

**Socio- Economic Impact Assessment of 300MW Photovoltaic Electricity Generation Facility Kenhardt  
(Portions 6 and 3 of Farm 187 Olyvenkolk, Kenhardt District),**

For

**Solar Energy Land cc**

In support of the Environmental Basic Assessment Report by Eco Impact Legal Consulting (Pty) Ltd.



Compiled by  
**leap**  **sustainable development**  
CK 1988/033181/23  
c/o Rainier & Church Street, Malmesbury, 7300  
info@leapsd.co.za  
022 482 4653

## **Executive Summary**

Solar Energy Land cc intends to construct a 300MW solar photovoltaic (PV) energy generation facility, 710ha in extent, on Portions 3 & 6 of Farm 187, Kenhardt, Kai !Garib Municipality, Northern Cape. The total facility of 700MW, consisting of two sites on both sides of R27 Pofadder link road is ±2000ha in extent and proposed on Portions 3, 6 and 7 of farm Olyvenkolk No 187, Kenhardt.

In 2018 Eco Impact Legal Consulting (Pty) Ltd, was appointed by Solar Energy Land cc to undertake an Environmental Assessment for the proposed commercial Photovoltaic Energy Generation Facility and associated infrastructure on Portion 3 & 6 of Farm Olyvenkolk No 187, Kenhardt District in accordance with the Environmental Management Act, 1998 (Act no 107 of 1998), as amended and the Environmental Assessment Regulations, 2010. Leap Sustainable Development cc was appointed to undertake the specialist socio-economic impact assessment as part of the Basic Environmental Impact Assessment.

## **Purpose**

This assessment outlines the socio economic cost to create a solar facility of this magnitude in the Kai !Garib Municipal Area. Socio-Economic Impact Assessments analyses i.e. predicts, reflects, evaluates and manages, the intended (direct) and unintended (residual and cumulative) consequences on the human environment (receptors) of planned interventions (policies, programmes, plans and projects) and any social change processes invoked by those interventions so as to bring about a more sustainable and equitable biophysical and human environment (Vanclay, 2002).

At a broad level the impacts on the overall welfare of a community should be investigated considering the efficiency, equity and sustainability of the project as well as the trade-offs or 'opportunity cost' the various alternatives will yield. Externalisation of disadvantages occurs when there is no or insufficient consideration given to the associated social costs that will be borne by the public.

The proposed activity and its impact should not result in unacceptable opportunity costs. Thus the operation of the solar facility should outweigh the net benefit yielded by next best alternative, that is farming and its benefits, being foregone for the receiving community. Or the operation of the solar facility should not compete to use limited community resources i.e. water.

## **Approach**

The approach to the study (preliminary report and final report) is directed by the requirements for Environmental Impact Assessments and the Guidelines for Social Impact Assessments (SIA) and Economic Impact Assessments commissioned by DEA&DP. Hence the followings activities were executed:

- “ Review of project information and preliminary specialist reports;
- “ Collection and synthesis of baseline socio-economic data on the area;
- “ Identification project results and key social and economic variables, and the impact of the project results on the receiving society and economy as per Guidelines for Social Impacts;
- “ Verification of some results, social variables and impacts through communication and correspondence with developer, specialists and key project team members (Addendum A);
- “ Evaluating/ Rating the significance, duration, probability and intensity of identified impacts during the construction, operation and decommissioning phases and proposing mitigation measures. (As per the table below and in Addendum B);

Rating	Score -	Score +
Low	0 to – 40	0 to 40
Medium	- 41 to – 80	- 41 to 80
High	- 81 to – 120	- 81 to 120
Very High	> - 120	> 120

- “ Preparation of draft and Final Socio-Economic Impact Assessment (SIA);

## Assumptions and Limitations

### Assumptions

Assumptions include

- a) the extent of the wage bill assumed to be 19,7%, the same as a construction project and which is the percentage used in the calculations of this assessment.
- b) All figures for the decommissioning phase are projections based on the construction figures.

### Limitations

- a) Assessment of alternatives is limited to the proposed project site and the no-go alternative as the only alternatives.
- b) Demographic data is based on the 2011 Census which is older than 5 years.
- c) Ratings are a validation by and not a representative sample of the receptor community, specialists and developer.

## Proposed Development

Solar Energy Land cc intends to construct a 300MW solar photovoltaic (PV) energy generation facility, 710ha in extent, on Portions 3 & 7 of Farm 187, Kenhardt, Kai !Garib Municipality, Northern Cape. The total facility of 700MW, consists of two sites on both sides of R27 Pofadder link road and is ±2000ha in extent and proposed on Portions 3, 6 and 7 of farm Olyvenkolk No 187, Kenhardt.

## Summary of Impacts of the Preferred Alternative

Overall the impacts are of low significance. Most of the impacts identified and rated are manageable and can be mitigated. Impacts that rated as significantly negative impacts could be mitigated to be less significant but stayed negative except for one impact that changed to be positive. Impacts with different positive ratings were mitigated to become significantly positive at a local level. Residual impacts are rated as positive. The cumulative impact is irreversible but positive.

The impacts are as follows:

- a) The local community will experience significant positive changes in their economic and material well-being as
  - More job and job opportunities will be generated.
  - Household income will increase as members of households are employed.
  - Skills levels will increase as training and skills development form an integral part of the project (High positive).
- b) The community will experience the heritage environment to be under stress (moderately during operations and highly during demolition) as the resource may be lost, but through mitigation the impact is become less negative as an opportunity to generate income in the long term is created.
- c) The community will experience change in the sense of place as a negative high intensity impact without much mitigation possibilities.
- d) The cumulative impact of solar facilities competing with agriculture causes a change in economic sector locally and regionally. This change outweighs the net benefit yielded by next best alternative, that is farming and its benefits, being foregone for the receiving community locally.

Two mitigation measures will indirectly enhance the receiving community's institutional arrangements:

- e) The formalization and institutionalization of educational support, a residual impact, will benefit Kenhardt and the region as the school drop-out rate will decrease;
- f) Political intervention to reserve jobs, will be in support of women and youth and will improve the self-esteem of both groups. Institutionalizing standard procedures and a monitoring committee to govern appointments shall ensure fair appointments and avoid party political preferences.

## Preferred Alternative's Impacts Assessed per Project Phase

Impacts reported below are as per the different phase i.e. Construction, Operations and Demolition:

### Phase: Construction

During the construction phase most of the impacts:

- Are manageable as some are low positive or most are low negative,
- Are not cumulative of nature and
- That result in residual impacts, are manageable.

Positive impacts of low significance before and if mitigatable, after mitigation include:	Negative impacts of low significance before and after mitigation include:
<ul style="list-style-type: none"> <li>- Population influx of skilled employed persons</li> <li>- Increased household income</li> <li>- Sales volume</li> <li>- Increased GGP</li> </ul>	<ul style="list-style-type: none"> <li>- Population influx of unemployed persons</li> <li>- Increased demand for services and amenities</li> <li>- Increased traffic</li> <li>- Increased crime</li> <li>- Increased dust and noise levels</li> <li>- Change in sense of place</li> <li>- Loss of heritage resources</li> <li>- Water scarcity</li> <li>- Agricultural potential</li> </ul>

One positive impact, “increased income” is of low significance when assessed regionally but of high significance if assessed locally

One impact, “change in soil profile and ecology” changes from low negative to neutral after mitigation.

One impact “Increased levels of employment” are of medium positive significance before and after mitigation at regional level and of high significance at local level.

One impact, “skills levels” are of medium positive significance before mitigation and changes to high positive significance after mitigation

Phase: Operations

During the construction phase most of the impacts:

- Are manageable as some are low positive or most are low negative,
- Are not cumulative of nature and
- That result in residual impacts, are manageable.

Positive impacts of low significance before and if mitigatable, after mitigation include:	Negative impacts of low significance before and after mitigation include:
<ul style="list-style-type: none"> <li>- Increased employment levels (regionally)</li> <li>- Increased GGP/ local economy</li> </ul>	<ul style="list-style-type: none"> <li>- Population influx of unemployed persons</li> <li>- Increased traffic</li> <li>- Agricultural potential</li> </ul>

One positive impact “Increased household income” are of medium significance regionally but of high significance locally before and after mitigation.

One impact “Water Scarcity” changes from medium negative to low negative.

One impact “increased sales” change from low to medium positive.

One impact, “loss of heritage resources” changes from Medium negative to low positive after mitigation turned it into an opportunity to generate income in the long term.

One impact “change in soil profile and ecology” change from low negative to neutral.

One impact, “changed sense of place” and visual appearance is rated highly significant and changes to medium negative after mitigation. The sense of place which is associating Kenhardt with Dorper sheep farming is replaced by the fifth biggest solar facility in Africa. The cumulative impact of all solar facilities replaces agriculture and its processes, structures and patterns. Although it is not the only impact causing the replacement of agriculture, it will have implications for the social history of the affected communities: the social history of farmers and teams of men going off sheering sheep changing to green energy production and teams of workers going off to maintain and clean solar panels.

Phase: Demolition

During the demolition phase most of the impacts:

- Are manageable as some are low positive or most are low negative,
- Are not cumulative of nature and
- That result in residual impacts, are manageable.

Positive impacts of low significance before and if mitigatable, after mitigation include:	Negative impacts of low significance before and after mitigation include:
<ul style="list-style-type: none"> <li>- Population influx of skilled employed persons</li> <li>- Increased income (regionally)</li> </ul>	<ul style="list-style-type: none"> <li>- Population influx of unemployed persons</li> <li>- Increased traffic</li> </ul>

One positive impact, “increased income” is of low significance when assessed regionally but of high significance if assessed locally

One negative impact of low significance under construction and operations change to become positive should the demolition of the facility proceed.

One negative impact of medium significance before changing to neutral is the *Change in Sense of Place*: will be reversed to as before the solar facility was built and will be neutralized. Should demolition not take place, the solar facility will degrade over time and the impact will change to high negative.

One impact of high negative significance before changing to medium negative significance is the loss of heritage resources as it is doubtful that the resources will stay an attraction whilst the solar facility is no longer an attraction.

One impact, “Increased dust and noise levels” changes from low negative to neutral.

**Preferred Alternative’s Direct Impacts per Impact Category**

Direct impacts are assessed and the findings are reported per impact categories.

- a) Population and family characteristics of the receiving community (receptors) are impacted by population influx and skills levels

Population Characteristics and family characteristics of the Receiving Community		Construction	Operations	Demolition
Category	Impact Result	Significance and Mitigation		

Population influx (skilled) & stability	<b>Temporary increase in local population numbers.</b> Employees with different skills levels are required for 2 – 3 years: 6% skilled, 38% semi-skilled and 56% unskilled. The Kenhardt community has 30% unskilled and 46.2% semi-skilled people. The presence of skilled outsiders will introduce different job options to local community.	Low positive	NA	Low positive
		<u>Mitigated</u> Low positive	NA	<u>Mitigated</u> Low positive
Population influx (unemployed) & stability	<b>Increase in local population numbers and presence of unemployed outsiders looking for work.</b> The unemployed anticipate that the proposed facility will generate work and migrate to Kenhardt and its immediate surroundings. This influx can be semi –permanent affecting the homogeneousness of the local population but cultural and social functions continue although perhaps modified slightly	Low negative	Low negative	Low negative
		<u>Mitigated</u> Low negative	<u>Mitigated</u> Low negative	<u>Mitigated</u> Low negative
Skills levels improve/ Levels of Education improve	<b>Skills base of local population expands and deepens.</b> The education and skills levels in Kenhardt are: 30.1% unskilled, 46.2% semi-skilled, 22.8% skilled and 1% highly skilled. Implementing capacity building and skills development training programmes will benefit the community in the short term and long term. The solar facility should a) make a social contribution dedicated to skills development and should b) provide (fund) facilities (skills centres) or enhance existing facilities to promote the enhancement and offering of skills.	Medium, positive	NA	NA
		<u>Mitigated</u> High, positive	NA	Na
Family structure change	<b>Changes in family structure</b> <b>Construction, Operational and Demolition Phase:</b> Should no provision be made to break the cycle of hopelessness, youngsters will stay unemployed. Changes in family structure may not take place i.e. releasing some family members to work and/or some to dedicate time to the family's wellbeing.	Rated as residual impact: increased self-esteem		

- b) Political, social and community resources within the receiving community are impacted by employment levels, demand for services and amenities, traffic levels and safety and security.

<b>Political and Social Resources within the Receiving Community</b>		<b>Construction</b>	<b>Operations</b>	<b>Demolition</b>
Increased employment levels	<b>Some locals find employment:</b> <b>Construction Phase:</b> 90% of 160 (56%) jobs in the unskilled category and 108 (38%) jobs in the skilled category (thus 144 and 97) being created, will be earmarked for locals. The wage bill for 12 months for a period of 3 years is R63 860 000 <b>Operational Phase:</b> 60 jobs, involving maintenance and cleaning, of which 57 should benefit locals. <b>Demolition Phase:</b> Same as construction for 12 months.	Positive: Medium, (regional) High (Local)	Positive: Low (Regional) High (local)	Positive: Low (Regional) Low (local)
		<u>Mitigated</u> Positive: Medium (regional) High (local)	<u>Mitigated</u> Positive: Low (Regional) High (local)	No mitigation
Increased demand for services & amenities	<b>Demand for services increases</b> Demand for services and amenity capacity may increase slightly as demand for services (basic services i.e. water, sewerage and electricity and refuse removal) and emergency capacity to cope with any construction related accidents increases. Long term additional pressure on health services may result due to dealing with the consequences of dissimilar social	Low negative	Not applicable	Not applicable
		<u>Mitigated</u> Low negative	<u>Mitigated</u> Not applicable	<u>Mitigated</u> Not applicable

	practices (i.e. HIV/ Aids and teenage pregnancies) as a third of Kenhardt population is youth (15 – 35 years), associated with higher risk.			
Increased traffic levels	<b>Increase in regular and heavy, slow moving traffic</b> Increased traffic may disrupt and cause changes in movement patterns and road safety of the community:	Low negative	Low negative	Low negative
	Phase	Increase per day (per peak hour)		
	Construction	39 vehicles/h 2x	None	None
	Operational	11 vehicles/h 2x		
	Demolition	21vehicles/h 2x		
	The road infrastructure is capable of accommodating the additional traffic and sight distance is adequate. Road signals will have to be upgraded to decrease conflicting situations and particular pedestrian safety.			
Crime increase	<b>Safety and security decrease</b> Whilst the material well-being of the community improves, the presence of contractors creates the opportunity for those who want to commit crime (livestock and petty theft, human trafficking, littering, drunken driving and illegal vending), to do so. As more disposable income is at hand, other social ills such as substance abuse may increase.	Low negative	Not applicable	Not applicable
		<u>Mitigated</u> None	<u>Mitigated</u> Not applicable	<u>Mitigated</u> Not applicable

c) Health and social well-being (quality of the living environment) of the receiving community are impacted by noise and dust levels (family health) and sense of place (social wellbeing)

Health and Social well-being:		Construction	Operations	Demolition
Increased noise & dust levels	<b>Decreased health as noise and dust levels increase.</b> Construction and demolition activities will contribute to the noise and dust levels. These impacts will be of a local nature (immediate surrounding of the solar facility) and for a limited period of time (2- 3 years or 1 year). No Noise and dust will be generated during the operational phase.	Low negative	NA	Low negative
		<u>Mitigated</u> Low negative	<u>Mitigated</u>	<u>Mitigated</u> Low negative
Change in sense of place	<b>Changes in the quality of the living environment:</b> The change of sense of place will impact on people's relationship to environment. From sheep grazing on the uninhabited site with no structures on the land to 710ha of land covered with PV photovoltaic arrays and three substations and a 132 Kv line that will follow the route of an existing powerline that will be relocated. The 300 MW facility being the fifth biggest solar facility in Africa, will affect agriculture and its processes, structures and patterns. The sense of place within the immediate surrounding area will be significantly altered. A new sense of place will be created which will address the challenges of climate change in a responsible and sustainable manner. There are no settlements within the visual catchment. There are two public viewpoints: Kenhardt – Pofadder road along which the site will not be visible, with the only significant views restricted to 6km along the bypassing public road. Site is not visible from R27. Therefore impact is assessed to be of moderate significance	Low negative	High negative	Medium negative
		<u>Mitigated</u> Low negative	<u>Mitigated</u> Medium negative	<u>Mitigated</u> Neutral



- a) Economic and material well-being impacts on heritage resources, water, soils and ecology, agricultural potential, household income, sales, GGP (culture and gender relations)

Economic & Material Well-being		Construction	Operations	Demolition
Inaccessible and loss of heritage resources	<p><b>Loss of heritage resources</b> Loss of and inaccessible heritage resources and lack of agri-tourism.</p> <p><b>Archaeological Resources</b> A number of Later Stone Age sites lie along water courses whilst several all open Early (ESA) and Middle (MSA) Stone Age artefacts scatters are present across the proposed site. The significance of the archaeology of this area is attributed to the very high density of large cutting tools found on the ESA scatters. Such densities are seldom recorded.</p> <p><b>Paleontology</b> “The site of the proposed solar facility is underlain at depth by glacial-related sediments of the Permo-Carboniferous Dwyka Group (Mzibane Formation) that are generally of low paleontological sensitivity.”</p>	Low negative	Medium negative	High negative
		<u>Mitigated</u> Low negative	<u>Mitigated</u> Low positive	<u>Mitigated</u> Medium negative
Water Scarcity	<p><b>Loss of water and lack of water as domestic resource</b> Competing uses i.e. industrial and agricultural can adversely affect water sources and availability for domestic use.</p> <p><b>Groundwater</b> on the farm is the only water source. The borehole water on site is used for livestock and farming operations. During construction and operation water will be sourced from existing boreholes (and be registered under the National Water Act water use). Water usage by the solar facility is minimal. Cleaning would be undertaken using wet cloth as required. New self-cleaning technology is also investigated and will be implemented if feasible.</p> <p>The proposed photovoltaic panels are located above the 1:100 year flood line of the two watercourses on site and at least 300m (portion 6) away from the centre line of the water course. The risk of flooding is low. Storm water is concentrated into the water courses crossing the site. Rain water will run off the solar panels and naturally drain eastwards towards the drainage lines in between the solar panels.</p>	Low negative	Medium negative	Not applicable
		<u>Mitigated</u> Low negative	<u>Mitigated</u> Low negative	None
Change of soil profile and ecological processes	<p><b>Alteration of soil profile and ecological processes</b> Geotechnical condition will not change: Agricultural potential will stay suitable for limited grazing, due to harsh climate, shallow soils and low annual rainfall</p>	Low negative	Medium negative	Not applicable

	<p>The arrays of the proposed facility have to be anchored. To prohibit corrosion steel frames have to be galvanized.</p> <p>The dense nature of the soil cause alternative foundations designs to be investigated.</p> <p>Ecological processes will alter as:</p> <p>Water (drainage) and sunlight (shading) availability change and <b>habitat structure and composition alter.</b></p> <p>Changes in soils leading to loss of vegetation and habitat <b>alter ecological processes.</b></p> <p>i.e. nocturnal patterns, exclusion or entrapment <b>alter fauna and faunal behavior.</b></p> <p>as collusion with powerlines, solar panels (mistaken for water) and electrocution cause <b>bird fatalities.</b></p>	<u>Mitigated</u> Neutral	<u>Mitigated</u> Neutral	Not applicable
Agricultural potential	<p><b>Agricultural potential will decrease</b></p> <p>As there will be no change in soil structure and limited impact on ecology including avifauna, local's access to natural resources i.e. water will not change and processes, structures or patterns that are valued as part of social history of an area will not be affected, the impact is low negative and neutralize with mitigation evening changing to be positive: The economic viability of the agricultural land unit will improve. The agricultural entity consist of 6 units 7011ha in extend. This land carries 600 ewes and has a carrying capacity of 12ha per small stock unit. Ten percent (10%) or 710ha of Portion 6 of Farm Olyvenkolk 187, Kenhardt will be sterilized by the solar facility. Overall (7011ha), there will be sufficient land left (5011ha) to accommodate the 417 ewes.</p>	Low negative	Low negative	Medium positive
		None	None	None
Increased household income	<p><b>Increased household income</b></p> <p><b>Construction and Demolition Phase:</b></p> <p>The 241 members of households that found employment as a result of the proposed solar facility development will benefit as there will be a stable and most likely increased income for 24 – 36 months (construction) or 12 months (demolition). <b>Operational Phase:</b></p> <p>The 57 member(s) of households will be employed to maintain and to keep the solar facility clean for 20 - 30 years.</p> <p>The increased income has disposable component varying between R7200 and R4 320</p>	Positive: Low Regional High Local	Positive Moderately Regional High Local	Positive Low Regional High Local
		None	None	None
Increased sales	<p><b>Sales volume and GGP will increase.</b></p> <p>Direct and indirect sales volume will increase and it is highly likely that sales will be diluted to the benefit of the region. The GGP though of the region will increase.</p> <p>Number of small businesses operated by locals increase</p>	Low positive	Low positive	Not applicable
		<u>Mitigated</u> Low positive	<u>Mitigated</u> Medium positive	Not applicable

## No Go Alternative

The No-Go Alternative would lose an opportunity for the region and the Northern Cape to generate alternative energy. Losing the opportunity to be home to the fifth biggest solar facility in Africa will in turn have consequence such as:

- a) The loss of employment opportunities generated during construction and operations.
- b) The loss of economic opportunities generated by small businesses and tourism.

The No-Go alternative is not recommended by the socio-economic impact.

## Residual Impacts

### Women and young people's self-esteem improve

It is most likely that fewer young people and women will be employed as part of the local labour component as they do not have the skills or experience. Through employing youth and women their self-esteem will improve together with several indirect social aspects for example improved cohesion within the community of Kenhardt, less reason to pursue social ills (teenage pregnancies and substance abuse) and distributing household income (increased per capita household income) and consequently addressing inequalities (gap between rich and poor). Demographically 70% young people and 50% women should be employed by the proposed solar facility. It will provide families with hope.

The opportunity afforded to youth and women has a positive impact during **all phases** and changes to moderately positive after mitigation. The changed social wellbeing of youth and women undoubtedly will change the social wellbeing of families. Therefore the impact is viewed as significant as it may likely contribute to improved family cohesion, closer extended family networks and acknowledgement of traditional roles played by family members.

### Institutionalization of school support to improve levels of education

Youngsters and particularly girls are afforded an opportunity to improve their skills and education as an educational School Support Programme is institutionalized. The social welfare of young people improves as the dropout rate, particularly in high school (38%), decreases.

## Cumulative Impacts

### Change in Local Culture and in Economic Sectors

*Energy generation replaces Agriculture and cause demographic changes.*

As a consequence of the proposed solar facility the following cumulative impacts will be assessed:

- a) Change of economic sectors contributing to the GDP (from Agriculture to Energy Generation)
- b) Demographic changes relating to the economic sector changes

The cumulative impact of the solar facilities will cause agriculture to be replaced by energy generation. The proposed facility being the fifth biggest solar facility in Africa, and the loss of agricultural potential will cause locals to change their relationship to the environment as it will affect agriculture and its processes, structures and patterns that are valued as part of the social history of the area. The social history of farmers and teams of men going off sheering sheep will change to green energy production and teams of workers going off to clean the solar panels.

The significance of the impact on economy and demographics will be initially perceived as high negative locally. With mitigation and over time the impact will change to be medium positive locally.

## **Conclusion**

The Northern Cape Economic Potential and Investment Profile, 2012 highlights the energy sector as one of the sectors to enhance the socio-economic circumstances of the Northern Cape. Moreover, the carbon footprint to generate electricity will get reduced.

The Northern Cape large scale projects occur across a range of industries, namely tourism, science and technology, sport and recreation, education and renewable energy. Projects supportive to renewable energy generation includes:

- development of Upington Airport into a world-class cargo hub
- Northern Cape University offering post graduate studies in renewable and low carbon energy.
- Upington Special Economic Zone: focus on solar energy research and development in Upington and hosts a Solar Park and research hub and act as an anchor in the Northern Cape Solar Corridor. The Northern Cape Solar Corridor includes a 1GW solar park at Prieska.

The proposed development is therefore supported from a policy and socio-economic perspective.

