used to determine, as accurately as possible, the full range of visual impacts that the Orlight SA Solar PV Power Plants and their respective construction and operational activities will have on the surrounding visual environments.

### 7.2.3 Fauna and flora

SITE	KENHARDT
<i>Aspect</i>	Fauna and Flora
<i>Potential impact</i>	<p>As result of construction activities, a number of negative impacts may occur on fauna and flora, such as:</p> <ul style="list-style-type: none"> <li>• Vegetation removal and destruction;</li> <li>• Habitat destruction affecting mammals, reptiles, amphibians, avifauna and invertebrates;</li> <li>• Increased run off during rain events;</li> <li>• Fencing of the site which will hinder migratory routes of remaining animals; and</li> <li>• Areas underneath of the solar PV panels will create a potential habitat where alien invasive plant species could establish.</li> </ul> <p>As result of the operational activities, such as the cleaning of solar PV panels, the contamination of soil may occur due to the cleaning agents and solvents. Fencing of the site may negatively affect the migratory routes of animals.</p>
<i>I&amp;AP concern</i>	Yes, during the information sharing meetings, community members and interested and affected parties enquired about the ecological sensitivity of the proposed project. Other stakeholders suggested that offset areas be created where plants (and animals) can be re-established or reintroduced.
<i>Way forward</i>	To mitigate or lessen the potential impacts of the construction and operational activities on fauna and flora, the baseline characterisation of the biological environment must be fully understood through comprehensive flora and fauna studies. It is recommended that two surveys are undertaken in April 2012 and early September 2012 to correspond with the flowering season of dominant plant species in the area. Utilisation of biodegradable/organic soaps for cleaning must be used when the project commences.

### 7.2.4 Soil and agricultural potential

SITE	KENHARDT
<i>Aspect</i>	Soil and agricultural potential
<i>Potential impact</i>	During the construction phase, site clearance and vehicular activity could result in soil erosion, soil compaction, loss of land capability. The land use will be changed, resulting in a loss of grazing land. In addition, potential soil pollution and loss of land capability may occur as result of the the vehicle hard park areas and hydrocarbon spills, as well as pollution through

SITE	KENHARDT
	domestic waste, solvents and sewage.
<i>I&amp;AP concern</i>	No, the current land use of the area is mainly for grazing purposes.
<i>Way forward</i>	A soil and land capability assessment must be undertaken to identify measures to prevent or mitigate soil erosion for different soil types. During construction and operation, the disturbance of soil profiles must be minimised by restricting vehicular activity to designated areas. A construction management plan must be compiled, including emergency spill response and waste management plans. Land use change can be minimised by restricting the project footprint. The land types present in the study area have restrictive soil properties and inherent low agricultural potential, it is, therefore, recommended that the soil and land capability assessment be undertaken on a reconnaissance level only.

#### 7.2.5 Tourism and land use

SITE	KENHARDT
<i>Aspect</i>	Tourism and land use
<i>Potential impact</i>	The proposed Orlight SA Solar PV Power Plant may result in a number of potential positive impacts such as increased demand for hospitality and catering, as well as negative impacts such as: <ul style="list-style-type: none"> <li>• Loss of sense of place (visual and noise impacts);</li> <li>• Loss of land use (grazing and farming opportunities);</li> <li>• Loss of vegetation (surface clearing for construction); and</li> <li>• Loss of tourism growth potential and sustainability of the tourism industry (due to industrial development).</li> </ul>
<i>I&amp;AP concern</i>	No. During the information sharing meetings, a local I&AP suggested it may create a positive tourism impact by creating a tourist attraction for the town. These unique solar plants may thus serve as an educational tourist attraction and have the potential to support the existing tourism industry.
<i>Way forward</i>	The tourism industry in the Northern and Western Cape Provinces area mainly dependent on natural and cultural resources such as seasonal flowers, vast open areas and outdoor activities such as hiking and 4x4-ing. A Tourism Screening Assessment will be undertaken as part of the EIA Phase.



### 7.2.6 Socio-economic environment

SITE	KENHARDT
<i>Aspect</i>	Socio-economics
<i>Potential impact</i>	Positive impacts may be created as result of employment opportunities for local people, as well as the creation of support industries, such as transport and catering services or accommodation. Four direct job opportunities will be created per MW generation capacity during the construction phase and one direct employment opportunity per MW generation capacity will be created during the operational phase. During the construction and operational phase, accommodation of employees, contractors and consultants will be required. If feasible, accommodation will be provided in the town closest the project site. Negative impacts may be created as a result of the influx of job seekers and associated pressures on municipal services, the creation of informal settlements, vandalism and poaching.
<i>I&amp;AP concern</i>	Yes, in terms of the information from Stats SA Community Survey (2007), it is clear that there are socio-economic imbalances within the proposed project area. People are living in poverty with little educational background and with limited skills. During the information sharing meeting, it was requested that Orlight SA employ local people and provide skills training for them as the area has many people with matric and tertiary qualifications who are still unemployed.
<i>Way forward</i>	The proposed project has a potential to benefit communities within the study areas through the generation of new employment opportunities and indirect benefits in terms of local economic development. Benefits of the proposed project should be optimised and the negative impacts must be minimised. Potential negative impacts should be prevented or mitigated through the implementation of effective social management plans and programmes. Orlight SA will consult social specialists to work closely with the relevant communities and manage the administrative process for local employment. A number of relevant local businesses will also be supported such as accommodation, catering and transport where possible.

### 7.2.7 Archaeology and heritage

SITE	KENHARDT
<i>Aspect</i>	Archaeology and heritage
<i>Potential impact</i>	The following activities may cause potential impacts on sites of archaeological and heritage significance: <ul style="list-style-type: none"> <li>• Potential damage, destruction or disturbance of physical heritage resources, mainly Stone Age and palaeontological artefacts or sites,</li> </ul>

SITE	KENHARDT
	<p>as result of site clearance, access control and fencing of site, construction of lay-down yard and the anchoring and installation of solar PV panels during the construction phase;</p> <ul style="list-style-type: none"> <li>• Compaction of sites, damage to sites and artefacts as result of vehicular activities during the construction and operational phase;</li> <li>• Potential contamination by hydrocarbons on datable material on site and as runoff as result of vehicle hard park and hydrocarbon management (fuel, oil and waste oil); and</li> <li>• Increased human activity may increase risk of site destruction, vandalism and looting as result of employment and potential accommodation of construction workers.</li> </ul>
<i>I&amp;AP concern</i>	No. No issues were raised during the information sharing meetings or during other consultation with interested and affected parties.
<i>Way forward</i>	<p>This site may be exempted from a Heritage Impact Assessment, as no significant heritage resources occur or were noted in the CRP research, apart from Stone Age material. The type of development is furthermore considered to be extremely low-impact, and should not damage or affect any heritage resources. A Phase 1 Archaeological Impact Assessment should be undertaken considering the fairly dense occurrence of lithics noted during the screening survey. Effect of hydrocarbon spills not known on archaeological dating, but young/old carbon known to contaminate material; therefore, effective containment and management of hydrocarbons would be required.</p>

