DRAFT ENVIRONMENT IMPACT ASSESSMENT REPORT

APPLICATION FOR ENVIRONMENTAL AUTHORIZATION
GOVERNMENT NOTICE REGULATIONS
GNR 327, 325, 324 AND GNR 326
NATIONAL ENVIRONMENT MANAGEMENT ACT 1998

for a

300MW PHOTOVOLTAIC ELECTRICITY GENERATION FACILITY

and

132 KV POWERLINE OF TO FEED THE ELECTRICITY GENERATED INTO THE EXISTING ARIES SUBSTATION

on

PORTIONS 6 AND 3 OF FARM 187 OLYVENKOLK, KENHARDT DISTRICT

Prepared for: Solar Energy Land (Pty) Ltd
P.O. Box 1022
Wellington
7654
Tel: 021 873 6682
Fax: 086 605 3006
Email: Michael Stoeltzing michael@bakenhof.co.za

Prepared by: Eco Impact Legal Consulting (Pty) Ltd
P.O. Box 45070
Claremont
South Africa
7735
Tel: 021 671 1660;
Fax: 021 671 9976
Email: admin@ecoimpact.co.za

DEA REFERENCE NUMBER: 14/12/16/3/3/2/1094

February 2019

PROJECT DETAILS

General Site Information

- Descriptions of all affected farm portions:
  Portions 6 and 3 of Farm 187 Olyvenkolk, Kenhardt, Northern Cape.
  Portion 6 is 711.3 hectares in size.
  Portion 3 is 2115 hectares in size.

- 21-digit Surveyor General codes of all affected farm portions:

C	0	3	6	0	0	0	0	0	0	0	0	0	1	8	7	0	0	0	0	6
C	0	3	6	0	0	0	0	0	0	0	0	0	1	8	7	0	0	0	0	3

- Copies of deeds of all affected farm portions:
  See Appendix K.

- Photos of areas that give a visual perspective of all parts of the site:
  See Appendix D.

- Photographs from sensitive visual receptors:
  See Appendix G7 Visual Impact Assessment.

- Solar plant design specifications including:

    - Type of technology:
        - The proposed facility will consist of several arrays of photovoltaic (PV) panels using Polycrystalline and thin-film solar cell technology
        - Solar module mounting structures comprised of galvanised steel and aluminium. The mounting structures will be mounted on the ground using a ground screw. A concrete foot piece secured to a steel pen driven into the ground will be used where it is not feasible to use ground screws. The geo-technical assessment tests indicate that screws up to a depth of 1.8m can be installed.
        - Below ground electrical cables connecting the PV arrays to the inverter stations and collector substation; and
        - Inverters and mini-subs.

    - Roads and Other Infrastructure
        - One access road of ≤ 100m long, ≤8 m wide gravel access road running from the Kenhardt Pofadder gravel road will be constructed. The existing farm tracks will be used as it is ease for access to the different PV sites on the farm.
        - Service roads - ≤20 km of ≤4 m wide gravel internal service roads within the plant boundary (two different blocks)
        - Perimeter fencing around each PV block and gates as required.
        - Access control gate on access road.

    - There will be no Operational and Management Building on the property. The PV facility will be operated and managed from the buildings authorized in the EA for portion 3 and 13 on portion 13.

  - Structure height:
    Height of PV panels: approximately 5 m high.
    Height of substations: 30 m high including a 32 m high telecoms tower.
    Height of ESKOM powerline: approximately 30 m above ground level.

  - Surface area to be covered (including associated infrastructure such as roads):
    Block 1 - 223.83 hectares
    Block 2 - 265.96 hectares
    Total area of PV facility: 489.79 hectares.
    Approximately 8.9 hectares of roads.

  - Structure orientation:
    North facing (rows from east to west).

  - Laydown area dimensions (construction period and thereafter):
    The contractors camp and laydown area will be on portion 13 as authorized in the EA for portion 3 and 13.

  - Generation capacity: 300MW

- Generation capacity of the facility as a whole at delivery points:
  300MW

Title: Solar Energy Land (Pty) Ltd DRAFT Environmental Impact Assessment Report.		
Eco Impact No: 2 - 6 - 022019	**Date:** February 2019	**Report Status:** DRAFT
Carried Out By: Eco Impact Legal Consulting (Pty) Ltd P.O. Box 45070 Claremont 7735 Tel: 021 671 1660; Fax: 021 67 19976 E-mail: admin@ecoimpact.co.za	**Commissioned By:** Mr Michael Stoeltzing P.O. Box 1022 Wellington 7654 Tel: 021 873 6682 Fax: 086 605 3006 E-mail: michael@bakenhof.co.za	**Client:** Mr Michael Stoeltzing P.O. Box 1022 Wellington 7654 Tel: 021 873 6682 Fax: 086 605 3006 E-mail: michael@bakenhof.co.za
Author: Mrs. Jessica Hansen	**Client Contact Person:** Mr Michael Stoeltzing	

Verification	Capacity	Name	Signature	Date
Author	Senior EAP	Jessica Hansen		18 February 2019

APPENDICES

GLOSSARY OF TERMS

“Alluvial” Resulting from the action of rivers, whereby sedimentary deposits are laid down in river channels, floodplains, lakes, depressions etc

“Alternating Current (AC)” type of electrical current, the direction of which is reversed at regular intervals or cycles. Electricity transmission networks use AC because voltage can be controlled with relative ease.

"Activity" means an activity identified in Government Notice Numbers. R. 327, 325 and 324 of 2017 as a listed activity.

"Alternatives", in relation to a proposed activity, means different means of meeting the general purpose and requirements of the activity, which may include alternatives to property, activity, design or technology.

"Applicant" means a person who has submitted or intends to submit an application;

"Application" means an application for an environmental authorization in terms of Chapter 3 of the Environmental Impact Assessment Regulations, 2010.

"Associated Infrastructure" means any building or infrastructure that is necessary for the functioning of a facility or activity or that is used for an ancillary service or use from the facility.

“Biodiversity” The variety of life in an area, including the number of different species, the genetic wealth within each species, and the natural areas where they are found.

“Borehole” Includes a well, excavation or any artificially constructed or improved underground cavity which can be used for the purpose of:

- intercepting, collecting or storing water in or removing water from an aquifer;
- observing and collecting data and information on water in an aquifer; or
- recharging an aquifer.

“Climate Change” Climate change means a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods.

“Cultural significance” This means aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance.

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

"Environmental impact assessment' in relation to an application to which scoping must be applied, means the process of collecting, organizing, analysing, interpreting and communicating information that is relevant to the consideration of that application.

“Direct Current” A type of electricity transmission and distribution by which electricity flows in one direction through the conductor, usually associated with relatively low voltage and high current.

“Distribution” The electricity network infrastructure operating at nominal voltage of 132 kV or below.

“Environment” The environment has been defined as “The external circumstances, conditions and objects that affect the existence and development of an individual, organism or group”. These circumstances include biophysical, social, economic, historical, cultural and political aspects.

“Environmental Assessment Practitioner” Person or company, independent of the applicant (developer), that manages the environmental assessment process of a proposed project on behalf of the applicant.

“Environmental Impact Report” In-depth assessment of impacts associated with a proposed development. This forms the second phase of an Environmental Impact Assessment and follows on from the Scoping Report.

"Environmental management plan" means an environmental management plan in relation to identified or specified activities envisaged in Chapter 5 of the National Environmental Management Act and described in regulation 34;

“Heritage resources” This means any place or object of cultural significance. It also includes archaeological resources.

“Hydromorphic / hydric soil” Soil that in its undrained condition is saturated or flooded long enough during the growing season to develop anaerobic conditions favouring growth and regeneration of hydrophytic vegetation. These soils are found in and associated with wetlands.

“Independent Power Producer” Any undertaking by any person or entity, in which the government of South Africa does not hold a controlling ownership interest (direct or indirect), of new energy generation capacity at a generating facility following a determination made by the Minister in terms of section 34(1) of the Electricity Regulation Act (4 of 2006).

"Interested and Affected Party" means an interested and affected party contemplated in section 24(4) (d) of the Act, and which in terms of that section includes -
(a) any person, group of persons or organization interested in or affected by an activity; and
(b) any organ of state that may have jurisdiction over any aspect of the activity;

“Kilovolt (kV)” a unit of electric potential equal to a thousand volts (a volt being the standard unit of electric potential. It is defined as the amount of electrical potential between two points on a conductor carrying a current of one ampere while one watt of power is dissipated between the two points).

“Photovoltaic Module” The smallest environmentally protected, essentially planar assembly of solar cells and ancillary parts, such as interconnections, terminals intended to generate DC power under unconcentrated sunlight.

“Photovoltaic cell” The smallest semiconductor element within a PV module to perform the immediate conversion of light into electrical energy.

"Public Participation Process" means a process in which potential interested and affected parties are given an opportunity to comment on, or raise issues relevant to, specific matters; *"Registered Interested and Affected Party", in relation to an application, means an interested and affected party whose name is recorded in the register opened for that application in terms of regulation 57.*

“Red Data species” All those species included in the categories of endangered, vulnerable or rare, as defined by the International Union for the Conservation of Nature and Natural Resources.

“Renewable Feed-In Tariff” A tariff approved by NERSA for a renewable energy generator or cogeneration.

“Riparian” The area of land adjacent to a stream or river that is influenced by stream induced or related processes.

“Scoping Report” An “issues-based” report which forms the first phase of an Environmental Impact Assessment process.

“Study corridor” The corridors identified after initial investigation of technical and environmental attributes of the total study area which will then be assessed in more detail to identify a route corridor.

"Significant impact" means an impact that by its magnitude, duration, intensity or probability of occurrence may have a notable effect on one or more aspects of the environment;

“Substation” A collection of equipment for the purpose of raising, lowering and regulating the voltage of electricity.

"The Act" means the National Environmental Management Act, 1998 (Act No.107 of 1998).

“Transmission” The electricity network infrastructure operating at nominal voltage of 275 kV, 400kV or 765kV or below.

ABBREVIATIONS

BID: Background Information Document
DEA: Department of Environmental Affairs
DWA: Department of Water Affairs
EAP: Environmental Assessment Practitioner
ECO: Environmental Control Officer
EMPr: Environmental Management Programme
ENPAT: Environmental Potential Atlas
EIA: Environmental Impact Assessment
EIAr: Environmental Impact Assessment Report
FSR: Final Scoping Report
NCBCP: Northern Cape Biodiversity Conservation Plan
NCDEANC: Northern Cape Department of Environmental Affairs and Nature Conservation
GDP: Gross Domestic product
GHG: Greenhouse Gases
GIS: Geographic Information System
GPS: Global Positioning System
HIA: Heritage Impact Assessment
I&APs: Interested and Affected Parties
IDP: Integrated Development Plan
IEP: Integrated Energy Plan
IPP: Independent Power Producer
IRP: Integrated Resource Plan
ISEP: Integrated Strategic Electricity Planning
Kwh: Kilowatt hour
MAR: Mean annual rainfall
MW: Megawatt
MWp: Megawatt peak
NEMA: National Environmental Management Act
NEMBA: National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004)
NEM:WA: National Environmental Management: Waste Act
NEM:AQA: National Environmental Management: Air Quality Act
NERSA: National Energy Regulator of South Africa
NERP: National Energy Response Plan
NHRA: National Heritage Resources Act
NIRP: National Integrated Resource Plan
NSBA: National Spatial Biodiversity Assessment
NWA: National Water Act, 1998 (Act No. 36 of 1998)
PPA: Power Purchase Agreement
PPP: Public Participation Process
PV: Photovoltaic
REFIT: Renewable Energy Feed-In Tariff
SACNASP: South African Council for Natural Scientific Professions
SANBI: South African National Biodiversity Institute
SDF: Spatial Development Framework
SG: Surveyor General
SIA: Social Impact Assessment
ToR: Terms of Reference
NER: National Electricity Regulator
VIA: Visual Impact Assessment
GNR 327: National Environmental Management Act 107 of 1998, Environmental Impact Assessment Regulations Listing Notice 1 of 2014, Published under Government Notice R983 in Government Gazette 38282 of 4 December 2014 and amended by GN 327 in GG 40772 of 2017/04/07.
GNR 325: National Environmental Management Act 107 of 1998, Environmental Impact Assessment Regulations Listing Notice 2 of 2014, Published under Government Notice R984 in Government Gazette

38282 of 4 December 2014 and amended by GN 325 in GG 40772 of 2017/04/07.
GNR 324: National Environmental Management Act 107 of 1998, Environmental Impact Assessment Regulations Listing Notice 3 of 2014, Published under Government Notice R985 in Government Gazette 38282 of 4 December 2014 and amended by GN 324 in GG 40772 of 2017/04/07.
GNR 326: National Environmental Management Act 107 of 1998, Environmental Impact Assessment Regulations, 2014 Published under Government Notice R982 in Government Gazette 38282 of 4 December 2014 and amended by GN 326 in GG 40772 on 2017/04/07.

EXECUTIVE SUMMARY

Solar Energy Land is proposing the establishment of commercial solar electricity generating facilities and associated infrastructure on Portions 6 and 3 of Farm 187 Olyvenkolk, Kenhardt, Northern Cape. Solar Energy Land propose the establishment of a 300 MW Photovoltaic plant to generate electricity to feed into the national grid. The project is also in line with the government's commitment to provide renewable energy as an alternative energy source to those currently utilized.

The proposed facility will consist of several arrays of photovoltaic (PV) panels using Polycrystalline and thin-film solar cell technology with a generating capacity of approximately 300 MW and associated infrastructure. These units comprise of blocks of photovoltaic arrays, mounted on pedestals, with a converter unit and supported by associated infrastructure, permanent and temporary. Each converter unit has its own step-up transformer. These transformers will be fed to a central point of connection consisting of switch gear and protection infrastructure. Electricity is fed to the ESKOM 132 kV network via this point of connection, which will be situated on the southern edge of the electricity generation facility. The panels will be mounted on the ground using a ground screw. A concrete foot piece secured to a steel pen driven into the ground will be used where it is not feasible to use ground screws. The geo-technical assessment tests indicate that screws up to a depth of 1.8m can be installed. This means that the solar panels will follow the sun in order to increase the efficiency of the panel.

The overall **heritage** impact (archaeology, palaeontology and cultural landscape) is likely to be of **low significance** as the sites, features or objects of cultural heritage significance were identified in the study area and excluded from the developable area. However, the **visual impacts and impacts on sense of place** have a **medium significance** even after mitigation. 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 caring for the sheep changing to green energy production and teams of workers going off to maintain and clean solar panels.

The overall impact on **soil and agricultural potential (inclusive of land reform)** during the construction and operation is likely to be of **low significance** given the implementation of the recommended mitigation measures. In general, the proposed infrastructure is unlikely to have a low significant agricultural impact on the area. The impacted area is not suitable for dry land crop production. The full farming unit consists of 6 cadastral units with a total of 7011ha. The current farmer stocks 600 ewes on the 7011 ha. This is a small stock carrying capacity of 12ha per small stock unit. On these cadastral units, 4 will eventually have PV electricity generation facilities should all of them be constructed. In total, 2000ha will be lost to agriculture and sheep farming should all the PV facilities be constructed. The remaining farming unit will still consist of

5 011 ha and will be able to stock 417 ewes. The income generated from the PV facility will however be much more that the income that will be generated from the ewes that will be lost and the farming unit will still be financially viable. Because the undisturbed site already has extremely limited agricultural potential, it means that the consequence of any impact for agricultural production is limited with the result that the consequence and significance of agricultural impacts is low. Furthermore, the poor, very shallow soil conditions reduce the significance of loss of topsoil and 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 country.

The overall impact on **ecology** is likely to be of a **medium significance** given the implementation of mitigation measures. The habitats, such as drainage lines and rare endangered species are being regarded to be of high importance in terms of ecological sensitivity. The proposed facility (preferred layout) will not impact on any of these high ecological sensitive areas, including their set buffer area. Changes in the broader habitat as a consequence of variation in physical factors within the site (e.g. shading of vegetation, changes in surface water flow regime), changes in the surface hydrology (freshwater impacts) and possible impacts on avifauna species are rated as medium significance.

The overall **social and socio-economic** impact in terms of positive and negative impacts is likely to be of a **low significance** during both the construction and operational phases when assessed regionally but of high significance if assessed locally. The potential negative impacts associated with the construction phase are typical of construction related projects and are expected to respond to the mitigation measures proposed. The possible job creation and skills development are regarded as a **significant positive** injection into the area. The project would result in significant positive economic spin-offs for the local area and region primarily because of the labour-intensive operational practices that would be associated with it.

The proposed facility maintains a very low profile and follows the natural lay of the land. Facility fits only partially into surroundings. The Aries substation and associated transmission lines, as well as other similar facilities authorized in the direct vicinity of the proposal, sets a precedent for the development of similar activities in the area. The visual impact is assessed to be of **moderate significance** with mitigation. The reasons for this are mainly 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 the Pofadder – Kenhardt road. The implication of this situation is that views from the road will in any case be of short duration (travellers). Furthermore, during the operational phase, activities on-site will be minimal and will only include maintenance and security. Mitigation measures as proposed will ensure that the impact will be reduced even further.

The establishment of the facility will have positive benefits as the integration of an additional 300 MW may alleviate the pressure on the local grid to a small extent and would contribute to the national target of renewable energy.