## Contents

1.	Project Overview and Scope of Socio-Economic Assessment.....	17
1.1	Introduction.....	17
1.2	Description of Proposed Development and Alternatives.....	17
1.3	Purpose of the Assessment.....	21
1.4	Approach.....	21
1.5	Assumptions & Limitations.....	22
1.6	Specialist details.....	22
1.7	Declaration of Independence.....	23
1.8	Report Outline.....	23
2:	Socio- Economic Overview and Legal Context.....	24
2.1	Socio- Economic Overview of Kenhardt.....	24
2.2	Policy and Planning Context.....	27
2.2.1	National Level.....	27
2.2.2	Provincial and District Level.....	30
3:	Assessment of Impacts.....	34
3.1	Construction, Operations and Demolition Phases:.....	34
3.1.1	Construction Phase.....	34
3.1.2	Operational Phase.....	36
3.1.3	Demolition Phase:.....	37
3.2	Direct Impacts.....	37
3.3	No Go Alternative.....	67
3.4	Residual Impacts.....	67
3.5	Cumulative Impacts.....	71
3.6	Summary.....	73
4.	Management guidelines to address socio-economic impacts.....	77
4.1	Preferential procurement of goods, services and labour.....	77
4.2	Skills transfer.....	78
4.3	Safety Management.....	78
4.4	Traffic Regulation.....	78
4.5	Dust and Noise control.....	78
4.6	Enhancing the economy.....	79
4.7	Increased income.....	79
4.8	Increase in small business.....	80
4.9	Increase in tourism.....	80
4.10	Maintaining Sense of place.....	80
4.11	Conclusion.....	82
Addendum A:	Assessment Measures.....	83
	<i>Figure 1: Solar Photovoltaic Panel, Close up.....</i>	19
	<i>Figure 2: Large scale Solar PV arrays.....</i>	19
	<i>Figure 3: Solar Array.....</i>	20
	<i>Figure 4: Schematic Diagram: Solar Energy Generation.....</i>	20
	<i>Figure 5: San Rock Art.....</i>	24
	<i>Figure 6: High concentration of Archaeological Resources.....</i>	54
	<i>Figure 7: Brussels Street and Longlands Street.....</i>	79

<i>Figure 8: Eucalyptus Trees at corner of Main and Lourens Street</i> .....	80
<i>Graph 1: Household Income, Kenhardt</i> .....	25
<i>Graph 2: Levels of education, Kenhardt &amp; Kai !Garib</i> .....	25
<i>Graph 3: Services provided, Kenhardt</i> .....	26
<i>Table 1: Impact Rating Scale</i> .....	34
<i>Table 2: Activities and Skills required: Construction Phase</i> .....	36
<i>Table 3: Impact caused by employed outsiders, All Phases</i> .....	39
<i>Table 4: Impact caused by unemployed outsiders, All Phases</i> .....	40
<i>Table 5: Impact caused by skills development, training and capacity building, All Phases</i> .....	42
<i>Table 6: Impact of job creation: Construction, Operational and Demolition Phases</i> .....	44
<i>Table 7: Impact caused by increased demand for services and amenities, All Phases</i> .....	45
<i>Table 8: Impact caused by Traffic, All Phases</i> .....	48
<i>Table 9: Impact caused by crime, Construction and Demolition Phases</i> .....	49
<i>Table 10: Impact caused by dust and noise, All Phases</i> .....	50
<i>Table 11: Impact caused by Visual Changes, All Phases</i> .....	53
<i>Table 12: Impact on Heritage Resources, All Phases</i> .....	56
<i>Table 13: Impact caused by Water Use, all Phases</i> .....	58
<i>Table 14: Impact on Geology and Ecology, All Phases</i> .....	61
<i>Table 15: Impact on Agricultural potential, all Phases</i> .....	63
<i>Table 16: Impact on household income, All Phases</i> .....	65
<i>Table 17: Impact on Sales, All Phases</i> .....	67
<i>Table 18: Impact on youth and women, All Phases</i> .....	69
<i>Table 19: Impact of Institutionalization of School Support, Operation Phases</i> .....	71
<i>Table 20: Impact on Economic Sectors and Demographics, All Phases</i> .....	73



## environmental affairs

Department:  
Environmental Affairs  
REPUBLIC OF SOUTH AFRICA


### DETAILS OF SPECIALIST AND DECLARATION OF INTEREST

	(For official use only)
File Reference Number:	12/12/20/ or 12/9/11/L
NEAS Reference	DEA/EIA
Number: Date Received:	

Application for integrated environmental authorization and waste management license in terms of the-

- (1) National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Environmental Impact Assessment Regulations, 2014; and
- (2) National Environmental Management Act: Waste Act, 2008 (Act No. 59 of 2008) and Government Notice 921, 2013

### PROJECT TITLE

**Solar Energy Land cc: Proposed 300MW Photovoltaic Electricity Generation Facility**

Specialist:	Anelia Coetzee		
Contact	P.O. Box 488		
person: Postal	Malmesbury		
address:	7299	Cell:	082 3394338
Postal code:		Fax:	022 4871661
Telephone:	022 4824653		
E-mail:	info@leapsd.co.za		
Professional affiliation(s) (if any)			

Project	EcolImpact Legal Consulting (Pty) Ltd		
Consultant:	Nicolaas Hanekom		
Contact person:	PO Box 45070		
Postal address:	Claremont	Cell:	+27 (0) 76 963 6450
Postal code:	7735	Fax:	+27 (0) 21 671 9976
E-mail:	Nicolaas@ecoimpact.co.za		

4.2 The specialist appointed in terms of the Regulations\_

I, Anelia Coetzee declare that –

General declaration:

I act as the independent specialist in this application;  
I will perform the work relating to the application in an objective manner, even if this result in views and findings that is not favourable to the applicant;  
I declare that there are no circumstances that may compromise my objectivity in performing such work;  
I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;  
I will comply with the Act, Regulations and all other applicable legislation;  
I have no, and will not engage in, conflicting interests in the undertaking of the activity;  
I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;  
all the particulars furnished by me in this form are true and correct; and  
I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.



---

Signature of the specialist:

Leap Sustainable Development cc

---

Name of company (if applicable):

28 November 2018

---

Date:



# **1. Project Overview and Scope of Socio-Economic Assessment**

## **1.1 Introduction**

Solar Energy Land cc intends to construct a 300MW solar photovoltaic (PV) energy generation facility, 710ha in extent on Portions 3 & 6 of Farm 187, Kenhardt, Kai !Garib Municipality, Northern Cape. The total facility of 700MW, consists of two sites on both sides of R27 Pofadder link road and is ±2000ha in extent and proposed on Portions 3, 6 and 7 of farm Olyvenkolk No 187, Kenhardt.

Eco Impact Legal Consulting (Pty) Ltd, was appointed by Solar Energy Land cc to undertake an Environmental Assessment for the proposed commercial Photovoltaic Energy Generation Facility and associated infrastructure on Portion 3 & 6 of Farm Olyvenkolk No 187, Kenhardt District in accordance with the Environmental Management Act, 1998 (Act no 107 of 1998), as amended and the Environmental Assessment Regulations, 2010. Leap Sustainable Development cc was appointed to undertake the specialist socio-economic impact assessment as part of the Basic Environmental Impact Assessment.

## **1.2 Description of Proposed Development and Alternatives**

The proposed Solar Energy Land (Pty) Ltd development involves the construction of a 300MW Photovoltaic Electricity Generation facility, 710ha in extent, and a 132 kV power line on Portion 3 and 6 of Farm Olyvenkolk, located approximately 37km southwest of the town of Kenhardt in the Northern Cape Province. The infrastructure associated with this facility includes:

- Solar panels arranged in units with a generating capacity of approximately 300 MW and a total footprint of approximately 600ha.
- A 132 kV power line (mono pole structures) of approximately 7 km over Portions 3 and 6 of Farm 187 to feed the electricity generated into the existing Aries substation.
- Expansion of the Aries substation to receive the generated electricity into the ESKOM grid; and
- Ancillary infrastructure such as inverters and transformers, conductors (cables), a central bushbar, isolators, switch gear, protection infrastructure, measurement devices and maintenance facility and security and control room.

The proposed development will be constructed closer than 32 meters from watercourses. The electricity cable connecting the panels to each other, the distribution network will be laid underground and access roads will be constructed through some of the drainage lines.

The panels would be mounted on the ground using a ground screw. A concrete foot piece secured to a steel pen driven into the ground would be used where it is not feasible to use ground screws. The maximum height of the panels in operation would be approximately 5m and would allow some ground clearance for the free flow of surface water underneath the panels and for agricultural purposes where required. The solar panels may be equipped with sun-trackers.

The facility and associated infrastructure will be accessed on a 6m wide road with direct access off the Kenhardt to Pofadder gravel road. A combination of paving and or treated gravel may be utilized for this road. A 5m management track will surround each block of photovoltaic arrays, totaling approximately 9km of gravel road. These single track management roads will be used as access roads to service and maintain structures and to serve as fire breaks. On full commissioning of the facility, any access points to the site which are not required during operational phase will be closed and rehabilitated. Water will be sourced from existing boreholes, which will be registered under the National Water Act water use.

The total facility of 700MW, consists of two sites on both sides of R27 Pofadder link road and is  $\pm 2000$ ha in extent and proposed on Portions 3, 6 and 7 of farm Olyvenkolk No 187, Kenhardt.

## **Background to Solar Electricity Generation Facilities**

The use of solar energy, a natural resource, is non-consumptive and emits zero greenhouse gasses. Solar energy facilities, such as those using PV panels, use the energy from the sun to generate electricity through a process known as Photovoltaic Effect. This effect refers to photons of light colliding with electrons, and therefore placing the electrons into a higher state of energy to create electricity.

The Renewable Energy Feed-in Tariff Process (criteria not yet finalized by the National Energy Regulator of South Africa), selection process, IRP from government, and the economics of the solar plant will be key in determining the final technology combination and the schedule of implementation for the facility.

The overarching objective for the solar facility is to maximize electricity production through exposure to the solar resource, while minimizing infrastructure, operational and maintenance costs, as well as social and environmental impacts. In order to try meeting these objectives local level environmental and planning issues will be assessed through a site-specific assessment during the EIA Phase in order to delineate areas of sensitivity within the broader site. This will serve to inform the design of the facility.

Solar Photovoltaic Panels make use of the semi-conductor characteristics of Silicon to convert Solar Irradiation (sunlight) directly into electricity. This technology is proven and has been used both in photovoltaic applications as well as the electronic industry for the last 40 years, with major improvements in both reliability and cost, resulting from large scale application especially in the computer industry over the last 20 years. The Silicon is typically deposited in thin layers and sandwiched between two protective plate safety glass sheets. This forms a typical Solar Photovoltaic panel as shown in figure below.



*Figure 1: Solar Photovoltaic Panel, Close up*

Solar Photovoltaic is the most reliable of all the renewable energy technologies available for producing electricity. It is the only solid state technology i.e. that directly converts sunlight into electricity. All other renewable technologies, including Wind, Biomass and other Solar technologies are indirect technologies which first have to convert sunlight to thermal or mechanical energy prior to producing electricity.

Solar PV is also the most environmental friendly of the renewable energy technologies. Unobtrusive due to its close proximity to the ground, it also is completely quiet due to no moving parts within the system. It uses no water, produces no effluent and has no irreversible impact on soil utilization after decommissioning.

Several disadvantages which are prevalent in all other forms of renewable energy generation are absent from a Solar PV installation. Several other technologies exist for converting Solar Energy into electricity. Most are however in the very early stages of commercial exploitation and do not have the successful track record associated with Solar PV.

### **Construction phase**

For large scale installations, these panels are typically arranged in arrays arranged in a grid formation in an open field arrangement where maximum sunlight can be harvested. Shown below in Figures 6 and 7 are two typical examples of solar arrays similar to that planned for this project. The panels are attached to mounting frames and located close to the ground at a fixed inclination angle to maximize daily sunlight



*Figure 2: Large scale Solar PV arrays*

An individual PV module is made of layers of amorphous silicon, which acts as a semi-conductor. When light shines on the cell it creates an electric field across the layers, causing electricity to flow. Higher light intensity will increase the flow of electricity. This charge is discharged *via* the module's transparent conductive front layer and metallic rear layer. The direct current generated within the module is fed into the electrical grid *via* an inverter (Figures below).

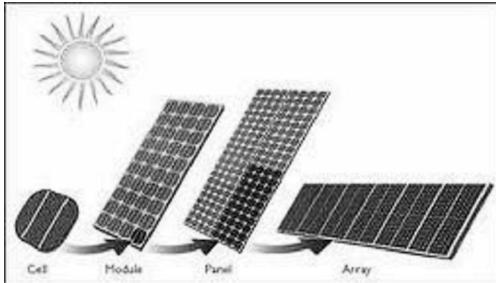


Figure 3: Solar Array

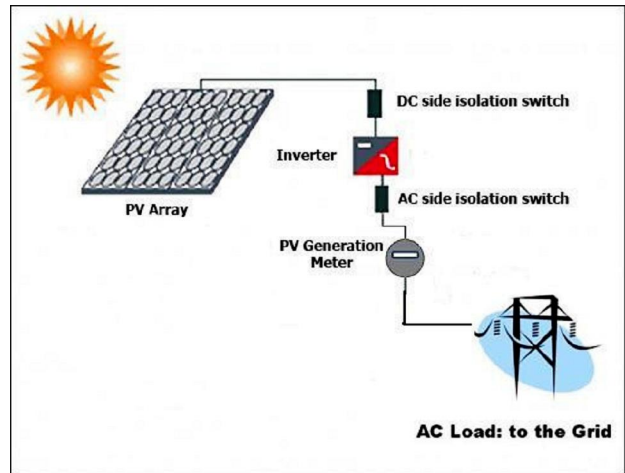


Figure 4: Schematic Diagram: Solar Energy Generation

The proposed thin-film PV modules are 1.9m<sup>2</sup> (0.99m x 1.96m) in size, and comprise four panels. Each module is mounted on a metal supporting structure, no more than 1.8m off the ground, and has a potential output of 380W. There are a number of options regarding the structures and their anchoring to the ground. Typically this is done by means of a small concrete “foot” at the base of the pole supporting the structure. This facility will make use of a specially designed metal ground screw that will be screwed into the ground and the support structure will then be bolted onto it. Individual grounded PV panels (also referred to as free field or standalone arrays) will be connected into a ‘string’ of panels of approximately 3.4m in height. The ‘string’ will be attached to a steel support structure set at an angle so to receive the maximum amount of solar radiation.

The facility is made up of one or more solar panels, usually a controller or power converter, and the interconnections and mounting for the other components.

The proposed Solar Facility would typically comprise of:

- An array of photovoltaic panels with an installed capacity of up to 2x 75MW;
- Inverter/transformer enclosures;
- Grid connection and 132kV overhead power lines;
- A mounting structure, ground screws and a steel support structure;
- Cabling between the project components (underground);
- Electrical power lines to be erected en route to the existing electrical substation;
- Internal access roads and fencing; and
- A workshop area for maintenance, storage, and offices.

### Operation phase

The electricity that is generated from the PV modules will be stepped up through the onsite transformers. Thereafter the power will be fed to the Aries substation via a 132 kV overhead power line to be constructed. It is anticipated that a full-time security, maintenance and control room staff will be required on site. Each component within the solar energy facility will be operational except under circumstances of mechanical breakdown, unfavourable weather conditions or maintenance activities. Maintenance will consist mostly of panel replacement and other mechanical and electrical

infrastructure repairs. Cleaning would be undertaken using wet cloth as required. New self cleaning technology is also investigated and will be implemented if feasible. Water usage is minimal. An onsite maintenance facility will be used as a repair base and storage of maintenance equipment. Grounds will be maintained. All waste generated will be transported weekly or when required to the Kenhardt waste managing facilities.

### **Decommissioning phase**

The PV is expected to have a lifespan of approximately 30 years (with maintenance). The infrastructure would only be decommissioned once it has reached the end of its economic life. If economically feasible, the decommissioning activities would comprise the disassembly and replacement of the individual components with more appropriate technology/infrastructure available at the time. However, if not deemed so, then the facility would be completely decommissioned which would include the following decommissioning activities:

- (a) The site will be prepared by confirming the integrity of the access to the site to accommodate the required equipment and the mobilization of decommissioning equipment.
- (b) The components would be disassembled and reused and recycled or disposed of in accordance with regulatory requirements or existing components will be replaced.

### **1.3 Purpose of the Assessment**

This assessment outlines the socio economic cost to create a solar facility of this magnitude in the Kai !Garib Municipal Area. Socio-Economic Impact Assessments analyses i.e. predicts, reflects, evaluates and manages, the intended and unintended consequences on the human environment of planned interventions (policies, programmes, plans and projects) and any social change processes invoked by those interventions so as to bring about a more sustainable and equitable biophysical and human environment (Vanclay, 2002).

At a broad level the impacts on the overall welfare of a community should be investigated considering the efficiency, equity and sustainability of the project as well as the trade-offs or 'opportunity cost' the various alternatives will yield. Externalisation of disadvantages occurs when there is no or insufficient consideration given to the associated social costs that will be borne by the public.

The proposed activity and its impact should not result in unacceptable opportunity costs. Thus the operation of the solar facility should outweigh the net benefit yielded by next best alternative, that is farming and its benefits, being foregone for the receiving community. Or the operation of the solar facility should not compete to use limited community resources i.e. water.

### **1.4 Approach**

The approach to the study is directed by the requirements for Environmental Impact Assessments and the Guidelines for Social Impact Assessments (SIA) and Economic Impact Assessments commissioned by DEA&DP Western Cape. Hence these guidelines were used to provide a benchmark for the assessment conducted in the Northern Cape. The following activities were executed:

- “ Review of project information and preliminary specialist reports;
- “ Collection and synthesis of baseline socio-economic data on the area;
- “ Identification project results and key social and economic variables, and the impact of the project results on the receiving society and economy as per Guidelines for Social Impacts;

- “ Verification of some results, social variables and impacts through interviews or correspondence with developer, specialists and key project team members (Addendum A);
- “ Evaluating/ Rating the significance, duration, probability and intensity of identified impacts are assessed during the construction, operation and decommissioning phase and mitigation measures are proposed. (Addendum B);
- “ Evaluating/ Rating the extent and duration of the identified impacts (Addendum B);
- “ Preparation of draft and Final Socio-Economic Impact Assessment (SIA);

## 1.5 Assumptions & Limitations

The following assumptions and limitations shaped the impact assessment:

### Assumptions

- a) The extent of the wage bill:  
The Social Accounts Matrix for the building and construction and civil engineering sectors in South Africa presents the wage bill as 19,7% of the cost of construction and building. The wage bill was assumed to be the same (19.7%) as a construction project and which is the percentage used in the calculations of this Socio Economic Impact Assessment. This bill will be used to verify the number of jobs anticipated to be generated and to determine the number of indirect jobs.
- b) Decommissioning Figures:  
All figures for the decommissioning phase are projections based on the construction figures and need verification and benchmarking when detail planning of this phase takes place. However it is anticipated that the impacts will not differ extensively.

### Limitations

- a) Assessment of alternatives is limited.  
The alternatives assessed in the Socio- Economic Impact Assessment are limited to the proposed project site and the no-go alternative as the only alternatives.
- b) Demographic data is dated.  
The demographic data used in the study is dated as it is based on the 2011 Census which is older than 5 years. However, the data does provide useful information on the demographic profile of the study area. Where more recent data was used, discrepancies are described.
- c) Interviews with a limited group representing the communities concerned.  
The number of people to be interviewed is not a representative sample but will include interested and affected parties, key officials, some community members and business men. However, the sample amplifies the issues at hand regarding the development to inform the Environmental Impact Assessment.

## 1.6 Specialist details

The author of this report is an independent specialists with, 13 years' experience in the field of rural development, 7 years in community education, 13 years in project management and coordination, 13 years in town and regional planning (Reg. no: A/1369/2010) and 11 years in socio-economic research.

## **1.7 Declaration of Independence**

This is to confirm that Anelia Coetzee, responsible for conducting the study and preparing the Socio Economic Impact Assessment Report, is independent and has no vested or financial interests in the proposed development being either approved or rejected.

## **1.8 Report Outline**

The report is divided into four sections, namely:

- Section 1: Project Overview & Assessment Scope
- Section 2: Socio- Economic Overview of Study Area and Applicable Legal Context
- Section 3: Assessment of Impacts: Construction, Operations and Decommissioning Phases
- Section 4: Management guidelines to address socio-economic impact.

## 2: Socio- Economic Overview and Legal Context

This section provides an overview of the baseline socio-economic conditions of the receiving environment and the policy context.

### 2.1 Socio- Economic Overview of Kenhardt

**Kai !Garib Local Municipality** is situated along the Orange River, and is bordered by Dawid Kruiper Municipality on the north-east and Namibia on the north-west. It falls within the ZF Mgcawu District Municipality. This area consists of three large towns: Kakamas, Keimoes and Kenhardt and six former settlements in total. Kenhardt is about 120km from Upington in the Northern Cape.

It is characterized by its unique **landscape** with the Kalahari Desert on the one side and the Orange River on the other.

As the **rainfall is low**, the area is dry (Dorsland) and sparsely vegetated with very low shrubs and yellow grass covering arid brown sand interspersed with black dolerite boulders. It boasts with a Quiver Tree forest, about 8km south of Kenhardt. The **forest** comprises approximately **4000 to 5000 kokerbome**. The area is also known for its **sociable weber bird** nests either in quiver trees or telegraph poles accommodating 150 or more birds, to breed and lasts for more than a century.

The Hartbees River crosses this part of the Bushmanland region and feeds into the Rooiberg Dam. The Rooiberg Dam provides water for agricultural irrigation including to Kenhardt. The **agricultural** sector is the main **economic sector** with the largest potential for economic growth. Kenhardt is famous for being at the heart of the **Dorper sheep-farming** area. Kenhardt's main economic activity is sheep farming (dorpers and karakul), but wheat is cultivated along the courses of the Hartbees, Sak and Olifants Rivers.

Several shallow pans occur in the area and one can view **San** (also known as Bushmen) **rock carving** and Anglo Boer War remains. One such a **pan is Verneukpan** on which Sir Malcolm Campbell tried, in Bluebird 1, to set a **new world land-speed record** in 1929.

Figure 5: San Rock Art



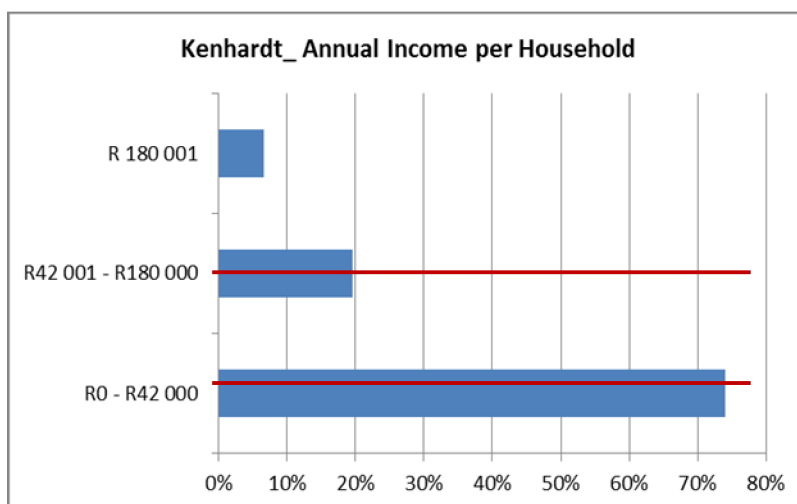
Kenhardt has a total population of 4 843 people (and 1 167 households) of whom nearly a third (31%) is fourteen (14) years of age and younger whilst those over 65 years represent less than ten percent (8.1%) and the working age (15 – 64) population represents 60.9%. Thus for every one and a half persons that can work there is one person dependent on them. With an average household size of 4 persons it means that each family has two or more people working with nearly 2 people dependent.