### 7.3 Loeriesfontein

#### 7.3.1 Topography and hydrology

SITE	LOERIESFONTEIN
<i>Aspect</i>	Topography and hydrology
<i>Potential impact</i>	<p>With regards to topography and hydrology, the main adverse impacts that may occur will be during the construction phase. This include:</p> <ul style="list-style-type: none"> <li>• Loss of seepage areas during the construction phase as result of site clearance, construction lay-down yard, vehicle hard park and hydrocarbon management (fuel, oil and waste oil) and on site-accommodation of construction workers.</li> <li>• Impacts to water quality during construction and operational phase as result of domestic waste and sewage management, vehicular activity and cleaning of solar PV panels.</li> <li>• Impeding water flow of watercourses during the construction phase as result of the anchoring and installation of solar PV panels.</li> </ul>

SITE	LOERIESFONTEIN
<i>I&amp;AP concern</i>	Yes, during the information sharing meeting, the I&APs highlighted the importance of surface water management and storm water management. It was reiterated that water is a scarce resource in the region; however, the land owner indicated that good quality groundwater may be available for utilisation. There is an existing small farm dam on site.
<i>Way forward</i>	<ul style="list-style-type: none"> <li>• Confirm buffer zones around drainage lines within which no construction activities will be allowed.</li> <li>• Implement a dirty water management plan and utilisation of biodegradable/organic soaps for cleaning only.</li> <li>• Prevent construction within the delineated watercourse areas.</li> </ul>

### 7.3.2 Visual

SITE	LOERIESFONTEIN
<i>Aspect</i>	Visual
<i>Potential impact</i>	During construction, there may be a change in the aesthetic characteristics of the sites as result of site clearance and dust generation which affects visibility and the visual nature of the areas. Minor visual disturbances may be created due to construction activities, including the construction of a vehicle hard park. The main visual impacts are expected due to the introduction and establishment of large solar panels during the construction and operational phases. Minor visual impacts are expected due to the fencing of the sites.
<i>I&amp;AP concern</i>	No. It has been established, after carrying out all of the PPP meetings, that the landowners and locals in all of the areas are excited about the potential solar projects and the visual impact that the panels will introduce was not raised as a concern amongst the attendees as the meetings.
<i>Way forward</i>	<p>In order to mitigate and manage the potential visual impacts, a full VIA must be conducted by carrying out the following activities:</p> <ul style="list-style-type: none"> <li>• Carry out theoretical viewshed models using Geographic Information Systems.</li> <li>• Construction of ground-truth theoretical models;</li> <li>• Gather information about the visual sensitivity and characteristics of the proposed sites;</li> <li>• Identify potential receptors and attempt to quantify the extent of the visual impacts on these receptors.</li> <li>• Synthesise viewshed model results, information gathered in the field and additional VIA research done to determine, as accurately as possible, the full range of visual impacts that the solar parks will have on their surrounding visual environments.</li> </ul>

### 7.3.3 Fauna and flora

SITE	LOERIESFONTEIN
<i>Aspect</i>	Fauna and flora
<i>Potential impact</i>	<p>As result of construction activities, a number of negative impacts may occur on fauna and flora, such as:</p> <ul style="list-style-type: none"> <li>• Vegetation removal and destruction;</li> <li>• Habitat destruction affecting mammals, reptiles, amphibians, avifauna and invertebrates;</li> <li>• Increased run off during rain events;</li> <li>• Fencing of the site which will hinder migratory routes of remaining animals; and</li> <li>• Areas underneath of the solar PV panels will create a potential habitat where alien invasive plant species could establish.</li> </ul> <p>As result of the operational activities, such as the cleaning of solar PV panels, the contamination of soil may occur due to the cleaning agents and solvents. Fencing of the site may negatively affect the migratory routes of animals.</p>
<i>I&amp;AP concern</i>	Yes, during the information sharing meetings, community members and interested and affected parties enquired about the ecological sensitivity of the proposed project. Other stakeholders suggested that offset areas be created where plants (and animals) can be re-established or reintroduced.
<i>Way forward</i>	To mitigate or lessen the potential impacts of the construction and operational activities on fauna and flora, the baseline characterisation of the biological environment must be fully understood through comprehensive flora and fauna studies. It is recommended that two surveys are undertaken in April 2012 and early September 2012 to correspond with the flowering season of dominant plant species in the area. Utilisation of biodegradable/organic soaps for cleaning must be used when the project commences.

### 7.3.4 Soil and agricultural potential

SITE	LOERIESFONTEIN
<i>Aspect</i>	Soil and agricultural potential
<i>Potential impact</i>	During the construction phase, site clearance and vehicular activity could result in soil erosion, soil compaction, loss of land capability. The land use will be changed, resulting in a loss of grazing land. In addition, potential soil pollution and loss of land capability may occur as result of the the vehicle hard park areas and hydrocarbon spills, as well as pollution through

SITE	LOERIESFONTEIN
	domestic waste, solvents and sewage.
<i>I&amp;AP concern</i>	No, the current land use of the area is mainly for grazing purposes.
<i>Way forward</i>	A soil and land capability assessment must be undertaken to identify measures to prevent or mitigate soil erosion for different soil types. During construction and operation, the disturbance of soil profiles must be minimised by restricting vehicular activity to designated areas. A construction management plan must be compiled, including emergency spill response and waste management plans. Land use change can be minimised by restricting the project footprint. The land types present in the study area have restrictive soil properties and inherent low agricultural potential, it is, therefore, recommended that the soil and land capability assessment be undertaken on a reconnaissance level only.

### 7.3.5 Tourism and land use

SITE	LOERIESFONTEIN
<i>Aspect</i>	Tourism and land use
<i>Potential impact</i>	The proposed Orlight SA Solar PV Power Plant may result in a number of potential positive impacts such as increased demand for hospitality and catering, as well as negative impacts such as: <ul style="list-style-type: none"> <li>• Loss of sense of place (visual and noise impacts);</li> <li>• Loss of land use (grazing and farming opportunities);</li> <li>• Loss of vegetation (surface clearing for construction); and</li> <li>• Loss of tourism growth potential and sustainability of the tourism industry (due to industrial development).</li> </ul>
<i>I&amp;AP concern</i>	No. During the information sharing meetings, a local I&AP suggested it may create a positive tourism impact by creating a tourist attraction for the town. These unique solar plants may thus serve as an educational tourist attraction and have the potential to support the existing tourism industry.
<i>Way forward</i>	The tourism industry in the Northern and Western Cape Provinces area mainly dependent on natural and cultural resources such as seasonal flowers, vast open areas and outdoor activities such as hiking and 4x4-ing. A Tourism Screening Assessment will be undertaken as part of the EIA Phase.