Therefore, based on the findings of the studies undertaken, in terms of environmental constrains identified through the initial Environmental Assessment process, **no environmental fatal flaws** were identified with the establishment of the proposed PV plant and it is recommended that the project should be authorised. However, a number of issues requiring mitigation have been highlighted. Environmental specifications for the management of these issues / impacts are detailed within the draft Environmental Management Programme (EMP).

1. INTRODUCTION

This report has been prepared in compliance with the requirements of Regulations contained in Government Notices No's GNR 327, 325, 324 and GNR 326 as promulgated in terms of the National Environmental Management Act 107 of 1998, known as the Environmental Impact Assessment **(EIA)** Regulations.

The purpose of these Regulations is to regulate procedures and set criteria as contemplated in Chapter 5 of the Act to enable the submission, processing, consideration and decision-making regarding applications for environmental authorization of activities and matters pertaining thereto.

Requirement	Section in Report
(a) details of- (iii) the EAP who prepared the report; and	Section 1.2 page 18.
(iv) the expertise of the EAP, including a curriculum vitae;	Section 1.2 page 18 and Appendix H for curriculum vitae.
(b) the location of the development footprint of the activity on the approved site as contemplated in the accepted scoping report, including:	Section 3.1 and Appendix B.
(i) the 21-digit Surveyor General code of each cadastral land parcel;	Section 3.1 page 35.
(ii) where available, the physical address and farm name; and	No physical address. Farm name include Section 3.1. page 35.
(iii) where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties;	GPS co-ordinates on page 36-38.
(c) a plan which locates the proposed activity or activities applied for as well as the associated structures and infrastructure at an appropriate scale, or, if it is-	Appendix B.
(i) a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken;	GPS co-ordinates on page 38.
(ii) on land where the property has not been defined, the coordinates within which the activity is to be undertaken;	GPS co-ordinates on page 36-38.
(d) a description of the scope of the proposed activity, including-	Section 3.1 page 38-42.
(i) all listed and specified activities triggered and being applied for; and	Listed activities specified on pages 28 and 81-82.
(ii) a description of the associated structures and infrastructure related to the development;	Pages 38-42.
(e) a description of the policy and legislative context within which the development is located and an explanation of how the proposed development complies with and responds to the legislation and policy context;	Chapter 2.

(f) a motivation for the need and desirability for the proposed development, including the need and desirability of the activity in the context of the preferred development footprint within the approved site as contemplated in the accepted scoping report;	Chapter 6.
(g) a motivation for the preferred development footprint within the approved site as contemplated in the accepted scoping report;	Environmental Impact Statement on page 164.
(h) a full description of the process followed to reach the proposed development footprint within the approved site as contemplated in the accepted scoping report, including:	Pages 66-67.
(i) details of the development footprint alternatives considered;	Page 67.
(ii) details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs;	Chapter 5 and Appendix E.
(iii) a summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them;	Will be included in the final EIAr. None to date.
(iv) the environmental attributes associated with the development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;	Chapter 4.
(v) the impacts and risks identified including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts-	Chapter 8.
(aa) can be reversed;	Chapter 8.
(bb) may cause irreplaceable loss of resources; and	Chapter 8.
(cc) can be avoided, managed or mitigated;	Chapter 8.
(vi) the methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks;	Section 8.1 pages 70-71.
(vii) positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;	Chapter 8.
(viii) the possible mitigation measures that could be applied and level of residual risk;	Chapter 8.

(ix) if no alternative development footprints for the activity were investigated, the motivation for not considering such; and	Alternative development footprints for the activity were investigated.
(x) a concluding statement indicating the location of the preferred alternative development footprint within the approved site as contemplated in the accepted scoping report;	Page 168.
(i) a full description of the process undertaken to identify, assess and rank the impacts the activity and associated structures and infrastructure will impose on the preferred development footprint on the approved site as contemplated in the accepted scoping report through the life of the activity, including-	Chapter 8.
(i) a description of all environmental issues and risks that were identified during the environmental impact assessment process; and	Chapter 8.
(ii) an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures;	Chapter 8.
(j) an assessment of each identified potentially significant impact and risk, including-	Chapter 8.
(i) cumulative impacts;	Chapter 8.
(ii) the nature, significance and consequences of the impact and risk;	Chapter 8.
(iii) the extent and duration of the impact and risk;	Chapter 8.
(iv) the probability of the impact and risk occurring;	Chapter 8.
(v) the degree to which the impact and risk can be reversed;	Chapter 8.
(vi) the degree to which the impact and risk may cause irreplaceable loss of resources; and	Chapter 8.
(vii) the degree to which the impact and risk can be mitigated;	Chapter 8.
(k) where applicable, a summary of the findings and recommendations of any specialist report complying with Appendix 6 to these Regulations and an indication as to how these findings and recommendations have been included in the final assessment report;	Section 8.2.
(l) an environmental impact statement which contains-	Pages 164-167.
(i) a summary of the key findings of the environmental impact assessment:	Pages 164-167.

(ii) a map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred development footprint on the approved site as contemplated in the accepted scoping report indicating any areas that should be avoided, including buffers; and	Appendix C.
(iii) a summary of the positive and negative impacts and risks of the proposed activity and identified alternatives;	Pages 159-161.
(m) based on the assessment, and where applicable, recommendations from specialist reports, the recording of proposed impact management outcomes for the development for inclusion in The EMPr as well as for inclusion as conditions of authorisation;	Pages 169-170.
(n) the final proposed alternatives which respond to the impact management measures, avoidance, and mitigation measures identified through the assessment;	Chapter 8.
(o) any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation;	Pages 169-170.
(p) a description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed;	Section 1.6 page 22. Pages 162 and 164.
(q) a reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation;	Pages 164-167.
(r) where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required and the date on which the activity will be concluded and the post construction monitoring requirements finalised;	Does include operational aspects.
(s) an undertaking under oath or affirmation by the EAP in relation to-	Will be included in the final EIAr.
(i) the correctness of the information provided in the reports;	Will be included in the final EIAr.
(ii) the inclusion of comments and inputs from stakeholders and I&APs;	Will be included in the final EIAr.
(iii) the inclusion of inputs and recommendations from the specialist reports where relevant; and	Will be included in the final EIAr.
(iv) any information provided by the EAP to	Will be included in the final EIAr.

interested and affected parties and any responses by the EAP to comments or inputs made by interested or affected parties;	
(t) where applicable, details of any financial provision for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts;	None included in the EIR. The financial provision requirements associated with the EMPr will be costed and included in the financial documents that will be supplied by the preferred bidder once selected as a preferred bidder in the South African Renewable Energy Feed-in Tarif ("REFIT") program to reach financial close and approval to commence with construction and operation of the facility.
(u) an indication of any deviation from the approved scoping report, including the plan of study, including-	None.
(i) any deviation from the methodology used in determining the significance of potential environmental impacts and risks; and	Page 123.
(ii) a motivation for the deviation;	Page 123.
(v) any specific information that may be required by the competent authority; and	As per comments and response report in Appendix E.
(w) any other matters required in terms of section 24(4)(a) and (b) of the Act.	Not applicable

1.1 Background and Purpose of the Environmental Impact Report

Solar Energy Land is proposing the establishment of commercial solar electricity generating facilities and associated infrastructure on Portions 6 and 3 of Farm 187 Olyvenkolk, Kenhardt, Northern Cape.

The solar facility intends to accommodate a Photovoltaic component and associated infrastructure on the proposed site. The proposed site for the Solar Energy Land Photovoltaic Electricity Generation Facility was identified through an extensive site selection process which took several conditions such as climatic conditions, topography and grid connection into consideration.

Eco Impact Legal Consulting Pty Ltd (Eco Impact) have been appointed by Solar Energy Land as the independent environmental assessment practitioner **(EAP)** for this project as required in terms of the regulations. Eco Impact will be managing the application for authorization, having already submitted an Application form, draft and final Scoping Reports to the Department of Environmental Affairs **(DEA)**, and will be preparing the final EIAr for submission to DEA following this draft EIAr phase.

The EIA will be evaluated by DEA who will either issue an Environmental Authorization (with conditions), or alternatively, refuse the application for authorization.

Solar Energy Land propose the establishment of a 300 MW Photovoltaic plant to generate electricity to feed into the national grid. The project is also in line with the government's

commitment to provide renewable energy as an alternative energy source to those currently utilized.

The nature and extent of this facility, as well as potential environmental impacts associated with the construction, operation and decommissioning phases are explored in more detail in this Draft EIAr.

1.2. Environmental Assessment Practitioner

This report has been prepared by Mrs. Jessica Hansen of Eco Impact.

Name of the Environmental Assessment Practitioner ("EAP") responsible for the application:	Eco Impact Legal Consulting (Pty) Ltd		
Company name (if any):	Jessica Hansen		
Postal address:	P.O. Box 45070		
	Claremont	Postal code:	7735
Telephone:	021 671 1660	Cell:	083 666 8046
E-mail:	admin@ecoimpact.co.za	Fax:	021 671 9976

The role of the EAP is to manage the application for an EA on behalf of the applicant. The EAP must adhere to all relevant legislation and guidelines, ensuring that the reports contain all the necessary and relevant information required by the competent authority to make a decision. It is the responsibility of the EAP to perform all work relating to the application in an objective, appropriate and responsible manner.

Eco Impact is appointed by the Solar Energy Land as the independent environmental assessment practitioner (EAP) for this project as required in terms of the regulations. Eco Impact is an environmental consultancy established in 2008.

Jessica has a BSc (Honours) in Environmental and Geographical Science in 2011 from the University of Cape Town and subsequently obtained her MSc in Zoology in 2013. Jessica is a registered Professional Natural Scientist in the environmental science field with the South African Council for Natural Scientific Professions ("SACNASP") and a qualified EAP who holds a Master of Science Degree from the University of Cape Town.

Jessica has trained as an Environmental Assessment Practitioner since 2013 and has been involved in the compilation, coordination and management of Basic Assessment Reports, Environmental Impact Assessments, Environmental Management Programmes, Waste Licence Applications, Water Use Licence Applications and Baseline Biodiversity Surveys for numerous clients.

Refer to Appendix H for a copy of the EAP's CV.

1.3. The EIA Process to Date

The current EIA process for the proposed development application was initiated by Eco Impact in July 2018. As required by the Regulation under NEMA, this initially consisted of a Scoping phase during which members of the public were notified of the process, and invited to submit comments and raise any issues and concerns. The purpose of the Scoping process was to identify the environmental impacts and range of feasible alternatives requiring more detailed investigation in the EIA. The Scoping process culminated in the compilation of a Scoping Report (Eco Impact 2018) containing the following information:

- A detailed background to the project;
- An overview of the legal requirements for the proposed activities;
- The terms of reference for the EIA, and overview of the approach to and scope of the environmental investigation;
- A description of the public participation process undertaken for the project;
- A detailed description of the proposed activities and the full range of identified project alternatives;
- An overview of the affected environment; and
- A summary of the potential environmental impacts identified by the public, literature review and professional inputs.

The Scoping Report outlined the full range of potential environmental impacts and feasible project alternatives and how these were derived. Moreover, included with the Scoping Report was a Plan of Study for EIA, which outlined in detail the proposed approach to the subsequent and final phase of the EIA process, *viz.* the (EIAr) phase. The aforementioned documents were submitted to DEA and accepted.

We are now in the Environmental Impact Report (EIAr) Phase of the EIA process, and the sequence of documents produced thus far are as follows:

- The Department of Environmental Affairs (DEA) Application Form, providing the formal application for the projects.
- The Draft and Final Scoping Reports, outlining the findings of the Scoping Process and reflecting public comment in this regard.
- The Plan of Study for EIA, describing the proposed approach to the Environmental Impact Report phase.

1.4. Structure and Scope of this Report

As outlined above, the EIA process undertaken to date has culminated in the production of a comprehensive Scoping Report which provides detailed information relevant to the project. However, for the sake of being succinct, information contained within the Scoping Report is not repeated within this EIAr unless it has direct bearing on the issues under discussion. **Accordingly, to ensure a holistic understanding of the project, the nature of the activities and the substance of the environmental process, it is critical that this EIAr is read in conjunction with the Final Scoping Report** (Eco Impact 2018).

The structure of this EIAr has been informed by NEMA GNR 326 Appendix 3 and the need

for a clear and succinct document to facilitate informed decision-making by the applicant and environmental authorities.

The EIAr contains the following information:

- Details of the EAP who compiled the report and the expertise of the EAP to carry out an environmental impact assessment
- A detailed description of the proposed activity
- A description of the property on which the activity is to be undertaken and the location of the activity on the property
- A description of the environment that may be affected by the activity and the manner in which the physical, biological, social, economic and cultural aspects of the environment may be affected by the proposed activity
- Details of the public participation process conducted
- A description of the need and desirability of the proposed activity
- A description of identified potential alternatives to the proposed activity, including advantages and disadvantages that the proposed activity or alternatives may have on the environment and the community that may be affected by the activity
- An indication of the methodology used in determining the significance of potential environmental impacts
- A description and comparative assessment of all alternatives identified during the environmental impact assessment process
- A summary of the findings and recommendations of any specialist report or report on a specialised process
- A description of all environmental issues that were identified during the environmental impact assessment process, an assessment of the significance of each issue and an indication of the extent to which the issue could be addressed by the adoption of mitigation measures
- An assessment of each identified potentially significant impact, including cumulative impacts, the nature of the impact, the extent and duration of the impact, the probability of the impact occurring, the degree to which the impact can be reversed, the degree to which the impact may cause irreplaceable loss of resources, and the degree to which the impact can be mitigated
- A description of any assumptions, uncertainties and gaps in knowledge
- A reasoned opinion as to whether the activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation
- An environmental impact statement which contains a summary of the key findings of the environmental impact assessment, and a comparative assessment of the positive and negative implications of the proposed activity and identified alternatives
- A draft environmental management programme
- Copies of any specialist reports and reports on specialized processes
- Any specific information that may be required by the competent authority

1.5. Approach to the Project

1.5.1. The EIAr phase

As outlined in the Scoping Report, there are three distinct phases in the EIA process, as required in terms of the NEMA, namely the Initial Application, the Scoping Report and the EIAr phases. This Report covers the final phase, *viz.* the EIAr phase. The Initial Application phase entailed the submission of the Application Form, whilst the Scoping Report phase entailed the compilation and submission of the Scoping Report and Plan of Study for EIA.

The purpose of the EIAr is to describe and assess the range of feasible alternatives identified during the Scoping process in terms of the potential environmental impacts identified. The ultimate purpose of the EIAr is to provide a basis for informed decision-making, firstly by the applicant with respect to the option they wish to pursue, and secondly by the environmental authority regarding the environmental acceptability of the applicant's preferred option.

The approach to the EIAr phase entailed the following:

- Undertaking a further review of relevant literature;
- Appointing various specialists to undertake the specialist studies identified during the Scoping Report phase:
    - Nicolaas Hanekom - Eco Impact - Biodiversity and Ecological Specialist, Agricultural Specialist
    - Review specialists (Ecology) - Avhafarei Phamphe (Pr.Sci.Nat-Ecological Science) – Nemai Consulting
    - Review specialists (Agricultural) – Michael Wright (Pr.Sci.Nat: B.Sc. Agric) – Michael Wright Environmental Scientist and Ecotourism Consultant
    - Dr John Almond - NATURA VIVA cc - Palaeontological Impact Assessments
    - Jayson Orton – ASHA - Heritage Impact Assessments
    - Anelia Coetzee - Leap Sustainable Development– Socio-Economic Study
    - Martin Langenhoven– Visual Impact Assessment
    - SKCM Consulting Engineers – Geo-Technical Assessment, Flood Line Determination and Traffic Impact Assessment Engineering Services Report
    - Johann Strauss – Electrical Engineer – Stellenbosch University – Grid Connections input and descriptions directly included in the EIR report

Consultation with the public forms an integral component of this investigation and enables I&APs *e.g.* landowners, local authorities, businesses, informal traders, environmental groups, civic associations and communities, to comment on the potential environmental impacts associated with the feasible alternatives and to identify additional issues which they feel have not been adequately addressed in the EIAr. A detailed summary of the public participation process, and the comments submitted by I&APs, is provided in Section 5 and in Appendix E.

1.5.2. Authority involvement

In accordance with the requirements of GNR 326, a Scoping Report and a Plan of Study for EIA for the proposed project were compiled and submitted to the competent authorities. DEA accepted the Final Scoping report on the 26rd of November 2018. Note: As per GNR 326, the Final EIAr must be submitted within 106 days of the acceptance of the scoping. The period of 15 December to 5 January must be excluded in the reckoning of days. Hence the final EIAr must be submitted by Wednesday 3 April 2019.

1.5.3 Decision making

The Final EIAr will be completed and all I&AP will be incorporated into the report. The EIAr will be submitted to DEA for review and decision making. The competent authority must within 107 days of receipt of the environmental impact assessment report and EMPr issue a decision.

Once DEA have reviewed the document and are satisfied that it contains sufficient information to make an informed decision, DEA will determine the environmental acceptability of the applicant's preferred options. Thereafter DEA will issue an Environmental Authorization outlining the decision. Following the issuing of the Environmental Authorization, DEA's decision will be communicated to all identified I&APs and there will be an appeal period within which I&APs will have an opportunity to appeal against the decision to the Minister of the Department of Environmental Affairs in terms of the NEMA.