**Kai !Garib** has a total **population of 65 869 people** (and **16 703 households** of whom 2076 are rural) of whom nearly a quarter (24.4%) is fourteen (14) years of age and younger whilst those over 65 years represents five percent (5.1%) and working age (15 – 64) population presents 70.5%. Thus for every two persons that can work there is one person dependent on them. With an average **household size of 2.9 persons** it means that each family has two people working and one person dependent. The annual growth rate in the municipal area is 1.16%

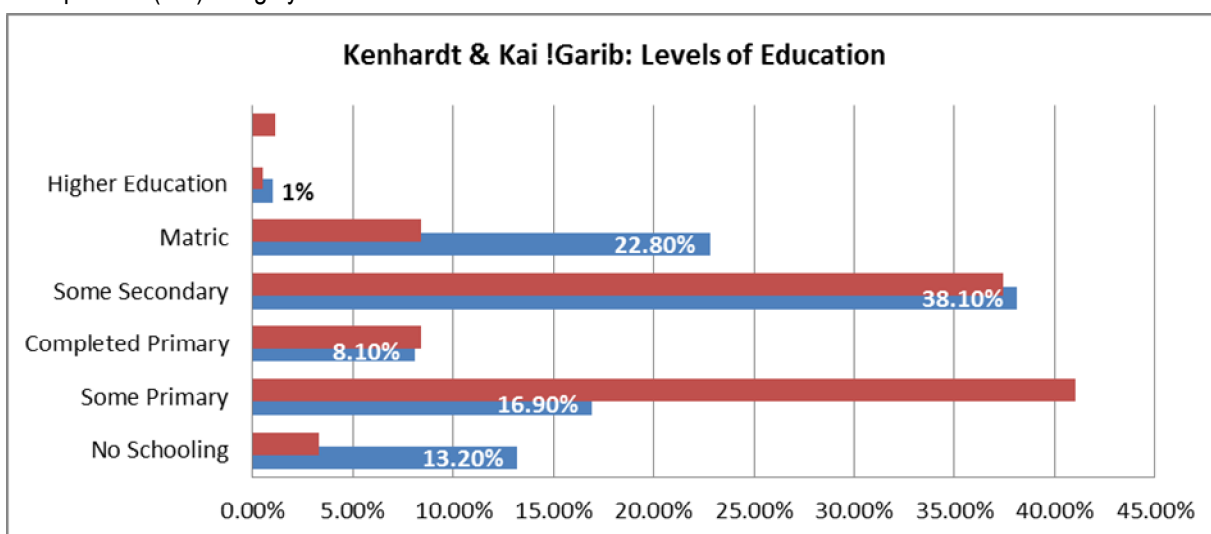
**Household income** overall is low as 74% of the population earns R42 000 (maximum R3 500 per month) and less, whilst 19.6% earns between R 3 501 and R 15 0000 per month) and 6.15% earn more than R15 000 per month.

The high **unemployment (10%)** and high **youth unemployment rate (10%)** together with low monthly household income necessitate economic growth and broadening and extending the skills base within Kai !Garib. Forty seven percent (47% or 30 949) people in the Kai !Garib area are economically active (employed or unemployed but looking for work) whilst sixty two percent (62% or 19 375) of these economically active people are youth (15 – 35 years).



Graph 1: Household Income, Kenhardt

Considering the **educational level** of the population in Kenhardt, thirty percent (30.1%) of the population is unskilled whilst nearly half (46.2%) of the population is semi-skilled, whilst twenty three percent (22.8%) is skilled and one percent (1%) is highly skilled.



Graph 2: Levels of education, Kenhardt & Kai !Garib

Considering the educational level of the population in Kai !Garib, nearly 90% of the population is unskilled(44.3%) and semi- skilled (45.8%), whilst ten percent (8.4%) is skilled and less than 1% is highly skilled.

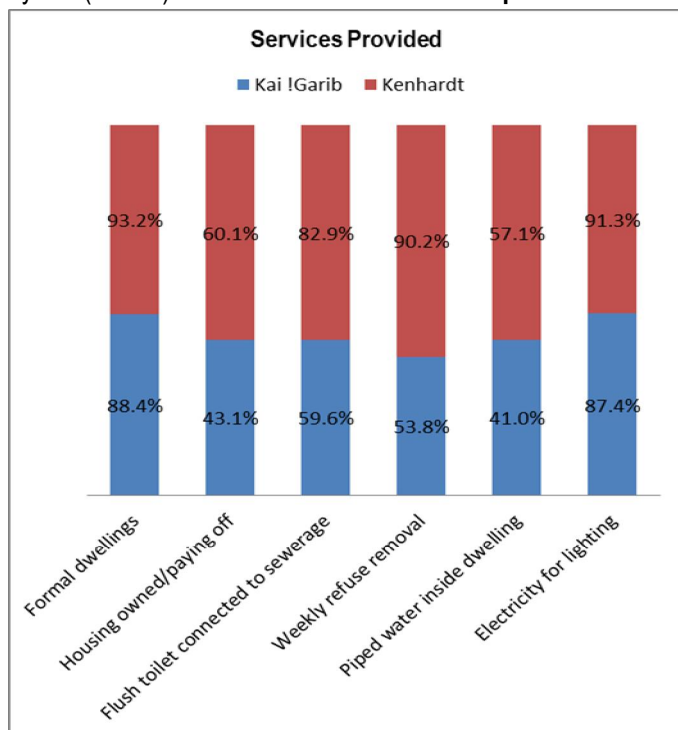
In the Kai !Garib municipal area there are slightly more **males** than **females**. From ages birth to 14 there are slightly more (0.7%) males than females, whilst in the age group 15 to 44 there are 4.4% more males than female. After 44 years of age the number of males and females are equal for each age cohort.

In the Kenhardt there are slightly more female than males: From ages birth to 14 there are slightly less (0.6%) males than females, whilst in the age group 15 to 44 there are 0.3% less males than female. After 44 years of age the number of males is 5.2% less than the number of females. There are slightly less males than females as more (5%) females survive after 45 years of age. Nearly half (46.3%) of households are female headed households.

The difference between more or less males and females is also demonstrated in the number of female headed household: There are 46.3% of female headed households in Kenhardt and 34.6% female headed households in Kai !Garib.

More (sixty percent (60.1%)) household is Kenhardt **own** their **homes** or are paying it off than in Kai !Garib (43.1%). More (93.2%) households Kenhardt live in **formal dwellings** whilst 88.4% households in Kai !Garib live in formal dwellings. Overall more households in Kenhardt have access to services than in the Municipal area of Kai !Garib as per the table below:

Ninety six (95.9%) households have **access to potable water** from the regional or local water scheme. Of the



95.4% people having **flush toilets**, there are Eighty three (82.9%) people connected to the sewerage system whilst 13.5% have septic tanks.

Although few people (25.5%) are **mobile**, most people (3/4+) have **access to information** either through television or radio and are in touch with the world either by land line or by cell phone. Less than 25% of the population has access to internet.

Kenhardt suffers from a **drastically high rate of inter-generational alcoholism**, some estimate it as high as 90%. There is a high incidence of **gender violence (sexual abuse and domestic violence)** and most (99%) of the of court cases relate to substance abuse. According to "Graph 3: Services provided, Kenhardt

- Women and men drink together,

- Most sexual abuse occurs during 'black-out',
- Most pregnancies are unplanned; or are planned to obtain Child Welfare support that is "equivalent to less than 24 loaves of bread"
- Fetal Alcohol Syndrome is the most common birth defect,

Whilst Women and men drink together, leaving children unattended and uncared for

- Children raise children.
- Children begin drinking, smoking & using drugs before their teens.
- School drop-out begins in elementary school.
- There is no recreational place of interest outside of taverns.

The community estimates the unemployment rate to be 80% (in comparison with 10% for the municipal area as per StatsSA, 2011).

## **2.2 Policy and Planning Context**

An analysis of the compatibility of the proposed project with the relevant sector policies and development plans is required. The following policies and plans are considered:

- Constitution (1996) and Bill of Rights
- White Paper on Energy Policy for the RSA (1998);
- White Paper on Renewable Energy (2003);
- National Climate Change Response White Paper (2011)
- National Energy Act (Act 34 of 2008);
- National Energy Efficiency Strategy (2016)
- National Spatial Development Framework (2006);
- Northern Cape Spatial Development Framework (2012) (NCSDF and Provincial Development and Resource Management Plan);
- Northern Cape Local Economic Development Strategy (2009);
- Northern Cape Manufacturing Strategy (2009);
- Northern Cape's Large Scale Projects (2013).

### **2.2.1 National Level**

#### **Constitution, 1996 and Bill of Rights**

Everyone has the right:

- To an environment that is not harmful to their health or wellbeing; and
- To have the environment protected, for the benefit of the present and future generations, through reasonable legislative and other measures:
  - prevent pollution and ecological degradation
  - promote conservation; and
  - Secure ecologically sustainable development and the use of natural resources while promoting justifiable economic and social development.

The proposed solar facility is in line with the Constitution (1996) and the Bill of Rights as it promotes the use of renewable resources to generate energy. These resources i.e. sun and wind are harmful to the health or well-being of the population and protect the environment for the benefit of present and future generations.

### **White Paper on Energy Policy for the RSA (1998)**

The White Paper on Energy Policy for South Africa (December 1998) give recognition to “renewable energy sources in their own right; are not limited to small-scale and remote applications, and have significant medium and long-term commercial potential”. “Renewable resources generally operate from an unlimited resource base and, as such, can increasingly contribute towards a long-term sustainable energy future”. As South Africa has a very attractive range of renewable resources, particularly solar and wind, the fact that renewable applications are the least costly particularly when social and environmental costs are considered, is strongly emphasized.

The proposed solar facility is in line with the principles of the White Paper on Energy Policy for South Africa as it promotes the use of renewable resources to generate energy.

### **White Paper on Renewable Energy (2003)**

As signatory to the Kyoto Protocol, Government is determined to, by means of the White Paper on Renewable Energy (November, 2003):

- a) Make good the country's commitment to reduce greenhouse gas emissions and
- b) Ensure energy security through diversification of supply (National Energy Act).

Government's long-term goal is to establish a renewable energy industry that will offer in future sustainable, fully non-subsidized alternatives to fossil fuels. The medium-term (10-year) target set in the White Paper is *10 000 GWh renewable energy contribution to final energy consumption by 2013, to be produced mainly from biomass, wind, solar and small-scale hydro electrical plants*. This target constitutes 4% of the total projected demand. The proposed Solar Facility supports government's medium and long term renewable energy goals as it will assist to make good the country's greenhouse gas emissions and ensure energy security.

### **National Energy Act (2008)**

Again, the National Energy Act (Act 34 of 2008) promotes diversification of energy sources and supply including renewable resources, i.e. solar and wind. The diversified energy resources have to be available in sustainable quantities at affordable prices and should support economic growth, poverty alleviation and consider the preservation of the environment.

As the proposed 300MW Solar Facility enhances energy source diversification, it is thus in line with the National Energy Act.

### **National Climate Change Response White Paper (2011)**

The Climate Change Response White Paper was largely informed by a process known as the Long-Term Mitigation Scenario (LTMS) formulation. The Response addressed South Africa's dependency on its energy intensive industry reliant on coal, poverty and inequality and moving to a low carbon development path (Emissions peak in 2020-2025, remain for a decade and decline in absolute terms from 2030 -2035 onwards).

The proposed 300MW Solar Facility enhances moving to a low carbon development path, it is thus in line with the National Climate Change Response White Paper.

**National Spatial Development Framework, 2006 (NSDF)**

The National Spatial Development Framework (or Spatial Perspective) serves as instrument to coordinate all government action and to align social, economic and environmental goals. The National Spatial Development Framework provides the basis to maximize the overall social and economic impact of government development investment through interpreting the strategic direction, policy coordination and combining government action into a continuous spatial framework of reference.

The ultimate goal is to provide basic services, to ameliorate poverty and undo uneven and ineffective spatial patterns and address the additional burden on poor people.

The proposed Solar Facility complies with the normative principles of the National Spatial Development Framework as follows:

<b>NSDF Principles</b>	<b>Proposed <u>Photovoltaic Electricity Generation Facility, Kenhardt</u></b>
a) Economic growth is a prerequisite to achieve policy objectives;	The proposed project will contribute positively to the GGP of the province.
b) Government spending on fixed investment should therefore be focused on localities of economic growth or economic potential;	The Northern Cape has been earmarked by the National Government for the generation of alternative energy and in particular solar energy. The proposed project is located in the Northern Cape and enhances government spending on localities of economic growth.
c) Efforts to address past and current social inequalities should focus on people not places.	The proposed solar facility create employment and on the job skills development opportunities.
d) To overcome the spatial distortions of apartheid, future settlement and economic development opportunities should be channeled into corridors and nodes that are adjacent to or link the main economic growth centers;	The proposed facility will provide economic development opportunities aligned with growth corridors in the Northern Cape. .
e) Future urban and rural development in the province should change the current pattern of resource application and investment significantly to ensure a sustainable environment for the future. Infrastructure investment and development spending should primarily support localities that will become major growth nodes in South Africa	The resource application and investment are aligned with national energy strategies and enhance the resource base of the Kai !Garib Municipality. .

The proposed solar facility is in line with the principles of the National Spatial Development Framework as it promotes alternative energy generation and is within the “Karoo” corridor promoting economic growth.

## 2.2.2 Provincial and District Level

### Northern Cape Provincial Spatial Development Framework, 2012 (NCSDF)

The principles of the National Spatial Development Strategy inform the Northern Cape Provincial Spatial Development Framework. The specific principles of social, economic, biodiversity and technological sustainability within the NCSDF, 2012 are supported by the solar facility:

<b>A. Social Sustainability (refers to need)</b>	<b>Compliance by proposed Solar Facility</b>
Improve the quality of human life, including the elimination of poverty.	Indirectly contributing to the elimination of poverty as employment will be created.
Recognize the extent of cultural diversity and respond accordingly.	Not applicable
Protect and promote human health through a healthy environment.	Protect and promote human and environmental health, as the generation of solar energy does not generate greenhouse gasses.
Implement skills training and capacity enhancement for historically disadvantaged people.	The proposed project dedicates 1.5% of its annual revenue to reinvest in social responsibility and in particular to training teachers to teach scarce subjects i.e. mathematics, physical science, science and technology.
<b>B. Economic Sustainability:</b>	<b>Compliance by proposed Solar Facility</b>
a) Ensure that new development promotes qualitative urban integration, affordable housing, and densification in a financially viable manner, without undermining existing property values.	Not applicable
b) Ensure that as a whole, the for- and nonprofit projects combine into a financially viable local economy that benefits all stakeholders.	The generation of energy has a strong for- and nonprofit focus and supports viable economies to the benefit of the stakeholders.
c) Promote employment creation.	Temporary jobs will be created during the construction and demolition phase whilst permanent jobs will be generated during the operational phase.
d) Enhance competitiveness within the context of the promotion of policies and practices that advance environmental sustainability	Solar energy generation advances environmental sustainability.
e) Invest a meaningful share of the proceeds from the	Proposed project commits 1.5% of annual revenue to

use of nonrenewable resources in social and human made capital, to maintain the capacity to meet the needs of future generations.	develop human capital and small businesses.
f) Protect and enhance the property and investments of all inhabitants.	Proposed project impacts visually on property of Kenhardt inhabitants. Visual Impact assessments proposed mitigation measures to minimize the impact of the proposed <u>Photovoltaic Electricity Generation Facility</u> on the investment of inhabitants of Kenhardt.

<b>C. Biophysical Sustainability:</b>	<b>Compliance by proposed Solar Facility</b>
a) Minimise the use of the four generic resources, namely energy, water, land and materials.	Minimize the use of materials i.e. coal to generate energy.
b) Maximize the reuse and/or recycling of resources.	Maximize the re-use of resources such as the energy of the sun.
c) Use renewable resources in preference to nonrenewable resources.	Use renewable resources
d) Minimise air, land and water pollution.	Minimize air pollution
e) Create a healthy, nontoxic environment.	Create a healthy, non-toxic environment.
f) Maintain and restore the Earth's vitality and ecological diversity.	Enhance the Earth's vitality and ecological diversity by making use of renewable sources instead of nonrenewable sources.
g) Minimize damage to sensitive landscapes, including scenic, cultural, and historical aspects.	Mitigation measures ensure minimization of any possible damage i.e. to sensitive scenic, cultural and historic landscapes.

<b>D. Technical Sustainability (to create a qualitative cultural environment, in harmony with the natural environment within which it is located)</b>	<b>Compliance by Solar Facility</b>
a) Construct durable, reliable and functional structures.	Durable low maintenance structures to generate electricity.
b) Pursue quality in creating the built environment.	Not applicable.

Other NCSDF directives the proposed solar facility supports, are:

#### **Emerging Growth Centers:**

The two areas identified are Upington and Springbok. Balancing the downscale of export grapes and copper mines industries with the growth prospects in non-traditional sectors i.e. energy generation and science will be the focus. Hence, significant rural-urban shift with some stepwise (onward and outward) migration to other major centers both inside and outside the province may be experienced. This migration will place greater demand for services on local

authorities who are not identified as growth nodes. Development priorities in these areas and the proposed solar facility at Kenhardt are aligned i.e.:

<b>D NCPSDF</b>	<b>Proposed Solar Facility</b>
Promoting of emerging growth opportunities to absorb the employment needs of a growing population;	Promote alternative energy, an emerging industry in South Africa
Developing small and medium enterprises in emerging economic sectors;	The photovoltaic energy generation facility will provide opportunities for small and medium enterprises to offer their services to the facility.
Re-distribution of service provision to take into account the internal movement of people into these towns from other centers.	The project has a 20-year life span and it is likely to be repeated. Its permanency will enable Kai !Garib Municipality to comply with its service demands.

### **Development Corridors and Special Resource Areas**

There are four discernible development/ transport corridors of which the Orange River corridor (from Springbok through Upington to Kimberley (and the Free State and Gauteng)) is of concern for the proposed solar facility. These corridors aim to link the major economic centers in the province and are vital lifelines from a transport perspective. Hence, flagship economic development projects along these transport/ development corridors are priority. .

The proposed Solar Facility is supportive of the majority of the focus area strategies of the Northern Cape Provincial Spatial Development Strategy.

### **Northern Cape Local Economic Development Strategy (2009)**

The Northern Cape LED Strategy aims to mobilize local people and resources to enhance business activity, create meaningful employment and reduce poverty. Opportunities to broaden the provincial economic base include renewable energy and of cause tourism.

### **Northern Cape Manufacturing Strategy (2009)**

This Strategy places emphasis on cluster development with the intention of enhancing productivity, economies of scale and exports while promoting local value-chains. Three clusters were identified and include agro-processing, Mineral beneficiation and Energy and technology. The latter includes renewable electricity, energy crops, technology hubs etc.

The Manufacturing Strategy advocates the development of these clusters through the formation of Special Economic Zones (SEZs) and Development Corridors. This includes the development of a multi-sector SEZ around Upington Airport, An Upington-Prieska Solar Corridor and advancement of the Upington Manufacturing Corridor.

### **Northern Cape's Large Scale Projects**

Northern Cape Provincial Government envisages addressing structural challenges in the rural economy, capacitating communities in locally driven development, and facilitating business establishment and job creation holistically through large scale projects.



The large scale projects occur across a range of industries, namely tourism, science and technology, sport and recreation, education and renewable energy. A brief overview of the project follows:

Science and Technology:

Bloodhound SSC initiative, 2016) is the design and manufacturing of a super-sonic car capable of setting a new land speed record (1610km or 1 000 miles per hour). Hakskeenpan (a dry lakebed) will host the event.

Northern Cape Astronomy Initiative includes the Square Kilometer Array (SKA), a global mega science project advancing radio-telescope facilities, the Meerkat telescope (largest and most sensitive radio –telescope in southern hemisphere and southern African Large telescope SALT which is the most powerful single optical telescope in the southern Hemisphere

The development of Upington Airport into a world-class cargo hub and storage facility ('mothballing' of ±350 private and government owned aircraft on a 50ha platform) should ensure that Upington Airport becomes a preferred destination for transporting large equipment such as those involved in extreme sports, astronomy and renewable energy technology.

Sports and Recreation: Northern Cape is repositioning itself as **Africa's 'Extreme Sport Destination'** as it is host to a range of large-scale events with the capacity to catalyze economic growth and development i.e. the Green Kalahari Canoe Marathon (99km), the Maloof Money Cup (skateboarding in Kimberley), Kalahari Desert Speed Week, Eco Speed Week and Upington All Tar Speed Week. With natural and manmade infrastructure i.e the river, Hakskeen pan and Upington Airport having one of the world's longest runways (5.5.km) and a cargo hub as the runway allows for the landing of jumbo jets capable of accommodating massive cargo loads.

Education: Kimberley has been earmarked to establish a university for the Northern Cape Province. Post graduate studies in astronomy, renewable energy, low carbon energy, hydrology and water resources management and climate variability will be offered by the University.

Renewable Energy: Upington Special Economic Zone: focus on solar energy research and development in Upington and hosts a Solar Park and research hub and act as an anchor in the Northern Cape Solar Corridor. The Northern Cape Solar Corridor includes a 1GW solar park at Prieska.

Economic Corridors: The Saldanha Northern Cape Development Corridor (a Strategic infrastructure Project (SIPs)) to move iron ore from Kathu to Saldanha and the Gamagara Mining corridor promotes mining related services and industrialization, which forms part of the Saldanha Northern Cape Development Corridor.

Hence its *Strategic Vision is to enhance local livelihoods and facilitate economic growth in the wider Green Kalahari region by establishing the area as a top tourism destination. To achieve this vision, event related opportunities, additional activities outside of the event and establishing an event legacy are the three drivers to establish World renowned destinations.* (Bloodhound Integrated Development Strategy, 2013, Department of Economic Development and Tourism, South Africa)

### 3: Assessment of Impacts

The chapter provides a description of **direct impacts** assessed according standard assessment measures (Addendum A) within the following impact categories:

- a. Health and Social Well being
- b. Quality of living environment
- c. Economic and Material Well being
- d. Family and Community life
- e. Cultural Impacts
- f. Gender relations
- g. Institutional, Legal, Political systems and Equity

The assessment of **direct impacts** will be reflected according to the following ratings as per standard assessment measures.

Rating	Score -	Score +
Low	0 to - 40	0 to 40
Medium	- 41 to - 80	- 41 to 80
High	- 81 to - 120	- 81 to 120
Very High	> - 120	> 120
NI	No impact	
NER	No evaluation required	

Table 1: Impact Rating Scale

**Residual impacts** are the result of a project(s) or action, secondary to the main purpose of the project, that is nonetheless impacting on the surroundings and the community (<https://bizfluent.com>, September 2017). Residual Impacts are defined as those impacts that remain following the implementation of mitigation measures (Seagrave Road Environmental Statement Addendum Vol1)

**Cumulative Impacts** are the impact which results from the action when added to other past, present, and reasonably foreseeable future actions which include proposed project activities, other similar activities and unregulated background pressures and trends. The analysis of a project's incremental impacts combined with the effects of other projects can often give a more accurate understanding of the likely results of the project's presence than just considering its impacts in isolation (Business Biodiversity and Offsets Programme (BBOP) 2012).

The combined effect of individual impacts occurs when a receptor is affected by more than one impacts during any phase of development (Seagrave Road Environmental Statement Addendum Vol1)

#### 3.1 Construction, Operations and Demolition Phases

##### 3.1.1 Construction Phase

The construction phase will include the following broad activities:

Activity	Description	Skills required
1. Scan & survey site (conduct surveys)	Conduct surveys such as, but not limited to, geotechnical, site surveys and confirmation of PV array micro-siting, road servitudes, etc.	Specialist survey skills PV site construction knowledge.