### 7.3.6 Socio-economic environment

SITE	LOERIESFONTEIN
<i>Aspect</i>	Socio-economics
<i>Potential impact</i>	Positive impacts may be created as result of employment opportunities for local people, as well as the creation of support industries, such as transport and catering services or accommodation. Four direct job opportunities will be created per MW generation capacity during the construction phase and one direct employment opportunity per MW generation capacity will be created during the operational phase. During the construction and operational phase, accommodation of employees, contractors and consultants will be required. If feasible, accommodation will be provided in the town closest the project site. Negative impacts may be created as a result of the influx of job seekers and associated pressures on municipal services, the creation of informal settlements, vandalism and poaching.
<i>I&amp;AP concern</i>	Yes, in terms of the information from Stats SA Community Survey (2007), it is clear that there are socio-economic imbalances within the proposed project area. People are living in poverty with little educational background and with limited skills. During the information sharing meeting, it was requested that Orlight SA employ local people and provide skills training for them as the area has many people with matric and tertiary qualifications who are still unemployed.
<i>Way forward</i>	The proposed project has a potential to benefit communities within the study areas through the generation of new employment opportunities and indirect benefits in terms of local economic development. Benefits of the proposed project should be optimised and the negative impacts must be minimised. Potential negative impacts should be prevented or mitigated through the implementation of effective social management plans and programmes. Orlight SA will consult social specialists to work closely with the relevant communities and manage the administrative process for local employment. A number of relevant local businesses will also be supported such as accommodation, catering and transport.

### 7.3.7 Archaeology and heritage

SITE	LOERIESFONTEIN
<i>Aspect</i>	Archaeology and heritage
<i>Potential impact</i>	The following activities may cause potential impacts on sites of archaeological and heritage significance: <ul style="list-style-type: none"> <li>• Potential damage, destruction or disturbance of physical heritage resources, mainly Stone Age and palaeontological artefacts or sites,</li> </ul>

SITE	LOERIESFONTEIN
	<p>as result of site clearance, access control and fencing of site, construction of lay-down yard and the anchoring and installation of solar PV panels during the construction phase;</p> <ul style="list-style-type: none"> <li>• Compaction of sites, damage to sites and artefacts as result of vehicular activities during the construction and operational phase;</li> <li>• Potential contamination by hydrocarbons on datable material on site and as runoff as result of vehicle hard park and hydrocarbon management (fuel, oil and waste oil); and</li> <li>• Increased human activity may increase risk of site destruction, vandalism and looting as result of employment and potential accommodation of construction workers.</li> </ul>
<i>I&amp;AP concern</i>	<p>Yes. Although no major issues were raised during the information sharing meetings or during other consultation with interested and affected parties, the land owner indicated that there may be a site of significance behind a <i>koppie</i> of this study area. The specific area has not been investigated yet, but will be considered during the EIA Phase.</p>
<i>Way forward</i>	<p>This site may be exempted from a Heritage Impact Assessment. However, both Phase 1 archaeological and palaeontological assessments are recommended. Effect of hydrocarbon spills not known on archaeological dating, but young/old carbon known to contaminate material; therefore, effective containment and management of hydrocarbons would also be required.</p>

## 7.4 Vanrhynsdorp

### 7.4.1 Topography and hydrology

SITE	VANRHYNSDORP
<i>Aspect</i>	Topography and hydrology
<i>Potential impact</i>	<p>During the construction phase, site clearance and the establishment of the construction lay-down yard and vehicle hard park may lead to a loss of seepage areas. Impacts to water quality may occur during the construction and operational phase as result of domestic waste and sewage management, vehicular activity and cleaning of the solar PV panels.</p>
<i>I&amp;AP concern</i>	<p>Yes, during the information sharing meeting, the I&amp;APs highlighted the importance of surface water management and storm water management. It was reiterated that water is a scarce resource in the region.</p>
<i>Way forward</i>	<p>Suitable buffer zones around drainage lines must be established, within which no construction activities will be allowed. A water management plan must be implemented to ensure separation of dirty and clean water and the</p>

SITE	VANRHYNSDORP
	utilisation of biodegradable/organic soaps for cleaning must be used when the project commences. Construction infrastructure will be temporary, such as tented warehouses, and where possible existing permanent infrastructure will be used, such as barns.

#### 7.4.2 Visual

SITE	VANRHYNSDORP
<i>Aspect</i>	Visual
<i>Potential impact</i>	During construction, there may be a change in the aesthetic characteristics of the sites as result of site clearance and dust generation which affects visibility and the visual nature of the areas. Minor visual disturbances may be created due to construction activities, including the construction of a vehicle hard park. The main visual impacts are expected due to the introduction and establishment of large solar panels during the construction and operational phases. Minor visual impacts are expected due to the fencing of the sites.
<i>I&amp;AP concern</i>	No. It has been established, after carrying out all of the PPP meetings, that the landowners and locals in all of the areas are excited about the potential solar projects and the visual impact that the panels will introduce was not raised as a concern amongst the attendees as the meetings.
<i>Way forward</i>	A VIA must be conducted. The VIA will include the modelling of theoretical and practical viewsheds using GIS. Information on the visual sensitivity and characteristics of the proposed sites must be gathered. Potential receptors must be identified in an attempt to quantify the extent of the visual impacts on these receptors. The assessments will be used to determine, as accurately as possible, the full range of visual impacts that the Orlight SA Solar PV Power Plants and their respective construction and operational activities will have on the surrounding visual environments.

#### 7.4.3 Fauna and Flora

SITE	VANRHYNSDORP
<i>Aspect</i>	Fauna and Flora
<i>Potential impact</i>	As result of construction activities, a number of negative impacts may occur on fauna and flora, such as: <ul style="list-style-type: none"> <li>• Vegetation removal and destruction;</li> <li>• Habitat destruction affecting mammals, reptiles, amphibians, avifauna and invertebrates;</li> <li>• Increased run off during rain events;</li> </ul>



SITE	VANRHYNSDORP
	<ul style="list-style-type: none"> <li>Fencing of the site which will hinder migratory routes of remaining animals; and</li> <li>Areas underneath of the solar PV panels will create a potential habitat where alien invasive plant species could establish.</li> </ul> <p>As result of the operational activities, such as the cleaning of solar PV panels, the contamination of soil may occur due to the cleaning agents and solvents. Fencing of the site may negatively affect the migratory routes of animals.</p>
<i>I&amp;AP concern</i>	Yes, during the information sharing meetings, community members and interested and affected parties enquired about the ecological sensitivity of the proposed project. Other stakeholders suggested that offset areas be created where plants (and animals) can be re-established or reintroduced. Vanrhynsdorp has one of the world's largest succulent nurseries in the world.
<i>Way forward</i>	To mitigate or lessen the potential impacts of the construction and operational activities on fauna and flora, the baseline characterisation of the biological environment must be fully understood through comprehensive flora and fauna studies. It is recommended that two surveys are undertaken in April 2012 and early September 2012 to correspond with the flowering season of dominant plant species in the area. Utilisation of biodegradable/organic soaps for cleaning must be used when the project commences.