1.6 Assumptions and Limitations

In undertaking this investigation and compiling the Scoping Report and EIAr, the following has been assumed:

- The information provided by the client, engineers and specialists is accurate and unbiased.
- The scope of this investigation is limited to assessing the environmental impacts associated with the development.
- Should the proposed project be authorised, the applicant will incorporate the recommendations and mitigation measures outlined in the EIAr into the detailed design and construction contract specifications and operational management system for the proposed project.

1.7 The Legal Framework for Renewable Energy in South Africa

Allocation of applicable environmental legislation:

Environmental Legislation	Description of Activity
Kai! Garib Municipality: Antenna System By-law	Erection of antennae or satellite dishes
Kai! Garib Municipality: Building Control By-Law	The construction of buildings
Kai! Garib Municipality: Fire Services By-law	Storage of combustible materials and gas filled devices. Fire outbreak procedure. Making fires
Kai! Garib Municipality: Electricity By-law	Electricity generation and consumption
Kai! Garib Municipality: Water Services By-law	Water supply, discharge of industrial effluent and storage and removal of sewage
Kai! Garib Municipality: By-Law on The Control Over Advertising Signs and The Disfigurement of The Front or Frontages of Streets	Commercial advertising which may have an environmental impact
Kai! Garib Municipality: By-Law on Municipal Land Use Planning	Land development requiring approval
Kai! Garib Municipality: Waste Management By-Law	Regulate waste disposal and control. Generation, transportation, removal and disposal of waste.
Kai! Garib Municipality: By-Laws Relating	Prohibition of causing a nuisance

to Nuisance	
ATMOSPHERIC POLLUTION PREVENTION ACT, 45 OF 1965 Regulations only	Activities that result in emissions of dust, vehicle emissions and noxious or offensive gasses.
CONSERVATION OF AGRICULTURAL RESOURCES ACT, 43 OF 1983	Weeds and the tolerance thereof, which applies in both urban and other areas.
FERTILIZERS, FARM FEEDS, AGRICULTURAL REMEDIES AND STOCK REMEDIES ACT, 36 OF 1947 and relevant regulations	Activities associated with pest control and the use of agricultural remedies.
NATIONAL HEALTH ACT, 61 OF 2003	Littering and causing a nuisance
HAZARDOUS SUBSTANCES ACT, 15 OF 1973 and relevant Regulations	The storage and/or use of substances which may cause injury or ill-health to or death of human beings by reason of their toxic, corrosive, irritant, strongly sensitizing or flammable nature or the generation of pressure thereby in certain circumstances, and for the control of certain electronic products and radioactive material.
NATIONAL BUILDING REGULATIONS AND BUILDING STANDARDS ACT, 103 OF 1977 and relevant regulations	The erection of new buildings.
NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 107 OF 1998 and relevant regulations	Various general activities, too numerous to list, including but not limited to the control of emergency incidents and the care and remediation of environmental damage. Listed activities that trigger the requirement for an environmental authorization
NATIONAL ENVIRONMENTAL MANAGEMENT: WASTE ACT, 59 OF 2008 and relevant regulations	Listed waste management activities and the requirements for a license, waste removal and transportation, waste disposal, littering and the requirements for an integrated waste management plan
NATIONAL ROAD TRAFFIC ACT, 93 OF 1996 and relevant regulations	Driving on public roads and in particular, the transportation of certain dangerous goods.
NATIONAL WATER ACT, 36 OF 1998 and relevant regulations	The use of water, including any water purification and effluent treatment facilities, dams and irrigation systems.
NATIONAL ENVIRONMENTAL MANAGEMENT: AIR QUALITY ACT, 39 OF 2004 and relevant regulations	Activities that may affect the air quality on site and the environment surrounding it.
WATER SERVICES ACT, 108 OF 1997 and relevant regulations	The use of water and sanitation services of a water services provider.
NATIONAL ENVIRONMENTAL MANAGEMENT: BIODIVERSITY ACT, 10 OF 2004 Threatened or Protected Species Regulations.	Threatened or Protected Species and vegetation types identified under National Spatial Biodiversity Assessment.
National Forest Act, Act 84 of 1998 and relevant regulations	Protected tree species.

2. THE LEGAL FRAMEWORK FOR RENEWABLE ENERGY IN SOUTH AFRICA

2.1 Policy and Planning Context for Solar Energy in South Africa

2.1.1 White Paper on the Energy Policy of the Republic of South Africa, 1998

This white paper was developed to ensure (as per the Constitution) that the state establishes an energy policy which will ensure that the national energy resources will be adequately tapped and developed to cater for the needs of the nation. The paper states that energy production and distribution must not only be sustainable, but also lead to an improvement of the standard of living of all citizens. For this to happen, the state must ensure that energy production and utilisation are done with maximum efficiency. The white paper clarifies government policy regarding the supply and consumption of energy over the decade following publication and addresses all elements of the energy sector. This includes renewables.

The paper constitutes a formal framework within which the energy sector will operate within the broad national strategy for reconstruction and development. The energy sector can generally be viewed from a demand and supply perspective. The policy takes social issues into account especially based on South Africa's racially exclusive past. It identifies integrated energy planning as the most suitable base for planning purposes even though it admits there are drawbacks to this method.

The paper considers the following three aspects in order to understand the energy policy context and energy sector challenges:

- Economic, social and environmental policies and forces
- The nature of the South African energy sector and its linkages with broader forces; and
- What the sector needs to achieve overall policy goals

The objectives of the policy are to increase access to affordable energy services, improve energy governance, stimulate economic development, manage energy-related environmental and health impacts and securing supply through diversity.

Relevance to the Project

The white paper forms the basis for the direction in which the Government has taken with regard to energy in South Africa. It identifies the advantages of renewable energy sources, especially in remote areas where grid electricity supply is not feasible. The policy also highlights that renewables can in many cases provide the least cost energy service, particularly when social and environmental costs are included.

2.1.2 White Paper on Renewable Energy, 2003

This paper sets out the Government's vision, policy principles, strategic goals and objectives for promoting and implementing renewable energy in South Africa. Through this policy document, a ten-year target of how renewable energy technologies could diversify the country's energy mix and secure cleaner energy was set. The objectives were to:

- Ensure that an equitable level of national resources were invested in renewable technologies;

- Direct public resources to implementation of renewable energy technologies;
- Introduce suitable fiscal incentives for renewable energy and;
- Create an investment climate for the development of the renewable energy sector.

Some of the main benefits of the white paper will be renewable energy for rural communities, remote schools and clinics, energy for rural water supply and desalination. This will promote sustainable development and improve the situation of some of the poorest communities in South Africa. Large scale utilisation of renewable energy will also reduce the emissions of carbon dioxide, thus contributing to an improved environment both locally and worldwide. The paper identifies that renewable energy must assume a significant role in supporting economic development and to create greater competition in electricity markets. This is being achieved through the recent signing of the Independent Power Producers agreement.

Renewable energy also supports human capacity building programmes at both formal and informal levels. The policy document intends to support the development of training centres and integrated energy centres which can be used to disseminate information and create awareness about renewable energy.

South Africa currently relies heavily on coal to meet its energy needs. It is a relatively low-cost means of supplying electricity to many residential, commercial and institutional consumers. However, conscious of the concerns around the use of fossil fuels and global warming, the need to utilise renewable energy resources more has been recognised. The Department of Minerals and Energy (DME) thus embarked on an Integrated Energy Plan (IEP) to develop the renewable energy resources, while taking safety, health and the environment into consideration.

The long-term goal of the Government is the establishment of a renewable energy industry producing modern energy carriers that will offer a sustainable, full non-subsidised alternative to fossil fuels.

Relevance to the Project
The White Paper is in support of renewable energy as indicated above and acknowledges that Projects such as this one could contribute to sustainable economic growth and development.

2.1.3 Integrated Resource Plan for Electricity, 2010-2030 (2050)

The Integrated Resource Plan (IRP) is a long-term electricity capacity plan, which defines the need for new generation and transmission capacity for the country. The objective of the IRP is to develop a sustainable electricity investment strategy for generation capacity and transmission infrastructure for South Africa over the next twenty years.

The IRP is intended to:

- Improve the long-term reliability of electricity supply through meeting adequacy criteria over and above keeping pace with economic growth and development;

- Ascertain South Africa's capacity investment needs for the medium-term business planning environment;

- Consider environmental and other externality impacts and the effect of renewable energy technologies;

The IRP is a “living plan” which must be revised frequently. Thus, the Draft Plan for comment was published on 27 August 2018 with comments closing on 26 October 2018. There have been a number of assumptions which have changed that have necessitated the current review. Key assumptions that have changed include electricity demand projection that did not increase as envisaged, Eskom plant performance which is way below the 80% availability factor, additional capacity committed to and commissioned as well as technology costs that declined significantly. The update process consisted of four key milestones which are:

- Development of input assumptions;
- Development of a credible base-case and scenario analysis;
- Production of a balanced plan; and
- Policy adjustment

The initial study period from 2010 – 2030 has also been extended to 2050.

Relevance to the Project
The IRP 2010-2030 recognises renewable energy as a critical component of the energy mix going forward. The updated IRP still only has a firm plan until 2030 and recommends that the path post-2030 must not be confirmed until certain studies are undertaken. The updated IRP does curtail certain new capacity developments and has steered away from the nuclear option. Solar energy is still regarded as one of the key components of the energy mix until 2030.

2.1.4 National Climate Change Response White Paper (2011)
Global climate change and South Africa’s commitment to emission reduction has necessitated an even stronger drive to move toward cleaner energy options such as solar and wind energy. The White Paper identifies priority areas and activities for adaptation and mitigation. Certain areas were prioritised for adaptation (e.g.: water and agriculture) and other for mitigation (e.g.: energy and mining). One of the important aspects was the commitment to create 300 000 new jobs in the “green economy” by 2020.

Relevance to the Project
Climate change has been a catalyst for focus on cleaner energy provided by projects such as this and because it is a fairly new area (due to South Africa’s historic reliance on energy from coal) there is the opportunity to create many jobs. Added to this is the fact that projects such as this are situated in rural areas results in the upliftment of persons in such areas which are generally not economic hubs.

2.1.5 Renewable Energy Independent Power Producers Procurement Process (REIPPPP)
The NERSA Renewable Energy Feed-In Tariff (REFIT) Guidelines were published in 2009 under the Electricity Regulation Act, 4 of 2006. The program ran into trouble and was replaced by the REIPPPP which resulted in a competitive bidding process for renewable energy.

Relevance to the Project
The REIPPPP has proven to be really successful and resulted in new renewable energy capacity for electricity production resulting in an increased delivery of clean energy per annum into the energy mix.

2.2 Energy Statutes

2.2.1 National Energy Act (34 of 2008)

This Act aims to ensure that diverse energy resources are available, in sustainable quantities and at affordable prices, to the South African economy in support of economic growth and poverty alleviation.

Relevance to the Project

The Act recognises that environmental management requirements are taken into account in planning and that increased generation of renewable energies is required.

2.2.2 Electricity Act, 41 of 1987

The objective of the Electricity Act, 41 of 1987, is to provide for the continued existence of the National Electricity Regulator and the control of the generation and supply of electricity and related matters. As such it takes over the functions of the previous Electricity Control Board and has as its objects, "…*to exercise control over the electricity supply industry so as to ensure order in the generation and sufficient supply of electricity*…". The functions of the Regulator include the issuing of licenses, determination of process, settling disputes, collecting information and related matters.

Relevance to the Project

The proposed development requires a generation licence from NERSA.

2.2.3 National Energy Regulator Act 40 of 2004

The objective of this Act is to establish a National Energy Regulator for the regulation of the electricity, piped-gas and petroleum pipelines industries.

Relevance to the Project

The proposed development requires a generation licence from NERSA.

2.2.4 Electricity Regulation Act 4 of 2006

The objective of the Electricity Regulation Act is to achieve the efficient, effective, sustainable and orderly development and operation of electricity supply infrastructure in South Africa. The Act also promotes the use of diverse energy sources and energy efficiency.

Relevance to the Project

The proposed development is a renewable energy plant.

2.3 Environmental Statutes

2.3.1 Constitution of the Republic of South Africa (No. 108 of 1996)

The legal foundation for environmental law in South Africa originates in the Constitution of the Republic of South Africa, Act 108 of 1996. All environmental aspects should be interpreted within the context of the Constitution. The Constitution has enhanced the status of the environment by virtue of the fact that environmental rights have been established (Section 24) and because other rights created in the Bill of Rights may impact on environmental management.

Relevance to the Project
The Constitution is applicable in respect of all actions of the citizens of South Africa.

2.3.2 National Environmental Management Act (No. 107 of 1998) as amended

NEMA (107 of 1998) is the key legislation setting out the framework for environmental management in South Africa. The Act promotes cooperative environmental governance and establishes principles for decision-making on matters affecting the environment. NEMA is the primary legislation influencing the Scoping and EIA. Specifically, Chapter 5 deals with Integrated Environmental Management and promotes the application of appropriate tools. The "EIA Regulations" published in GN R326 in terms of Section 24(5) and 44 of NEMA require that certain activities listed in GN R327 and 324 will require a "Basic Assessment", and those in GN R325 will require a "Scoping and EIA" respectively before they can proceed.

Relevance to the Project
This project includes a number of listed activities which collectively form part of the proposal. Those activities falling under GN R325 trigger the requirement for a Scoping and EIA whilst those falling under GN R327 and 324 trigger a Basic Assessment.

Listed Activities associated with the proposed development for which Environmental Authorization is applied for:

Indicate the number and date of the relevant notice:	**Activity No (s) (in terms of the relevant notice):**	**Describe each listed activity as per project description[1]:**
GNR 327, 2017/04/07.	Activity 11 (i)	A 132-kV power line (mono pole structures) of 9.570 km in length over Portions 6 and 3 of Farm 187 to feed the electricity generated into the existing Aries substation.
GNR 327, 2017/04/07.	Activity 19	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.
GNR 327, 2017/04/07.	Activity 28 (ii)	The proposed solar PV facility will be constructed on a portion of Portion 6 of Farm 187, Olyvenkolk. It is understood that the land is currently used for agricultural purposes (mainly grazing). The proposed 300 MW PV facility, which is considered to be a commercial/industrial development, will have an estimated footprint of approximately 500 ha.
GNR 325, 2017/04/07.	Activity 1	The proposed PV facility will generate approximately 300MW.
GNR 325,	Activity 15	The proposed solar PV facility will be constructed

[1] Please note that this description should not be a verbatim repetition of the listed activity as contained in the relevant Government Notice, but should be a brief description of activities to be undertaken as per the project description.

2017/04/07.		on a portion of Portion 6 of Farm 187, Olyvenkolk. The proposed development area consists of indigenous vegetation that will be cleared on an estimated footprint of approximately 500 ha.
GNR 324, 2017/04/07.	Activity 14 (ii) (a)	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 service roads will be constructed through some of the dendritic drainage lines.

2.3.3 National Heritage Resource Act (No. 25 of 1999)

SAHRA - (South African Heritage Resource Agency) is tasked with protecting heritage resources of national significance. Under Section 38 of the National Heritage Resources Act, all new developments which will change the character of a site and which exceed an area of 5 000 m², must at the very preliminary stages of initiating such a development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development.

The authorities must ensure that the EIA fulfils the Provincial Heritage Resources Agency (PHRAG) requirements, and that any comments and recommendations from PHRAG have been taken into account prior to the granting of the consent by the relevant authority. PHRAG is thus able to restrict and/or regulate development within a heritage environment.

Relevance to the Project

Section 38 of the NHRA states that Heritage Impact Assessments (HIAs) are required for certain kinds of development such as rezoning of land greater than 10 000 m^2 in extent or exceeding 3 or more sub-divisions, or for any activity that would alter the character or landscape of a site greater than 5,000 m^2. A Heritage Impact Assessment and a desktop Palaeontological Impact Assessment have been undertaken. These relevant specialist studies are included in the EIA Reports that will be released to I&APs for review during the EIA Phase. The proposed project will be loaded onto the South African Heritage Resources Information System (SAHRIS) for comment. Once a final comment has been issued by the heritage authority, the recommendations should be included in the conditions of the EA (should it be granted). This will essentially give 'permission' from the heritage authorities to proceed. If any archaeological mitigation is required then this would need to be conducted by an appropriate specialist under a permit issued to that specialist by SAHRA - (South African Heritage Resource Agency). This permit has no bearing on the developer or development but is purely a way in which the heritage authority can be sure that the mitigation work will be carried out satisfactorily.

2.3.4 The National Water Act (No. 36 of 1998)

The National Water Act (Act 36 of 1998) is the fundamental law for managing South Africa's water resources. The purpose of the Act is to ensure that water resources of the nation are protected, used, developed, conserved and controlled. It is concerned with the allocation of equitable access and the conservation of water resources within South Africa. The National Water Act (Act 36 of 1998) repeals many of the powers and functions of the Water Act (Act 54 of 1956). The proposed development is located on an area with rivers and drainage lines. Under the National Water Act (No.36 of 1998), drainage lines and rivers are classified as water resources, and as such are protected and should not be subjected to any pollution or damage.