	Final design work Procurement and manufacturing of equipment	Procurement skills Manufacturing skills
2. Establish access roads	Access to site is via the Pofadder gravel road. Between the individual components and within the site itself an internal road / track will be established connecting to the external access road (for construction purposes and for maintenance).	Grading and making gravel road
3. Site preparation	Site clearing: This will include clearance of vegetation at all the roads and building footprints. These activities will require the stripping of topsoil which will need to be stockpiled, backfilled and/or spread on site. Fence and secure site and create firebreaks.	Clearance of vegetation. Stripping, stockpile and backfilled topsoil. Fencing. Creating firebreaks
4. Contouring	Natural contouring must be used when constructing the facility. This enables limited artificial contouring to be used.	Site preparation and leveling skills
5. Establishment of laydown areas	Laydown and storage areas will be required for the construction equipment and building materials required on site.	Identification and compacting of laydown areas.
6. Establishment of ancillary and facility infrastructure	The establishment/ building of facilities/buildings will require the clearing of vegetation and levelling of the development site and the excavation of foundations prior to construction. A workshop area for maintenance, storage, and offices will be allocated and the workshop and offices will be constructed. Internal access roads will be constructed Security fencing will be erected.	Excavation, trenching, sleeve and cable laying, concrete work, casting foundations (for buildings only) and road building and compacting. Connect services: electricity, water and sewerage.
7. Arrange arrays of panels in grid formation (large scale installations)	Panels are typically arranged in arrays arranged in a grid formation in an open field arrangement where maximum sunlight can be harvested. The panels are attached to mounting frames and located close to the ground at a fixed inclination angle to maximize daily sunlight Mounting frames will be assembled consisting of a mounting structure, a steel support structure on which the modules are mounted. ( $\pm 1.8\text{m}$ off the ground) Panels will be constructed as modules are installed (Filling up a panel): Several cells form a module and several modules form a panel with a potential output of 380W. Individual grounded PV panels (also referred to as free field or standalone arrays) will be connected into a 'string' or an array of panels of approximately 3.4m in height and with an installation capacity of 2x 75MW. The 'string' will be attached to a steel support structure set at an angle so to receive the maximum amount of solar radiation.	Steelwork assembly. Casting and mounting steel frames. Stringing arrays. Operating cranes.
8. Anchoring structures	Structures are anchored to the ground making use of metal ground screws and the support structure will then be bolted onto it. (and no typically small concrete "foot" at the base of the supporting pole structure).	Anchoring (bolting) structures

8. Commission site and connect services	Substation construction will take place. Electrical site work (digging trenches and installing cabling) will be done followed by installing controllers or power converters/inverters/transformers and grid interconnections. An array link to an inverter, link to a PV generator meter and link to the grid. Once the internal network is completed, the site will be tested and commissioned. After it was commissioned it will be linked to the transformer. 132kV Electrical power lines to be erected en-route to the existing electrical substation.	Mechanical and electrical assembly. Testing site. Connecting with substation.
9. Undertake site remediation	Once construction is completed and all construction equipment is removed, the site must be rehabilitated where practical and reasonable. On full commissioning of the facility, any access points to the site which are not required during the operational phase must be closed and rehabilitated	Site cleanup and rehabilitation Closure and rehabilitation of redundant access points

Table 2: Activities and Skills required: Construction Phase

The proposed Photovoltaic Electricity Generation Facility will have generating capacity of approximately 300 MW with a total foot print of approximately 710ha.

The cost to install utility scale PV systems was R24.51/W with 50% (49.73%) local content (Solar PV Baseline Report (draft 2) May 2013). Extracting the cost of construction, results in R3.31/W of which the wage bill represents R0.63/W. A Socio-economic development contribution to the amount of 1% of revenue for 20 years will be made. For a 300MW plant the figures are as follows:

Item	Cost per W	Cost 300 MW
Installing utility scale PV systems (international costing)	R24.51	R 7 353 000 000
Constructing PV facility (solar guideline)	R3.31	R 991 683 000
Wage bill- construction (as per SAM for construction)	R0.66	R 188 419 770
Skilled wages (6%) R 540 000/ employee/ annum/300MW	18	R 9 720 000
Semi-skilled (38%) R 288 000/ employee/ annum/300MW	108	R31 104 000
Unskilled (56%) R 144 000/ employee/annum/300MW	160	R23 040 000
Wage bill – construction per annum	286	R63 860 000

A total of 286 direct jobs will be generated requiring: 18 skilled persons, 108 semi-skilled persons and 160 unskilled persons

### 3.1.2 Operational Phase

The electricity that is generated from the PV modules will be stepped up through the onsite transformers. Thereafter the power will be fed to the Aries substation via a 132 kV overhead transmission power line to be constructed (adjacent to an existing power line). It also follows the same route as transmission lines of adjacent solar facilities to the west on farms 3/187, 8/187 and 12/187 as well as for a facility concurrently applied for to the south on farm 6/187.

It is expected that full-time security, maintenance and control room staff and general staff and technicians will be required on site. Each component within the solar energy facility will be operational except under circumstances of

mechanical breakdown, unfavourable weather conditions or maintenance activities. Maintenance will consist mostly of panel replacement and other mechanical and electrical infrastructure repairs. Cleaning would be undertaken using wet cloth as required. New self-cleaning technology is also investigated and will be implemented if feasible. Water usage is minimal. An onsite maintenance facility will be used as a repair base and storage of maintenance equipment. Grounds will be maintained. All waste generated will be transported weekly or when required to the Kenhardt waste managing facilities.

The operational phase is estimated to last 25 -30 years, the lifespan of the solar facility.

It is anticipated that approximately 60 direct jobs will be created for the full duration of the operational lifespan of the solar facility.

Skills Level	No	Annual Cost /100MW	Annual Cost /300MW	10 Year cost
Skilled wages (5%) R 540 000/ employee/ annum	1	R 540 000	R1 620 000	R 16 200 000
Semi-skilled (40%) R 288 000/ employee/ annum	8	R 2 304 000	R6 912 000	R 69 120 000
Unskilled (55%) R 144 000/ employee/annum	11	R1 584 000	R4 752 000	R 47 520 000
<b>Total</b>	<b>20</b>	<b>R 4 428 000</b>	<b>R13 284 000</b>	<b>R 132 840 000</b>

### 3.1.3 Demolition Phase:

The PV is expected to have a lifespan of approximately 30 years (with maintenance). The infrastructure would only be decommissioned once it has reached the end of its economic life. If economically feasible, the decommissioning activities would comprise the disassembly and replacement of the individual components with more appropriate technology/infrastructure available at the time. However, if not deemed so, then the facility would be completely decommissioned which would include the following decommissioning activities:

- (a) The site will be prepared by confirming the integrity of the access to the site to accommodate the required equipment and the mobilization of decommissioning equipment.
- (b) The components would be disassembled and reused and recycled or disposed of in accordance with regulatory requirements or existing components will be replaced.

The demolition phase of the solar facility will create some work. A similar number of employees may be required than during the construction period (direct employees) i.e. 18 skilled persons, 108 semi-skilled persons and 160 unskilled persons.

Item	Number of Employees	Cost 300 MW
Skilled wages (6%) R 540 000/ employee/ annum	18	R 9 720 000
Semi-skilled (38%) R 288 000/ employee/ annum	108	R31 104 000
Unskilled (56%) R 144 000/ employee/annum	160	R23 040 000)
Wage bill – construction per annum	286	R63 860 000

The impacts identified during all three phase, are assessed and mitigation measures are suggested in the section below.

## 3.2 Direct Impacts

### 3.2.1 Impacts on Population and Family Characteristics of Receiving Community

### a) Population Influx, Community Stability and Homogeneousness

The **construction, operational and demolition phase** of the proposed solar facility will impact on the population of Kenhardt and its immediate surroundings and cause an

- i. influx of skilled people temporarily as they come to work on the construction site and
- ii. influx of unemployed people semi-permanently in anticipation to access employment.

The influx of people may result in a socially less stable community.

During the construction phase of the plant and related infrastructure it is estimated that two hundred and eighty six (286) opportunities could be created. The duration of the construction phase of the complete plant will be 24 – 36 months. During this period, 6% skilled, 38% semi-skilled and 56% unskilled employees are required. Preferably the construction contractor is from the province. However, due to the lack of skills within the Kenhardt community (30% unskilled and 46.2% semi-skilled) qualified others may be employed to do the work even though most of the jobs do not require qualification. Recruiting qualified others will be based on the perception that qualified employees will do a better job as those unqualified.

The no go option will not result in the influx of people and has no impact on the population of Kenhardt and its immediate surroundings.

The rating will be done on an average number of 286 direct jobs per annum, over a period of three years, created by the development of the solar facility.

The population influx will impact mainly at a local level.

- i. Influx of Skilled, Semi- and Unskilled People: Construction Phase.

The rating applied will be project specific.

Impact	Temporary increase in the local population numbers.						
<b>Nature of Impact</b>	<u>Presence of skilled outsiders introduces job option possibilities</u> During the construction and demolition phases, the presence of skilled and semi-skilled outsiders will: <ol style="list-style-type: none"> <li>a) increase the population for a 2 – 3 year period, yet they will contribute to the local economy.</li> <li>b) introduce different job options to the local community</li> </ol>						
<b>ALTERNATIVES</b>	<b>Preferred</b>				<b>No Go</b>		
<b>Phase</b>	<b>Construction</b>		<b>Operations</b>		<b>Demolition</b>		<b>All</b>
<b>Extent of impact (A)</b>	Regional	3	NA		Regional	3	No impact 0
<b>Duration of Impact (B)</b>	Short term	1	NA		Short term	1	No impact 0
<b>Probability of occurrence (C)</b>	High Probable	3	NA		High Probable	3	No impact 0
<b>Intensity of Impact(D)</b>	Medium, positive	2	NA		Medium, positive	2	No impact 0
<b>Degree of confidence (E)</b>	Moderate	2	NA		Moderate	2	No impact 0
<b>Level of significance (AxBxD+E)xC</b>	Low, positive	24	NA		Low, positive	24	No impact 0
Mitigation measures Construction and Demolition Phases: <ul style="list-style-type: none"> <li>• Contractor appointed to announce the project so that the municipality, local community and local community organizations should be informed of potential job opportunities</li> <li>• Ensure that 90% of the semi- and unskilled employees contracted by Contractor are local;</li> </ul>							

<ul style="list-style-type: none"> <li>• Of locals employed, 90% has to be previously disadvantaged;</li> <li>• Of locals employed, a minimum of 30% has to be female and has to be provided with training and education to develop the appropriate skills;</li> <li>• Should employees not be suitably qualified, skill transfer should take place.</li> <li>• Where suitable and appropriately qualified local employees are not available, employ females and provide the appropriate training skills transfer.</li> <li>• Involve schools to visit site during the construction phase to inspire youngsters to join the construction industry.</li> <li>• Contractor appointed to announce the project so that the municipality, local community and local community organizations should be informed of potential job opportunities</li> <li>• Establish a Monitoring Committee for the construction phase in collaboration with representatives of the local community. The Monitoring Committee has to ensure that the EMPr is implemented and that any problem that arise and is associated with the construction of the structures is addressed.</li> <li>• Contractor to act as reference for locals employed.</li> <li>• Contractor to liaise with existing or future projects to access employment for locals.</li> </ul>							
<b>Level of significance after mitigation</b>	(A ) Local: 4	30	NA		(A ) Local: 4	30	No mitigation
<b>Residual impacts</b>	None						

Table 3: Impact caused by employed outsiders, All Phases

The influx of skilled people (employed by the contractor) has a low positive impact locally. It is unlikely that the influx should cause the social stability and homogeneousness of the local community to decrease. With mitigation, the presence of contractor employees can be enhanced to introduce different job options to the local community.

During the **construction, operational and demolition phase** the migration of the unemployed into Kenhardt and its immediate surroundings in search of work, which started during the construction phase, will continue as job seekers anticipate getting work. The influx can become semi –permanent. Should these job seekers not find work, the rate of unemployment will rise. The influx of unemployed persons will cause a degree of social instability of the local community.

ii. Influx of Unemployed People.

<b>Impact</b>	<b>Increase in local population numbers and presence of unemployed outsiders looking for work.</b>							
<b>Nature of Impact</b>	<u>Presence of unemployed outsiders decrease community stability</u> The construction, operational and demolition phases may create the impression that there are jobs and will cause the unemployed to migrate to Kenhardt and its immediate surroundings in search of work. This influx can last for the construction period or longer or can even be semi -permanent. Should these job seekers not find work the unemployment rate will rise. The presence of outsiders will cause a degree of social instability. The demolition phase may create the impression that there sellable material encouraging unemployed to migrate to Kenhardt.							
<b>ALTERNATIVES</b>	<b>Preferred</b>						<b>No Go</b>	
<b>Phases</b>	<b>Construction</b>		<b>Operational</b>		<b>Demolition</b>		<b>All</b>	
<b>Extent of impact (A)</b>	Local	4	Local	4	Local	4	No impact	0
<b>Duration of Impact (B)</b>	Short term	1	Long term	2	Short term	1	No impact	0

<b>Probability of occurrence (C)</b>	Highly Probable	3	Probable	2	Probable	2	No impact	0
<b>Intensity of Impact(D)</b>	Medium, negative	-2	Medium, negative	-2	Medium, negative	-2	No impact	0
<b>Degree of confidence (E)</b>	High	3	Moderate	3	Moderate	2	No impact	0
<b>Level of significance (AxBxD+E)xC</b>	Low, negative	-15	Low, negative	-26	Low, negative	-12	No impact	0
Mitigation measures Construction Phase: None Mitigation measures Operational Phase: None Mitigation measures Demolition Phase: Keep security employed until demolition is completed to prohibit the erection of temporary structures								
<b>Level of significance after Mitigation</b>	No mitigation			No mitigation				
<b>Resultant impacts</b>	<p>The proposed solar facility may enhance indirectly the influx of different cultures in search of finding markets for their produce to be sold. This influx may cause local trade to be replaced by outsider trade.</p> <p>To keep local traders afloat, the contractor has to sensitize and incentivize project staff to spend money locally and purchasing South African brands i.e. discount at shops in the municipal area subsidized by contractor.</p>							

Table 4: Impact caused by unemployed outsiders, All Phases

#### Construction Phase:

The influx of unemployed persons will impact negatively on the social stability and homogeneousness of local and receiving community, yet the impact will be low. The homogeneousness of the local population is affected and altered but cultural and social functions continue although modified slightly.

During the **Construction and Operational Phases** the loss of homogeneity is locally perceived as negative depending on the cohesiveness and stability of the receiving community and at a regional level it is perceived as negligible. Should **demolition** for whatever reason not take place, an informal settlement character may arise as the unemployed may create shelter onsite. No mitigation is proposed, besides that demolition should be a condition of development.

#### b) Skills levels

##### Construction Phase:

The education and skills levels of the population in Kai !Garib and its immediate surroundings are very low: 44.% unskilled, 45.8% semi-skilled, 8.4% skilled and <1% highly skilled, whilst the education and skills levels in Kenhardt are slightly higher: 30.1% unskilled, 46.2% semi-skilled, 22.8% skilled and 1% highly skilled. Keeping these skills levels in mind, it is likely that:

- a) most locals from Kenhardt will be employed and
- b) the receiving community may not have the skills required as outlined at the start of this section.

Implementing capacity building and skills development training programmes will benefit the community in the short term and long term. As people get trained their skills level and income will increase and their economic and material well-being will improve.



Obtaining skills will enable community members to find work at future construction projects or to do maintenance in the area, municipal area and the region. The creation of the opportunity to work and to receive training and skills development will cause more jobseekers to settle in the Kenhardt and immediate surrounding communities. This may cause societal tension and instability particularly if locals do not find work. Such jobseekers settling in Kenhardt, will increase the pressure on the provision of housing and services.

Future projects where employment can be obtained are the building of fully subsidized houses and similar solar parks or facilities. Given the Northern Cape's Solar Irradiance and climate, more of these projects will be proposed and developed.

**Operational Phase:**

After the solar facility has been completed, there is no direct skills development initiative as a result of the development. As mitigation measure(s) the solar facility should allocate part of its social contribution to a) skills development and should b) provide (fund) facilities (skills centres) or enhance existing facilities to promote the enhancement and offering of skills.

The contribution made during the operational phase is not rated as it is a residual impact.

A summary of the impact follows in table below.

<b>Impact</b>	<b>Skills development, training and capacity building are offered.</b>						
<b>Nature of Impact</b>	Skills base of local population expands and deepens. <b>Construction Phase</b> Skills levels and skills capacity will increase. Those with newly acquired skills may leave the area as new projects in surrounding areas are implemented or as outsiders may be employed to do the job. Job seekers may join the community and impact on safety and security and the stability of the society.						
<b>ALTERNATIVES</b>	<b>Preferred Local</b>				<b>No Go</b>		
<b>Phases</b>	<b>Construction</b>	<b>Operational</b>		<b>Demolition</b>	<b>All</b>		
<b>Extent of impact (A)</b>	Local	4	NA	NA	No impact	0	
<b>Duration of Impact (B)</b>	Long term	3	NA	NA	No impact	0	
<b>Probability of occurrence (C)</b>	Probable	2	NA	NA	No impact	0	
<b>Intensity of Impact(D)</b>	Moderately positive	2	NA	NA	No impact	0	
<b>Degree of confidence (E)</b>	Medium	2	NA	NA	No impact	0	
<b>Level of significance (AxBxD+E)xC</b>	Medium, positive	52	NA	NA	No impact	0	
<p>Mitigation measures during the <b>Construction Phase:</b> Requires contractor to</p> <ul style="list-style-type: none"> <li>• Reserve 90% of the unskilled jobs for local labour.</li> <li>• Apply mechanisms to enable locals to access jobs offered during the construction phase.</li> <li>• Offer formal and informal skills transfer:</li> <li>• Should skilled persons from outside the community be employed, the contractor appointed should offer formal and informal training and skills development programme to enhance the opportunities for local historically disadvantaged individuals in the construction industry. Measures should be put in place to ensure successful training and development i.e. structured job shadowing and learnerships. Such programmes should be offered in liaison with an accredited Further Education and Training College or</li> </ul>							

University of Technology.								
<b>Level of significance after Mitigation</b>	Intensity: High	76					No mitigation	0
<b>Residual impacts</b>	Skills drain in the Municipal area as people find work elsewhere. Others are afforded the opportunity to develop their skills instead of locals as locals may not have been afforded the opportunity to be employed.							

Table 5: Impact caused by skills development, training and capacity building, All Phases

### Construction Phase:

The impact of the skills increase is medium positive and this rating increases but stay medium positive after mitigation. Creating skills development opportunities for locals, irrespective of its significance, is viewed positive given the challenge of unemployment in the municipal area and in the province. Moreover skills development is a long term investment.

### c) Family Structure Change

As more family members find employment and contribute to the household income, the household structure may change.

### Construction, Operational and Demolition Phase:

Should no provision be made to break the cycle of hopelessness, youngsters will stay part of the household and unemployed.

Should youngsters' self-esteem stay high and the work environment enable them to keep their self-esteem high i.e. by developing skills, the youth become more employable and changes in family structure may take place i.e. releasing some family members to work and/or some to dedicate time to the family's wellbeing. This result, obtained over a longer period of time, will be indirect but positive.

## 3.2.2 Political, Social and Community Resources within Receiving Community

### a) Employment Opportunities

#### Construction Phase:

The average number of direct jobs the development will create over a period of two years is 286 per annum. During this period, 6% skilled, 38% semi-skilled and 56% unskilled employees are required. Ninety percent (90%) of the semi- and unskilled jobs should be reserved for locals.

Given the trend of employed, unemployed, discouraged work seekers and economically not active people in the Kai !Garib Municipality, the same trend should be found in Kenhardt. Of the 46 422 people of working age, 67% (30 949 people) are economically active (employed or unemployed but looking for work) and (32% people) 14 534 are not economically active. Of these that are of working age, 10% (4 642) are unemployed. A 10% unemployment rate for Kenhardt relates to 295 people of those that are economically active that does not have employment.

Of the 19 375 economically active youth (15 – 35 years) in the area, 10% (1 937) are unemployed.

A breakdown of the jobs generated during the construction of the proposed solar facility follows below

<b>No of jobs:</b>	<b>Contract duration</b>	<b>Skills levels Required</b>	<b>Value of employment opportunities/ jobs</b>	<b>Involvement of locals</b>
±286	24 - 36 months	160 unskilled 108 semi-skilled 18 skilled	R188 419 770 (36 months) R63 860 000 (12 months)	Moderate, locals may lack skills required and be mainly employed in unskilled jobs

Granting most (90%) of the unskilled and semi-skilled jobs to locals will limit the competition with “outsiders”. The employment of locals would have a highly positive impact on the economic and material wellbeing of the local and regional (Kai !Garib) community as the expected value of employment for these skill levels over 36 months is ±R179 million. Of this amount 90% or R160 829 793 (R160 million) should benefit the local and regional community over a three years (R53.6million per annum).

However, the employment of contract workers or outside job seekers may have an impact on the community stability and homogeneity. Conflict between locals and outsiders may be experienced given the unemployment rate (10% of employable population) in Kai !Garib Municipality.

The intensity of the impact on the local population will be measured according to the following scale:

	<b>Rating</b>	<b>Low</b>	<b>Medium</b>	<b>High</b>	<b>Very High</b>
<b>Local Level</b>	Number of jobs (286) (1% of employable population: 464)	0 - 4 642 (<10%)	4 643 – 9 284 (<20%)	9 285 – 13 927 (<30%)	>13 927+ (>30%)

The impact rates low as a number less than 1% of employable people, can be employed during the construction of the proposed solar facility whilst the unemployment rate is 10% (4 642). Of the total number of unemployed (4 642 or 10%) 6% could find employment for approximately two years or slightly more. At a local level as many as 241 out of 295 unemployed people could be employed. Therefore, the community rate creating jobs as highly significant.

#### **Operational Phase:**

The proposed development will generate 60 direct jobs (some full-time and some part time at regular intervals) that are maintenance related and will benefit the local community. As these jobs are few the impact rates as low (less than 1% of employable people). Again at a local level, the community rates creating jobs as highly significant given that 20% of the unemployed could find employment.

A summary of the impact follows in Table below.

<b>Impact</b>	<b>Employment is generated</b>			
<b>Nature of Impact</b>	<u>Some locals find employment</u> <b>Construction Phase:</b> 90% of 160 Jobs in the unskilled category and 108 Jobs in the semi-skilled category (thus 144 and 97) being created, will be earmarked for locals. <b>Operational Phase:</b> Jobs (60 or less) will be created, benefitting locals. The formal jobs will involve maintenance and cleaning the solar facility. <b>Demolition Phase:</b> None			
<b>ALTERNATIVES</b>	<b>Preferred Local</b>			<b>No Go</b>
<b>Phase</b>	<b>Construction</b>	<b>Operations</b>	<b>Demolition</b>	<b>All</b>

<b>Extent of impact (A)</b>	Local	4	Local	4	Local	4	No impact	0
<b>Duration of Impact (B)</b>	Short term	1	Long term	3	Short term	1	No impact	0
<b>Probability of occurrence (C )</b>	High Probable	4	Probable	2	Probable	2	No impact	0
<b>Intensity of Impact(D)</b>	High	3	Low, positive	1	Medium	2	No impact	0
<b>Degree of confidence (E)</b>	Medium	2	Moderate	2	Medium	2	No impact	0
<b>Level of significance (AxBxD+E)xC</b>	Moderate, positive	56	Low, positive	28	Low positive	16	No impact	0
<p>Mitigation measures <b>Construction Phase:</b></p> <ul style="list-style-type: none"> <li>Contractor should be required to employ 90% (241) local and at least 90% (217) of the locals should be HDIs. If there is a lack of suitably qualified people, skills transfer should be prioritized whilst construction is taking place.</li> <li>The municipality, local community and local community organizations should be informed of the project and potential job opportunities by the developer;</li> <li>The service provider database of local companies or individuals (including small businesses owned and run by HDIs that qualify as service providers of construction, catering, waste collection or site cleaning companies etc.) should be used by contractors to appoint service providers. Should a local company not be registered on the municipal service providers list, the contractor should assist such a company to register and comply prior with the commencement of the project. These firms should be invited to render services where required;</li> <li>Establish a Monitoring Committee for the construction phase in collaboration with representatives of the local community. The Monitoring Committee has to ensure that the EMPr is implemented and that any problems that arise and is associated with the construction phase, is addressed.</li> </ul> <p>Mitigation measures <b>Operational Phase:</b></p> <ul style="list-style-type: none"> <li>Jobs are reserved for youth.</li> <li>Youth are afforded an opportunity to enhance their skills and/ or improve their education.</li> <li>Youth are afforded opportunity to access start up or seed capital to establish own businesses.</li> </ul>								
<b>Level of significance after Mitigation</b>	Degree of confidence – High 3	60	Highly probable - 3	30	No mitigation		No mitigation	
<b>Residual impacts</b>								

Table 6: Impact of job creation: Construction, Operational and Demolition Phases

The increase in the number of jobs is positive, and the impact is of medium significance at a regional level and of high significance at a local level during the **construction** phase. The impact is of low significance regionally during the **operational phases** but of high significance locally as it is a long term impact. Mitigation for both phases enhances the impact yet its significance stays at the same level. During the demolition phase the impact rates low at regional level and medium at local level. No mitigation is proposed. The No go alternative has no impact. Some jobs are generated during the **Demolition Phase**, but the involvement of locals stay limited and the impact rates low.

## b) Increased use of Social Amenities and Municipal Services

### Construction Phase:

Health amenities, i.e. the local clinic, local doctors and regional ambulances will be utilized should a construction related accident happens. It is anticipated that any serious emergencies will be routed to Upington. However the likelihood of emergencies occurring is unlikely as national safety standards will be adhered to.