#### 7.4.4 Soil and agricultural potential

SITE	VANRHYNSDORP
<i>Aspect</i>	Soil and agricultural potential
<i>Potential impact</i>	During the construction phase, site clearance and vehicular activity could result in soil erosion, soil compaction, loss of land capability. The land use will be changed, resulting in a loss of grazing land. In addition, potential soil pollution and loss of land capability may occur as result of the the vehicle hard park areas and hydrocarbon spills, as well as pollution through domestic waste, solvents and sewage.
<i>I&amp;AP concern</i>	No, the current land use of the area is mainly for grazing purposes.
<i>Way forward</i>	A soil and land capability assessment must be undertaken to identify measures to prevent or mitigate soil erosion for different soil types. During construction and operation, the disturbance of soil profiles must be minimised by restricting vehicular activity to designated areas. A construction management plan must be compiled, including emergency spill response and waste management plans. Land use change can be minimised by

SITE	VANRHYNSDORP
	restricting the project footprint. The land types present in the study area have restrictive soil properties and inherent low agricultural potential, it is, therefore, recommended that the soil and land capability assessment be undertaken on a reconnaissance level only.

#### 7.4.5 Tourism and land use

SITE	VANRHYNSDORP
<i>Aspect</i>	Tourism and land use
<i>Potential impact</i>	The proposed Orlight SA Solar PV Power Plant may result in a number of potential positive impacts such as increased demand for hospitality and catering, as well as negative impacts such as: <ul style="list-style-type: none"> <li>• Loss of sense of place (visual and noise impacts);</li> <li>• Loss of land use (grazing and farming opportunities);</li> <li>• Loss of vegetation (surface clearing for construction); and</li> <li>• Loss of tourism growth potential and sustainability of the tourism industry (due to industrial development).</li> </ul>
<i>I&amp;AP concern</i>	No. During the information sharing meetings, a local I&AP suggested it may create a positive tourism impact by creating a tourist attraction for the town. These unique solar plants may thus serve as an educational tourist attraction and have the potential to support the existing tourism industry.
<i>Way forward</i>	The tourism industry in the Northern and Western Cape Provinces area mainly dependent on natural and cultural resources such as seasonal flowers, vast open areas and outdoor activities such as hiking and 4x4-ing. A Tourism Screening Assessment will be undertaken as part of the EIA Phase.

#### 7.4.6 Socio-economic environment

SITE	VANRHYNSDORP
<i>Aspect</i>	Socio-economics
<i>Potential impact</i>	Positive impacts may be created as result of employment opportunities for local people, as well as the creation of support industries, such as transport and catering services or accommodation. Four direct job opportunities will be created per MW generation capacity during the construction phase and one direct employment opportunity per MW generation capacity will be created during the operational phase. During the construction and operational phase, accommodation of employees, contractors and consultants will be required. If feasible, accommodation will be provided in the town closest the project

SITE	VANRHYNSDORP
	site. Negative impacts may be created as a result of the influx of job seekers and associated pressures on municipal services, the creation of informal settlements, vandalism and poaching.
<i>I&amp;AP concern</i>	Yes, in terms of the information from Stats SA Community Survey (2007), it is clear that there are socio-economic imbalances within the proposed project area. People are living in poverty with little educational background and with limited skills. During the information sharing meeting, it was requested that Orlight SA employ local people and provide skills training for them as the area has many people with matric and tertiary qualifications who are still unemployed.
<i>Way forward</i>	The proposed project has a potential to benefit communities within the study areas through the generation of new employment opportunities and indirect benefits in terms of local economic development. Benefits of the proposed project should be optimised and the negative impacts must be minimised. Potential negative impacts should be prevented or mitigated through the implementation of effective social management plans and programmes. Orlight SA will consult social specialists to work closely with the relevant communities and manage the administrative process for local employment. A number of relevant local businesses will also be supported such as accommodation, catering and transport.

#### 7.4.7 Archaeology and heritage

SITE	VANRHYNSDORP
<i>Aspect</i>	Archaeology and heritage
<i>Potential impact</i>	<p>The following activities may cause potential impacts on sites of archaeological and heritage significance:</p> <ul style="list-style-type: none"> <li>• Potential damage, destruction or disturbance of physical heritage resources, mainly Stone Age and palaeontological artefacts or sites, as result of site clearance, access control and fencing of site, construction of lay-down yard and the anchoring and installation of solar PV panels during the construction phase;</li> <li>• Compaction of sites, damage to sites and artefacts as result of vehicular activities during the construction and operational phase;</li> <li>• Potential contamination by hydrocarbons on datable material on site and as runoff as result of vehicle hard park and hydrocarbon management (fuel, oil and waste oil); and</li> <li>• Increased human activity may increase risk of site destruction, vandalism and looting as result of employment and potential accommodation of construction workers.</li> </ul>

SITE	VANRHYNSDORP
<i>I&amp;AP concern</i>	No. No issues were raised during the information sharing meetings or during other consultation with interested and affected parties.
<i>Way forward</i>	A Letter of Request for Recommendation of Exemption may be applied for as there is no likelihood that any heritage resources will be impacted.

## 7.5 Graafwater

### 7.5.1 Topography and hydrology

SITE	GRAAFWATER
<i>Aspect</i>	Topography and hydrology
<i>Potential impact</i>	During the construction phase, site clearance and the establishment of the construction lay-down yard and vehicle hard park may lead to a loss of seepage areas. Impacts to water quality may occur during the construction and operational phase as result of domestic waste and sewage management, vehicular activity and cleaning of the solar PV panels.
<i>I&amp;AP concern</i>	No.
<i>Way forward</i>	No drainage lines were identified in this study area. A water management plan must be implemented to ensure separation of dirty and clean water and the utilisation of biodegradable/organic soaps for cleaning must be used when the project commences. Construction infrastructure will be temporary, such as tented warehouses, and where possible exiting permanent infrastructure will be used, such as barns.

### 7.5.2 Visual

SITE	GRAAFWATER
<i>Aspect</i>	Visual
<i>Potential impact</i>	During construction, there may be a change in the aesthetic characteristics of the sites as result of site clearance and dust generation which affects visibility and the visual nature of the areas. Minor visual disturbances may be created due to construction activities, including the construction of a vehicle hard park. The main visual impacts are expected due to the introduction and establishment of large solar panels during the construction and operational phases. Minor visual impacts are expected due to the fencing of the sites.
<i>I&amp;AP concern</i>	No. It has been established, after carrying out all of the PPP meetings, that the landowners and locals in all of the areas are excited about the potential

SITE	GRAAFWATER
	solar projects and the visual impact that the panels will introduce was not raised as a concern amongst the attendees as the meetings.
<i>Way forward</i>	A Visual Impact Assessment (VIA) must be conducted. The VIA will include the modelling of theoretical and practical viewsheds using Geographic Information Systems (GIS). Information on the visual sensitivity and characteristics of the proposed sites must be gathered. Potential receptors must be identified in an attempt to quantify the extent of the visual impacts on these receptors. The assessments will be used to determine, as accurately as possible, the full range of visual impacts that the Orlight SA Solar PV Power Plants and their respective construction and operational activities will have on the surrounding visual environments.