Relevance to the Project
Section 19 refers to pollution prevention and places responsibility on the person who owns controls or uses the land to take all reasonable measures to prevent pollution of a water resource from occurring, continuing to occur or recurring as a result of activities on land. Prescribed waste standard or management practices require compliance. Section 21 classifies "water use in respect of requiring a license and these include (i) altering the bed, banks, course or characteristics of a watercourse etc.". Therefore, the relevant licensing or registration procedures may apply. The DWS will be consulted with during the EIA Process to confirm the need for a WUL, as well as to seek comment on the proposed project.

2.3.5 The National Environmental Management: Biodiversity Act (No. 10 of 2004)

South Africa has ratified the International Convention on Biological Diversity, which commits the country to follow a strategy for the conservation, sustainable use and equitable sharing of the benefits of diversity, making this Act applicable to all proposed development applications. The National Environmental Management: Biodiversity Act (Act 10 of 2004**)** or NEMBA provides for the management and conservation of South Africa's biodiversity within the framework of NEMA. This Act allows for the protection of species and ecosystems that warrant national protection, the sustainable use of indigenous biological resources, the fair and equitable sharing of benefits arising from bio-prospecting involving indigenous biological resources and the establishment and functions of the South African National Biodiversity Institute. Key elements of the Act are:

- The identification, protection and management of species of high conservation value;
- The identification, protection and management of ecosystems and areas of high biodiversity value;
- Alien invasive species control of which the management responsibility is directed to the landowner; and
- Section 53 of the Act identifies that any process or activity that is regarded as a threatening process in terms of a threatened ecosystem, requires environmental authorization via a full Environmental Impact Assessment.

Relevance to the Project
Chapter 4 in particular relates to threatened and protected ecosystems and species and related threatening processes and restricted activities. The EIA has taken into consideration those indigenous species listed as threatened or protected species in terms of Section 56(1) of the Act. In order to work within the framework of this Act, specialist ecological studies have been conducted for the study area. The specialist studies included:

- Terrestrial and riparian Vegetation
- Freshwater (rivers) and wetlands
- Red data species
- Avifauna

The results of these assessments influence the layout of the PV plant.

2.3.6 Conservation of Agricultural Resources Act (No. 43 of 1983) (CARA)

As part of a National strategy towards gaining control of invasive alien plant species and weeds, the Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983), as amended, stipulates that landowners are legally responsible for the control of invasive alien plants on their properties. Alien plants are rendering agricultural land uses and therefore if weeds or invader plants occur contrary to the provisions of these regulations, the land user must control them by means of any of the control methods that are appropriate for the species concerned (Regulation 15). Any action taken to control weeds or invader plants must be executed with caution and in a

manner that will have minimal environmental impact. The Act also deals with run-off control of surface water and control measures against erosion.

Relevance to the Project
Section 5 relates to the prohibition of the spreading of weeds and invader plants and Regulation 15 makes provision for these types of plants. Should alien plant species occur within the study area; this will be managed in line with the EMPr. Rehabilitation after disturbance to agricultural land is also managed by CARA. The DAFF reviews and approves applications in terms of these Acts according to their Guidelines for the evaluation and review of applications pertaining to renewable energy on agricultural land.

2.3.7 National Veld and Forest Fire Act (101 of 1998)
This Act serves a dual purpose being firstly established to prevent and combat veld, forest and mountain fires throughout South Africa. Secondly, the Act provides for a variety of institutions, methods and practices for achieving this purpose. It has numerous implications for fire prevention and firefighting.

Every landowner on whose land a fire may start or burn or from where a fire may spread must prepare and maintain a firebreak on his/her side of the border between his/her land and all the neighbours. Therefore, there is a need for appropriate emergency response plans to be in place to respond to and combat fires associated with the proposed PV plant and its associated infrastructure. Appropriate fire breaks will be in place and be maintained.

Relevance to the Project
Section 12(1) relates to the duty of the landowner to prevent fire from spreading to adjoining properties. Although the veld on site is not prone to veld fires, fire prevention procedures have been set out in the Draft EMP to reduce the risk of fire and to respond accordingly during both construction and operational phases.

2.3.8 National Environmental Management: Waste Act (No 59 of 2008)
The National Environmental Management: Waste Act, No. 59 of 2008 came into effect on 1 July 2009. The main objectives of the Waste Act are as follows:

- Promote an integrated approach in dealing with waste which focuses on prevention, minimization and responsible disposal of waste.
- Ensure that waste is properly managed in order to minimise its potential to cause damage to the socio-economic and bio-physical environments.

A list of waste management activities that no person may commence with, unless a waste management license is issued in respect of that activity was published. The Waste Act states that, any person who wished to commence, undertake or conduct:

- an activity listed under Category A, must conduct a Basic Assessment process
- an activity listed under Category B, must conduct a Scoping and EIA process.

A waste license will not be required for this proposed development; however, all other principles of this Act must be complied with.

Relevance to the Project
Chapter 4 sets out waste management measures. In particular, Part 3 (reduction, re-use, recycling and recovery of waste) and Part 5 (storage, collection and transportation of waste) are of relevance to the construction phase of the Project and are referred to in the Draft EMP.

2.3.9 National Environmental Management: Air Quality Act (No. 39 of 2004)

The National Environmental Management: Air Quality Act (No 39 of 2004), Section 21 states that The Minister, or the MEC may by notice in the Gazette publish a list of activities which result in atmospheric emissions and which the Minister or MEC reasonable believes have or may have a significant detrimental effect on the environment, including health, social conditions, economic conditions, ecological conditions or cultural heritage. No listed emissions are anticipated from the proposed construction of a PV plant; however, the provisions of this Act must be considered.

Relevance to the Project

Section 32 and 34 set out measures relating to the control of dust and noise which would be applicable to the construction phase of the Project.

2.3.10 Occupational Health and Safety Act (85 of 1993)

This Act provides the legal framework for the health and safety of persons at work and for those in connection with the use of plant and machinery.

Relevance to the Project

The Act is primarily aimed at ensuring the health and safety of persons at work and visitors and specifies the basic systems that need to be in place and measures that need to be taken. Section 9(1) in particular relates to the responsibility of the employers to provide and maintain as far as reasonably realistic a safe working environment that is not detrimental to the health of the employees and this would be applicable throughout the lifespan of the Project.

2.3.11. National Forests Act 84 of 1998

The National Forest Act (Act 84 of 1998) allows for the protection of certain tree species. The Minister has the power to declare a particular tree to be a protected tree. According to Section 12 (1) d (read with Sections (5) 1 and 62 (2) (c)) of the National Forest Act (Act 84 of 1998), a licence is required to remove, cut, disturb, damage or destroy any of the listed protected trees. The Department of Agriculture, Forestry and Fisheries (DAFF) is authorised to issue licences for any removal, cutting, disturbance, damage to or destruction of any protected trees.

Relevance to the Project

Protected tree species such as *Acacia erioloba; Boscia albitrunca* and *Euclea pseudebenus* are known to occur in the area. A license must be obtained before any protected tree in terms of this act may be disturbed or removed.

2.3.12. Astronomy Geographic Advantage Act 21 of 2007

The Astronomy Geographic Advantage (Act 21 of 2007) aims to provide for:

- the preservation and protection of areas within the Republic that are uniquely suited for optical and radio astronomy;
- intergovernmental co-operation and public consultation on matters concerning nationally significant
- astronomy advantage areas; and
- matters connected therewith.

The overall purpose of the Act is to preserve the geographic advantage areas that attract investment in astronomy. The entire Northern Cape Province, excluding the Sol Plaatjie Municipality, has been declared an astronomy advantage area. The South African MeerKAT

radio telescope is currently being constructed about 90 km north-west of Carnarvon in the Northern Cape Province. The MeerKAT radio telescope is a precursor to the Square Kilometre Array (SKA) telescope and will be integrated into the SKA Phase 1 (SKA South Africa, 2014).

Relevance to the Project
SKA has indicated that the facility will generate medium-to-low risk of interference on the nearest telescope (SKA005) on the SKA spiral arm.

2.3.13. Northern Cape Nature Conservation Act, Act 9 of 2009

This Act provides the legal framework for the protection of protected species as identify in the Northern Cape

Relevance to the Project
A license must be obtained before any species listed in terms of this act may be disturbed or removed. The Northern Cape Nature Conservation Act (Act 09 of, 2009) and in particular the Northern Cape Conservation: Schedule 2 – Specially Protected Species has reference to the proposed project. This Act aims at improving the sustainability in terms of balancing natural resource usage and protection or conservation thereof. It includes six schedules, as follows:

- Schedule 1 - Specially Protected species;
- Schedule 2 - Protected species;
- Schedule 3 - Common indigenous species;
- Schedule 4 - Damage causing animal species;
- Schedule 5 - Pet species; and
- Schedule 6 - Invasive Species.

With regards to protected flora, the Northern Cape Nature Conservation Act includes a list of protected flora. The plant species potentially present within the proposed project area will be identified as part of the Ecological Impact Assessment specialist study. However, it will be recommended as part of the EMPr, that a detailed plant search and rescue survey be conducted before the final design process and prior to the commencement of the construction phase. If any of the listed species are found, the relevant permits should be obtained by the Project Applicant prior to their relocation or destruction.

2.4 Guidelines

2.4.1 Guidelines published under NEMA

While compiling this Report the following Guidelines have been considered:

- Public Participation Guideline, October 2012 (Government Gazette 35769);
- DEADP and DEA Guidelines published in terms of the NEMA EIA Regulations, in particular:
  - Guideline on Alternatives (DEA, 2014)
  - Guideline on Transitional Arrangements (DEADP, March 2013);
  - Guideline on Alternatives (DEADP, March 2013);
  - Guideline on Public Participation (DEADP, March 2013); and
  - Guideline on Need and Desirability (DEADP, March 2013);
- Information Document on Generic Terms of Reference for EAPs and Project Schedules (March 2013);
- Integrated Environmental Management Information Series (Booklets 0 to 23) (Department of Environmental Affairs and Tourism (DEAT), 2002 – 2005);

    - DEAT (2002) Scoping, Integrated Environmental Management, Information Series 2, Department of Environmental Affairs and Tourism (DEAT), Pretoria.
    - DEAT (2005) Guideline 3: General Guide to the Environmental Impact Assessment Regulations, 2005, Integrated Environmental Management Guideline Series, Department of Environmental Affairs and Tourism (DEAT), Pretoria.
- Guidelines for Involving Specialists in the EIA Processes Series (DEADP; CSIR and Tony Barbour, 2005-2007);
- Guideline for Determining the Scope of Specialist Involvement in EIA Processes
- Guideline for Involving Biodiversity Specialists in EIA Processes
- Guideline for the Review of Specialist Input in EIA Processes
- Guideline for Involving Heritage Specialists in EIA Processes
- Guideline for Environmental Management Plans (EMP's)
- Guideline on Environmental Impact Assessments for Facilities to be Included in the Electricity Response Plan (NERP)
- South African National Standards (SANS) 10328, Methods for environmental noise impact assessments in term of NEMA
- United Nations Framework Convention on Climate Change (1997); and
- Kyoto Protocol (which South Africa acceded to in 2002).

2.4.2. Policies

- **National Spatial Development Framework**
  The Draft NSDF (June 2018) highlights the persistence of colonial and apartheid spatial patterns and their detrimental impact on the ability of government to meet its national development objectives of reducing poverty, inequality and unemployment. Renewable energy associated resource and on-site based production intensity will probably increase with an increased energy mix. The developmental implications need to be considered as that includes energy generation activity that provide limited direct employment benefits.
  Within national urban core regions enterprise opportunities, large scale innovations in service delivery and disruptive technology need to be actively explored to support urban economies and well-being. Within remote and arid regions in the west, the cumulative impact of growing number of wind farms and solar plants should be considered. The growth of existing towns close to these areas is supported but new and on-site settlement should be limited.
- **The Provincial Spatial Development Framework for the Northern Cape (31 July 2012)**
  The Provincial Spatial Development Framework (PSDF) identified a Solar Corridor where solar projects will be given priority. According to the PSDF, this Solar Corridor "centres around Upington and extends from roughly Kakamas in the north to De Aar in the east" (Department of Co-operative Governance, Human Settlements and Traditional Affairs, 2012, Page 68). The spatial vision for the Northern Cape constitutes a coherently structured matrix of sustainable land-use zones that collectively support a dynamic provincial economy vested in the primary economic sectors, in particular, mining, agriculture, tourism, and the energy industry.

- **ZF Mgcawu Spatial Development Framework (Siyanda DM 2012)**
  The Solar Corridor is seen as an initiative that 'should be pursued vigorously.' The corridor follows the main routes from Prieska to Upington and further along the N10. However, the Spatial Development Framework (SDF) map (Page 221) shows that the

corridor also extended along the N14 west. There are also a number of solar energy projects outside these corridors.

- **Kai! Garib IDP (Kai! Garib Municipality 2014)**
  Kenhardt and its surrounding rural area are seen as an agricultural region with a scenic environment and important cultural heritage. Dust pollution is seen as factor that "must be taken into consideration with future developments". It was noted that the municipality is "very optimistic about the future due to the rise of Solar Energy Developments in the municipal area". The IDP concurred that climate of the municipal area is favourable to this environmentally friendly source of energy.

3. DESCRIPTION OF THE PROPERTY AND PROPOSED ACTIVITY

3.1 General Site Information

- Descriptions of all affected farm portions:
  Portions 6 and 3 of Farm 187 Olyvenkolk, Kenhardt, Northern Cape.
  Portion 6 is 711.3 hectares in size.
  Portion 3 is 2115 hectares in size.

- 21-digit Surveyor General codes of all affected farm portions:

C	0	3	6	0	0	0	0	0	0	0	0	0	1	8	7	0	0	0	6
C	0	3	6	0	0	0	0	0	0	0	0	0	1	8	7	0	0	0	3

- Copies of deeds of all affected farm portions:
  See Appendix K.

- Photos of areas that give a visual perspective of all parts of the site:
  See Appendix D.

- Photographs from sensitive visual receptors:
  See Appendix G7 Visual Impact Assessment.

- Solar plant design specifications including:

  - Type of technology:
    - The proposed facility will consist of several arrays of photovoltaic (PV) panels using Polycrystalline and thin-film solar cell technology
    - Solar module mounting structures comprised of galvanised steel and aluminium. The mounting structures will be mounted on the ground using a ground screw. A concrete foot piece secured to a steel pen driven into the ground will be used where it is not feasible to use ground screws. The geo-technical assessment tests indicate that screws up to a depth of 1.8m can be installed.
    - Below ground electrical cables connecting the PV arrays to the inverter stations and collector substation; and
    - Inverters and mini-subs.

- Roads and Other Infrastructure
    - One access road of ≤ 100m long, ≤8 m wide gravel access road running from the Kenhardt Pofadder gravel road will be constructed. The existing farm tracks will be used as it is ease for access to the different PV sites on the farm.
    - Service roads - ≤20 km of ≤4 m wide gravel internal service roads within the plant boundary (two different blocks)
    - Perimeter fencing around each PV block and gates as required.
    - Access control gate on access road.
    - There will be no Operational and Management Building on the property. The PV facility will be operated and managed from the buildings authorized in the EA for portion 3 and 13 on portion 13.

- Structure height:
  Height of PV panels: approximately 5 m high.
  Height of substations: 30 m high including a 32 m high telecoms tower.
  Height of ESKOM powerline: approximately 30 m above ground level.

- Surface area to be covered (including associated infrastructure such as roads):
  Block 1 - 223.83 hectares
  Block 2 - 265.96 hectares
  Total area of PV facility: 489.79 hectares.
  Approximately 8.9 hectares of roads.

- Structure orientation:
  North facing (rows from east to west).

- Laydown area dimensions (construction period and thereafter):
  The contractors camp and laydown area will be on portion 13 as authorized in the EA for portion 3 and 13.

- Generation capacity: 300MW

- Generation capacity of the facility as a whole at delivery points:
  300MW

3.2 Technical Details for the Proposed Facility

Component	Description / dimensions
Height of PV panels	Solar PV panels: approximately 5 m high.
Height of substations	Collector (on-site) substation approximately: 30 m high including a 32 m high telecoms tower.
Height of ESKOM powerline	On-site 132 kV transmission line: approximately 30 m above ground level.
Area of PV Array	Block 1 - 223.83 hectares Block 2 - 265.96 hectares Total area of PV facility: 489.79 hectares.
Number of inverters required	78
Area occupied by inverter / transformer stations / substations	Each substation covers area of 80 x 50m = = 0.8ha total. Two substations.
Capacity of on-site substation	22/33 kV to 132 kV collector substation to receive, convert and step up electricity from the PV facility to the 132 kV grid suitable supply. The facility will house control rooms and grid control yards for both Eskom and the Independent Power Producer. A 32 m telecommunications tower (lattice or monopole type) will be established in the substation area.
Area occupied by both permanent and construction laydown areas	The PV blocks footprint, access roads, two substations and overhead powerlines connecting the two substations on the boundary of the property parallel with the Pofader Kenhardt road. An overhead 132 kV powerline of approximately 8km will be constructed next to the existing ESKOM 33kv overhead powerline.
Area occupied by buildings	None
Length of internal roads	20km gravel road
Width of internal roads	4m wide
Proximity to grid connection	± 8km to the west to Aries Substation
Height of fencing	2.4m
Type of fencing	Palisade 2.4m fence on boundary of PV

A description of the property and the proposed activity

The facility will be constructed east of the Aries ESKOM Substation southwest of the town Kenhardt, Northern Cape (See Appendix A – Locality Maps) on Portions 6 and 3 of Farm 187 Olyvenkolk. The property where the facility is proposed covers a total area of approximately 711.3 hectares in size.