The temporary stay of the foreign construction team will add negligible pressure on the demand for services as they utilize basic services i.e. water, sewerage and electricity and refuse removal. However the use of services and health amenities will be minimal and the impact limited.

### Operational Phase:

As those employed during the operational phase are part of the community of Kenhardt there are no additional basic services required. No additional pressure should be added on services. The No Go alternative will have no impact.

A summary of the impact follows in Table below.

Impact	Demand for services increases							
Nature of Impact	Increased uptake of services and less reserves Demand for services may increase slightly and emergency capacity is required to cope with any construction related accidents.							
ALTERNATIVES	Preferred						No Go	
Phases	Construction		Operations		Demolition		All	
Extent of impact (A)	Local	4	NA		NA		No impact	0
Duration of Impact (B)	Short term	1	NA		NA		No impact	0
Probability of occurrence (C)	Probable	2	NA		NA		No impact	0
Intensity of Impact(D)	Low negative	-1	NA		NA		No impact	0
Degree of confidence (E)	Medium	2	NA		NA		No impact	0
Level of significance (AxBxD+E)xC	Low, negative	-4	NA		NA		No impact	0
Mitigation measures:								
<ul style="list-style-type: none"> <li>To adhere to international construction, health and safety standards and precaution measures.</li> <li>To provide health and social training for the project team and in the community which include HIV/AIDs awareness training.</li> <li>Foreign employees are restricted to limited work cycles and have to return home regularly.</li> </ul>								
Level of significance after Mitigation	Probability: Unlikely: 1	- 2					No mitigation	
Residual impacts	Dissimilar social practices (undesirable sexual behavior).							

Table 7: Impact caused by increased demand for services and amenities, All Phases

The impact of the temporary construction team on amenities, authority and municipal serves (Increased demand for basic services (water, electricity and sewerage)) is low. After mitigation it is unlikely that the construction phase will have an impact and the level of significance decreases as the impact neutralized. Kenhardt has couped with similar impacts on health amenities and municipal services during projects of the same scale. The No Go alternative will have no impact.

In future, additional pressure may be placed on community health services to deal with the consequences of dissimilar social practices (i.e. undesirable sexual behavior treating HIV/ Aids and teenage pregnancies) as nearly a

third of the population in Kenhardt is between 15 – 35 and thus youth. Young people are associated with higher risk and additional pressure may be put on the local clinic in the long term.

The project will not directly impact on, or address the housing need as, should locals be employed, no additional need for housing will be generated.

### **c) Increased traffic levels**

The proposed facility is located south West of Kenhardt on the Pofadder gravel road, off the R27. Sight distances along the Pofadder gravel road are adequate to allow safe use of the access to the site albeit the traffic statement.

- The total number of trips during the construction and operational phase in the AM and PM peak hours is 39veh/hour.
- The total number of trips that will be generated by the permanent work force during the operational phase in the AM and PM peak hours is 11 veh/ hour.

As the traffic generate will be less than 150 vehicles per peak hour a traffic impact assessment is not required.

#### **Construction Phase:**

During the construction phase, construction vehicles (graders, TLB's and cement trucks etc.) would be used that may impact and disrupt the daily living and movement patterns. However the increase of traffic on the road into Kenhardt will be restricted as several of the vehicles would stay onsite.

Vehicles transporting goods, materials and equipment would make use of the gravel road between the R27 and Pofadder and R27.

- It is anticipated that during the construction period 10 trips per day will suffice to deliver the necessary building materials. During an 8 hour day it will result to 2 or fewer vehicles per hour.
- Employees will be bussed to the site. Six (6) taxis will drop and pick up employees as will three (3) busses and nearly thirty (28) private vehicles.

It is unlikely that the increased traffic (39 veh/hour) will impact on the movement patterns of pedestrians.

An increase of 39 trips/ vehicles per AM and PM peak hour, constitutes low significance. The slow moving delivery vehicles (trucks with loads) could impact on road safety on the gravel road between the Pofadder and the R27 and the R27 itself. Road signs, erected to create awareness of the presence of the slow moving vehicles, will neutralize this impact.

No new public roads will be constructed and hence the proposed facility does not separate communities

#### **Operational Phase:**

During the operational phase maintenance vehicles would visit the solar facility. The increase of traffic on the R27 into Kenhardt and on the gravel road between Pofadder and R27 will be limited to 11 vehicle trips per AM and per PM peak hours. Half of the trips would be made by public transport i.e. taxis to transport the workforce whilst the other half would be made by private or company vehicles.

#### **Demolition Phase:**

During the demolition phase, slow moving vehicles would be used that may impact and disrupt the daily living and movement patterns. However the increase of traffic on the road into Kenhardt will be restricted as some of the vehicles would stay onsite. Vehicles transporting materials and equipment would make use of the R27 into Kenhardt and on the gravel road between Pofadder and R27.

It is anticipated that during the demolition a similar number of trips will be made to remove the demolished materials than during the construction phase to deliver the materials. Employees will be transported by minibus and by private vehicles. It is estimated that 11 vehicle trips transporting people and 8 – 10 vehicle trips to transport material, will be made during AM and PM peak hour totaling twenty –one (21) trips per day.

An increase of 21 trips per day constitutes low significance. The slow moving vehicles (trucks with loads) could impact on road safety on the R27 into Kenhardt and on the gravel road between Pofadder and R27. Road signs, erected to create awareness of the presence of the slow moving vehicles, will neutralize this impact. A summary of the impact follows in Table below.

It is unlikely that the increased traffic will impact on the movement patterns of pedestrians.

A summary of the impact follows in Table below.

<b>Impact</b>	<b>Increase in regular and heavy, slow moving traffic</b>							
<b>Nature of Impact</b>	<u>Disruption and changes in movement patterns and road safety.</u> <b>Construction Phase:</b> Traffic will increase 39 veh/h 2x per day. <b>Operational Phase:</b> Traffic will increase 11 veh/h 2x per day. <b>Demolition Phase:</b> Traffic will increase 21veh/h 2x per day (Similar to construction phase). The road infrastructure is capable of accommodating the additional traffic caused by heavy and slow moving construction and demolition vehicles and the general vehicles transporting people to and from work. Road signals will have to be upgraded to decrease conflicting situations and particular pedestrian safety.							
<b>ALTERNATIVES</b>	<b>Preferred</b>						<b>No Go</b>	
<b>Phases</b>	<b>Construction</b>		<b>Operations</b>		<b>Demolition</b>		<b>All</b>	
<b>Extent of impact (A)</b>	Local	4	Local	4	Local	4	No impact	0
<b>Duration of Impact (B)</b>	Short term	1	Long term	1	Short term	1	No impact	0
<b>Probability of occurrence (C)</b>	Probable	2	Probable	2	Probable	2	No impact	0
<b>Intensity of Impact(D)</b>	Medium, negative	-2	Medium, negative	-2	Medium, negative	-2	No impact	0
<b>Degree of confidence (E)</b>	Moderate	2	Moderate	2	Moderate	2	No impact	0
<b>Level of significance (AxBxD+E)xC</b>	Low, negative	-12	Low, negative	-12	Low, negative	-12	No impact	0
Mitigation measures <b>Construction and Demolition Phase:</b> <ul style="list-style-type: none"> <li>• Upgrade road signs to address the conflict that could be caused by movement.</li> <li>• Provide transport to and from work to decrease pedestrian traffic.</li> <li>• Restrict heavy vehicles to specific hours.</li> <li>• Erect road signs signaling times when heavy vehicles will make use of the road.</li> <li>• Adhere to national traffic safety standards and precaution measures.</li> <li>• During the construction phase the contractor has to provide a traffic safety awareness programme for all employees and the project team; the community and particularly kids.</li> </ul> Mitigation measures <b>Operational Phase:</b>								
<b>Level of significance after Mitigation</b>	None		None		None		No mitigation	
<b>Residual</b>	Increase in pedestrian traffic along R27 into Kenhardt and on the gravel road between							

<b>impacts</b>	Pofadder and R27 particularly during the demolition phase.
----------------	--

Table 8: Impact caused by Traffic, All Phases

**Construction and Demolition Phases:**

The intensity of the impact caused by the increase of traffic is of low significance but negative. Mitigation measures will decrease the negative experience.

The No Go alternative will have no impact.

**d) Crime**

The common crimes include substance abuse, theft and drunken driving. It is unlikely that crime will increase directly because of the construction of the proposed solar facility.

Irrespective of local or “others” be employed, there is the perception that increased crime, trespassing on the remainder of the farm, livestock and petty theft, human trafficking, littering, drunken driving and illegal vending may be experienced. The perception that crime will increase provides criminals, not the locals or employed outsiders, the opportunity to commit crimes.

During the **Construction and Demolition Phase**, theft of livestock is rated as of low significance and likelihood improbable should mitigation measures be fully implemented albeit the Agricultural Impact Assessment, Hanekom, 2018. As mitigation measures, fine structures should be introduced and these fines should reflect livestock value to ensure replacement value should theft occur. According to Hanekom, for every stock theft incident on a commercial farm, it is estimated that three similar incidents take place amongst emerging farmers, leaving them with empty kraals. Mitigation include demarcated work areas, security control and movement restriction limited to the site only.

All these measures should be included in the EMPr.

A summary of the impact follows in Table below.

<b>Impact</b>	<b>Crime increases</b>						
<b>Nature of Impact</b>	<p><u>Safety and security of the local community decrease.</u>          Whilst the material well-being of the community improves, the presence of contractors creates the opportunity for those who want to commit crime, to do so.          As more disposable income is at hand, other social ills such as substance abuse may increase.</p>						
<b>ALTERNATIVES</b>	<b>Preferred</b>					<b>No Go</b>	
<b>Phases</b>	<b>Construction</b>		<b>Operations</b>		<b>Demolition</b>	<b>All</b>	
<b>Extent of impact (A)</b>	Local	4	NA		NA	No impact	0
<b>Duration of Impact (B)</b>	Short term	1	NA		NA	No impact	0
<b>Probability of occurrence (C )</b>	Low probability	1	NA		NA	No impact	0
<b>Intensity of Impact(D)</b>	Low negative	-1	NA		NA	No impact	0
<b>Degree of confidence (E)</b>	Moderate	2	NA		NA	No impact	0
<b>Level of significance (AxBxD+E)xC</b>	Low, negative	-2	NA		NA	No impact	0
Proposed Mitigation measures: <ul style="list-style-type: none"> <li>• Fine structures for livestock theft</li> <li>• Restrict movement to inside the site.</li> </ul>							



<ul style="list-style-type: none"> <li>• Demarcate work areas which are safeguarded with a fence.</li> <li>• Keep security control to enter and exit premise.</li> </ul>							
<b>Level of significance after Mitigation</b>	None		NA		NA		No mitigation
<b>Residual impacts</b>							

Table 9: Impact caused by crime, Construction and Demolition Phases

The proposed solar facility may lead to increased crime and substance abuse and impacts slightly negatively on the receiving community. Although the probability is low, mitigation measures are proposed.

### 3.2.3 Health and Social Well-being

#### a) Increased noise and dust levels

##### Construction and Demolition Phase:

During construction, excavation activities for building foundations, trenches for cabling and piping contribute to the noise and dust levels. After preparation and during the building period noise will be generated by activities such as unloading and moving solar panels, steel frames and other components, construction and transport vehicles to and from the site along gravel roads, building and steel work, and the installation of services. On-site vehicle movement, delivery of materials and equipment and additional traffic will also create noise. These impacts will be of a local nature (surrounding solar facility) and for a limited period of time.

During demolition uprooting cabling and piping, removing solar panels and steel frames and on site vehicle movement may affect the noise and dust levels.

These impacts will be of a local nature (surrounding of the solar facility) and for a limited period of time.

##### Operational Phase:

Noise and dust will not be generated during the operational phase.

A summary of the impact follows in Table below

<b>Impact</b>	<b>Noise and dust levels increase.</b>						
<b>Nature of Impact</b>	<p>Health and well-being of the local population may be affected.</p> <p><b>Construction and Demolition Phase:</b>  Sporadic &amp; intensified dust &amp; noise levels may impact on the health of employees and inhabitants at the solar facility and may cause respiratory or psychological illnesses in the long term. However an increase in dust and noise levels will occur only during the construction period lasting for 24 – 36 months (2 – 3 years), which is short term. Dust and noise suppression can be applied as mitigation measures to maintain the standard of health for employees on site.  During the demolition phase lasting 9 months, which is short term, an increase in dust and noise levels will occur.  The location of the proposed solar facility is removed from the town environment and will not cause an impact on the receiving community.</p>						
<b>ALTERNATIVES</b>	<b>Preferred</b>						<b>No Go</b>
<b>Phase</b>	<b>Construction</b>		<b>Operations</b>		<b>Demolition</b>		<b>All</b>
<b>Extent of impact (A)</b>	Local	4	NA		Local	4	No impact 0
<b>Duration of Impact (B)</b>	Short term	1	NA		Short term	1	No impact 0

<b>Probability of occurrence (C )</b>	Probable	2	NA		Probable	2	No impact	0
<b>Intensity of Impact(D)</b>	Moderate, negative	-2	NA		Moderate, negative	-2	No impact	0
<b>Degree of confidence (E)</b>	High	3	NA		High	3	No impact	0
<b>Level of significance (AxBxD+E)xC</b>	Low, negative	-10	NA		Low, negative	-10	No impact	0
<p>Mitigation measures <b>Construction and Demolition Phase:</b></p> <ul style="list-style-type: none"> <li>• Dust creation must be controlled as per construction and demolition management and control code.</li> <li>• Noise creation should be controlled as per construction and demolition management and control code.</li> <li>• Appoint an Environmental Control Officer to supervise construction and building and demolition.</li> <li>• Adhere to the Environmental Management Plan (EMPr) for the Construction and Demolition Phase.</li> <li>• All workers and management must undergo an induction course for both phases.</li> <li>• Enforce strict operating hours for heavy vehicles and construction activities on site to reduce noise and dust impacts on adjacent landowners.</li> <li>• Implementation dust suppression measures;</li> <li>• Access must be on recognized routes.</li> <li>• Litter and littering must be strictly controlled.</li> <li>• All construction waste and building rubble must be removed off site.</li> </ul> <p>Mitigation measures <b>All Phases:</b></p> <p>Divert impact to make Kenhardt the focus point:</p> <ol style="list-style-type: none"> <li>Cover dirt roads in town with a natural looking material (not tar) to prohibit dust i.e. main street to Kaap Agri, Brussels street to old town precinct, Longlands Street.</li> <li>Plant indigenous and historic alien (that is currently part of the urban landscape) trees.</li> </ol>								
<b>Level of significance after Mitigation</b>	Intensity: low: -1	-2	NA		Intensity: low: -1	-2	No Mitigation	0
<b>Residual Impacts</b>								

Table 10: Impact caused by dust and noise, All Phases

### Construction and Demolition Phase:

The intensity of the impact of dust and noise is low negative and the significance low as the impact occurs over a short period of time and is removed from settlements and neighborhoods. Mitigation will neutralize the impact as the intensity decreases and the likelihood of the impact to occur becomes less.

The Operational Phase and No Go alternative have no impact.

### b) Change in sense of place

#### Sense of place

The proposed 300MW Photovoltaic Electricity Generation Facility with a total foot print of approximately 710ha comprises of the following elements which have a visual implication.

- Arrays of photovoltaic panels mounted on pedestals not exceeding a height of 2 meters from the natural ground level.
- The panels are arranged in blocks each with its own converter unit and step up transformer.
- Electricity generated is fed via the central point of connection (switch gear and protection infrastructure) to a new 132 Kv transmission line which is connected to substation feeding into the Aries substation.
- The array will be fixed at an angle to face in a northern direction. The front of the arrays will thus face towards the public road located north of the site.

- A 5m wide gravel road will surround each block and will be used to service and maintain infrastructure. A 4m wide gravel road will give direct access to the public road.
- Construction workers will be housed in temporary structures located  $\pm 2.5$ km to the west, on land previously used as a construction camp when the Shishen railway line was built.
- Materials and workshops to be housed in temporary containers that will be removed from the site.
- A security fence will be erected around the facility
- Security lighting may be installed.

The landscape (receiving environment) has a uniform character consisting of undulating plains with no prominent topographical features besides shallow drainage valleys and flat ridges and homogeneous grass and small shrubs cover. The landscape has a typical farmland character of uninterrupted openness and isolation, simply organized by minimal farming infrastructure. The landscape (receiving environment) around the site has a uniform character of undulating plains (No screening potential). Small stands of trees occur where it has been planted for example at the farmstead or near watering holes.

The Aries substation and associated transmission lines though, dominates the landscape and along with a recently constructed Photo-voltaic Electricity Generation Facility directed to the west of the Aries substation. It sets a precedent for large scale human intervention in the area and lowers the potential intensity of the visual impact considerably.

The following scenic resources are impacted upon:

- The highest point (965m amsl) is a ridgeline located  $\pm 10$ km to the south which is only accessible by the owners of the land.  
The only elevated area (940m amsl) is around the Aries substation which is located  $\pm 7$ km to the south west. The land on which the photovoltaic arrays will be located has north western slope towards the Graafwaters River, with an average slope of 0.8% - 1.5%.
- .Settlement pattern: There are no settlements within the visual catchment and only agricultural infrastructure i.e. fences, gravel farm roads and wind pumps are present. The Olyvenkolk farmstead  $\pm 500$ m to the west is the only habitable building in close proximity. The closest settlement is Kenhardt which is  $\pm 37$ km to the north east.
- As it is not enclosed by natural features, the view shed cannot be defined, it has expansive views in all directions. Consequently the facility will be visible and hidden depending on the location of the viewpoint in the landscape. The site is only visible two public roads: from the Kenhardt-Pofadder gravel road: restricted to 6km along the bypassing public road; after 10km the site will not be visible
- The site is not visible from the R27 (between Kenhardt and Brandvlei).
- The solar panels reflect sunlight which may attract birds as the reflection may be mistaken for water bodies and the extent of the reflection may be distractive for humans.
- The sense of place within the surrounding area will be significantly altered: From sheep grazing on the uninhabited site with no structures on the land to 710ha of land covered with PV photovoltaic arrays and three substations and a 132 Kv line that will follow the route of an existing powerline that will be relocated.
- A new sense of place will be created which will represent South Africa's attempt to address the challenges of climate change in a responsible and sustainable manner. This visual impact will therefore be experienced by many, including many who are sensitive to environmental issues as being positive.
- The impact is assessed to be of moderate significance with mitigation. The reason being the nature of the activity (low level) as well as the shape of the view catchment area and the fact that most receptors will be restricted to Pofadder-R27 to Kenhardt road. The implication will be that views from the road will be of short duration (travelers)). During the operational phase, activities on-site will be minimal i.e. maintenance and security.

- Mitigation measures as proposed will ensure that impact will be reduced.

**Demolition Phase:**

The sense of place will be restored to as before the solar facility was built. Should demolition not take place, the solar facility will degrade over time and cause a shabby appearance. The rating of the impact of the demolition phase is evaluating the event of the demolition not taking place.

A summary of the impact follows in Table below

<b>Impact</b>	<b>Changes in visual appearance and the sense of place</b>							
	The change of sense of place will impact on people's relationship to environment.							
<b>Nature of Impact</b>	<u>Changes in the quality of the living environment</u>							
	Construction: The sense of place within the surrounding area will be significantly altered. A new sense of place will be created which will represent South Africa's attempt to address the challenges of climate change in a responsible and sustainable manner.							
	Operations: The visual environment of the area will change as the impact is direct and additive. The solar panels reflect sunlight which may attract birds as the reflection may be mistaken for water bodies and the extent of the reflection may be distracting for humans.							
	Demolition The sense of place will be restored to as before the solar facility was built.							
<b>ALTERNATIVES:</b>	<b>Preferred</b>						<b>No Go</b>	
<b>Phases</b>	<b>Construction</b>		<b>Operational</b>		<b>Demolition</b>		<b>All</b>	
<b>Extent of impact (A)</b>	Local	4	Local	4	Local	4	No impact	0
<b>Duration of Impact (B)</b>	Short term	1	Long term	3	Long term	3	No impact	0
<b>Probability of occurrence (C)</b>	Highly Probable	3	Highly Probable	3	Probable	2	No impact	0
<b>Intensity of Impact(D)</b>	Medium, Negative	-2	High, Negative	-3	High negative	-3	No impact	0
<b>Degree of confidence (E)</b>	High	3	High	3	Medium	3	No impact	0
<b>Level of significance (AxBxD+E)xC</b>	Low	-	High	-	Medium	-		
		15		99		66		
<b>Mitigation measures Construction</b>								
<ul style="list-style-type: none"> <li>- Keep disturbed areas to a minimum;</li> <li>- No clearing of land to take place outside the demarcated footprint;</li> <li>- Buildings and similar structures must be in keeping with regional planning policy documents, especially the principles of critical regionalism, namely sense of place, sense of history, sense of nature, sense of craft and sense of limits.</li> <li>- Utilize existing roads and tracks to the maximum extent possible.</li> <li>- Outdoor lighting must be strictly controlled so as to prevent light pollution.</li> <li>- All lighting must be installed at downward angles.</li> <li>- Sources of light must as far as possible be shielded by physical barriers such as buildings or structures i.e. steel frames.</li> <li>- Use only minimum wattage light fixtures.</li> </ul>								

<p>Mitigation Measures Operational</p> <p>Apply the following development guidelines</p> <ul style="list-style-type: none"> <li>- The use of lighting is to be monitored over the entire life of the project to minimize light pollution. <ul style="list-style-type: none"> <li>• All lighting must be installed at downward angles.</li> <li>• Sources of light must as far as possible be shielded by physical barriers such as built structures.</li> <li>• Only minimum wattage light fixtures must be used.</li> <li>• A strict fire prevention policy must be implemented and monitored</li> <li>• Divert impact to make Kenhardt the focus point: <ul style="list-style-type: none"> <li>a) Amplify the Eucalyptus Trees at corner of Main and Lourens Street as a focus point;</li> <li>b) Link older precinct to one another i.e. Brussels street</li> <li>c) Plant indigenous and historic alien (that is currently part of the urban landscape) trees.</li> </ul> </li> </ul> </li> </ul>							
<p>Mitigation measures Demolition:</p> <p>Ensure that demolition is made a condition of development and form part of Environmental Management Programme</p>							
<b>Level of significance after Mitigation</b>	<i>Intensity Low:-1</i>	-3	Intensity Medium: 2	-63	Probability Unlikely: 1 Intensity Medium Positive: 2	27	No mitigation
<b>Residual Impacts</b>							

Table 11: Impact caused by Visual Changes, All Phases

**Construction, Operational and Demolition Phase:**

The intensity of the visual impact during construction is low and during the operational and demolition phases it is high negative and medium negative respectively. After mitigation, the impact during construction stays low negative and during operations and demolition change to medium negative and neutral. .

The restoration of the sense of place is rated as medium negative and should it be part of the Management Programme and stay a requirement, the restoration of the sense of place is low positive. The No Go alternative has no impact

At this time people associate Kenhardt with Dorper sheep farming country side, being barren and rugged. The successful installing of the solar facility will cause people to change peoples' relationship to environment as the proposed facility being the fifth biggest solar facility in Africa, will affect agriculture and its processes, structures and patterns.

Although it is not the only impact causing this change, it will have implications for social history of the affected communities. The social history of farmers and teams of men going off sheering sheep will change to energy production and teams of workers going off to clean the solar panels..

**Cumulative impacts:**

Renewable energy facilities tend to locate, close to existing substations and transmission lines. This facility is one of 7 photovoltaic electricity generation projects in the immediate vicinity of Aries substation, of which 3 has already been authorized and one built.