### 7.5.3 Fauna and flora

SITE	GRAAFWATER
<i>Aspect</i>	Fauna and flora
<i>Potential impact</i>	<p>As result of construction activities, a number of negative impacts may occur on fauna and flora, such as:</p> <ul style="list-style-type: none"> <li>• Vegetation removal and destruction;</li> <li>• Habitat destruction affecting mammals, reptiles, amphibians, avifauna and invertebrates;</li> <li>• Increased run off during rain events;</li> <li>• Fencing of the site which will hinder migratory routes of remaining animals; and</li> <li>• Areas underneath of the solar PV panels will create a potential habitat where alien invasive plant species could establish.</li> </ul> <p>As result of the operational activities, such as the cleaning of solar PV panels, the contamination of soil may occur due to the cleaning agents and solvents. Fencing of the site may negatively affect the migratory routes of animals.</p>
<i>I&amp;AP concern</i>	Yes, during the information sharing meetings, community members and interested and affected parties enquired about the ecological sensitivity of the proposed project. Other stakeholders suggested that offset areas be created where plants (and animals) can be re-established or reintroduced.
<i>Way forward</i>	To mitigate or lessen the potential impacts of the construction and operational activities on fauna and flora, the baseline characterisation of the biological environment must be fully understood through comprehensive flora and fauna studies. It is recommended that two surveys are undertaken in April 2012 and early September 2012 to correspond with the flowering

SITE	GRAAFWATER
	season of dominant plant species in the area. Utilisation of biodegradable/organic soaps for cleaning must be used when the project commences. Cultivated lands and areas disturbed by quarrying activities can be rehabilitated by using local vegetation that may be cleared from other areas in this study region during construction.

#### 7.5.4 Soil and agricultural potential

SITE	GRAAFWATER
<i>Aspect</i>	Soil and agricultural potential
<i>Potential impact</i>	During the construction phase, site clearance and vehicular activity could result in soil erosion, soil compaction, loss of land capability. The land use will be changed, resulting in a loss of grazing land. In addition, potential soil pollution and loss of land capability may occur as result of the the vehicle hard park areas and hydrocarbon spills, as well as pollution through domestic waste, solvents and sewage.
<i>I&amp;AP concern</i>	No, the current land use of the area is mainly for grazing purposes.
<i>Way forward</i>	A soil and land capability assessment must be undertaken to identify measures to prevent or mitigate soil erosion for different soil types. During construction and operation, the disturbance of soil profiles must be minimised by restricting vehicular activity to designated areas. A construction management plan must be compiled, including emergency spill response and waste management plans. Land use change can be minimised by restricting the project footprint. The land types present in the study area have restrictive soil properties and inherent low agricultural potential, it is, therefore, recommended that the soil and land capability assessment be undertaken on a reconnaissance level only.

#### 7.5.5 Tourism and land use

SITE	GRAAFWATER
<i>Aspect</i>	Tourism and land use
<i>Potential impact</i>	The proposed Orlight SA Solar PV Power Plant may result in a number of potential positive impacts such as increased demand for hospitality and catering, as well as negative impacts such as: <ul style="list-style-type: none"> <li>• Loss of sense of place (visual and noise impacts);</li> <li>• Loss of land use (grazing and farming opportunities);</li> <li>• Loss of vegetation (surface clearing for construction); and</li> </ul>

SITE	GRAAFWATER
	<ul style="list-style-type: none"> <li>Loss of tourism growth potential and sustainability of the tourism industry (due to industrial development).</li> </ul>
<i>I&amp;AP concern</i>	No. During the information sharing meetings, a local I&AP suggested it may create a positive tourism impact by creating a tourist attraction for the town. These unique solar plants may thus serve as an educational tourist attraction and have the potential to support the existing tourism industry.
<i>Way forward</i>	The tourism industry in the Northern and Western Cape Provinces area mainly dependent on natural and cultural resources such as seasonal flowers, vast open areas and outdoor activities such as hiking and 4x4-ing. A Tourism Screening Assessment will be undertaken as part of the EIA Phase.

#### 7.5.6 Socio-economic environment

SITE	GRAAFWATER
<i>Aspect</i>	Socio-economics
<i>Potential impact</i>	Positive impacts may be created as result of employment opportunities for local people, as well as the creation of support industries, such as transport and catering services or accommodation. Four direct job opportunities will be created per MW generation capacity during the construction phase and one direct employment opportunity per MW generation capacity will be created during the operational phase. During the construction and operational phase, accommodation of employees, contractors and consultants will be required. If feasible, accommodation will be provided in the town closest the project site. Negative impacts may be created as a result of the influx of job seekers and associated pressures on municipal services, the creation of informal settlements, vandalism and poaching.
<i>I&amp;AP concern</i>	Yes, in terms of the information from Stats SA Community Survey (2007), it is clear that there are socio-economic imbalances within the proposed project area. People are living in poverty with little educational background and with limited skills. During the information sharing meeting, it was requested that Orlight SA employ local people and provide skills training for them as the area has many people with matric and tertiary qualifications who are still unemployed.
<i>Way forward</i>	The proposed project has a potential to benefit communities within the study areas through the generation of new employment opportunities and indirect benefits in terms of local economic development. Benefits of the proposed project should be optimised and the negative impacts must be minimised. Potential negative impacts should be prevented or mitigated through the implementation of effective social management plans and programmes.

SITE	GRAAFWATER
	Orlight SA will consult social specialists to work closely with the relevant communities and manage the administrative process for local employment. A number of relevant local businesses will also be supported such as accommodation, catering and transport.

### 7.5.7 Archaeology and heritage

SITE	GRAAFWATER
<i>Aspect</i>	Archaeology and heritage
<i>Potential impact</i>	<p>The following activities may cause potential impacts on sites of archaeological and heritage significance:</p> <ul style="list-style-type: none"> <li>• Potential damage, destruction or disturbance of physical heritage resources, mainly Stone Age and palaeontological artefacts or sites, as result of site clearance, access control and fencing of site, construction of lay-down yard and the anchoring and installation of solar PV panels during the construction phase;</li> <li>• Compaction of sites, damage to sites and artefacts as result of vehicular activities during the construction and operational phase;</li> <li>• Potential contamination by hydrocarbons on datable material on site and as runoff as result of vehicle hard park and hydrocarbon management (fuel, oil and waste oil); and</li> <li>• Increased human activity may increase risk of site destruction, vandalism and looting as result of employment and potential accommodation of construction workers.</li> </ul>
<i>I&amp;AP concern</i>	No. No issues were raised during the information sharing meetings or during other consultation with interested and affected parties.
<i>Way forward</i>	A Phase 1 AIA should be undertaken considering the undetermined position of the two heritage resources identified during the CRP.



## 8 PLAN OF STUDY FOR EIA PHASE

The purpose of an EIA is to investigate the potential negative and positive impacts of a proposed project's activities on the environment. The objectives of this EIA process are:

- To ensure that the environmental impacts of developments are taken into consideration in a decision to approve or reject an application;
- To promote sustainable development;
- To ensure activities undertaken do not have a substantial detrimental impact on the environment and/or to reduce/mitigate those impacts;
- To ensure public involvement;
- To regulate the development; and
- To provide a process aimed at enabling authorities to make more informed decisions, especially in respect of their obligation to take environmental considerations into account when making those decisions.