GPS readings:

Block 1 – south west block:
Point 1 : 29°27'05.2"S 20°52'31.6"E
Point 2 : 29°27'08.8"S 20°52'31.6"E
Point 3 : 29°27'08.7"S 20°52'37.6"E
Point 4 : 29°27'16.1"S 20°52'37.6"E
Point 5 : 29°27'16.0"S 20°52'43.3"E
Point 6 : 29°27'23.4"S 20°52'43.3"E
Point 7 : 29°27'23.3"S 20°52'49.2"E
Point 8 : 29°27'34.4"S 20°52'49.1"E
Point 9 : 29°27'34.4"S 20°52'54.9"E
Point 10 : 9°27'38.0"S 20°52'54.9"E
Point 11: 29°27'37.9"S 20°53'00.9"E
Point 12 : 29°27'45.3"S 20°53'00.8"E
Point 13: 29°27'45.4"S 20°52'54.8"E
Point 14 : 29°27'49.0"S 20°52'54.7"E
Point 15: 29°27'49.3"S 20°52'43.0"E
Point 16 : 29°27'53.0"S 20°52'42.8"E
Point 17 : 29°27'53.4"S 20°52'25.1"E
Point 18: 29°27'57.1"S 20°52'25.1"E
Point 19: 29°27'57.3"S 20°52'13.4"E
Point 20: 29°27'42.6"S 20°52'13.5"E
Point 21: 29°27'42.9"S 20°51'55.6"E
Point 22: 29°27'57.9"S 20°51'55.3"E
Point 23: 29°27'57.8"S 20°52'01.4"E
Point 24: 29°28'05.0"S 20°52'01.3"E
Point 25: 29°28'05.2"S 20°51'49.6"E
Point 26 : 29°27'50.5"S 20°51'49.7"E
Point 27 : 29°27'50.5"S 20°51'44.4"E
Point 28 : 29°27'21.0"S 20°51'44.6"E
Point 29 : 29°27'20.9"S 20°51'50.1"E
Point 30 : 29°27'17.1"S 20°51'50.1"E
Point 31: 29°27'16.9"S 20°51'56.1"E
Point 32 : 29°27'13.2"S 20°51'56.2"E
Point 33 : 29°27'13.0"S 20°52'08.0"E
Point 34: 29°27'09.3"S 20°52'08.1"E
Point 35 : 29°27'09.2"S 20°52'13.9"E
Point 36 : 29°27'05.5"S 20°52'14.0"E

Block 2 – north east block:
Point 1: 29°26'19.0"S 20°53'49.3"E
Point 2: 29°26'55.9"S 20°53'48.5"E
Point 3: 29°26'56.1"S 20°53'42.8"E
Point 4: 29°27'33.2"S 20°53'42.4"E
Point 5: 29°27'33.4"S 20°53'36.4"E
Point 6: 29°27'37.2"S 20°53'36.4"E
Point 7: 29°27'37.4"S 20°53'24.4"E
Point 8: 29°27'41.1"S 20°53'24.4"E

Point 9: 29°27'41.3"S 20°53'12.9"E
Point 10: 29°27'33.9"S 20°53'12.9"E
Point 11: 29°27'34.0"S 20°53'07.2"E
Point 12: 29°27'26.6"S 20°53'07.2"E
Point 13: 29°27'26.7"S 20°53'01.2"E
Point 14: 29°27'15.6"S 20°53'01.3"E
Point 15: 29°27'15.7"S 20°52'55.5"E
Point 16: 29°27'08.3"S 20°52'55.5"E
Point 17: 29°27'08.4"S 20°52'49.5"E
Point 18: 29°27'01.0"S 20°52'49.6"E
Point 19: 29°27'01.1"S 20°52'43.8"E
Point 20: 29°26'53.8"S 20°52'44.0"E
Point 21: 29°26'53.5"S 20°52'49.7"E
Point 22: 29°26'49.9"S 20°52'49.8"E
Point 23: 29°26'49.8"S 20°52'55.8"E
Point 24: 29°26'46.1"S 20°52'55.9"E
Point 25: 29°26'45.9"S 20°53'01.8"E
Point 26: 29°26'42.2"S 20°53'01.8"E
Point 27: 29°26'42.1"S 20°53'07.8"E
Point 28: 29°26'38.4"S 20°53'07.9"E
Point 29: 29°26'38.3"S 20°53'13.6"E
Point 30: 29°26'34.6"S 20°53'13.7"E
Point 31: 29°26'34.4"S 20°53'19.8"E
Point 32: 29°26'30.7"S 20°53'19.8"E
Point 33: 29°26'30.6"S 20°53'25.6"E
Point 34: 29°26'26.9"S 20°53'25.7"E
Point 35: 29°26'26.8"S 20°53'31.7"E
Point 36: 29°26'23.1"S 20°53'31.8"E
Point 37: 29°26'22.8"S 20°53'43.6"E
Point 38: 29°26'19.1"S 20°53'43.7"E

Powerline:
Start – south west end point: 29°29'20.7"S 20°47'53.6"E
Middle – 29°27'46.0"S 20°50'18.7"E
End – north west end point: 29°26'56.8"S 20°52'43.9"E

The study site is situated approximately 37km southwest of Kenhardt, east of the Aries Eskom substation. The study area is north of the gravel road from Kenhardt to Pofadder. The gravel road turns west off the R27 south of the town Kenhardt.

Activities on adjacent properties to the site comprise agricultural activities. The site is currently being used for agricultural activities (sheep grazing). The Aries Eskom substation is situated west of the site.

The construction of the Solar Energy Land (Pty) Ltd 300 MW Photovoltaic Electricity Generation and 132 kV power line on Portions 6 and 3 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 500ha.

- A 132-kV power line (mono pole structures) of 9.570km in length over Portions 6 and 3 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 the infrastructure and services roads on the PV layout impacting on dendritic drainage lines.

One (1) dendritic drainage line on block 1 and four (4) on block 2. The PV facility will be constructed over these areas. These dendritic drainage lines were not identified as ecological sensitive areas.

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 5m and would allow some ground clearance for the free flow of surface water underneath the panels and for agricultural purposes where required.

The facility and associated infrastructure will be accessed on an 8m wide 100m long gavel road with direct access off the Kenhardt to Pofadder gravel road. A 4m management track will surround each block of photovoltaic arrays, totalling approximately 20km 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 (required in construction phase only) will be sourced from existing boreholes authorized in the EA for portion 3 and 13. The facility will not use water during operational phase. Solar panels will not be cleaned using water.

Electricity Generated distribution to ESKOM Grid:

The PV plant consists of two (2) PV blocks. At each of these blocks the DC input voltage from the PV panels is converted to AC by means of inverters. The AC output voltage from the inverter is then stepped up with a 400 V to 132 kV step-up transformer at each block. The electrical power is then transported via aboveground cables from the two substations on the southern edge of the PV facility blocks in a 22m wide servitude 132 kv overhead powerline parallel to the Kenhardt Pofadder road, next to existing 33kv Eskom Powerline. The two substations will be connected to the ESKOM grid via a 132-kV overhead transmission line. The powerline is 9.570km in length.

Aries Substation Upgrades

The Aries MTS is a 400-kV substation. In order to expand the capacity of the substation, an intermediate bus at a nominal voltage of 132 kV via a 400 kV:132 kV transformer(s) bus in the substation must be constructed in the existing Aries Substation for the connection of the PV

power plant via a 132-kV transformer(s).

Apart from the transformer(s) necessary to establish a new bus, other power system components and equipment are necessary. These typically include amongst other circuit breakers, current transformers and bus isolators at each side of the transformer for each transformer. All newly established busses will also be equipped with capacitive voltage transformers to measure the bus voltages. All of these components are mounted on steel structures with height of approximately 3 to 3.5 meters from ground level. Lastly, the steel structures for the support of the overhead busbar conductors and cabling are of the order of 10 m in height. The expansion to Aries Substation does not requires Environmental Authorizations. The proposed expansions will not result in expanded capacity that will exceed 275 kilovolts and the development footprint will not increase. The expansion is 132 kilovolts and within the existing Aries substation.

Fencing
For health & safety and security reasons, the plant will have to be fenced off from the surrounding farm.

Construction phase

a) Conduct surveys
Prior to construction, surveys such as, but not limited to, geotechnical, site surveys and confirmation of PV array micro-siting, road servitudes, etc. must be conducted.

b) Establish access roads
Access to site is via the Pofadder gravel road. Within the site itself, access will be required from the existing roads to the individual facility components for construction purposes (and later limited access for maintenance).

c) Site preparation
This will include clearance of vegetation at all the roads and infrastructure. These activities will require the stripping of topsoil which will need to be stockpiled, backfilled and/or spread on site.

d) Establishment of laydown areas
Laydown and storage areas will be required for the construction equipment required on site.

e) Establishment of ancillary infrastructure
The establishment of these facilities/buildings will require the clearing of vegetation and levelling of the development site and the excavation of foundations prior to construction. A laydown area for building materials and equipment associated with these buildings will also be required.

f) Contouring
Natural contouring must be used when constructing the facility. No artificial contouring to be used.

g) Construction of infrastructure foundations
The geo-technical assessment tests indicate that screws up to a depth of 1.8m can be installed. Screw-on foundations will be constructed for the “feet” of the PV panels. This statistically tested technology saves money and is environmentally friendly as no digging or concreting is necessary.

Picture of Ground Screw

h) Transport of components and equipment to site
Trucks will be used to transport all components (e.g. trucks, graders, compaction equipment, and panels) to site. The equipment will be transported to the site using appropriate National and Provincial routes and the dedicated access road to the site itself.

i) Establishment of PV panels
PV panels are transported in containers. The steel structures will be assembled on site. The supports for the panels are made of steel structures directly driven into the ground or mounted on a steel pen driven into the soil with a concrete foot piece. The panels are arranged in a binary structure. The height of the supports has been determined so that the maximum height of the panel in operation is approximately 4.80 m. This choice is motivated by the need to avoid production losses due to fouling of the panels and the absorption of sunlight by clouds to the ground during the cold season. The minimum height is greater than 0.8m from the ground level to allow freedom and enjoyment of the land for agricultural or pastoral purposes where required.

j) Connection of PV panels to the substation
The PV plant consists of smaller PV blocks. At each of these blocks the DC input voltage from the PV panels is converted to AC by means of inverters. The AC output voltage from the inverter is then stepped up with a 400 V to 132 kV step-up transformer at each block. The electrical power is then transported via above ground cables.

k) Connect substation to the grid
The plant will be connected to the ESKOM grid via a 132-kV overhead transmission line through the appropriate protection switch gear, ext. via an overhead transmission line.

Aries Substation Upgrades

The Aries MTS is a 400 kV substation. In order to expand the capacity of the substation, an intermediate bus at a nominal voltage of 132 kV via a 400 kV:132 kV transformer(s) bus in the substation must be constructed in the existing Aries Substation for the connection of the PV power plant via a 132 kV transformer(s).

Apart from the transformer(s) necessary to establish a new bus, other power system components and equipment are necessary. These typically include amongst other circuit breakers, current transformers and bus isolators at each side of the transformer for each transformer. All newly established busses will also be equipped with capacitive voltage transformers to measure the bus voltages. All of these components are mounted on steel structures with height of approximately 3 to 3.5 meters from ground level. Lastly, the steel structures for the support of the overhead busbar conductors and cabling are of the order of 10

m in height.

The transmission line will entail a configuration very similar to the 66 kV transmission lines found throughout South Africa to electrify rural parts of the country, i.e. concrete poles with the three conductors spaced in a triangular arrangement. The only possible difference is slightly thicker conductors than what is normally seen.

l) 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.

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 ESKOM grid via a 132-kV overhead power line. 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 cloth as required. New self-cleaning technology is also investigated and will be implemented if feasible. 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 will only be decommissioned once it has reached the end of its economic life. If economically feasible, the decommissioning activities will 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 will be completely decommissioned which will include the following decommissioning activities.

(a) Site preparation
Activities will include confirming the integrity of the access to the site to accommodate the required equipment and the mobilisation of decommissioning equipment.

(b) Disassemble and replace existing components
The components will be disassembled and reused and recycled or disposed of in accordance with regulatory requirements.

4. DESCRIPTION OF THE RECEIVING ENVIRONMENT

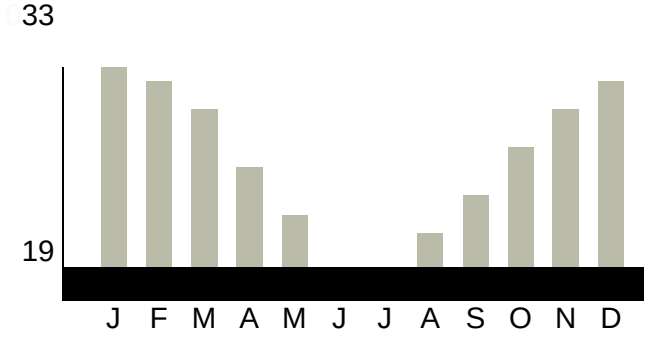
4.1 Climate

The study area is characterised by an arid climate. Kenhardt normally receives about 70mm of rain per year, with most rainfall occurring mainly during autumn. The chart below shows the average rainfall values for Kenhardt per month. It receives the lowest rainfall (0mm) in June and the highest (23mm) in March. The monthly distribution of average daily maximum temperatures

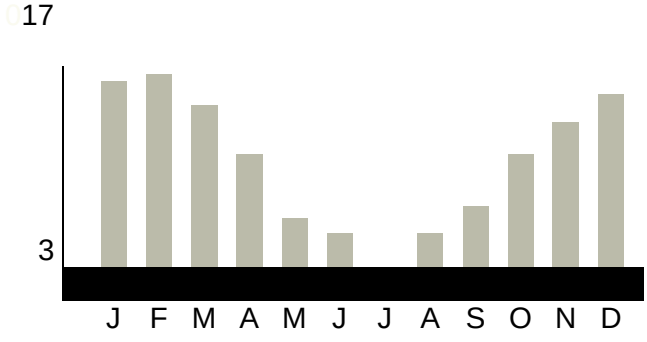
shows that the average midday temperatures for Kenhardt range from 19°C in June to 33°C in January. The region is the coldest during July when the mercury drops to 2.6°C on average during the night. Consult the chart below for an indication of the monthly variation of average minimum daily temperatures.

Average rainfall (mm)

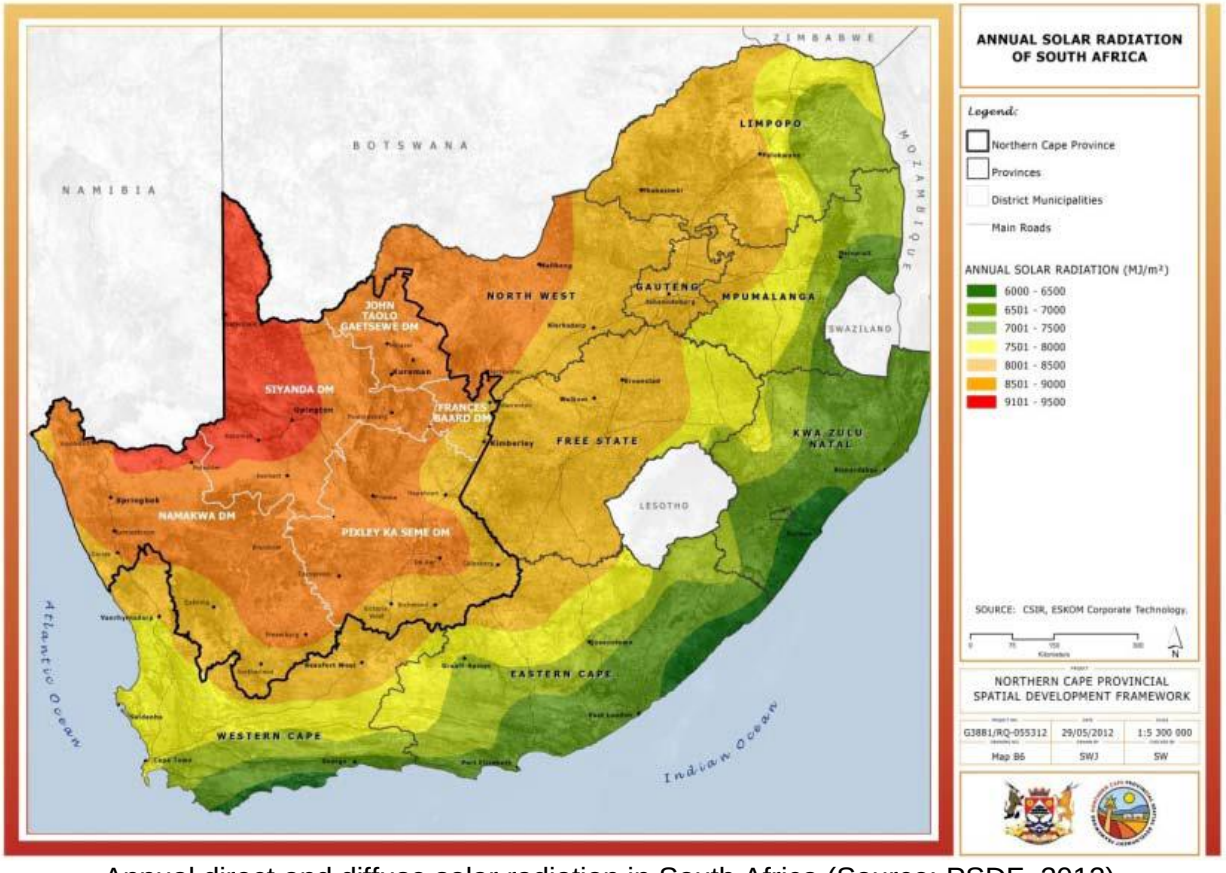
Average midday temperature (°C)



Average night-time temperature (°C)



The portions of the Northern Cape that border on the Orange River and Namibia have the highest solar radiation intensity in the world.This represents a huge comparative economic advantage. The map below illustrates the measured annual direct and diffuse solar radiation of the Northern Cape in context of the country as a whole.