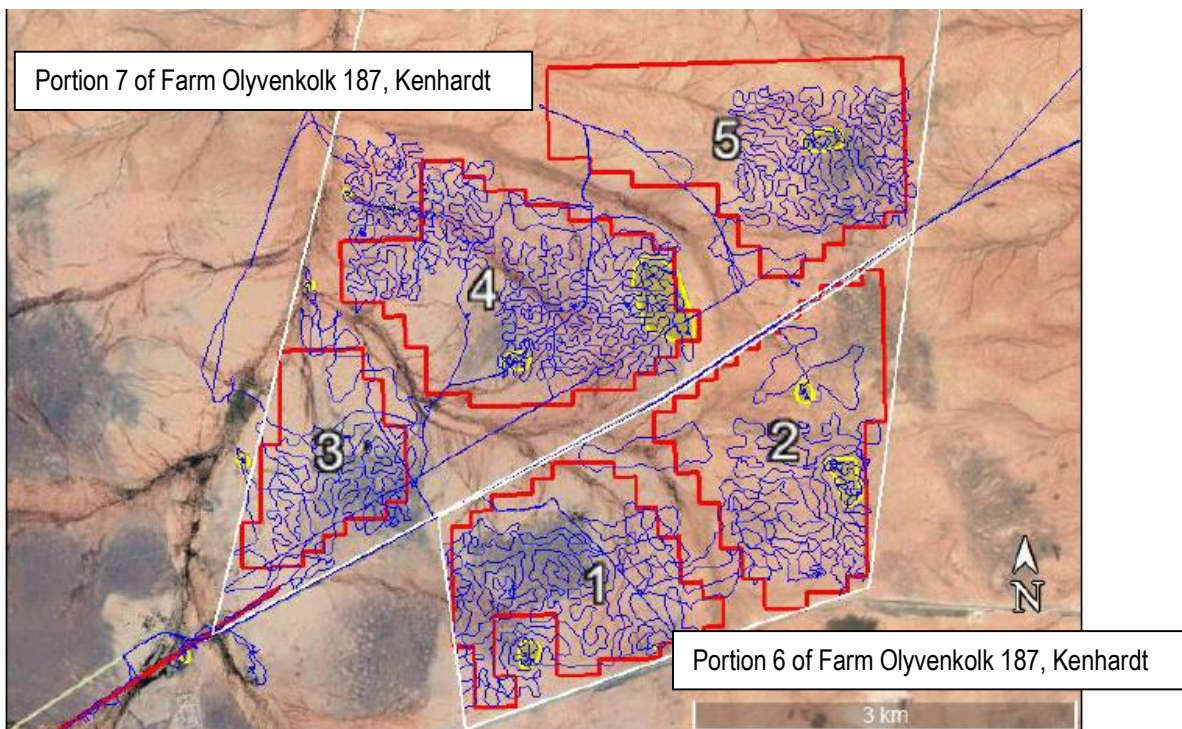
Should all 5 projects be implemented the intensity of the visual impact, from a local perspective would be higher as the visual character of a larger area will be affected. From a sub-regional perspective thought, the 5 facilities impact on the same view shed and will the visual impact not be significantly enlarged.

### 3.2.4 Economic and Material Well-being

#### a) Heritage Resources

##### Archaeological Resources on Portion 6 of Farm Olyven Kolk No.187, Kenhardt

A number of Later Stone Age sites lie along water courses whilst several all open Early (ESA) and Middle (MSA) Stone Age artefacts scatters are present across the proposed site. The significance of the archaeology of this area is connected to the very high density of large cutting tools (LCTs) found on the ESA scatters. Such densities are seldom recorded. Orton, J. ASHA Consulting, 2018. Letter regarding Final Layout of proposed solar energy facilities on Olyven Kolk Farm 6/187 and 7/187, Kenhardt



Aerial view of the wider study area showing Portions 6 and 7 (smaller and larger white polygons respectively), the survey tracks (blue lines) and the five PV blocks proposed for development (numbered red polygons). Sensitive archaeological sites are shown as yellow shapes. The following images show close-up views of each block.

Figure 6: High concentration of Archaeological Resources

##### Paleontology

“The site of the proposed solar facility is underlain at depth by glacial-related sediments of the Permo-Carboniferous Dwyka Group (Mzibane Formation) that are generally of low paleontological sensitivity. The main categories of fossils recorded from the Mbizane beds include a small range of interglacial trace fossils, petrified woods and other plant materials, palynomorphs and supposed stromatolites (the last possible spurios). Quaternary to Recent Aeolian sediments of the Gordonia Formation (Kalahari Group) as well as alluvial gravels and calcretes along shallow drainage lines and around pans, all of generally low palaeontoligical sensitivity, are also encountered near surface in the study area. Two billion year old granites and metasediments of the Namaqua-Natal Province crop out in a small portion of the study area but these rocks are unfossiliferous, and in any case will be directly affected by the proposed development.”

“The overall palaeontological sensitivity of the entire Olyvenkolk 187 (Portions 6 and 3) solar facility project area, including the various PV solar array site options as well as the associated 132 kV overhead transmission line corridor to Aries Substation, is assessed as Low. Small pockets of locally High sensitivity might occur along drainage lines and around any pans. Plio-Pleistocene calcretised gravel and finer – grained alluvium as well as calccrete handpans in these last settings might contain mammalian remains such as bones, teeth and horn cores in addition to abundant, low-density trace fossil assemblages but these are rare and inherently unpredictable.”

A summary of the impact follows in Table below.

<b>Impact</b>	<b>Inaccessibility and loss of heritage resources t</b>							
<b>Nature of Impact</b>	Loss historic cultural changes and tourism opportunities							
<b>ALTERNATIVES:</b>	<b>Preferred</b>						<b>No Go</b>	
<b>Phases</b>	<b>Construction</b>		<b>Operational</b>		<b>Demolition</b>		<b>All</b>	
<b>Extent of impact (A)</b>	Local	4	Local	4	Local	4	No impact	0
<b>Duration of Impact (B)</b>	Short term	1	Long term	3	Long term	3	No impact	0
<b>Probability of occurrence (C)</b>	Highly Probable	3	Probable	2 (1)	Highly Probable	3	No impact	0
<b>Intensity of Impact(D)</b>	Medium, Negative	-2	High, Negative	-3 (2)	High Negative	-3	No impact	0
<b>Degree of confidence (E)</b>	Medium	2	Medium	2	Medium	2	No impact	0
<b>Level of significance (AxBxD+E)xC</b>	Low	-18	Medium	-68	High	-99		
<b>Mitigation measures</b>								
<b>Archaeology</b>								
<ul style="list-style-type: none"> <li>- There are no archaeological resources within the development that required in situ conservation.</li> <li>- Archaeological mitigation of those areas that cannot be avoided is deemed acceptable. Mitigation would be via surface collection. All open Early (ESA) and Middle (MSA) Stone Age artefacts scatters would require mitigation because they fall within the development footprint area but are very easy to sample.</li> <li>- Later Stone Age sites that lie along water courses have been avoided.</li> <li>- A marked trail could be developed to access and view the resources telling the story of the different ages. Access to such a trail and opening it to the public are dependent on the security measures related to the facility and would best be place between the two boundary fences. Such an endeavor could become one of the local youth driven businesses.</li> </ul>								
<b>Palaeontology</b>								
Mitigation measure to safeguard any fossils exposed on site during the construction phase of the development area proposed:								
<ul style="list-style-type: none"> <li>- The ECO responsible of the development must remain aware that all sedimentary deposits have the potential to contain fossils and he should monitor all deeper (&gt;1m) excavations into sedimentary bedrock for fossil remains on an on-going basis. Should any remains be found, the prescribed and standard reporting procedure should be followed.</li> <li>- A chance-find procedure should be implemented so that: <ul style="list-style-type: none"> <li>• Work can be stopped</li> <li>• Reporting the discovery to provincial heritage resources</li> <li>• Specialist palaeontologist to inspect, record and sampled or collect the fossil remains.</li> <li>• Implement further mitigation measures</li> </ul> </li> </ul>								

<ul style="list-style-type: none"> <li>• Allow work to resume</li> <li>- During maintenance and servicing of infrastructure, if excavation is required, it shall be limited to the distributed footprint as far as practicable. Should bulk works exceed the existing disturbed footprint, SAHRA shall be notified.</li> </ul> <p>Mitigation during Demolition The trails and archeological site should be re-established (fenced) and rejuvenated as it is likely that it will operate as an isolated entity with the solar facility being removed.</p>							
<b>Level of significance after Mitigation</b>	<i>Intensity:</i> <i>Low: -1</i>	-6	<i>Probability</i> <i>Unlikely: 1</i> <i>Intensity:</i> <i>Medium</i> <i>positive: 2</i>	14	<i>Probability</i> <i>Probable: 2</i> <i>Intensity</i> <i>medium</i> <i>negative: -2</i>	-44	
<b>Residual Impacts:</b>							

Table 12: Impact on Heritage Resources, All Phases

The overall impact significance (pre-mitigation) of the proposed PV Solar Facility on Portion 6 of Farm Olyvenkolk 187 is low during construction, medium during operations and high during demolition. This assessment applies equally to all the PV solar array site options as well as the proposed 132KV transition line. There is no preference on palaeontological heritage grounds for any of the PV array site options or any particular transmission line route option to the Aries substation. The No-Go option (No PV facility) would have a neutral impact on local fossil heritage resources. Providing that the construction phase mitigation recommendations outlined below are followed through, there are no objections on palaeontological heritage ground to authorization of the proposed development.

Should the mitigation measures outlined above be adhering to, the impact significance of any phase on local archaeological and palaeontological resources are considered to be very low negative during construction, change to low positive during operations and change to medium negative during demolition. The impact changes to low positive during operations as access to leisure opportunities i.e. historical hiking trails is likely to improve. During demolition the impact changes to medium negative. The reason being that an archaeological trail is proposed that can be visited during operations and should the solar facility be removed, it is doubtful that the heritage resources alone will be a strong attraction.

Mitigation measure should be incorporated into the Environmental Management Plan (EMP) for the Olyvenkolk 187 (Portion 6 & 3) PV solar facility project.

## b) Water

### Water Use

**Groundwater** on the farm is the only water source. The borehole water on site is used for livestock and farming operations. During construction and operation water will be sourced from existing boreholes (and be registered under the National Water Act water use).

Kenhard's historic and trusted water sources, a borehole on the way to Brandvlei, had been supplemented by a waterline from Keimoes. Both sources suffer due to Eskom electricity supply interruptions when pumps cannot function. The water gear at the borehole is not in working order and has to be replaced.

**Surface water:** Rain water will run off the solar panels and naturally drain eastwards towards the drainage lines in between the solar panels. The design of the equipment and layout of the facility do not cause concentrated



rainwater runoff. The maximum height of the panels in operation would be approximately 5m and would allow some ground clearance for the free flow of surface water underneath the panels and for agricultural purposes where required.

Water usage by the solar facility is minimal. Cleaning would be undertaken using wet cloth as required. New self-cleaning technology is also investigated and will be implemented if feasible.

During Construction:

The proposed solar facility may affect the social environment in term of human needs (i.e. by affecting quality of the water): A Water Quality Management Report will be submitted as part of the EIA phase for approval to DWA for all water uses identified under the National Water Act.

During Operations: T

he Water Quality Management report will indicate all river tributaries that are located on the study site and design the proposed development in such a way as to minimise any impacts on the present water resources. Determine ground water use requirements

The study site is located in a very arid part of South Africa on a plain which slope gently (20m drop in 2 km) towards the north. This landscape is typical of the broader region and the pattern repeats itself every 30 km in any direction.

Several drainage lines drain the water collected on the site, which eventually feed into the upper catchment of the Graafwatersrivier, a non-perennial river north of the site.

### **Flood line Report Portion 6**

By calculating the 1:100 return period's peak flow at representative cross sections along the relevant water courses and plot the flood lines on a drawing. The proposed photovoltaic panels are located above the 1:100 year flood line. The risk of flooding and associated damage to the structures is low.

There is one main water course running across portion 6 and crossed the Saldanha-Sishen railway reserve and runs between Arrays precinct No 1 and 2 and drains into the Graafwater River. Minor water courses cross the site which is depicted by the thorns shrubs. The vegetation is mostly sparse grass and light thorn shrub growing in the watercourses. The uppermost soils on the site are very permeable, with the harder layers below being described as impermeable. The watercourses are partially overgrown with the thorn shrubs and in general are fairly straight with constant gradients with no natural or manmade ponds or dams.

Array precinct No 1 and 2 should be positioned at least 100m away from the centre line of the water course to be positioned well above the 1:100 year flood line. The terrain is generally flat (slope <1.3%). Sheet flooding will occur during abnormal high rainfall. The Sishen Saldanha railway line on the eastern border (upstream) acts as a cut off drain above the site. The railway reserve concentrates the storm water that crosses it into the water courses crossing the site. Array precincts 1 & 2 are located at least 300m away from the watercourse.

Photovoltaic panel installation is generally positioned at least 100m away from the centre line of the water course to be positioned well above the 1:100 year flood line. The terrain is generally flat (slope <1.5%). Sheet flooding will occur during abnormal high rainfall. Cut off drains can be constructed above the sites to divert storm water away from the sites to minimize the sheet flooding.

Panels are mounted on a frame structure anchored in the ground. This type of construction will allow free flow of surface water underneath the panels. Due to the gentle slope of the site, rapid surface water flow is not expected. The risk of flooding and associated damage in the area indicated for the panel installation is therefore low.

A summary of the impact follows in Table below

<b>Impact</b>	<b>Competing Uses of Water</b>							
<b>Nature of Impact</b>	Lack of water as domestic resource Competing uses i.e. industrial and agricultural can adversely affect water sources and availability for domestic use.							
<b>ALTERNATIVES:</b>	<b>Preferred</b>						<b>No Go</b>	
<b>Phases</b>	<b>Construction</b>		<b>Operations</b>		<b>Demolition</b>		<b>All</b>	
<b>Extent of impact (A)</b>	Local	4	Local	4	NA		No impact	0
<b>Duration of Impact (B)</b>	Short term	1	Long term	3	NA		No impact	0
<b>Probability of occurrence (C)</b>	Probable	2	Probable	2	NA		No impact	0
<b>Intensity of Impact(D)</b>	Medium, Negative	-2	High, Negative	-3	NA		No impact	0
<b>Degree of confidence (E)</b>	Medium	2	Medium	2	NA		No impact	0
<b>Level of significance (AxBxD+E)xC</b>	Low negative	-12	Medium	-68	NA			
<b>Mitigation measures</b> <b>Construction and Demolition Phase</b> <ul style="list-style-type: none"> <li>- Where required and applicable harvest rain water to clean panels</li> <li>- Use recycled/ grey water for dust suppression.</li> </ul> <b>Operational Phase</b> <ul style="list-style-type: none"> <li>- Implement self-cleaning technology</li> <li>- Where required and applicable harvest rain water to clean panels.</li> </ul> <b>All phases</b> <ul style="list-style-type: none"> <li>- Provide alternative energy to borehole on the way to Brandvlei (i.e. provide its own solar installation)</li> <li>- Refurbish the water gear at the borehole so that it can function</li> <li>- Manage and maintain the operation of the borehole as part of the management of the solar sites</li> </ul>								
<b>Level of significance after Mitigation</b>	Intensity: Low: -1	-4	Intensity Low Negative	-20	None		No mitigation	
<b>Residual impacts</b>								

Table 13: Impact caused by Water Use, all Phases

The impact of the proposed solar facility is low negative before and after mitigation during the construction phase. During operations, the impact is medium negative before mitigation and change to low negative after mitigation. The mitigation measures are neutralizing competing uses. The No Go alternative has no impact.

**Cumulative impacts:** Renewable energy facilities tend to cluster and locate close to existing substations and transmission lines. This facility is one of 5 photovoltaic electricity generation projects in the immediate vicinity of Aries substation, of which 3 has already been authorized and one built. Domestic water sources may come under pressure and may marginalize the local community. Should all 5 projects be implemented the cumulative impact on local people accessing water would be higher than from a sub-regional perspective as these activities is local and the 5 facilities is concentrated within a 30km radius..

### c) Soil and Ecological potential

#### Geotechnical Report

Geotechnical investigation of Portion 6 of Farm Olyven Kolk 187:

The proposed sites have a low risk of flooding and seismic activity in the area is limited. Ground movement is less than approximately 50cm/s with a 10% probability of exceeding this limit in 50 years.

The agricultural potential of the sites is low is suitable for limited grazing only, mainly due to the harsh climate, shallow soils and low annual rainfall

The soil pH ranges between 6.4 and 6.9. The soils are therefore slightly corrosive. Conventional galvanising should be sufficient to protect critical elements in contact with the ground from corrosion.

The soil profile over the study area can be described as a loose to medium dense sand in the upper layer and generally underlain by dense to very dense calcareous pedogenic layers that disintegrate into coarse gravel during excavation.

Only four of the twelve trial pits could be excavated down to 1 600mm (Portion 6) by the digger loader. For the rest of the trial pits, the depth varied to refusal varied from 250mm to 1600mm and could only be excavated to 300mm before machine refusal or weathered rock. An excavator should however be able to excavate through this layer.

Although the anchoring method (foundation screws or steel piles) for the solar panels is still to be determined, the dense nature the soil poses the question whether the anchors will be able to penetrate the very dense material. The average depth to weathered rock for this portion (Portion 6) is approximately 1 000mm deep. We propose that additional tests be conducted by the specialist contractor responsible for the design and installation of the anchors. Alternative foundations designs should be investigated for areas where the weathered rock is shallow.

The study area is considered to be suitable from a geotechnical perspective for the proposed development of a solar power facility.

### **Ecological processes:**

The proposed solar facility will impact on ecological processes in the following way:

#### **Alteration of habitat structure and composition**

- Construction:
  - a) Increased shading as a consequence of –PV arrays cause plant community structures to change as water and sunlight availability change
  - b) because of surface drainage patterns on account of construction activities leading to change in plant communities:
    - o Ousting of fauna through anthropogenic activities, disturbance of refugia and general change in habitat.
    - o Changes in the geomorphological state of drainage lines as hydraulic changes arise within the catchment.
- Demolition:
  - a) A reversion of present state of the faunal population within the study area

#### **Alteration of ecological processes**

- a) as certain fauna is excluded inherent to functional state of land within PV facility:
- b) changes in edaphics (soils) on account of excavation of soils, leading to the alternation of plant communities and fossorial species in and around these points lead to loss on indigenous vegetation and habitat.
- c ) Changes to the Pan/ Wetlands

#### **Alteration in fauna and faunal behavior**

- a) Increased electrical light pollution (ELP), leading to changes in nocturnal behavioural patterns amongst fauna.
- b) Exclusion or entrapment of in particular large fauna, on account of the fencing of the site: habitat change.
- c) Alteration of ecological processes on account of the exclusion of certain fauna, inherent to the functional state of the land within the PV facility. The fencing of the site, possibly with electric fencing, lead to the exclusion of certain species and possible mortalities.

**Avifauna Impacts: Bird fatalities and Habitat loss/ alteration**

- a) Collusion with powerlines and electrocution (whereby a bird perches on an electrical structure and causes an electrical short circuit by bridging the gap between live components and or live and earthed components)
- b) Attraction and/ or collision with solar panels as panels will reflect sunlight may be mistaken for water bodies.

A summary of the impact follows in Table below

<b>Impact</b>	<b>Alteration of soil profile and ecological processes</b>							
<b>Nature of Impact</b>	<p><b>Geotechnical condition will not change:</b>  The agricultural potential will stay suitable for limited grazing, due to the harsh climate, shallow soils and low annual rainfall  The arrays of the proposed facility have to be anchored. To prohibit corrosion steel frames have to be galvanized. The dense nature of the soil cause alternative foundations designs to be investigated for areas where weathered rock is shallow.</p> <p><b>Ecological processes will alter as:</b>  Water (drainage) and sunlight (shading) availability change and <b>habitat structure and composition alter.</b>  Changes in soils leading to loss of vegetation and habitat <b>alter ecological processes.</b>  i.e. nocturnal patterns, exclusion or entrapment <b>alter fauna and faunal behavior.</b>  as collusion with powerlines, solar panels (mistaken for water) and electrocution cause <b>bird fatalities.</b></p>							
<b>ALTERNATIVES</b>	<b>Preferred</b>					<b>No Go</b>		
<b>Phases</b>	<b>Construction</b>		<b>Operations</b>		<b>Demolition</b>	<b>All</b>		
<b>Extent of impact (A)</b>	<i>Local</i>	4	<i>Local</i>	4	NA		No impact	0
<b>Duration of Impact (B)</b>	<i>Short term</i>	1	<i>Long term</i>	3	NA		No impact	0
<b>Probability of occurrence (C)</b>	<i>Probable</i>	2	<i>Probable</i>	2	NA		No impact	0
<b>Intensity of Impact(D)</b>	<i>Low, Negative</i>	-1	<i>Low, Negative</i>	-1	NA		No impact	0
<b>Degree of confidence (E)</b>	<i>Moderate</i>	2	<i>Moderate</i>	2	NA		No impact	0
<b>Level of significance (AxBxD+E)xC</b>	<i>Low negative</i>	-2	<i>Medium</i>	-20	NA		No impact	0
Proposed Mitigation measures:								
<b>Geotechnical</b>								
Conventional galvansing of steel frames and pedestals should be applied to protect critical elements in contact with the ground from corrosion.								
<b>Alteration of habitat structure and composition</b>								

- Non-perennial (Graafwater River Portion 6 and 7) and others and pan should be avoided and a no go buffer of 100 m should be applied.
- Staff and Vehicles to be kept off pan and restricted movement otherwise i.e. keeping on existing roads.
- Prohibit propagate alien plant species / weeds during construction
- Introduce plant rescue operations
- Introduce weed control
- Conduct a fauna and avifauna sweep of site
- Maintain vegetation and avoid “blading” clearance.

**Alteration of ecological processes**

- Provision of critter paths within the fencing to be provided (include during design).
- Promote and support faunal presence and activities within the proposed PV facility.
- Ripping of compact soils when and where extensive compaction arises.

**Alteration in fauna and faunal behavior**

- Reduce level of lighting and placement of lighting to be judiciously considered at time of implementation
- Ensure that live electrical fence wire is not placed at ground level.
- Conduct regular daily inspections of the fence line to address any animals that may be affected by the fence.

**Avifauna Impacts: Bird fatalities and Habitat loss/ alteration**

- Non-perennial Graafwater River and pan should be avoided and a no go buffer of 100 m should be applied.
- Staff and Vehicles to be kept off pan and restricted movement otherwise i.e. keeping on existing roads.
- Prohibit propagate alien plant species / weeds during construction
- A site specific avifaunal walk through should be conducted by a qualified ornithologist as part of the site specific EMP just prior to construction, as to ensure that no sensitive bird species have started breeding on or near the site. In such a case mitigation measure should be designed.
- For birds nesting during operations, a case by case basis should be followed including the application to the provincial authority for permits for any necessary nest management.
- Facility lighting during construction should be kept to a minimum and should make use of latest technology to ensure light disturbance is minimized. This will also reduce attraction of insects ( and in return insectivorous birds) to the facility.
- Construct powerlines in exiting and approved servitudes and routes

<b>Level of significance after Mitigation</b>	<i>Intensity: None</i>	0	<i>Intensity: None</i>	0				
<b>Residual Impacts</b>								

Table 14: Impact on Geology and Ecology, All Phases

As there will be no change in soil structure and limited impact on ecology including avifauna, local’s access to natural resources i.e. water will not change and processes, structures or patterns that are valued as part of social history of an area will not be affected the impact is low negative and neutralizes.

**d) Soil and Agricultural potential**

The proposed development is located on land zoned and used for agriculture and associated with sheep farming. The soil has a very low agricultural potential and cultivation is unlikely. However it is suitable for low intensity grazing and has a small stock carrying capacity of 12ha per small stock unit.

The full farming concern totals 7011ha of land grazing 600 ewes. Should all the PV facilities be constructed, ±2000ha will be lost to agriculture and sheep farming. The remaining 5011ha and will be able to stock 417 ewes. The income generated from the PV facility will however be much more than the income generated from the ewes and the farming concern will stay financially viable

Impacts identified can be effectively mitigated and are unlikely to result in significant agricultural and environmental impacts. The environmental management plan must deal with the mitigation measures described in the Agricultural potential report and rehabilitation of the area at the decommissioning phase should be a condition of approval and operation. The rating of this phase is based on the likelihood of the decommissioning being implemented.