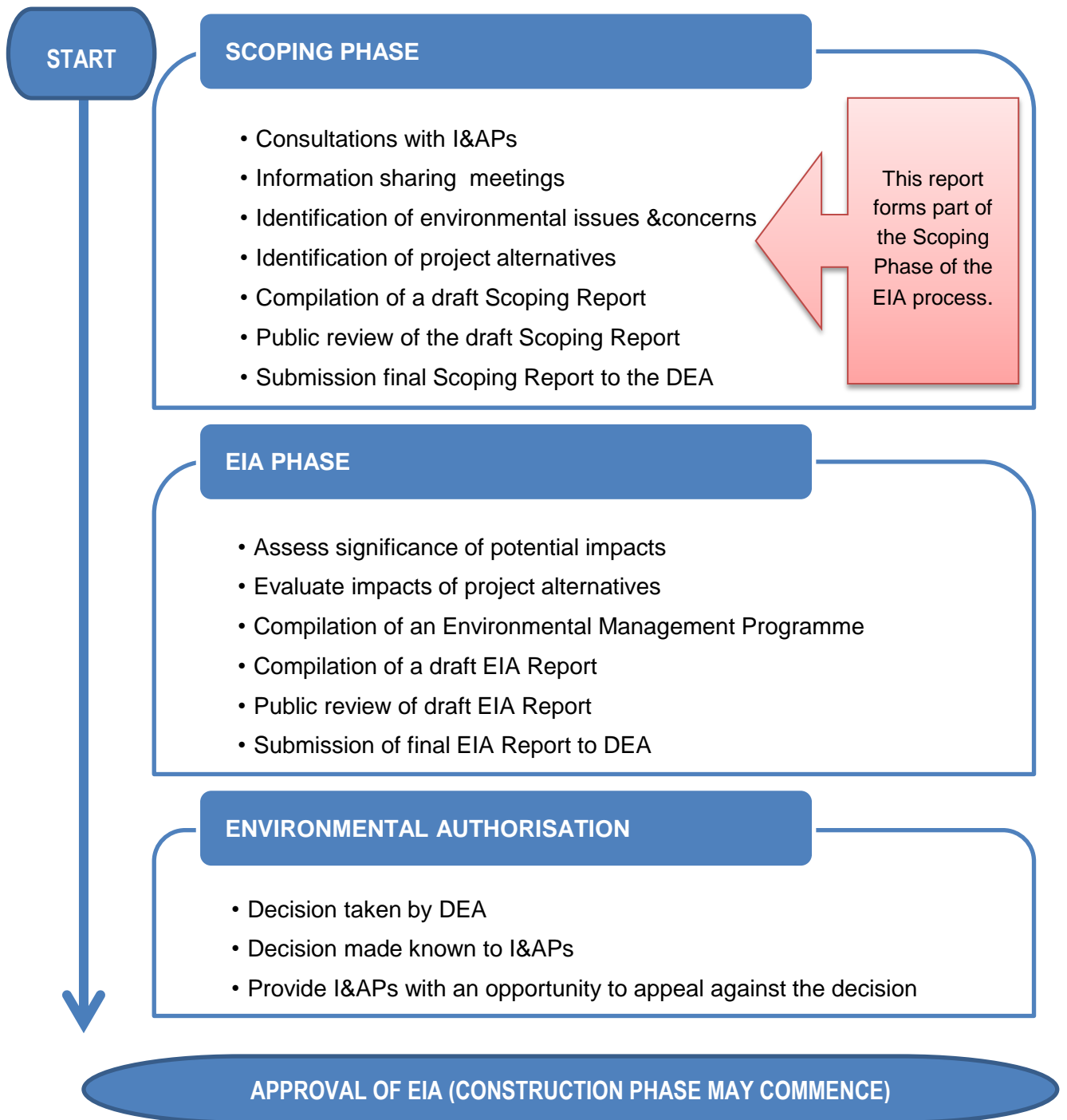
### 8.1 Approach

As illustrated in Figure 8-1, the Scoping and EIA is part of an integrated approach to obtain environmental authorisation to proceed with the development.

### 8.2 EIA Methodology

In order to clarify the purpose and limitations of the impact assessment methodology, it is necessary to address the issue of subjectivity in the assessment of the significance of environmental impacts. Even though Digby Wells and the majority of environmental impact assessment practitioners propose a numerical methodology for impact assessment, one has to accept that the process of environmental significance determination is inherently subjective. The weight assigned to the each factor of a potential impact and the design of the rating process itself, is based on the values and perception of risk of members of the assessment team, I&APs and authorities who provide input into the process. It is for this reason that it is crucial that all EIAs make reference to the environmental and socio-economic context of the proposed activity in order to reach an acceptable rating of the significance of impacts. It is not the purpose of the EIA process to provide an incontrovertible rating of the significance of various aspects, but rather to provide a structured, traceable and defensible methodology of rating the relative significance of impacts within a specific context.

The methodology employed for the EIA is divided into two distinct phases, namely impact identification and impact assessment.



**Figure 8-1: EIA process to be undertaken**

### 8.2.1 Impact identification

Impact identification is performed by use of an input and output model, which serves to guide the assessor in assessing all the potential instances of ecological and socio-economic change, pollution and resource consumption that may be associated with the activities required during the construction, operational, closure and post-closure phases of the project.

Outputs may generally be described as any changes to the biophysical and socio-economic environments, both positive and negative in nature, and also include the product and waste produced by the activity. During the determination of outputs, the effect of outputs on the various components of the environment (e.g. topography, water quality, etc.) is considered.

During consultation with I&APs, perceived impacts were identified. These perceived impacts will become part of the impact assessment and significance rating in order to differentiate between probable impacts and perceived impacts.

### 8.2.2 *Impact rating*

The impact rating process is designed to provide a numerical rating of the various environmental impacts identified by use of the input and output model. The significance rating process follows the established impact/risk assessment formula:

$$\textit{Significance} = \textit{Consequence} \times \textit{Probability}$$

Where                      Consequence                      = Severity + Spatial Scale + Duration

And                              Probability                              = Likelihood of an impact occurring

The severity, spatial scale, duration and probability of an impact occurring are assigned a rating out of seven as indicated in Table 8-1. The matrix calculates an overall significance rating out of 147. Impacts are rated prior to mitigation and again after consideration of the mitigation measure proposed in the EMP.

The significance of an impact is determined by reference to the significance rating to the probability consequence matrix shown in Table 8-2 after which it is categorised into one of four categories, as indicated in Table 8-3.