Annual direct and diffuse solar radiation in South Africa (Source: PSDF, 2012).

4.2 Topography

The study site is located mostly on flats plains which slope gently (20m drop in 2 km) towards the north. This landscape is typical of the broader region within which the study area is located and the pattern repeats itself up 30 km in any direction. The plains are situated at an elevation of 927 m. The highest point on the plains within the study site is at the southern side of the site and it drains down to the north. The site is situated in a very arid part of South Africa. 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 study area.

The gentle slopes (1.3 %) of the site will aid storm water drainage and prevent ponding of surface water. Due to the gentle slope of the terrain, the risk of erosion will remain low.

4.3 Geology and Soil

Soils and soil profile

The area in the vicinity of the site is masked by red brown Aeolian soils of Quaternary age (Q) of the Kalahari Group, Gordonia Formation. These soils are underlain by soils and weathered rock of the Karoo Supergroup, Dwyka Group (C-Pd), comprising Carboniferous Tillite, Diamictite, subordinate Sandstone, Mudstone and Dolomitic Limestone.

The site is overlain with brown to reddish brown Aeolian soils that form the topsoil layer (Orhic A diagnostic horison). Below this layer, a hard calcareous pedogenic layer is encountered that disintegrates into coarse gravel when excavated. The diagnostic layers can be identified as a Neocarbonate B horizon underlain by Dorbank or a hardpan carbonate horizon. Using these diagnostic horizons and information contained on the Agricultural Research Council database (ARC) (www.agis.agric.za), the soils of the site is classified as Augrabies and Trawal soil forms. Dolorite outcrops and cobbles are evident on the surface layer of the site.

The general soil profile comprises a layer of medium to coarse sand underlain by a calcareous pedogenic layer that is dense to very dense in the undisturbed form. This material disintegrates into coarse gravel during excavation.

The soils that cover most of the site are silty sand and gravel with a low heave classification. Closer to the drainage lines, the sands tend to be deeper and finer with lower clay content.

The overlying soils are very shallow (250mm to 500mm deep) for most of Sites B & C. Rocky outcrops were also observed in this area.

The various soil types found on the farm were analysed previously and are included in this report. The general soil parameters of the samples are as follows:
1) Material Classification: Sand
2) Plasticity Index: NP to SP
3) Linear Shrinkage: 0 - 0.5%
4) Heave Classification: Low
5) Grading Modulus: 2.20 - 2.56
6) PH: 6.4 -6.9

Geology

According to the 1: 250 000 geology map 2920 Kenhardt the project area for the proposed PV solar facility on Portions 6 and 3 of Farm Olyvenkolk 187 is underlain at depth by glacially-related sediments of the Permo-Carboniferous Dwyka Group (Karoo Supergroup, C-Pd). Small exposures of Mokolian (Mid Proterozoic) basement rocks of the Namaqua-Natal Province (De Bakken Granite, Mdk, Kokerberg Formation, Mko, Zandbergshoop Formation, Mz) occur in the north-eastern Portion of farm Olyven Kolk 187.They comprise two-billion-year-old granitoid intrusions and highly metamorphosed sediments that are of no palaeontological interest, so they will not be treated further here. Quaternary alluvium associated with shallow water courses as well as more widespread wind-blown sands of the Gordonia Formation (Kalahari Group) (Q) plus other Late Caenozoic superficial sediments - mostly unmapped at 1: 250 000 scale - such as surface downwasted surface gravels and calcrete hardpans mantle a large proportion of the Namaqua-Natal and Dwyka bedrocks here. Small outcrop areas of Karoo Dolerite (Jd) outside and to the east of the study area.

Dwyka Group
Permo-carboniferous glacially-related sediments of the Dwyka Group (C-Pd in Fig. 3) underlie the thin, superficial cover of Gordonia sands, calcrete and Late Caenozoic alluvium and crop out at surface within the study area southwest of Kenhardt. The geology of the Dwyka Group has been summarized by Visser (1989), Visser et al. (1990) and Johnson et al. (2006), among others. The geology of the Dwyka Group along the north-western margin of the Main Karoo Basin as far east as Prieska has been reviewed by Visser (1985). Other studies on the Dwyka in or near the Prieska Basin include those by Visser et al. (1977-78; summarized by Zawada 1992) and Visser (1982). Fairly detailed observations by Prinsloo (1989) on the Dwyka beds on the northern edge of the Britstown 1: 250 000 geology sheets are in part relevant to the more proximal (near-source) outcrops at Kenhardt. Massive tillites at the base of the Dwyka succession (Elandsvlei Formation) were deposited by dry-based ice sheets in deeper basement valleys. Later climatic amelioration led to melting, marine transgression and the retreat of the icesheets onto the continental highlands in the north. The valleys were then occupied by marine inlets within which drifting glaciers deposited dropstones onto the muddy sea bed ("boulder shales"). The upper Dwyka beds (Mbizane Formation) are typically heterolithic, with shales, siltstones and fine-grained sandstones of deltaic and / or turbiditic origin. These upper successions are typically upwards-coarsening and show extensive soft-sediment deformation (loading and slumping). Varved (rhythmically laminated) mudrocks with gritty to fine gravely dropstones indicate the onset of highly seasonal climates, with warmer intervals leading occasionally even to limestone precipitation.

Refer to Appendix G8: Geotechnical Impact Assessment and Appendix G4c: Palaeontological Impact Assessment for more details.

4.4 Historical and Archaeological Characteristics

The region is generally quite inhospitable and has been only very sparsely occupied during historical and modern times. This, and the dominant agricultural activity of sheep farming, has resulted in a very minimal historical footprint on the landscape. The main anthropogenic features are widely spaced farm complexes, fences, farm tracks and wind pumps. None of the reports cited above documented any historical remains, although Pelser (2011) did mention the possibility that a small informal stone structure might be historical in age.

Archaeology
The entire study area was found to be coated in artefacts attributable to background scatter of varying age. The vast majority would appear to date to the MSA, although, aside from faceted platforms and some characteristic triangular flakes, diagnostic elements were rare or even absent. The LSA seems least well represented. Where the power line route crosses the large water course a number of LSA sites were found.

Although stone artefacts are widespread across the landscape, certain areas have been identified as being denser and of greater significance. These consist of occasional Later Stone Age sites along water courses and around a pan and large scatters of Early Stone Age artefacts that include many large cutting tools. MSA artefacts are widespread and generally of little concern. The landscape will also be impacted, but its cultural component is very limited. Furthermore, the presence of power lines, a substation a small solar energy facility and the Sishen-Saldanha Railway Line have already compromised the landscape. Although a historical structure of medium significance is present, it will not be impacted.

Impacts to archaeological resources, and in particular ESA material, are thus the primary concern for this project. The LSA sites will likely be protected due to their close proximity to water courses and a pan. The cultural landscape is weakly developed and has already been compromised by the presence of the Sishen-Saldanha Railway Line, a substation, a large power line and a small solar energy facility. The site is very remote and landscape impacts are of little concern. No other aspects of heritage were found to be relevant. There are no fatal flaws, although a follow-up survey and some mitigation work will very likely be required.

No graves were seen during the survey. The study area was virtually entirely over hard substrate and unmarked graves are not expected.

Refer to Appendix G4a: Heritage Impact Assessment and Appendix G4b: Heritage Impact Assessment – Letter on Final Layout for further details.

4.5 Biophysical Elements

Terrestrial Fauna
Fauna that are endemic to the region are considered to be typical of a harsh dry environment, with limited habitat variation across the study area giving rise to a primarily uniform distribution of such species. As is typical of the region, a large number of fossorial and burrowing species, including mammals and invertebrates, were identified across the site in general.

The following IUCN Red listed species are **DEFINATLEY PRESENT** on site: Striped Polecat, Aardwolf, Porcupine, Cape Ground Squirrel, Bat-eared Fox, Black-backed Jackal and Caracal. These are all listed as “least concern” in terms of the IUCN Red list.

The following IUCN Red listed or Critically Endangered, Endangered, Vulnerable and Protected Species (NEM:BA) are **LIKELY** found on site: Small Grey Mongoose, Small-spotted Genet, Aardvark, African Wild Cat, Honey Badger, Namaqua Rock Mouse, Suricate, Springhare, Striped Mouse, South African Hedgehog, Girdled lizard, Baboon spider and Burrowing scorpions. These are listed as “least concern” in terms of the IUCN Red list but the South African Hedgehog, Girdled lizard, Baboon spider and Burrowing scorpions are all Protected Species. Protected species are indigenous species of high conservation value or national importance that require national protection according to NEM:BA. The following IUCN Red listed species are **POSSIBLY** found on site: Cape Serotine Bat, Egyptian Split Faced Bat, Egyptian Free-tailed Bat, Yellow Mongoose, Scrub Hare, Short-tailed Gerbil, Hairy Footed Gerbil and Spectacled Dormouse. These are all listed as “least concern” in terms of the IUCN Red list. Springbok and Steenbok are IUCN Red listed species (least concern) and are present near the site. Springbok are present to the north of the site while Steenbok are present west of site.

Most larger mammals located within the subject site are not reliant upon the study area in particular and are likely to forage over extensive ranges that extend beyond the site boundaries. Suricates may use warrens for a number of months or possibly years, before relocating. Suricates are quite capable of establishing warrens within solar parks following their construction, while aardvark and other fossorial species are able to excavate under fencing, which may have initially served to exclude them from the site. The bats will be unaffected by development, as there are no roosting sites within the affected area that could be impacted upon by development. The species listed above occurring on site will not be affected negatively. The impact of the proposed development on them will be of low significance. Their

home ranges are much bigger than the proposed development and there are huge undeveloped home ranges for these species in the surrounding landscape.

With respect to **amphibians**, *Tomopterna cryptotis* (Tremolo sand frog) is likely to occur in the bigger area, but were not observed or recorded on site. These species will however be mostly present in the non-perennial drainage river and its riparian zone which will not be impacted upon. These areas are located inside the 100m no development zones.

Twenty-six **reptile species** are likely to inhabit the area. The following reptiles were observed on site during the survey: Psammobates tenorius verroxii (tent tortoise), Agama hispida (Spiny agama), Chondrodactylus turneri, Mabaya capensis (Cape Skink) and Stigmachelys pardalis (Leopard Tortoise).

Insect species observed during the survey includds: *Lamarickiana sp.*, *Bullacris intermedia*, *Lacustana pardanlina*, *Culex sp*, *Pseudolynchia canariensis*, *Messor capensis*, *Camponotus fulvopilosus*, *Grysllus simaculatus*, *Epusa guttula*, *Psammotermes allocerus*, *Hodotermes mossambicus*, *Trithemis aretoeriosa*, *Arachnid solifugae* and *Opistophthalmus spp.*

This arid area is home to several large terrestrial **bird and raptor species**, the most important of which are Ludwig's Bustard *Neotis ludwigii*, Kori Bustard *Ardeotis kori*, Secretary bird *Sagittarius serpentarius*, Karoo Korhaan *Eupodotis vigorsii,* Verreaux's Eagle *Aquila verreauxii* and Martial Eagle *Polemaetus bellicosus*. In addition to being classified as threatened regionally and in some cases globally, most of these species are facing significant threats to their survival from existing impacts in the arid parts of South Africa. In addition, this area is home to an assemblage of arid zone adapted smaller bird species including larks, sparrow-larks, chats and others. Most important of these from a conservation perspective are Red Lark *Calendulauda burra* and Sclater's Lark *Spizocorys sclateri*, both of which are listed as regionally threatened species (Vulnerable and Near-threatened respectively), have very restricted ranges and have been recorded in the broader area within which the study area is situated. Stark's Lark *Spizocorys starki* is also an important endemic present in the area, and Burchell's Courser *Cursorius rufus* (Vulnerable) is a nomadic species which occurs in the broader area.

Terrestrial Ecology

The study area lies within the Orange River Broken Veld vegetation type of the Northern Cape. The site is not isolated as it forms part of an extended natural veld area used as extensive grazing for sheep and cattle farming.

There are an estimated 5400 plant species in the Northern Cape Province. These plants occur in six large vegetation units known as biomes. Each biome is a broad ecological unit that represents major life zones of large natural areas, defined mainly by vegetation structure and climate. There are six biomes in the Northern Cape, namely the Savanna Biome, Nama Karoo Biome, Succulent Karoo Biome, Fynbos Biome, Grassland Biome & Desert. The proposed site falls within the Nama Karoo biome. Each biome is subdivided into vegetation types, which are groups of plant communities that share similar ecosystem processes, and have similar climatic and geological requirements. There are many vegetation types in the Northern Cape. The Orange River Nama Karoo is an example of one of these vegetation types, within the Nama Karoo Biome. It is found along most of the Orange River from its confluence with the Vaal River near Kimberley to the Richtersveld in the far north-western corner of the Northern Cape. A common plant of this vegetation type is the Quiver Tree (Kokerboom) *Aloidendron dichotomum* that grows on the broken, rocky terrain.

The Surveyor General's 1: 50 000 topo-cadastral maps and google images indicates that the entire site consists of natural vegetation. This was confirmed during the site survey.

The terrestrial vegetation area was identified as Other Natural Areas and the non-perennial Graafwater River and riparian zone with its 100m buffer area was identified as an Ecological Support Area. The study area is not regionally important from a biodiversity point of view and the survey found that the impact of the proposed development will not have any significant effects on the biodiversity and connectivity of the specific site or region.

The study area has been impacted upon to some degree by livestock farming, although the vegetation is in relatively good condition and natural. The recent drought has denuded the vegetation on the study site. The vegetation of the study area is dominated by *Stipagrostis ciliate var. capensis, Stipagrostis obtuse, Stipgrostis uniplumis var. Uniplumis, Salsola tuberculata*, *Eriocephalus ericoides*, *Rhigozum trichotomum*, etc.

The Bushmanland Arid Grassland and Bushmanland Basin Shrubland – South Western corner of site (Not Threatened) on the site is in a good condition, although sparsely vegetated due to the low rainfall.

Aloe claviflora, Aptosimum spinescens, Aloidendron dichotomum (Northern Cape Nature Conservation Act (1998)) and *Boscia albitrunca* (National Forest Act & Northern Cape Nature Conservation Act (1998)) is the only rare and endangered species known to occur in the area. Of the above only *Aloidendron dichotomum* were noted on the study site and *Aloe claviflora* adjacent to the site on the bigger property.

The proposed development will not impact significantly on the biodiversity pattern at neither the community or at an ecosystem level provided that the non-perennial Graafwater River and its 100m buffer area (Identified Ecological Support Area), the Nama Karoo Bushmanland Flat Pans and its 100m buffer area is protected as a No-Go Area, manage as sensitive areas and excluded from the development area.

Freshwater Ecology

The site is located in the Lower Orange catchment (Department of Water and Sanitation (DWS) Primary Drainage Region D), within the Lower Orange Water Management Area (WMA). The proposed water uses would pass through sections of the D53D quaternary catchment. D53D is drained primarily by the Orange River.

The non-perennial Graafwater River was classified as a NFEPA river. A Nama Karoo Bushmanland Flat Pan was recorded during the site survey which was not recorded as a NFEPA wetland. Three NFEPA artificial wetlands (two dams and one weir dam in Graafwater River) was recorded on portion 3 close to the 132 kV powerline connection route to Aries Substation. The 132kV powerline connecting the PV facility to the Eskom grid will not impact on these artificial wetland dams and weir. The powerline will run parallel to an existing Eskom powerline which mitigate and reduce its impacts on ecology and avifauna. The non-perennial river that will be impacted were identified as an Aquatic Ecological Support Area (ESA).

The non-perennial Graafwater River and other sensitive non-perennial tributaries identified in between the proposed PV infrastructure has already been impacted and crossed by the

Kenhardt to Pofadder gravel road as well as farm tracts. Livestock grazing occurs and has impacted on the non-perennial watercourses.