A summary of the impact follows in Table below:

Impact	Agricultural potential changes
<b>Nature of Impact</b>	<p data-bbox="544 869 852 898"><u>Change of economic sector.</u></p> <p data-bbox="544 902 815 931">Impacts occurring during</p> <p data-bbox="544 936 783 965"><b>Construction Phase:</b></p> <ul style="list-style-type: none"> <li data-bbox="544 969 1356 1272">- Theft of livestock during construction and decommissioning phases. Rated as low significance and likelihood improbable should mitigation measures be fully implemented. Fine structures in the EMP should reflect livestock value to ensure replacement value should theft occur. According to Hanekom, for every stock theft incident on a commercial farm, it is estimated that three similar incidents take place amongst emerging farmers, leaving them with empty kraals. Mitigation include demarcated work areas, security control and movement restriction to the site only are proposed.</li> <li data-bbox="544 1276 1356 1406">- Disturbance from access roads used and workers' camp for construction can be limited by keeping to existing roads and fencing workers' camps. Good management of personnel and construction sites can significantly reduce potential impacts on agriculture.</li> <li data-bbox="544 1411 1356 1507">- Fire hazards, It is not a fire driven ecological system and has no veld fire history. Mitigation is limited to the requirements of the National Veld and Forest Fire Act No 101 of 1998.</li> <li data-bbox="544 1512 1356 1608">- Land potentially removed from future Land Reform applications: As 20% of the Solar Facility will be BEE owned, agricultural land for non-agricultural enterprises will be redistributed, an indirect impact.</li> <li data-bbox="544 1612 1193 1641">- Disturbances of and impacts on ESKOM power supply</li> </ul> <p data-bbox="544 1646 767 1675"><b>Operational Phase:</b></p> <ul style="list-style-type: none"> <li data-bbox="544 1680 1356 1753">- Effect of zero sunlight on specific areas – unlikely to occur as sunlight can penetrate in between the panels.</li> <li data-bbox="544 1758 1356 1917">- Water runoff from panels and site into adjacent environment: Monitor erosion and maintain site after construction rehabilitation. Site is a flat plain (20m drop in 2km) and small drainage lines will be impacted. Water runoff from panels will penetrate soil and runoff will be reduced by the vegetation cover.</li> </ul>

	<ul style="list-style-type: none"> <li>- Fire</li> <li>- Sense of place</li> <li>- Impact on existing agricultural activities: The proposed facility will improve the economic viability of the agricultural land unit. The agricultural entity consist of 6 units 7011ha in extend. This land carries 600 ewes and has a carrying capacity of 12ha per small stock unit. Ten percent (10%) or 710ha of Portion 6 of Farm Olyvenkolk 187, Kenhardt will be sterilized by the solar facility. Overall (7011ha), there will be sufficient land left (5011ha) to accommodate the 417 ewes.</li> <li>- Disturbances of and impact on Eskom power supply will only happen when the facility is connected to the Eskom network and during maintenance. Eskom's communication network should be used to inform regular users.</li> </ul> <p><b>Decommissioning Phase:</b></p> <ul style="list-style-type: none"> <li>- Removal of equipment and rehabilitation of impacts: Waste could include glass and silicon and both should be removed.</li> <li>- Waste removal and waste management of panels, electrical wires, concrete and metal</li> </ul>							
<b>Phases</b>	<b>Construction</b>		<b>Operations</b>		<b>Demolition</b>		<b>All</b>	
<b>ALTERNATIVES</b>	<b>Preferred</b>						<b>No Go</b>	
<b>Extent of impact (A)</b>	Local	4	Local	4	Local	4	No impact	0
<b>Duration of Impact (B)</b>	Short term	1	Long term	3	Long term	3	No impact	0
<b>Probability of occurrence (C)</b>	High probability	3	High probability	3	Probable	2	No impact	0
<b>Intensity of Impact(D)</b>	Medium negative	-2	Medium negative	-2	Medium positive	2	No impact	0
<b>Degree of confidence (E)</b>	High	3	High	3	Moderate	2	No impact	0
<b>Level of significance (AxBxD+E)xC</b>	Low, negative	-15	Low, negative	-2	Medium, positive	56	No impact	0
Proposed Mitigation measures: None								
<b>Level of significance after Mitigation</b>								
<b>Residual impacts</b>	Change of economic sectors contributing to the GDP							

Table 15: Impact on Agricultural potential, all Phases

The impact on the agricultural potential of the farm is low negative during construction and operations whilst it turns to medium positive after demolition. The No Go Alternative has no impact.

**Cumulative impacts:**

This facility is one of 5 photovoltaic electricity generation projects in the immediate vicinity of Aries substation, of which 3 has already been authorized and one built. Should all 5 projects be implemented the intensity of the impact on agriculture (extent of the land being taken out of agriculture), from a local perspective would be higher than for the region and overall. The limited agricultural potential and cultivation of the area caused by poor and very shallow soils conditions reduced the significance of loss of topsoil (as covered by the solar panels). The low slope gradients reduce the significance of potential erosion impacts. Irreplaceability of resources is considered low

because the resource that is being impacted is non-arable, low potential grazing land which is not a scarce resource in the area, region or country. In the long term, the solar facilities will impact cumulatively on the social history of the area as it will affect agriculture and its processes, structures and patterns that area values as part of the social history of the area.

However, food production and protection of agricultural land is a high national priority. Hence nationally minimal and low impact on agriculture resources is a prerequisite of the country's renewable energy development strategy and regions such as this one, match the criteria. It is preferable to incur a higher cumulative loss (given the extent) in the region, than to lose agricultural land with a higher production potential elsewhere in the country.

### e) Increased household income

#### Construction and Operations Phase:

The average household income of Kai !Garib and Kenhardt is low as 65.3% and 74% of the households respectively earns R42 000 (maximum R3 500 per month) and less, whilst 28.2% and 19.6% earns between R42 001 and R 180 000 (maximum R15 000 per month) and 6.6% and 6.15% earn more than R15 000 per month

Annual household income	Kai !Garib Percentage	Kenhardt Percentage
below R42 000	65.3%	74%
between R42 001 and R180 000	28.2%	19.6%
above R180 001+	6.6%	6.15%

During **Construction**, a wage bill of R146 million (R48 726 000 per annum) over three years will benefit the locals directly. [R188 million wage bill – skilled wages and 10% of semi- and unskilled]

During **Operations**, the expected current value of direct employment for the first ten (10) years is R132 million of which 90% or R119 million rand will benefit previously disadvantaged individuals. Households may now have an income or additional income. Overall household income increases.

During **Demolition**, household income for families at the lower end of the income range will “increase” as the wage bill will be close to R64 million. The sales of the demolished material will contribute to the income of the lower end of the income range households.

(% of total households)	Construction – 3 years	Operations – 20 -30 years	Demolition – 1 year
Semi-skilled – Middle income	97 (8%) <sup>1</sup>	8 (0.7%)	97 (8%)
Unskilled – Low income	144 (12%)	11(0.9%)	144 (12%)
Kenhardt	4 843 population	1 167 households	
Kai !Garib	65 869 people	16 703 households (of which 2076 are rural)	

The No Go option will have no impact.

Impact	Increase in household income
Nature of Impact	<u>Improved standard of living</u> <b>Construction and Demolition Phase:</b>

<sup>1</sup> (% of total households)



	<p>The 241 members of households that found employment as a result of the proposed solar facility development will benefit as there will be a stable and most likely increased income for 24 – 36 months (construction) or 12 months (demolition). The increased income has disposable component varying between R7200 and R4 320</p> <p><b>Operational Phase:</b> The 57 member(s) of households will be employed to maintain and to keep the solar facility clean for 20 - 30 years. The increased income has disposable component of R7200 and R4 320 in the first 10 years.</p>							
<b>ALTERNATIVES</b>	<b>Preferred Local</b>						<b>No Go</b>	
<b>Phases</b>	<b>Construction</b>		<b>Operations</b>		<b>Demolition</b>		<b>All</b>	
<b>Extent of impact (A)</b>	Local	4	Local	4	Local	4	No impact	0
<b>Duration of Impact (B)</b>	Short term	1	Long term	3	Short term	1	No impact	0
<b>Probability of occurrence (C)</b>	Probable	2	Highly Probable	3	Probable	2	No impact	0
<b>Intensity of Impact(D)</b>	High, positive	3	Medium, positive	2	High, positive	3	No impact	0
<b>Degree of confidence (E)</b>	Medium	2	Medium	2	Medium	2	No impact	0
<b>Level of significance (AxBxD+E)xC</b>	Low, positive	28	Medium, positive	78	Low-, positive	28	No impact	0
<p>Mitigation measures <b>Construction Phase:</b> Reserve jobs for locals and vulnerable groups i.e. women.</p> <p>Mitigation measures <b>Operations Phase:</b></p> <ul style="list-style-type: none"> <li>• Developer and contractor to liaise with existing or future projects to enhance employment opportunities for locals.</li> <li>• Limit employees to locals only.</li> <li>• Offer training to develop employee's skills levels.</li> </ul>								
<b>Level of significance after Mitigation</b>	None		None		None		No mitigation	
<b>Residual Impacts</b>								

Table 16: Impact on household income, All Phases

### Construction and Operational Phase:

The operation of the proposed solar facility will impact moderately positively on the income of some local households as a member(s) of these households find employment. The construction and demolition phases impact low positively on the household income of the regional community but highly positively on the income of the local community. The No Go option will have no impact.

### f) Increased Sales and GGP

The improvement of the economy will be measure by the change in Gross Geographical Product (GGP) of the Kai !Garib Municipality. The proposed development's contribution will be spread over 3 years resulting in a contribution less than 1% to the Northern Cape GGP of R90 883 million (2016). Sales increase also as the increase in household income also results in more disposable income in the region.

Intensity of the change in sales will be measured according to the following scale:

<b>Rating</b>	<b>Low</b>	<b>Medium</b>	<b>High</b>	<b>Very High</b>
<b>% change to Sales output</b>	<b>&lt;10%</b>	<b>11% - 30%</b>	<b>31% - 50%</b>	<b>51%+</b>

Intensity of the change in GGP will be measured according to the following scale:

<b>Rating</b>	<b>Low</b>	<b>Medium</b>	<b>High</b>
<b>% change to GGP output</b>	<b>&lt;3%</b>	<b>3% -6%</b>	<b>&gt;6%</b>

**Construction and Demolition Phase: Increased Sales**

During the construction phase, the general project purchases i.e. construction materials and fuel will be purchased locally. Domestic purchases, such as food, liquor and health services will also be purchased in Kenhardt. This will cause the sales volumes (direct and indirect) to increase. Most of the building materials will be purchased regionally. The increased regional sales are not assessed, only sales at a local level.

As Kenhardt may not have all the facilities, people may tend to go shopping or purchase services and stock in regional centers such as Upington. This would lead to the dilution of sales in Kenhardt, lost to the district (Upington) and beyond (the region and SA). Effort should be made to keep the sales in the region (ZF Mgcawu) and not to lose these sales to outside the region. Appropriate mitigations measure should be explored

**Operational Phase: Increased small businesses**

Changes to the local economy will be measured through increased activities i.e. small businesses initiatives and tourism opportunities. Investment should focus to build small businesses and tourism activities which are linked to the generation of alternative energy. This will benefit the local economy in Kenhardt and its immediate surroundings in the long term.

The local economy will benefit as households will have more spending money (disposable income). As it is most likely that the income generated will benefit those at the lower end of the income range, local sales and indirectly GGP will increase slightly. The No Go alternative cause the status quo to remain and no changes will be experience in sales or GGP.

A summary of the impact follows in Table 6 below.

<b>Impact</b>	<b>Sales volume and GGP will increase</b>							
<b>Nature of Impact</b>	<u>GGP &amp; Sales increases</u> Direct and indirect sales volume will increase due to increased disposable income. Sales will be diluted to the benefit of the region. The Number of small businesses operated by locals, increase. The GGP increases slightly given the capital expenditure during the construction phase.							
<b>Related impacts</b>	None							
<b>ALTERNATIVES</b>	<b>Preferred</b>						<b>No Go</b>	
<b>Phases</b>	<b>Construction</b>		<b>Operations</b>		<b>Demolition</b>		<b>All</b>	
<b>Extent of impact (A)</b>	Local-Regional	2	Local	4	Local-Regional	2	No impact	0
<b>Duration of Impact (B)</b>	Short term	1	Long term	3	Short term	1	No impact	0
<b>Probability of occurrence (C)</b>	High Probable	3	Probable	2	High Probable	3	No impact	0
<b>Intensity of Impact(D)</b>	Moderately positive	2	Moderately positive	2	Moderately positive	2	No impact	0
<b>Degree of confidence (E)</b>	Medium	2	Medium	2	Medium	2	No impact	0
<b>Level of significance (AxBxD+E)xC</b>	Low	18	Low	52	Low	18	No impact	0
Mitigation measures <b>Construction and Demolition Phase:</b>								
<ul style="list-style-type: none"> <li>Contractor should be directed by tender criteria to purchase locally and to make use of local service</li> </ul>								

providers.

- Spending money locally purchasing from locals and South African should benefit employees. The proposed development should leverage discount in the local economy of the municipal area and employees should be made aware of it.
- Small business should be supported (i.e. skills training, assistance and guidance to set up small businesses) and joint ventures with previous disadvantaged persons should be promoted.
- The promotion of joint ventures between small business (owned by previous disadvantaged persons) and more established business should be encouraged.

Mitigation measures **Operational Phase:**

- The promotion of joint ventures between small business (owned by previous disadvantaged persons) and more established business.
- Implement formal small business training and mentoring programmes.
- Strengthen access to resources to build tourism sector.
- Market the tourism opportunities the solar facility offer and create links with other tourism activities through the local tourism office and its website.
- Develop a plan to intensify tourism
- Provide space for a tourism market (selling local hand crafts and food) at Eucalyptus Trees at corner of Main and Lourens Street
- Enhance social space around tree i.e. similar to Evita's Paronne: Community Garden and tourism market
- Celebrate the history of Bushmanland as part of this space.

<b>Level of significance after Mitigation</b>	Confidence, High: 3	21	Confidence, High: 3	54	Confidence, High: 3	21	No mitigation	
<b>Residual impact</b>	None							

Table 17: Impact on Sales, All Phases

The impact on local and regional sales and GGP is low, but positive. Mitigation measures may prohibit sales to be diluted and benefitting the country (outside the region). Mitigation measures will benefit the region and Kenhardt changing the impact during operations, which is far less intense, to be moderate. The No Go alternative has no impact.

### 3.3 No Go Alternative

The No-Go Alternative would lose an opportunity for the region and the Northern Cape to generate alternative energy. Losing the opportunity to be home to the fifth biggest solar facility in Africa will in turn have consequence such as:

- c) The loss of employment opportunities generated during construction and operations.
- d) The loss of economic opportunities generated by small businesses and tourism.

### 3.4 Residual Impacts

#### 3.4.1 Residual: Women and young people's self-esteem improves

Youth and women may be overseen for employment as they may not have the skills and experience to do the work. Therefore it is most likely that fewer young people and women will be employed as part of the local labour component.

In the Kenhardt there are slightly more female than males than in comparison with Kai !Garib where there are more males (in the age group 15 to 44 there are 4.4% more males than female): From ages birth to 14 there are slightly less (0.6%) males than females, whilst in the age group 15 to 44 there are 0.3% less males than female. After 44 years of age the number of males is 5.2% less than the number of females. There are slightly less males than females as more (5%) females survive after 45 years of age. Nearly half (46.3%) of households are female headed households. Of note is that there are 46.3% of female headed households in Kenhardt and 34.6% female headed households in Kai !Garib.

Equally young people have little to aspire to as employment would most likely be limited to entrance level jobs. This is reflected by the high youth unemployment rate (10%) in relation to the unemployment rate of 10%. Of the 286 jobs per annum, the demographics of the population should be reflected and 70% of the jobs should be earmarked to be taken up by people younger than 35 years of age. Job reservation for youth and women is a mitigation measure to improve the social wellbeing of the community and will enable the youth of Kenhardt to take advantage of employment opportunities associated with this development as youth may have to compete with more appropriately qualified applicants from elsewhere.

Women's options to earn money are directed by institutional arrangements i.e. social grants and how the community views them and that is to have a child to obtain a social welfare grant.

Through employing the youth and women, several indirect social aspects are impacted for example

- improved cohesion within the community of Kenhardt, and
- less reason to pursue social ills and
- distributing income and consequently addressing inequalities (gap between rich and poor).
- It is likely that teenage pregnancies and dependencies i.e. substance abuse will decrease.

In general there is a concern that job reservation could be manipulated by officials within the local authority as it is highly likely that the developer will approach the municipality to access the labour market. Members of a specific political party could be promoted by local authority. The likelihood of this happening is probable, but it will not impact the number of jobs created or on the increase household income. Standard procedures have to be put in place with an appropriate monitoring mechanism that can prohibit the probability.

Job reservation for the youth and women will cause the youth and women to have improved self-esteem (amongst them and within the community). This improved self-esteem initiated and generated during the construction phase should be maintained and strengthened. As job opportunities would be limited during the operational phase, the solar facility should support a service to assist youth to access job opportunities within other significantly contributing economic sectors i.e. tourism and government services (municipal workers). To ensure that the project's impact would reach beyond the construction phase, bursaries and seed capital for entrepreneurs should be made available and an education and skills facility should be established to afford youngsters and women the opportunity to improve their future options. These opportunities and enabling youngsters and women to pursue them, will enhance self-esteem.

The rating applied will be project specific.

A summary of the impact follows in Table below.

<b>Impact</b>	<b>Women and young people's self-esteem improves.</b>
<b>Nature of Impact</b>	<b>Job reservation for youth and for women provides them with a different meaning of their role in society.</b>

	<p><b>Construction Phase:</b> Young people and women often do not have the skills and experience and are excluded from the local labour component. Should young people and women be employed it may assist to break the cycle of hopelessness. The self- image of the youth and women improves as well as the way the community views them. Demographically 70% young people should be employed by the proposed solar facility.</p> <p><b>Operational and Demolition Phase:</b> Youth's and women's improved self-esteem stays in tact as their skills levels and education improves and young and female entrepreneurs have access to start-up capital.</p>							
<b>ALTERNATIVES</b>	<b>Preferred</b>						<b>No Go</b>	
<b>Phases</b>	<b>Construction</b>		<b>Operations</b>		<b>Demolition</b>		<b>All</b>	
<b>Extent of impact (A)</b>	Local	4	Local	4	Local	4	No impact	0
<b>Duration of Impact (B)</b>	Medium term	2	Long term	3	Short term	1	No impact	0
<b>Probability of occurrence (C )</b>	Probable	2	Probable	2	Probable	2	No impact	0
<b>Intensity of Impact(D)</b>	Medium positive	2	Low, positive	1	Low positive	1	No impact	0
<b>Degree of confidence (E)</b>	Medium	2	Medium	2	Medium	2	No impact	0
<b>Level of significance (AxBxD+E)xC</b>	Low, positive	36	Low, positive	28	Low, positive	12	No impact	0
<p>Mitigation measures <b>Construction Phase:</b> Requires contractor to</p> <ul style="list-style-type: none"> <li>• Reserve 70% of jobs for youth (18 – 35)</li> <li>• Reserve 50% of jobs for women.</li> <li>• Apply mechanisms to enable youth and women to access employment.</li> <li>• Pay youth and women market-related salaries and wages.</li> <li>• Provide youth and women equal access to training and education opportunities.</li> </ul> <p>Mitigation measures <b>Operational Phase:</b> None</p> <ul style="list-style-type: none"> <li>• Avail bursaries and seed capital for entrepreneurs;</li> <li>• Establish an education and skills centre (youngsters to improve their future options).</li> <li>• Enabling youngsters and women to pursue opportunities.</li> <li>• Facilitate access to employment in main sectors i.e. tourism.</li> </ul> <p>Mitigation measures <b>All Phases</b></p> <ul style="list-style-type: none"> <li>• Provide recreational and sport facilities for youngsters i.e. restore swimming pool and provide skate-board park.</li> <li>• Provide recreational activities and sport programmes during school holidays.</li> <li>• Enhance sport activities during school terms.</li> </ul>								
<b>Level of significance after Mitigation</b>	(C ) Highly probable: 3	54	(C ) Highly probable: 3	42	(C ) Highly probable: 3	18	No Mitigation	
<b>Residual impacts</b>	Families develop hope. Decreased dependencies i.e. substance abuse and teenage pregnancies.							

Table 18: Impact on youth and women, All Phases

The opportunity afforded to youth and women to improve their skills and education consequently enable youth, women and their families to hold youth and women in a position of higher esteem than when unemployed has a positive impact during **all phases** and changes to moderately positive after mitigation.

Although the significance of the impact is low positive, the change experience in the social wellbeing of youth and women undoubtedly will change the social wellbeing of families. Therefore the impact is viewed as significant. The proposed mitigation measures may likely contribute to improved family cohesion, closer extended family networks and acknowledgement of traditional roles played by family members. It will provide families hope. The impact changes to medium positive after mitigation.

### 3.4.2 Residual: Institutionalization of school support to improve levels of education

The education and skills levels of the population in Kai !Garib and its immediate surroundings are very low: 44.% unskilled, 45.8% semi-skilled, 8.4% skilled and <1% highly skilled, whilst the education and skills levels in Kenhardt are slightly higher: 30.1% unskilled, 46.2% semi-skilled, 22.8% skilled and 1% highly skilled. Due to the receiving community not having the skills required to be employed, capacity building and skills development training programmes will be implemented to benefit the community in the short term and long term.

The low educational levels of the population echo in a low matric pass rate. In the ZF Mgcawu District the matric pass rate was 78% in 2017. A similar drop-out rate of (76%) is estimated for Kenhardt, whilst the high school dropout rate is 38%. The solar facility should institutionalize a school support programme that will assist learners to improve their pass rate.

Opportunity should be afforded to learners to access education and skills development. As mitigation measure(s) the solar facility should allocate part of its social contribution to a) skills development and should b) provide (fund) facilities (skills centres) or enhance existing facilities to promote the enhancement and offering of skills. In addition a School Support Programme should be institutionalized. This will improve the social welfare of young people and girls and decrease the dropout rate particularly in high school.

A summary of the impact follows in Table below.

Impact	Improve skills and educational levels.						
Nature of Impact	Youngsters and particularly girls are afforded an opportunity to improve their skills and education as an educational School Support Programme is institutionalized. The social welfare of young people improves as the dropout rate, particularly in high school, decreases.						
ALTERNATIVES	Preferred Local					No Go	
Phases	Construction	Operations		Demolition	All		
Extent of impact (A)	NA		Local	4	NA		No impact 0
Duration of Impact (B)	NA		Long term	3	NA		No impact 0
Probability of occurrence (C)	NA		Probable	2	NA		No impact 0
Intensity of Impact(D)	NA		Highly, positive	3	NA		No impact 0
Degree of confidence (E)	NA		Moderate	2	NA		No impact 0
Level of significance (AxBxD+E)xC	NA		Moderately, positive	76	NA		No impact 0
Mitigation measures: Mitigation measures <b>All Phases</b>							
<ul style="list-style-type: none"> <li>Provide recreational and sport facilities for youngsters i.e. restore swimming pool and provide skate-board park.</li> <li>Provide recreational activities and sport programmes during school holidays.</li> <li>Enhance sport activities during school terms.</li> </ul>							
Level of significance after	No mitigation						

<b>Mitigation</b>							
<b>Residual impacts</b>							

Table 19: Impact of Institutionalization of School Support, Operation Phases

The improved circumstance for youngsters to prepare themselves for life, will impact moderately positively and will give young people hope. As young people get the opportunity to improve their education, self-development opportunities and income will increase and their economic and material well-being will improve. No further mitigation measures are proposed and the impact stays medium positive.

The No Go alternative has no impact.

### 3.5 Cumulative Impacts

#### 3.5.1 Cumulative: Change in Local Culture and Driving Economic Sectors

As a consequence of the proposed solar facility the following cumulative impacts will be assessed:

- c) Change of economic sectors contributing to the GDP (from Agriculture to Energy Generation)
- d) Demographic changes relating to the economic sector changes

The cumulative impact of the solar facilities will cause agriculture to be replaced by energy generation. With the changes experienced in agriculture it is most likely that most employees in the agricultural sector have urbanized and higher income families have moved their basis elsewhere. Agriculture may not play a main role in the lives of these former farm families now living in Kenhardt. However the generation of energy will have to replace the role agriculture did play in the lives of these families.

As low and no income household are the majority of households in rural areas the Northern Cape and in Kenhardt, it provides the platform for foreign traders to provide consumables to these households. It is most likely that as foreign traders provide services local traders are replaced by them.

This facility is one of five (5) photovoltaic electricity generation projects in the immediate vicinity of Aries substation, of which three (3) has already been authorized and one built. Should all be implemented the extent of the land being taken out of agriculture is locally substantial. Although the low potential grazing land is not a scarce or irreplaceable resource, the collective extent of the land enables the thriving Dorper sheep industry.

However, food production and protection of agricultural land is a high national priority and minimal impact on agriculture resources is a prerequisite of the country's renewable energy development strategy. It is preferable to incur a higher cumulative loss in the region with non-arable agricultural land such as this one, than to lose agricultural land with a higher production potential elsewhere in the country.