**Table 8-1: Impact assessment parameter ratings**

Rating	Severity		Spatial scale	Duration	Probability
	Environmental	Social, cultural and heritage			
7	Very significant impact on the environment. Irreparable damage to highly valued species, habitat or eco system. Persistent severe damage.	Irreparable damage to highly valued items of great cultural significance or complete breakdown of social order.	<u>International</u> The effect will occur across international borders.	<u>Permanent without mitigation</u> No mitigation measures of natural process will reduce the impact after implementation.	<u>Certain/definite</u> The impact will occur regardless of the implementation of any preventative or corrective actions.
6	Significant impact on highly valued species, habitat or ecosystem.	Irreparable damage to highly valued items of cultural significance or breakdown of social order.	<u>National</u> Will affect the entire country.	<u>Permanent with mitigation</u> Mitigation measures of natural process will reduce the impact.	<u>Almost certain/highly probable</u> It is most likely that the impact will occur.
5	Very serious, long-term environmental impairment of ecosystem function that may take several years to rehabilitate.	Very serious widespread social impacts. Irreparable damage to highly valued items.	<u>Provincial/regional</u> Will affect the entire province or region.	<u>Project life</u> The impact will cease after the operational life span of the project.	<u>Likely</u> The impact may occur.
4	Serious medium term environmental effects. Environmental damage can be reversed in less than a year.	On-going serious social issues. Significant damage to structures/ items of cultural significance.	<u>Municipal area</u> Will affect the whole municipal area.	<u>Long term</u> 6 to 15 years.	<u>Probable</u> Has occurred here or elsewhere and could therefore occur.
3	Moderate, short-term effects but not affecting ecosystem functions. Rehabilitation requires intervention of external specialists and can be done in less than a month.	On-going social issues. Damage to items of cultural significance.	<u>Local</u> Local extending only as far as the development site area.	<u>Medium term</u> 1 to 5 years.	<u>Unlikely</u> Has not happened yet but could happen once in the lifetime of the project, therefore there is a possibility that the impact will occur.
2	Minor effects on biological or physical environment. Environmental damage can be rehabilitated internally with or without help of external consultants.	Minor medium-term social impacts on local population. Mostly repairable. Cultural functions and processes not affected.	<u>Limited</u> Limited to the site and its immediate surroundings.	<u>Short term</u> Less than 1 year,	<u>Rare or improbable</u> Conceivable, but only in extreme circumstances and/ or has not happened during lifetime of the project but has happened elsewhere. The possibility of the impact occurring is very low as a result of design, historic experience or implementation of adequate mitigation measures.
1	Limited damage to minimal area of low significance. Will have no impact on the environment.	Low-level repairable damage to commonplace structures.	<u>Very limited</u> Limited to specific isolated parts of the site.	<u>Immediate</u> Less than 1 month.	<u>Highly unlikely</u> Expected never to happen.

**Table 8-2: Probability consequence matrix**

Significance		Consequence (severity + scale + duration)								
		1	3	5	7	9	11	15	18	21
Probability / Likelihood	1	1	3	5	7	9	11	15	18	21
	2	2	6	10	14	18	22	30	36	42
	3	3	9	15	21	27	33	45	54	63
	4	4	12	20	28	36	44	60	72	84
	5	5	15	25	35	45	55	75	90	105
	6	6	18	30	42	54	66	90	108	126
	7	7	21	35	49	63	77	105	126	147

**Table 8-3: Significance summary table**

Significance		
High	108- 147	
Medium-High	73 - 107	
Medium-Low	36 - 72	
Low	0 - 35	

### 8.3 Terms of References

The Terms of Reference (ToR) generally describe the purpose and structure of relevant specialist studies required for a project. In compliance with NEMA and other applicable legislative requirements, the ToR for all specialist studies has been included in this draft Scoping Report as Appendix D.

The following specialist studies will be undertaken as part of the EIA Phase for the proposed Orlight SA Solar PV Power Plants:

- Topography and hydrology;
- Visual;
- Fauna and flora;
- Soil and agricultural potential;
- Tourism screening assessment;
- Socio-economic section; and
- Archaeology and heritage

It is anticipated that the specialist studies would be completed by March 2012 and the final EIA Report will be submitted in June 2012. Seasonal studies will be completed as described in the ToR of the specialist studies and submitted accordingly.

## 9 CONCLUSION AND RECOMMENDATIONS

A preliminary environmental, socio-economic and cultural assessment of the proposed sites for the five new Orlight SA Solar PV Power Plants was undertaken to ensure the social and natural resources are not adversely affected by the proposed development. The main environmental and social impacts identified in this report relate to the potential positive impacts on the local socio-economic environment, as well as potential negative impacts on soil, visual and ecological environment. The main PPP concerns relate to potential employment opportunities, potential training and skills development, water utilisation and management, safety and security regarding potential sheep theft and environmental sensitivity.

This draft Scoping Report provides the findings of baseline reviews conducted by the relevant specialists and described the way forward for the EIA Phase. A summary of specialist recommendations is summarised in Table 9-1.

Once approval has been received for this report, further assessment will be completed to ensure that the proposed Orlight SA Solar PV Power Plants are designed and developed in such a way as to promote the positive impacts (i.e. contribution to fulfilment of national electricity demand, training and skills development and creation of local employment opportunities) and to minimise the negative impacts (i.e. soil erosion, visual disturbance and ecological impacts) from the proposed project activities.

**Table 9-1: Summary of specialist recommendations**

ASPECT	WAY FORWARD
Topography and hydrology	Suitable buffer zones around drainage lines must be established, within which no construction activities will be allowed. A water management plan must be implemented to ensure separation of dirty and clean water and the utilisation of biodegradable/organic soaps for cleaning must be used when the project commences. Construction infrastructure will be temporary, such as tented warehouses, and where possible existing permanent infrastructure will be used, such as barns.
Visual	A VIA must be conducted. The VIA will include the modelling of theoretical and practical viewsheds using GIS. Information on the visual sensitivity and characteristics of the proposed sites must be gathered. Potential receptors must be identified in an attempt to quantify the extent of the visual impacts on these receptors. The assessments will be used to determine, as accurately as possible, the full range of visual impacts that the Orlight SA Solar PV Power Plants and their respective construction and operational activities will have on the surrounding visual environments.
Fauna and flora	To mitigate or lessen the potential impacts of the construction and operational activities on fauna and flora, the baseline characterisation of the biological environment must be fully understood through comprehensive flora and fauna studies. It is recommended that two surveys are undertaken in April 2012 and early September 2012 to correspond with the flowering season of dominant plant species in the area. Utilisation of biodegradable/organic soaps for cleaning must be used when the project commences.
Soil and agricultural potential	A soil and land capability assessment must be undertaken to identify measures to prevent or mitigate soil erosion for different soil types. During construction and operation, the disturbance of soil profiles must be minimised by restricting vehicular activity to designated areas. A construction management plan must be compiled, including emergency spill response and waste management plans. Land use change can be minimised by restricting the project footprint. The land types present in the study area have restrictive soil properties and inherent low agricultural potential, it is, therefore, recommended that the soil and land capability assessment be undertaken on a