Within the site, surface flow is primarily by means of shallow channels that may vary on a temporal basis according to factors such as changes in the prevailing wind regime, vegetation growth or the movement of livestock. As such, these dendritic channels are often ephemeral in nature and do not show specific hygrophilous vegetation characteristics, nor do they show the presence of geohydromorphic soils. The absence of these indicators is due primarily to the fluctuating levels of inundation in these drainage features, over extended periods of time which is also driven by the intensity and erratic rainfall experienced in this region.

Flow is generally sluggish under these conditions, and following the cessation of rains, the water rapidly drains from site on account of the percolative, sandy conditions, or is lost to evaporation. Soils in these systems, may as a consequence of such evaporation, prove to be slightly saline in nature (Mucina and Rutherford, 2006). Given the absence of definitive geohydromorphic indicators, the Graafwater non-perennial river and other sensitive non-perennial tributaries on site have been delineated according to hydrogeomorphological features and an apparent change in vegetation form from a sparse and arrested growth form, to a more verdant state, associated with drainage. The delineation of the non-perennial river and one of the pans identified is also confirmed by the NFEPA map. Hydrogeomorphological features are indicated primarily by evidence of flow or deposition of materials (Brinson et al 1993; USDA 2008) while verdant vegetation establishment is a combination of both improved plant water relations and increased nutrient availability. Therefore, major drainage features are associated with a combination of both verdant vegetation structure and form as well as significant geomorphic indicators, while the depth and expanse of dendritic drainage features can also be utilized to distinguish between minor drainage lines (generally considered to be ‘rills’ and ephemeral in nature) and more permanent features (‘gullies’), which are more defined in morphological character.

Although short lived, in terms of the presence of water within these features, this non-perennial river does bestow intermittent hydrological benefit to the landscape and can be considered groundwater “recharge zones” in respect of the local subsurface hydrology. From a biotic perspective, the drainage lines do serve as seasonally important refugia and congregation points for inter alia invertebrates (e.g. Class Odonata) and vertebrates (e.g. Order Anura) (faunal aspects are described further in more detail below in this report).

Dendritic drainage features are evident in the site, which can be described as shallow, geologically driven channels that may in turn be further excavated by the movement of livestock. These features show very little evidence of regular flow and are generally identified through the more verdant growth of small woody shrubs such as Lycium cinereum. These dendritic drainage lines were not identified as ecological sensitive areas and the PV facility will be constructed over these areas. These dendritic drainage features must however be maintained inside the PV facility underneath and in between the panels in order to discharge storm water generated on the site.

4.6 Water Features

The non-perennial **Graafwater River** is classified as a NFEPA river.

Five **other drainage lines** (**dendritic drainage features**) drain the water collected on the site, which eventually feed into the upper catchment of the Graafwater River. Within the site, surface flow is primarily by means of shallow channels that may vary on a temporal basis according to factors such as changes in the prevailing wind regime, vegetation growth or the movement of livestock. As such, these dendritic channels are often ephemeral in nature and do not show specific hygrophilous vegetation characteristics, nor do they show the presence of geohydromorphic soils. The absence of these indicators is due primarily to the fluctuating levels of inundation in these drainage features, over extended periods of time which is also driven by the intensity and erratic rainfall experienced in this region. The dendritic drainage features evident in the site, which can be described as shallow, geologically driven channels that may in turn be further excavated by the movement of livestock. These features show very little evidence of regular flow and are generally identified through the more verdant growth of small woody shrubs such as Lyceum cinereum. These dendritic drainage lines were not identified as ecological sensitive areas and the PV facility will be constructed over these areas. These dendritic drainage features must however be maintained inside the PV facility underneath and in between the panels in order to discharge storm water generated on the site.

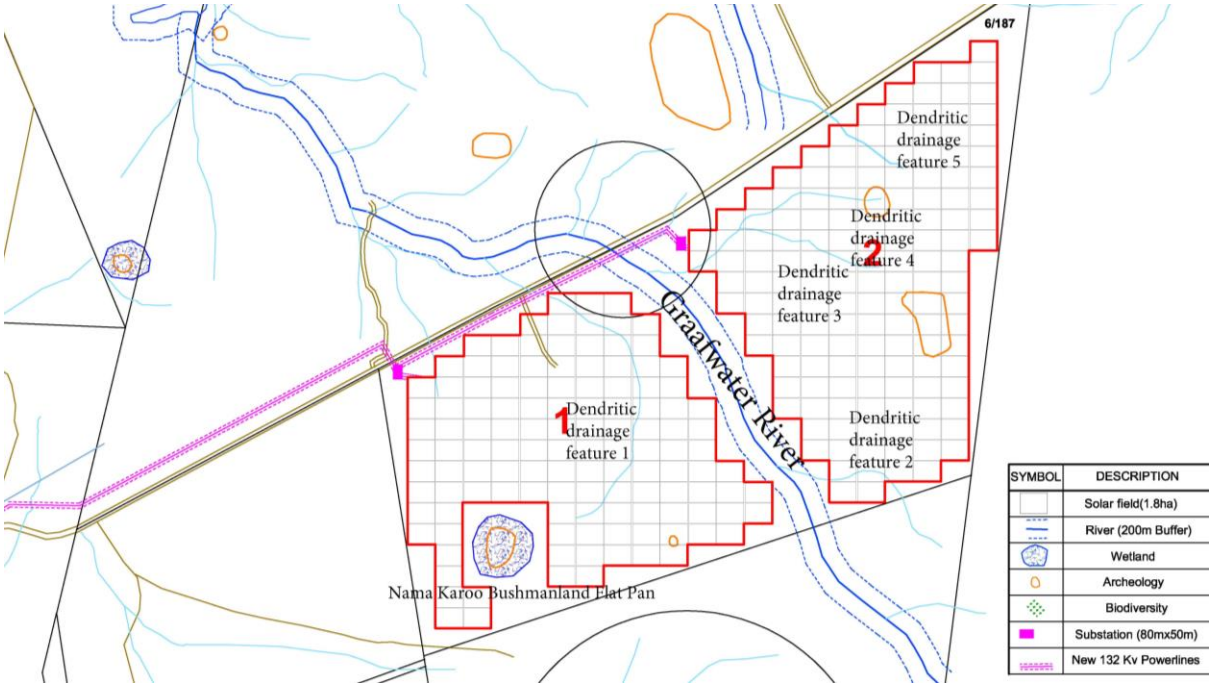
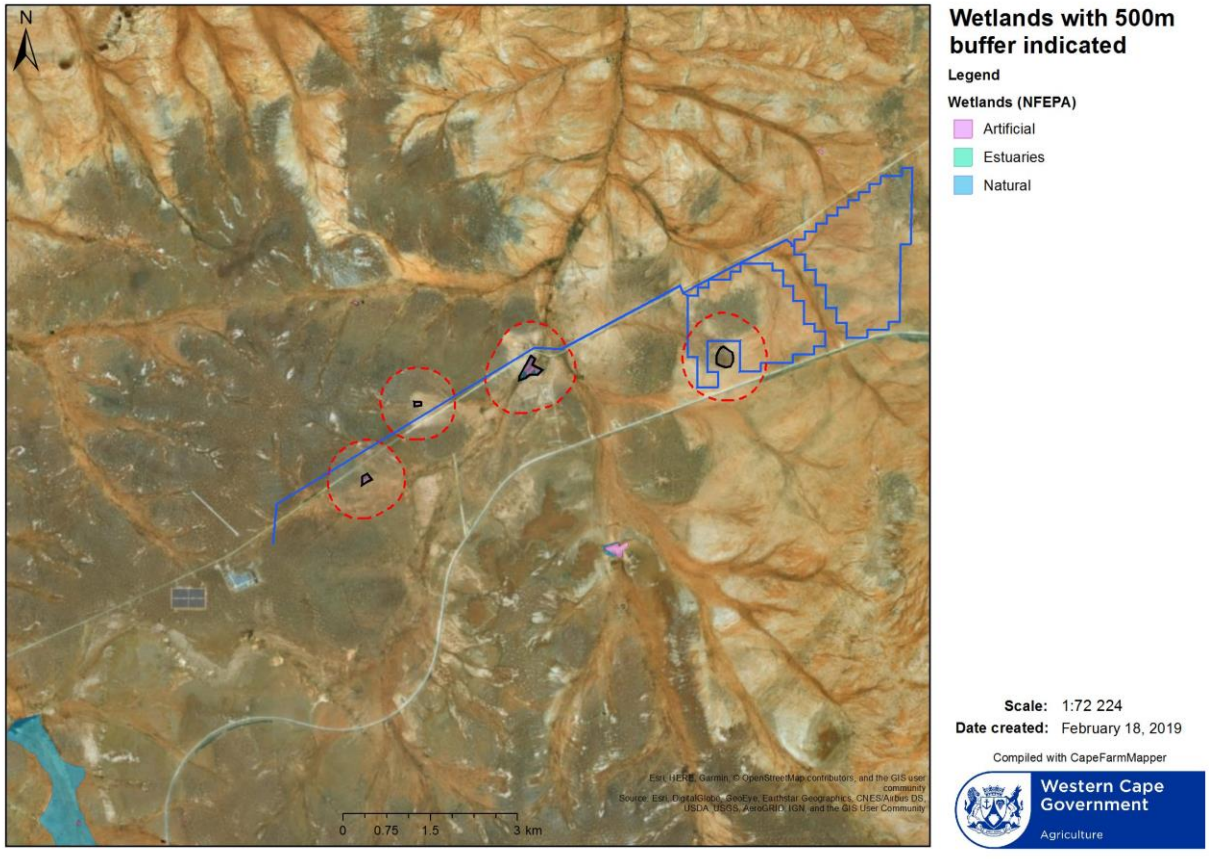


Figure 1: Graafwater River, Nama Karoo Bushmanland Flat Pan and several other drainage lines.

The four (4) “wetlands” identified within 500m of the proposed development are indicated in the figure below. The delineations were based largely on remotely-sensed imagery and therefore did not include historic wetlands lost through drainage, ploughing and concreting.



A Nama Karoo Bushmanland Flat Pan was recorded during the site survey which was recorded as a NFEPA wetland. Three NFEPA artificial wetlands (two dams and one weir dam in Graafwater River) was recorded on portion 3 close to the 132 kV powerline connection route to Aries Substation. The 132kV powerline connecting the PV facility to the Eskom grid will not impact on these artificial wetland dams and weir. The powerline will run parallel to an existing Eskom powerline which mitigate and reduce its impacts on ecology and avifauna.

Water Table and Ground Water

A total of 12 Trial Pits were analysed. No seepage water or water table was observed during trial pitting. Trial pitting was conducted on 24 August 2018 using a Terex digger/loader hired from TR Plant Hire in Kakamas. The aim was to excavate the trial pits to a depth of approximately 2.0m since these are the layers in which the structures are expected to be founded. Machine refusal however varied from a depth of 500m to 1600mm. Four trail pits could be excavated down to 1 600mm.

The aquifer classification system of South Africa classifies this area as “Minor”. The minor aquifer region is a moderately-yielding aquifer system of variable water quality (DWS, August 2012). The Aquifer Susceptibility classification indicates the qualitative measure of the relative ease with which a groundwater body can be potentially contaminated by anthropogenic

activities and includes both aquifer vulnerability and the relative importance of the aquifer in terms of its classification. This area is classified as “Low” Susceptibility (DWS, June 2013). The Aquifer Vulnerability classification indicates the tendency or likelihood for contamination to reach a specified position in the groundwater system after introduction at some location above the uppermost aquifer. The site is classified as the least vulnerable region that is only vulnerable to conservative pollutants in the long term when continuously discharged or leached (DWS, July 2013). The groundwater quality classification indicates the groundwater quality of South Africa. The area is classified as having a noticeably salty taste with EC (mS/m) of 150 – 370 (DWS, August 2012).

Flood Hydrology

The study area is situated in an arid region with a very low annual rainfall of 127mm and annual evaporation of between 2 600mm and 2 800mm per annum. Average temperatures vary between approximately 20°C in July and 36°C in January.

There is one main water course running through portion 6. The water course crosses the Saldanha-Sishen railway reserve and runs between block 1 and 2 and drains into the Graafwater River. There are also minor water courses crossing the site which is depicted by the thorn shrubs. The gradient can be classified as flat (<3.5%). The vegetation is mostly sparse grass and light thorn shrub growing in the watercourses. The uppermost soils of the site are very permeable, with the harder layers below being described as impermeable. The watercourses are partially overgrown with thorn shrub and in general are fairly straight with constant gradients with no natural or manmade ponds or dams.

A contour plan was generated using the Google Earth website. Representative cross sections of the water courses were extracted using the contour plan. Using the formula derived by Manning to determine the flow rate in a given section for a specified water depth and bed slope, graphs depicting flow rate vs flow depth were generated. Manning's roughness coefficient was taken as 0.018 in all instances. From the generated graphs, the flood level depth for the 1: 100-year floods could then be determined. These depths were converted into a horizontal offset from the centre of the watercourse. The maximum offset, calculated from the centre of the water course, is 30m. This information, together with onsite observations and Google Earth imagery, was used to generate the flood lines as per Appendix G3: Flood Lines Determination. The proposed photovoltaic panels are located outside the 1:100-year flood lines.

4.7 Noise

The study area has a rural character in terms of background noise levels. The only potential receptors are located at the existing farmyards and houses, which are situated far from the site. The only noise associated with this activity will be during construction and decommissioning of the facilities and vehicles during the operational phase. The electricity generation facility does not have moveable parts which can generate noise. No noise study is required.

4.8 Socio-Economic Elements

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).

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. 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 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 females 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.

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%) court cases relate to substance abuse.

- 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).

See Appendix G6: Social Impact Assessment for further details.

4.9 Sensitive Landscapes

Sensitive areas include the non-perennial river and pan as well as archaeological sites. Sensitive archaeological sites are mapped in the Appendix G4a: Heritage Impact Assessment and Appendix G4b: Heritage Impact Assessment – Letter on Final Layout.

4.10 Visual Impact Elements

In this case the landscape around the site has a uniform character consisting of gently undulating plains with no prominent topographical features, shallow drainage valleys and flat ridges. The elevation difference noticed is only about 30m. From a sub-regional perspective, a distinct viewshed cannot be defined with consequence that the facility will be alternately visible and hidden from view depending on the location of the viewpoint in the landscape. No views of the facility will be possible beyond ±10km from the site, with the only significant views thereof restricted to relative short distance of ±5km along the bypassing public road.

The landscape has a typical rural farmland character of peaceful tranquillity, uninterrupted openness and isolation, simply organized by minimal farming infrastructure. The Aries substation and associated transmission lines though, dominates the landscape and along with a recently constructed Photo-Voltaic Electricity Generation facility directly to the west of the Aries substation, sets a precedent for large scale human intervention in the area and lowers the potential intensity of the visual impact considerably.

The sense of place within the surrounding area will be significantly altered; however, a new sense of place will be created which will represent South Africa's attempts to address the challenges of climate change in a responsible and sustainable manner. The visual impacts will therefore be experienced by many, including many who are sensitive to environmental issues, as being positive.

The visual impact is assessed to be of moderate significance with mitigation. The reasons for this are mainly 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 the Pofadder – Kenhardt road. The implication of this situation is that views from the road will in any case be of short duration (travellers). Furthermore, during the operational phase, activities on-site will be minimal and will only include maintenance and security.

Refer to Appendix G7: Visual Impact Assessment for more details.

4.11 Ground Water Use

Water (required in construction phase only) will be sourced from existing boreholes authorized in the EA for portion 3 and 13.

4.12 Agricultural Potential

The agricultural sector in the area is the main economic sector with the largest potential for economic growth. The area is also ideal for small stock farming and the area around Kenhardt is known as the capital of Dorper sheep farming. The area has a carrying capacity to the order of 1 small stock unit per 6ha.

The study area has been impacted upon to some degree by livestock farming, although the natural vegetation is in relatively good condition. The veld is open with sparse grass cover. The vegetation of the study area is dominated by *Salsola tuberculata, Eriocephalus ericoides* and *Rhigozum trichotomum*. Dominant grasses include *Stipagrostis ciliata* var. *capensis, Stipagrostis obtusa, Stipagrostis uniplumis* var. *uniplumis*, and *Eragrostis curvula.*

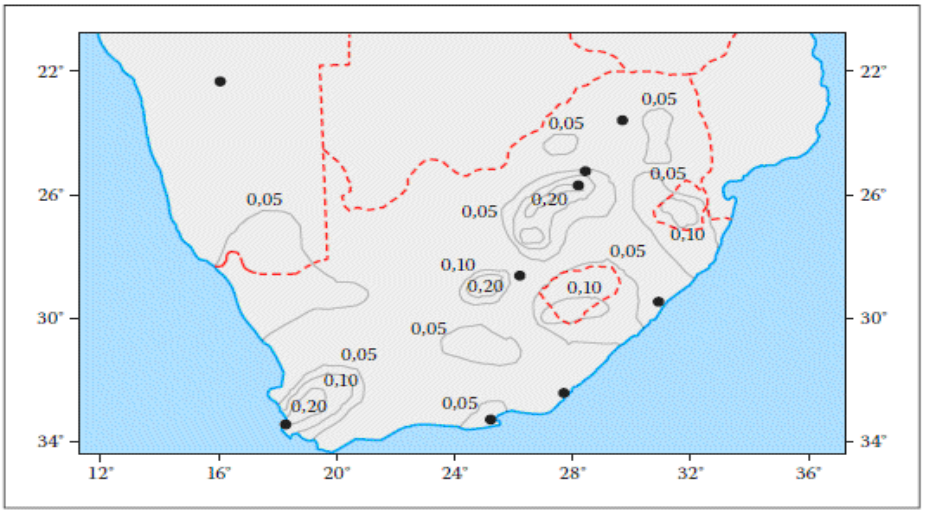
- *Salsola tuberculata* grows in plains, depressions and brackish veld. It is palatable and highly resistant to grazing and drought.
- *Eriocephalus ericoides* grows almost everywhere though the palatability varies greatly in the different regions, habitats and seasons.
- *Rhigozum trichotomum* grows on hills, apron veld and plains, but it prefers sandy soils. It is unpalatable but the flowers and pods can be grazed. It displaces more valuable plants and sometimes forms impenetrable thickets.
- *Stipagrostis ciliata* var. *capensis* grows in the gravel on plains and sandy areas, especially in river beds. Palatable and valuable grass. Is drought resistant with a high grazing value.
- *Stipagrostis obtusa* grows mostly in dry sandy soils. It is a palatable and valuable grass. Is drought resistant with a high grazing value.
- *Stipagrostis uniplumis* var. *uniplumis* grows on undisturbed sandy soils and flood plains. It is palatable with a medium grazing value.
- *Eragrostis curvula* grows mostly on disturbed areas. It is palatable with a medium grazing value.