The proposed facility being the fifth biggest solar facility in Africa, and the loss of agricultural potential will cause locals to change their relationship to the environment as it will affect agriculture and its processes, structures and patterns that are valued as part of the social history of the area. The social history of farmers and teams of men going off sheering sheep will change to energy production and teams of workers going off to clean the solar panels.

As 20% of the Solar Facility will be BEE owned, agricultural land for non-agricultural enterprises will be redistributed and support future Land Reform.

A summary of the impact follows in Table below.

<b>Impact</b>	<b>Energy generation replaces Agriculture and cause demographic changes.</b>			
<b>Nature of Impact</b>	<p>The cumulative impact of the total solar facility (700MW) as the fifth biggest solar facility in Africa, and of the other three facilities to be implemented will cause agriculture to be replaced by energy generation.</p> <p>With the changes experienced in agriculture it is most likely that most employees in the agricultural sector have urbanized and higher income families have moved elsewhere. Agriculture may not play a main role in the lives of these former farm families now living in Kenhardt. However the generation of energy will have to replace the role agriculture did play in the lives of these families.</p> <p>As low and no income household are the majority of households in rural areas the Northern Cape and in Kenhardt, it provides the platform for foreign traders to provide consumables to these households. It is most likely that as foreign traders provide services local traders are replaced by them.</p> <p>This facility is one of 5 photovoltaic electricity generation projects in the immediate vicinity of Aries substation, of which 3 has already been authorized and one built. Should all 5 projects be implemented the intensity of the impact on agriculture (extent of the land being taken out of agriculture), from a local perspective would be higher than for the region and overall. The limited agricultural potential and cultivation of the area caused by poor and very shallow soils conditions reduced the significance of loss of topsoil (as covered by the solar panels). Irreplaceability of resources is considered low because the resource that is being impacted is non-arable, low potential grazing land which is not a scarce resource in the area, region or country. Nationally minimal and low impact on agriculture resources is a prerequisite of the country's renewable energy development strategy and regions such as this one, match the criteria. It is preferable to incur a higher cumulative loss (given the extent) in the region, than to lose agricultural land with a higher production potential elsewhere in the country. Hence food production and protection of agricultural land is a high national priority.</p> <p>In the long term, the solar facilities will impact cumulatively on the social history of the area as it will affect agriculture and its processes, structures and patterns that the area values as part of the social history of the area.</p>			
<b>ALTERNATIVES</b>	<b>Overall</b>		<b>No Go</b>	
<b>Extent of impact (A)</b>	Local	4	No impact	0
<b>Duration of Impact (B)</b>	Long term	3	No impact	0
<b>Probability of occurrence (C)</b>	Highly Probable	3	No impact	0
<b>Intensity of Impact(D)</b>	Highly Negative	-2	No impact	0
<b>Degree of confidence (E)</b>	High	3	No impact	0
<b>Level of significance (AxBxD+E)xC</b>	Medium, Negative	-63	No impact	0
<p>Mitigation measures:</p> <ul style="list-style-type: none"> <li>- Ensure redistribution of non-agricultural enterprises as land is potentially removed from future Land Reform applications: 20% of the Solar Facility will be BEE owned. Ensure that locals are represented in the required 20%</li> <li>- Keep local traders afloat by sensitizing contractors to incentivize project staff to spend money locally and</li> </ul>				



purchasing South African brands i.e. discount at shops in the municipal area subsidized by contractor. - Facilitate the improvement of educational levels and skills - Enhance and contribute to the development of the skills centre supporting and building local businesses.				
<b>Level of significance after Mitigation</b>	Extent: Regional: 4; Local 1 Intensity: Medium positive: 2	27 (local) 81 (regional)	None	None

Table 20: Impact on Economic Sectors and Demographics, All Phases

Should all 5 projects be implemented the intensity of the impact on agriculture (extent of the land being taken out of agriculture), from a local perspective would be higher than for the region and overall. The limited agricultural potential and cultivation of the area caused by poor and very shallow soils conditions reduced the significance of loss of topsoil (as covered by the solar panels). Irreplaceability of resources is considered low because the resource that is being impacted is non-arable, low potential grazing land which is not a scarce resource in the area, region or country. In the long term, the solar facilities will impact cumulatively on the social history of the area as it will affect agriculture and its processes, structures and patterns that area values as part of the social history of the area.

The significance of the impact on the economy and demographics will be initially perceived as highly negative at a local level. With mitigation and assessing it at a regional level the impact will change to be low positive locally and medium positively regionally. The no-go alternative has no impact.

### 3.6 Summary

#### Preferred Alternative's Impacts Assessed per Project Phase

Impacts reported below are as per the different phase i.e. Construction, Operations and Demolition:

#### Phase: Construction

During the construction phase most of the impacts:

- Are manageable as some are low positive or most are low negative,
- Are not cumulative of nature and
- That result in residual impacts, are manageable.

Positive impacts of low significance before and if mitigatable, after mitigation include:	Negative impacts of low significance before and after mitigation include:
<ul style="list-style-type: none"> <li>- Population influx of skilled employed persons</li> <li>- Increased household income</li> <li>- Sales volume</li> <li>- Increased GGP</li> </ul>	<ul style="list-style-type: none"> <li>- Population influx of unemployed persons</li> <li>- Increased demand for services and amenities</li> <li>- Increased traffic</li> <li>- Increased crime</li> <li>- Increased dust and noise levels</li> <li>- Change in sense of place</li> <li>- Loss of heritage resources</li> <li>- Water scarcity</li> <li>- Agricultural potential</li> </ul>

One positive impact, “increased income” is of low significance when assessed regionally but of high significance if assessed locally

One impact, “change in soil profile and ecology” changes from low negative to neutral after mitigation.

One impact “Increased levels of employment” are of medium positive significance before and after mitigation at regional level and of high significance at local level.

One impact, “skills levels” are of medium positive significance before mitigation and changes to high positive significance after mitigation

Phase: Operations

During the construction phase most of the impacts:

- Are manageable as some are low positive or most are low negative,
- Are not cumulative of nature and
- That result in residual impacts, are manageable.

Positive impacts of low significance before and if mitigatable, after mitigation include:	Negative impacts of low significance before and after mitigation include:
<ul style="list-style-type: none"> <li>- Increased employment levels (regionally)</li> <li>- Increased GGP/ local economy</li> </ul>	<ul style="list-style-type: none"> <li>- Population influx of unemployed persons</li> <li>- Increased traffic</li> <li>- Agricultural potential</li> </ul>

One positive impact “Increased household income” are of medium significance regionally but of high significance locally before and after mitigation.

One impact “Water Scarcity” changes from medium negative to low negative.

One impact “increased sales” change from low to medium positive.

One impact, “loss of heritage resources” changes from Medium negative to low positive after mitigation turned it into an opportunity to generate income in the long term.

One impact “change in soil profile and ecology” change from low negative to neutral.

One impact, “changed sense of place” and visual appearance is rated highly significant and changes to medium negative after mitigation. The sense of place which is associating Kenhardt with Dorper sheep farming is replaced by the fifth biggest solar facility in Africa. The cumulative impact of all solar facilities replaces agriculture and its processes, structures and patterns. Although it is not the only impact causing the replacement of agriculture, it will have implications for the social history of the affected communities: the social history of farmers and teams of men going off sheering sheep changing to green energy production and teams of workers going off to maintain and clean solar panels.

Phase: Demolition

During the demolition phase most of the impacts:

- Are manageable as some are low positive or most are low negative,
- Are not cumulative of nature and
- That result in residual impacts, are manageable.

Positive impacts of low significance before and if mitigatable, after mitigation include:	Negative impacts of low significance before and after mitigation include:
<ul style="list-style-type: none"><li>- Population influx of skilled employed persons</li><li>- Increased income (regionally)</li></ul>	<ul style="list-style-type: none"><li>- Population influx of unemployed persons</li><li>- Increased traffic</li></ul>

One positive impact, "increased income" is of low significance when assessed regionally but of high significance if assessed locally

One negative impact of low significance under construction and operations change to become positive should the demolition of the facility proceed.

One negative impact of medium significance before changing to neutral is the *Change in Sense of Place*: will be reversed to as before the solar facility was built and will be neutralized. Should demolition not take place, the solar facility will degrade over time and the impact will change to high negative.

One impact of high negative significance before changing to medium negative significance is the loss of heritage resources as it is doubtful that the resources will stay an attraction whilst the solar facility is no longer an attraction.

One impact, "Increased dust and noise levels" changes from low negative to neutral.

**Summary of Impacts of the Preferred Alternative**

Overall the impacts are of low significance. Most of the impacts identified and rated are manageable and can be mitigated. Impacts that rated as significantly negative impacts could be mitigated to be less significant but stayed negative except for one impact that changed to be positive. Impacts with different positive ratings were mitigated to become significantly positive at a local level. Residual impacts are rated as positive. The cumulative impact is irreversible but positive.

The impacts are as follows:

- g) The local community will experience significant positive changes in their economic and material well-being as
  - More job and job opportunities will be generated.
  - Household income will increase as members of households are employed.
  - Skills levels will increase as training and skills development form an integral part of the project (High positive).

- h) The community will experience the heritage environment to be under stress (moderately during operations and highly during demolition) as the resource may be lost, but through mitigation the impact is become less negative as an opportunity to generate income in the long term is created.
- i) The community will experience change in the sense of place as a negative high intensity impact without much mitigation possibilities.
- j) The cumulative impact of solar facilities competing with agriculture causes a change in economic sector locally and regionally. This change outweighs the net benefit yielded by next best alternative, that is farming and its benefits, being foregone for the receiving community locally.

Two mitigation measures will indirectly enhance the receiving community's institutional arrangements:

- k) The formalization and institutionalization of educational support, a residual impact, will benefit Kenhardt and the region as the school drop-out rate will decrease;
- l) Political intervention to reserve jobs, will be in support of women and youth and will improve the self-esteem of both groups. Institutionalizing standard procedures and a monitoring committee to govern appointments shall ensure fair appointments and avoid party political preferences.

#### 4. Management guidelines to address socio-economic impacts

In order to ensure that the disadvantages are managed to maximize positive impacts, specific management strategies and mechanisms need to become part of the proposed development. These strategies and mechanisms need to be implemented through development conditions and are outlined below. It needs to be noted that some of these management guidelines are already practice as they are required by legislation applicable to the proposed development and to the practice of the implementation agent:

##### 4.1 Preferential procurement of goods, services and labour

- Contractor to employ 90% locals who were previously disadvantaged are suitably qualified; If not suitably qualified, make an effort to transfer skills on the job (already practiced)
- Involve schools to visit construction site to inspire youngsters to join the construction industry.
- The municipality, local community and local community organizations should be informed by the implementation agent (contractor) of the project and potential job opportunities;
- The contractor should make use of local HDI owned firms;
- Reserve 50% of jobs for women.
- **For Youth**
  - Reserve 70% of jobs for youth (18-35)
  - Require contractor to facilitate mechanisms to enable youth to access employment.
  - Pay youth market related prices for the job.
  - Require contractor to facilitate that youth gain equal access to training and education opportunities.
- Apply mechanisms to enable youth, women and locals to access employment and learning opportunities.
- A database of locally based firms, including SMME's owned and run by HDIs that qualify as service providers should be compiled by the contractor prior to the commencement of the implementation of the tender;
- Establish a Monitoring Committee for the construction and demolition phase in collaboration with representatives of the local community. The Monitoring Committee has to ensure that the EMP is implemented and that any problems that arise which are associated with the construction and demolition phase, are addressed.
- Implementation agent/ contractor to act as reference for locals employed.
- Implementation agent/ contractor to liaise with existing or future projects to access employment for locals.
- Municipality provide for enhancement of entrepreneurs and alternative use of properties in the community (self-employment).
- Ensure redistribution of non-agricultural enterprises as land is potentially removed from future Land Reform applications: 20% of the Solar Facility will be BEE owned. Ensure that locals are represented in the required 20%
- Keep local traders afloat by sensitizing contractors to incentivize project staff to spend money locally and purchasing South African brands i.e. discount at shops in the municipal area subsidized by contractor.
- Facilitate access to employment in main sectors i.e. tourism.

#### **4.2 Skills transfer**

- The proposed development should enhance formal and informal skills transfer:
  - Should skilled persons from outside the community be employed, the implementation agent should consider implementing on the job training and skills development programme to enhance the opportunities for local historically disadvantaged individuals in the construction and maintenance industry. Measures should be put in place to ensure successful training and development i.e. structured job shadowing and learnerships. Such a programme should be offered in liaison with an accredited Further Education and Training College or University of Technology;
- Skills transfer and development, formally and informally, should be implemented together with local education and skills training providers (e.g. job shadowing).
- Require contractor to facilitate mechanisms to enable local young people (who are not necessarily employed) to access the skills training opportunities.
- Require the contractor to enhance on-the-job training which should include formal and informal opportunities.
- Provide youth and women equal access to training and education opportunities.
- Establish an education and skills centre (youngsters to improve their future options).
- Enabling youngsters and women to pursue opportunities.
  - Facilitate the improvement of educational levels and skills
  - Enhance and contribute to the development of the skills centre supporting and building local businesses.

#### **4.3 Safety Management**

- Adhere to international construction health and safety standards and precaution measures (already practiced).
- Provide health and social training amongst the project team and in the community.
- Make effort to ensure that the construction team and their families meet regularly (every two weeks). (already practiced)

#### **4.4 Traffic Regulation**

- Upgrade road signs to address the movement conflict where required.
- Road signs for protecting pedestrians crossing and accessing the road should be displayed.
- Restrict heavy vehicles to specific hours.
- Erect road signs signal times when heavy vehicles will make use of the road.
- Adhere to national traffic safety standards and precaution measures.(already practiced)
- Provide traffic safety awareness amongst the project team and the community, particularly the kids.

#### **4.5 Dust and Noise control**

- Dust creation must be controlled as per construction and demolition management and control code.(already practiced)
- Noise creation should be controlled as per construction and demolition management and control code.(already practiced)
- Appoint an Environmental Control Officer to supervise construction and building and demolition. (already practiced)

- Adhere to the Environmental Management Plan (EMPr) for the Construction and Demolition Phases.
- All workers and management must undergo an induction course.
- Enforce strict operating hours for heavy vehicles and construction activities on site to reduce noise and dust impacts on adjacent landowners.
- Implementation dust suppression measures;
- Access must be on recognized routes.
- Litter and littering must be strictly controlled.
- All construction waste and building rubble and demolition waste and rubble must be removed off site.
- Cover dirt roads in town with a natural looking material (not tar) to prohibit dust i.e. Main street to Kaap Agri, Brussels street to old town precinct, Longlands Street.



Figure 7: Brussels Street and Longlands Street

#### 4.6 Enhancing the economy

- Implementation agent should be directed by tender criteria to purchase locally and to make use of local service providers.
- Spending money locally purchasing from locals and South African should benefit employees. The proposed development should leverage discount in the local economy of the municipal area and employees should be made aware of it.
- Small business should be supported (i.e. skills training, assistance and guidance to set up small businesses) and joint ventures with previous disadvantaged persons should be promoted.
- The promotion of joint ventures between small business (owned by previous disadvantaged persons) and more established business should be encouraged.

#### 4.7 Increased income

- Developer and contractor to liaise with existing or future projects to enhance employment opportunities for locals.
- Pay youth and women market-related salaries and wages

#### 4.8 Increase in small business

- The promotion of joint ventures between small business (owned by previous disadvantaged persons) and more established business.
- Implement formal small business training and mentoring programmes.
- Strengthening heritage resources and build tourism
- Avail bursaries and seed capital for entrepreneurs

#### 4.9 Increase in tourism

- Market the tourism activities and options the solar facility offer.
- Develop a plan to intensify tourism in Kenhardt.
- Create links with other tourism activities in Kenhardt through a website and the local tourism office.
- Provide space for a tourism market (selling local hand crafts and food) at Eucalyptus Trees at corner of Main and Lourens Street
- Enhance social space around tree i.e. similar to Evita's Paronne: Community Garden and tourism market
- Celebrate the history of Bushmanland as part of this space.
- Develop a marked trail to access and view the archaeological resources telling the story of the different ages. Access to such a trail and opening it to the public are dependent on the security measures related to the facility and would best be placed between the two boundary fences. Such an endeavor could become one of the local youth driven businesses.
- During demolition, the trails and archeological site should be re-established (fenced) and rejuvenated to operate as an independent entity (without the solar).



Figure 8: Eucalyptus Trees at corner of Main and Lourens Street

#### 4.10 Maintaining Sense of place:

##### Construction Phase

- *Keep disturbed areas to a minimum;*
- *No clearing of land to take place outside the demarcated footprint;*
- *Buildings and similar structures must be in keeping with regional planning policy documents, especially the principles of critical regionalism, namely sense of place, sense of history, sense of nature, sense of craft and sense of limits.*
- *Utilize existing roads and tracks to the maximum extent possible.*
- *Provide pedestrian walkways where desire lines are identified.*
- *Keep disturbed areas to a minimum*
- *Outdoor lighting must be strictly controlled so as to prevent light pollution.*



- Sources of light must as far as possible be shielded by physical barriers such as trees and buildings or structures
- All lighting must be installed at downward angles.
- Use only minimum wattage light fixtures. ‘
- Use only minimum wattage light fixtures.

### Operations phase

Apply the following development design guidelines

- The use of lighting has to be monitored over the entire life of the project to minimize light pollution.
- All lighting must be installed at downward angles.
- Sources of light must as far as possible be shielded by physical barriers such as built structures.
- Only minimum wattage light fixtures must be used.
- A strict fire prevention policy must be implemented and monitored
- Divert impact to make Kenhardt the focus point:
  - d) Amplify the Eucalyptus Trees at corner of Main and Lourens Street as a focus point;
  - e) Link older precincts to one another i.e. Brussels street
  - f) Plant indigenous and historic alien (that is currently part of the urban landscape) trees.



Figure 9: Sense of Place

#### 4.11 Access to Water

- Provide alternative energy to borehole on the way to Brandvlei (i.e. provide its own solar installation);
- Refurbish the water gear at the borehole so that it can function;
- Manage and maintain the operation of the borehole as part of the management of the solar sites;

#### 4.12 Youth

##### All Phases

- Provide recreational and sport facilities for youngsters i.e. restore swimming pool and provide skate-board park.
- Provide recreational activities and sport programmes during school holidays.
- Enhance sport activities during school terms.

#### **4.11 Conclusion**

The above management guidelines have been presented in terms of the specific social constraints that might result due to the proposed solar facility and related infrastructure. These guidelines aim to change the social constraints of the proposed development into benefits in favour of the local community of Kenhardt and the inhabitants of Cape Agulhas Municipality.

To implement the strategies and mechanisms, the administration thereof should be in partnership with the local authority.

## Addendum A: Assessment Measures

The assessment departs from a factual description of the nature of the impact. This description is followed by an appraisal including a description of the effect the activity has on the environment. The description should include what is being affected and how it is affected. Assessment Measures are then applied to refine the results.

### Extent (A)

This assessment measures the geographical scale of the impact

<b>Extent of the Impact</b>		
<b>Rating</b>	<b>Definition of rating</b>	<i>Score</i>
<b>Local</b>	Extending only as far as the activity, Will be limited to the site and its immediate surroundings	4
<b>Regional</b>	Will have an impact on the region	3
<b>National</b>	Will have an impact on a national scale	2
<b>International</b>	Will have an impact across international borders	1

Usually the scores are in ascending order from 1 to 4 (local to international) but given the levels of poverty and remoteness the scores for this project has been changed to a descending order of 4 to 1 (local to international).

### Duration (B)

This assessment measure indicates the lifetime of the impact.

<b><i>Duration of the Impact</i></b>		
<b><i>Rating</i></b>	<b><i>Definition of rating</i></b>	<b><i>Score</i></b>
<b><i>Short term</i></b>	<b><i>0-5 years</i></b>	<b><i>1</i></b>
<b><i>Medium term</i></b>	<b><i>e.g. 5-15 years</i></b>	<b><i>2</i></b>
<b><i>Long term</i></b>	<b>The impact will cease after the operational life of the activity, either because of natural process or by human intervention</b>	<b><i>3</i></b>
<b><i>Permanent</i></b>	<b>Where mitigation either by natural process or by human intervention will not occur in such a way or in such a time span that the impact can be considered transient</b>	<b><i>4</i></b>

The duration of some of the impacts during construction is considered mainly short term, whilst the duration of the impacts during the operational phase is considered long term.

### Intensity (C)

Here it should be established whether the impact is destructive or benign and should be indicated as:

<b>Intensity of the Impact</b>		
<b>Rating</b>	<b>Definition of rating</b>	<b>Score</b>
<b>Low</b>	The impact affects the environment in such a way that natural, cultural and social functions and processes are not affected	<b>1(±)</b>
<b>Medium</b>	The affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and	<b>2(±)</b>
<b>High</b>	Natural, cultural or social functions or processes are altered to the extent that it will temporarily or permanently cease.	<b>3(±)</b>

The intensity of some of the impacts of the proposed project varies. In the case of the proposed project the criteria was customize and refined to their particular study (e.g. a positive impact of “high” significance is when the project could reduce local employment by 5% or more).

### Probability (D)

This should describe the likelihood of the impact actually occurring indicated as:

<b>Probability of the Impact</b>		
<b>Rating</b>	<b>Definition of rating</b>	<b>Score</b>
<b>Improbable</b>	The possibility of the impact to materialize is very low either because of design or historic experience;	<b>1</b>
<b>Probable</b>	There is a distinct possibility that the impact will occur	<b>2</b>
<b>Highly probable</b>	It is most likely that the impact will occur	<b>3</b>
<b>Definite</b>	The impact will occur regardless of any prevention measures	<b>4</b>

### Significance

The significance of impacts can be determined through a synthesis of the aspects produced in terms of their nature, duration, intensity, extent and probability and be described as:

<b>Significance of the Impact: (F)= (A*B*D+E)*C</b>			
<b>Rating</b>	<b>Definition of rating</b>	<b>Score</b>	
<b>Low</b>		0 to – 40	0 to 40
<b>Medium</b>		- 41 to - 80	41 to 80
<b>High</b>		- 81 to - 120	81 to 120
<b>Very High</b>		> - 120	> 120

The above significance bands have been determined through calculating a maximum potential score of 156 (e.g. positive or negative) applying the above criteria. This was then subdivided into broad bands as indicated above to provide a comparative assessment of all impacts in relation to the maximum possible significance score. The overall status of the impact (after mitigation) for the preferred alternative are also assessed applying the above criteria.

The above rating scales will be applied to assess the impacts during the construction, operational and demolition phase.

## References:

Bloodhound Integrated Development Strategy, 2013, Department of Economic Development and Tourism, South Africa

Constitution of South Africa (1996) and Bill of Rights

Interviews with members of community, Anon, November 2018

National Climate Change Response White Paper (2011)

National Energy Act (Act 34 of 2008);

National Energy Efficiency Strategy (2016)

National Spatial Development Framework (2006);

Public Participation, Kenhardt Hotel, 23 August 2018

Statistics SA, 2011 Kai !Garib Local Municipality

White Paper on Energy Policy for the RSA (1998);

White Paper on Renewable Energy (2003);

Northern Cape Spatial Development Framework (2012) (NCSDF and Provincial Development and Resource Management Plan);

Northern Cape Local Economic Development Strategy (2009)

Northern Cape Manufacturing Strategy (2009)

Northern Cape's Large Scale Projects (2013)

400MW Photovoltaic Electricity Generation Facility on Portions 7 and 3 of Farm 187 Olyvenkolk, Kenhardt District:

- Almond, J.E. Palaeontological Study (2018)
- ASHA Consulting (Pty) Ltd. Archaeological Impact Statement on Final Layout on Olyven kOlk Farm 187/6 and 187/7, Kenhardt (2018)
- Hanekom, N. Agricultural Impact Assessment (2018)
- Hanekom, N. Ecological Impact Assessment, Terrestrial and Aquatic Ecology, Fauna and Avifauna (2018)
- Planscape Consulting Town and Regional Planners. Visual Impact Assessment (2018)
- SKCMasakhizwe Engineers (Pty) Ltd. Report on Geotechnical Investigation (2018)

- SKCMasakhizwe Engineers (Pty) Ltd. Floodline Report (2018)
- SKCMasakhizwe Engineers (Pty) Ltd. Traffic Impact Assessment (2018)