ASPECT	WAY FORWARD
	reconnaissance level only.
Tourism and land use	<p>The tourism industry in the Northern Cape and Western Cape Provinces are mainly dependent on natural and cultural resources such as seasonal flowers, vast open areas and outdoor activities such as hiking and 4x4 routes. A Tourism Screening Assessment will be undertaken as part of the EIA Phase to assess the potential impacts the project may have on the above tourist attractions.</p>
Socio-economic environment	<p>Benefits of the proposed project should be optimised and the negative impacts must be prevented or mitigated through the implementation of effective social management plans and programmes, including fair procurement policies.</p>
Archaeology and heritage	<p>As far as could be determined in the screening phase of the project, no significant heritage resources occur in the proposed project areas. Potential impacts may, furthermore, be considered negligible to low in all five project areas. Although evidence exists of past human occupation in the various landscapes, heritage resources most at risk are Stone Age material. Where necessary Phase 1 AIA and Phase 1 Paleontological Impact Assessments should address these sufficiently. Cumulative impacts on heritage resources can be addressed in the Phase 1 AIA studies and in the EMP.</p> <p>Exemption from conducting Heritage Impact Assessments for all the project sites is recommended as no historical buildings or landscapes, or intangible heritage was identified. Phase 1 AIAs should be conducted at the Graafwater Loeriesfontein, Kenhardt and Aggeneys project sites. A Phase 1 Paleontological Impact Assessment is recommended for the Loeriesfontein project site. It is requested that exemption from conducting an AIA on the Vanrhynsdorp project site be given as significant disturbance of the site by agricultural activities has already occurred.</p>

## 10 REFERENCES

### **Archives and databases consulted:**

The South African National Archives database (NAAIRS)

The Chief Surveyor-General database (CGS)

The University of the Witwatersrand Archaeological Database

The National Inventory of Registered Heritage Sites- <http://www.sahra.org.za/inventory.htm>

The South African Genealogical Database

### **Relevant local impact assessments consulted:**

FOURIE, W. May 2010. Concentrated Solar Power Eia – Kaalspruit Heritage Impact Assessment.

HALKETT, D. June 2009. An assessment of the Impacts on Heritage of the Proposed 66kv Overhead Powerline between the towns of Clanwilliam and Graafwater.

MORRIS, D. April 2011 Black Mountain Concentrated Solar Power Facility Development at Aggeneys, Northern Cape.

MORRIS, D. January 2011. A Phase 1 Heritage Impact Assessment for the proposed Aggeneis – Paulputs 220KV Transmission Line.

ORTON, J. December 2010. Heritage Statement for the proposed expansion of the Namakwa Sands MSP Landfill near Koekenaap, Vredendal Magisterial District, Western Cape.

VAN SCHALKWYK, J. March 2011. Heritage impact assessment for the proposed Eskom 400kv Electricity Transmission Line, Aggeneys to Helios Substations, Northern Cape Province.

VAN SCHALKWYK, J. April 2011. Heritage Impact assessment for the Proposed Establishment of the Inca Solar PV Power Plant, Kakamas Region, Northern Cape Province.

### **Published sources consulted:**

BEAUMONT, P & MORRIS, D. 1990. Guide to Archaeological sites in the Northern Cape. McGregor Museum: Kimberly.

BRINK, J & WEBLEY, L. 1996. Faunal evidence for pastoralist settlement at Jakkalsberg, Richtersveld, Northern Cape Province. Southern African Field Archaeology 5(2): 70-78.

- DEACON, J. 1988. The Power of a Place in Understanding Southern San Rock Engravings. *World Archaeology* 20(1) Archaeology in Africa: 129-140.
- DEACON, J. August 1990. The Graffiti Busters strike at last. *The Digging Stick*. Vol 7, No. 2.
- DEACON, H. J & DEACON, J. 1999. *Human Beginnings in South Africa*. David Phillip Publishers: Cape Town.
- FRANKENTAL, S & SICHONE, O. B. 2005. *South Africa's Diverse Peoples: a reference source book*. ABC-CLIO: California.
- JOLLY, P. 2006. Dancing with Two Sticks: Investigating the Origin of a Southern African Rite. *The South African Archaeological Bulletin* 61(184): 172-180.
- LEWIS-WILLIAMS, D. 1980. Ethnography and Iconography: Aspects of Southern San Thought and Art. *Man: New Series* 15(3): 467-482
- MANHIRE, A. 1993. A report on the excavations at Faraoskop Rock Shelter in the Graafwater District of the south-western cape. *Southern Africa Field Archaeology* 2: 3-23.
- MITCHELL, P. 2002. *The Archaeology of Southern Africa*. Cambridge University Press, Cambridge.
- MUCINA, L. AND RUTHERFORD, M.C. (eds) 2006. *The vegetation of South Africa, Lesotho and Swaziland*. Strelitzia 19. South African National Biodiversity Institute, Pretoria.
- ORTON, J; KLEIN, R. G; MACKAY, A; SCHWORTZ & STEELE, T. E. September 2011. Two Holocene rock shelter deposits from the Knersvlakte, southern Namaqualand, South Africa. *Southern African Humanities* 23: 109–50.
- OBERHOLZER, B. 2005. *Guideline for Involving Visual and Aesthetic Specialists in the EIA*
- PHILLIPSON, D. W. 2008. *African Archaeology*. Cambridge University Press, Cambridge.
- SKOTNES, P. 2002. The Politics of Bushmen Representations. In: Landau, P. S & Kaspin, D. D. *Images and empires: visibility in colonial and postcolonial Africa*. University of California Press: California.
- RUDNER, I. 1965. Archaeological Report on the Tsodilo Hills, Bechuanaland. *The South African Archaeological Bulletin* 20 (78): 51-70.
- RUDNER, J AND RUDNER, I. 1968. Rock-Art in the Thirstland Areas. *The South African Archaeological Bulletin* 23 (91): 75-89.

THACKERAY, A. I; THACKERAY, F. J; BEAUMONT, P. B & VOGEL, J. C. 1981. Dated Rock Engravings from Wonderwerk Cave, South Africa. Science, New Series 214(4516): 64-67

THACKERAY, A. I. 1983. Dating the Rock Art of Southern Africa. Goodwin Series 4 (New Approaches to Southern African Rock Art) : 21-26

VAN DER MERWE, N. 1987 Comment on Hromnik's Bored Stones. The South African Archaeological Bulletin 42 (145): 65-68.

VAN WYK, E., BREEN, C.M., ROUX, D.J. ROGERS, K.H., SHERWILL, T. & VAN WILGEN, B.W. (2006). The Ecological Reserve: Towards a common understanding for river management in South Africa. Water SA 32(3): 403 -409.

WATER RESEARCH COMMISSION (WRC) (2011). Implementation Manual for Freshwater Ecosystem Priority Areas. WRC Report No. 1801/1/11. ISBN 978-1-4312-0147-1. Set No. 978-1-4312-0148-8

**Unpublished sources and persons consulted:**

Azef, 2010. Arid Zone Ecology Forum, Biomes. (Online) Available at: [http://www.azef.co.za/biomes\\_karoo.htm](http://www.azef.co.za/biomes_karoo.htm) (Accessed 11 January 2012).

Azef, 2010. Arid Zone Ecology Forum, Biomes. (Online) Available at: [http://www.azef.co.za/biomes\\_nama.htm](http://www.azef.co.za/biomes_nama.htm) (Accessed 11 January 2012).

Gifberg Holiday Farm- <http://www.gifberg.co.za/index.html>

Gifberg Holiday Farm- Photos | Facebook- <http://www.facebook.com/pages/Gifberg-Holiday-Farm/137611239612605?sk=photos>

Green Kalahari Accommodation Kenhardt- <http://www.greenkalahari.com/kenhardt.html>

Vanrhynsdorp 2012 - <http://www.places.co.za/html/vanrhynsdorp.html>

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