Rain water will run off the solar panels and naturally drain eastwards towards the drainage lines in between the solar panels. In essence none to minimal concentrated water runoff will be evident.

The full farming unit consists of 6 cadastral units with a total of 7011ha. The current farmer stocks 600 ewes on the 7011 ha. This is a small stock carrying capacity of 12ha per small stock unit.

4.13. Geo-Technical

According to the seismic hazard map contained in SABS 0160-1993, (reproduced as Figure below), the proposed sites are located in an area where the peak ground acceleration will not exceed 0.05g (gravity acceleration) or approximately 50cm/s², with a 10% probability of exceedance in 50 years.



Seismic hazard map from SABS 0160-1993

According to a map produced by the United Nations Office for the Coordination of Humanitarian affairs depicting earthquake intensity zones in Africa, the proposed sites are located in an area where earthquake magnitude may vary from instrumental to fairly strong. (Earthquake intensity degree I –V according to the Modified Mercalli scale of 1956.) No incidences of widely perceived seismic activity have been recorded in the area. No special foundation measures are therefore required due to possible seismic activity.

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 by the digger loader. For the rest of the trial pits, the depth to refusal varied from 250mm to 1 600mm. An excavator should however be able to excavate through this layer.

Although the founding method (foundation screws or steel piles) for the solar panels is still to be determined, the dense nature of the soil poses a question mark whether the anchors will be able to penetrate the very dense material. The average depth to weathered rock for this portion is approximately 1000mm. It is proposed that additional tests be conducted by the specialist contractor responsible for the design and installation of the anchors. Alternative foundation designs should be investigated for areas where the weathered rock is shallow.

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 study area is considered to be suitable from a geotechnical perspective for the proposed development of a solar power facility but will most probably require different footings across the site.

5. PUBLIC PARTICIPATION PROCESS

5.1. Introduction

As outlined previously, public participation forms an integral component of the EIA process. The public participation process for the project initiation and Scoping Report phase was outlined in detail in the Scoping Report, and that for the EIAr was summarised in the Plan of Study for EIA. The purpose of this chapter is to provide a brief summary of the public consultation process undertaken to date and provide a more detailed overview of the public participation in the EIAr phase.

5.2. Summary of Public Participation to Date

The public participation process to date has entailed the following key components

Potential I&AP's were notified about the project by:

- Fixing notice boards at the boundary of the property
- Giving written notice to adjacent property owners and dwellers, the municipal councillor of the ward within which the site is located, the local municipality and organs of state having jurisdiction in respect of any aspect of the project
- Placing an advertisement in the local newspaper
- Additionally, the Scoping and Environmental Impact Reports was prepared and made available to any I&AP, as advised on the notice boards, notices and advertisements.

The Scoping Report was included for statutory comment with the written notice as sent to the commenting organs of state. List of Potentially Interested and Affected Parties was compiled. Each neighbour received a written notice inviting them to register and give comments on the proposed development. List of Registered Interested and Affected Parties was compiled. A summary of issues raised by Interested and Affected Parties was compiled. The draft EIAr was sent to all key departments and registered Interested and Affected Parties for a 30-day commenting period.

5.3. Authority Involvement

Liaison with the relevant authorities plays a crucial role in the successful completion of any EIA process. In addition to the interaction with DEA, the key departments on the registered list were provided with the relevant project documentation and invited to submit comment.

5.4. Comments on the Draft Environmental Impact Report

Comments on the Draft Environmental Impact Report from key departments and I&APs will be incorporated into the report.

5.5. Decision and Appeal Period

The Final EIAr will be completed and all I&AP comments will be incorporated into the report to be submitted to DEA for review and decision.

Once they have reviewed the document and are satisfied that it contains sufficient

information to make an informed decision, DEA will use the information contained within the EIAr to determine the environmental acceptability of the applicant's preferred options. Thereafter DEA will issue an Environmental Authorization outlining the nature of their decision and the Conditions of Approval attached to any authorisation should the proposed activity be approved.

Following the issuing of the Environmental Authorization, I&APS will be notified of DEA's decision by means of letters and there will be an appeal period during which I&AP's will have an opportunity to appeal against the decision.

Public Participation information attached as Appendix E.

6. NEED & DESIRABILITY OF THE ACTIVITY

South Africa currently faces an electricity shortage due to population growth and the resulting increase in electricity demand. South Africa relies heavily on coal to meet its energy needs and has developed an efficient, large scale, coal-based power generation system that provides low-cost electricity. However, South Africa has recognised that the emissions of greenhouse gases from the use of fossil fuels, such as coal and petroleum products, has led to increasing concerns about climate change in the country. The energy industry in South Africa is the biggest contributor to Greenhouse Gas emissions (GHGs). This has led the country to be rated amongst the top 20 emitters in the world. The utilisation of alternative energy sources is becoming a great opportunity in an effort to utilise renewable energy resources that have less adverse impacts on the environment. South Africa is well endowed with renewable sources; however, they have remained largely untapped. South Africa is one of the areas in the world with the highest count of sunny days per year, therefore making it also one of the most appropriate places in the world to use solar power energy.

The installation of a photovoltaic plant will:

- Reduce electricity demand on Eskom generation;
- Results in less non-renewable resources being used and less CO^2 being produced;
- Produce no pollution during operation;
- Improve the health of the nation (health benefits realised through reduced atmospheric pollution and improved living conditions).

The proposed project will be beneficial for the following reasons: -

Electricity supply
Over the last few years, South Africa has been adversely impacted by interruptions in the supply of electricity. The creation of a 'decentralised' power generation facility (i.e. not located in the traditionally centralised power producing regions of the Republic of South Africa) close to Aries Eskom Substation with it proposes to supply and strengthen the Northern Cape and National electricity grid, will secure a supplementary energy source for South Africa.

Green energy
Growing concerns such as climate change and the ongoing exploitation of non-renewable resources have prompted increased international pressure on countries to increase their share of renewable energy generation. Additionally, the project would contribute towards meeting the national energy target as set by the Department of Energy (DoE) and assist the government in achieving its proposed renewable energy target of 17 800 MW by 2030.

Climate change
The electricity generated by the photovoltaic facility will displace some fossil fuel-based forms of electricity generation. The photovoltaic facility, over its lifetime, will therefore avoid the production of a sizeable amount of CO^2, SO^2 and NO^2 that would otherwise be emitted to the atmosphere. The proposed project would also have international significance as it contributes to South Africa being able to meet some of its international obligations by aligning domestic policy with internationally agreed strategies and standards as set by the United Nations Framework Convention on Climate Change (UNFCCC), Kyoto Protocol, and the 2017 Paris Agreement, all of which South Africa is a signatory to. Renewable energy is critical to South Africa as this source of energy is recognised as a major contribution to climate protection, has a much lower environmental impact, as well as advancing economic and social development.

Job creation and social benefits
The towns in the Northern Cape are generally small with limited job opportunities, and the proposed project will provide an opportunity for additional employment in an area where job creation is identified as a key priority.
The local community will experience significant positive changes in their economic and material wellbeing 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).

1. Is the activity permitted in terms of the property's existing land use rights?		**NO**	**Please explain**
Currently zoned Agriculture 1 where the facility is proposed. A special consent zoning application for green energy production on agricultural land will be submitted to the Local Authority for a decision as part of this application process.			
2. Will the activity be in line with the following?			
(a) Provincial Spatial Development Framework (PSDF)	**YES**		**Please explain**
The proposed activity is in line with the NSDP. All three spheres of government have common objectives in so far as the achievement of economic growth and poverty alleviation through social development are concerned. It follows that all infrastructure and development spending programmes should therefore support the attainment of these objectives. The **NSDP** proposes that decisions by the different spheres of government on infrastructure and development spending should be guided by the following set of normative principles: • Economic growth is a prerequisite for the achievement of other policy objectives, key among which would be poverty alleviation; • Government spending on fixed investment, beyond the constitutional obligation to provide basic services to all citizens, should therefore be focused on localities of economic growth or economic potential in order to attract private sector investment, stimulate sustainable economic activities and create long-term employment opportunities; • Efforts to address past and current social inequalities should focus on people not places. In localities where there are both high levels of poverty and development potential this could include fixed capital investment beyond basic services to exploit the potential of those			

localities. In localities with low development potential, government spending, beyond basic services, should focus on providing social transfers, human resource development and labour market intelligence. This will enable people to become more mobile and migrate, if they choose to, to localities that are more likely to provide sustainable employment of other economic opportunities; and

- In order to overcome the spatial distortions of apartheid, future settlement and economic development opportunities should be channelled into corridors and nodes that are adjacent to or link the main economic growth centres. Infrastructure investment and development spending should primarily support localities that will become major growth nodes in South Africa.

Furthermore, the Land-Use Management Bill referred to above propose a set of Directive Principles that should guide the formulation, determination, development and implementation of all policies and legislation regulating spatial planning. These are: equality; efficiency; integration; sustainability; and fair and good governance.

(b) Urban edge / Edge of Built environment for the area	[redacted]	**NO**	**Please explain**
The proposed development will not affect the urban edge of Kenhardt. Situated far from the urban area.			
(c) Integrated Development Plan and Spatial Development Framework of the Local Municipality (e.g. would the approval of this application compromise the integrity of the existing approved and credible municipal IDP and SDF?).	**YES**	[redacted]	**Please explain**
The proposed land use is in line with the Existing Spatial Development Framework, and IDP. Activity will promote job creation.			
(d) Approved Structure Plan of the Municipality	**YES**	[redacted]	**Please explain**
Will create much needed jobs and a local economy.			
(e) An Environmental Management Framework (EMF) adopted by the Department (e.g. Would the approval of this application compromise the integrity of the existing environmental management priorities for the area and if so, can it be justified in terms of sustainability considerations?)	[redacted]	**NO**	**Please explain**
No EMF conducted for area.			
(f) Any other Plans (e.g. Guide Plan)	**YES**	[redacted]	**Please explain**

The REDZs and Power Corridors were identified through the development of three Strategic Environmental Assessments as part of the department's Strategic Environmental Assessment program. According to the department, the outputs of the three SEAs must now be gazetted to allow them to be implemented. "The REDZs and Power Corridors support two of the 18 Strategic Integrated Projects (SIPs) that were identified in the Infrastructure Development Plan, which is aimed at promoting catalytic infrastructure development to stimulate economic growth and job creation," the department said. The department has embarked on a program of Strategic Environmental Assessments (SEAs) for large-scale developments to support the SIPs.			
3. Is the land use (associated with the activity being applied for) considered within the timeframe intended by the existing approved Spatial Development Framework (SDF) agreed to by the relevant environmental authority (i.e. is the proposed development in line with the projects and programmes identified as priorities within the credible IDP)?	**YES**	■	**Please explain**
The new development will make a positive contribution to the area, and will give practical effect to planning guidelines and plans in the area.			
4. Should development, or if applicable, expansion of the town/area concerned in terms of this land use (associated with the activity being applied for) occur here at this point in time?	**YES**	■	**Please explain**
The problem regarding the South African network in the Northern Cape is that the 132 kV lines are long lines. As a rule of thumb, when lines are longer than about 80 km (and this is a rough estimate), it is not the thermal limit of the line, i.e. the maximum current capability, that determines the maximum power transfer capability anymore, but rather the phase shift between the sending end and receiving end of line (known as the power angle) that reaches a certain maximum. From here on, the longer the line, the less power can be transferred when that limit is reached. Aries Eskom substation is a strategic substation and a good location for a solar power plant. The necessary infrastructure is in place to connect the electricity generating facility to the ESKOM grid. In fact, connection to the grid will be fairly straight forward. A 132-kV line that will feed into the ARIES substation will be constructed to transport the 300 MW energy to be generated into the ESKOM distribution network. The facility will strengthen transmission capacity in the Northern Cape.			
5. Does the community/area need the activity and the associated land use concerned (is it a societal priority)? (This refers to the strategic as well as local level (e.g. development is a national priority, but within a specific local context it could be inappropriate.)	**YES**	■	**Please explain**
This is not a societal priority. However, it will create much needed jobs and help to create so called renewable electricity generation through solar for the Northern Cape. Within the REFIT program.			
6. Are the necessary services with adequate capacity currently available (at the time of application), or must additional capacity be created to cater for the development? (Confirmation by the relevant Municipality in this regard must be attached to the	**YES**	■	**Please explain**

final EIA Report.)			
In close proximity to Aries substation. Connecting to the substation will be fairly easy.			
7. Is this development provided for in the infrastructure planning of the municipality, and if not, what will the implication be on the infrastructure planning of the municipality (priority and placement of services and opportunity costs)? (Comment by the relevant Municipality in this regard must be attached to the final EIA Report.)		**NO**	**Please explain**
No municipal services needed.			
8. Is this project part of a national programme to address an issue of national concern or importance?	**YES**		**Please explain**
Both principles of energy security and diversification can only be possible if we bring on board Independent Power Producers (IPPs) to contribute to the energy balance. This commitment is enshrined in our White Paper on Renewable Energy Policy which is under review and the Integrated Resources Plan. The Northern Cape has been selected for this project after a careful consideration and the realization that the province meets many of the key criteria as confirmed by independent analysis. Some of the findings include: • excellent and consistent sun, • flat and sparsely-populated land, • the ability to connect to the electricity grid at multiple points,			
9. Do location factors favour this land use (associated with the activity applied for) at this place? (This relates to the contextualisation of the proposed land use on this site within its broader context.)	**YES**		**Please explain**
Can fairly easily be connected to the Aries Eskom Substation. Refer to rest of Scoping report for all criteria considered which further motivates why the location factors favour this activity on this site in this time and place.			
10. How will the activity or the land use associated with the activity applied for, impact on sensitive natural and cultural areas (built and rural/natural environment)?	**Please explain**		
The sensitive natural and cultural land uses were identified and respected during the EIA process and the development layout is designed according to such parameters.			
11. How will the development impact on people's health and wellbeing (e.g. in terms of noise, odours, visual character and sense of place, etc)?	**Please explain**		
Solar electricity health risks from PV panels are very slight once the panels are produced and installed. This type of solar electricity is known for reliability and low maintenance. The facility has no movable part. The noise impact is therefore limited mainly to vehicles.			
12. Will the proposed activity or the land use associated with the activity applied for, result in unacceptable opportunity costs?		**NO**	**Please explain**
The construction of such a facility is expensive. The cost of this development will be for the applicant or outside investors. The REFIT tariff (price of electricity sold to ESKOM) enables a reasonable return on investment. This tariff is the same for all solar electricity generation facilities and is controlled by National Government within their legal and policy frameworks.			
13. What will the cumulative impacts (positive and	**Please explain**		

negative) of the proposed land use associated with the activity applied for, be?			
Refer to scoping report for more detail.			
14. Is the development the best practicable environmental option for this land/site?	**YES**	■	**Please explain**
Generation of renewable electricity. All environmental factors have been identified in this report and will be assessed in the EIR report in the second phase.			
15. What will the benefits be to society in general and to the local communities?			**Please explain**
Electricity generation making use of renewable sources. Job creation. Refer to Socio-Economic study for more details. Will be assessed in more detail in the EIR phase.			
16. Any other need and desirability considerations related to the proposed activity?			**Please explain**
N/A			

7. IDENTIFIED POTENTIAL ALTERNATIVES

Introduction

As outlined previously, the purpose of the Scoping Report phase is to identify the range of feasible alternatives and potential environmental impacts requiring more detailed investigation and assessment in the EIAr.

A detailed description of the proposed activities as well as the full range of project alternatives was provided in the Scoping Report. The potential biophysical and social impacts associated with the project alternatives were outlined in the Scoping Report. These included potential impacts that may arise during the operational phase, as well as the potential construction related impacts (i.e. short-term impacts). Some of these impacts were screened out during the Scoping Phase, while others were identified as requiring more detailed assessment during this EIAr phase.

This chapter provides a brief review of the feasible alternatives and potential environmental impacts, for the proposed project, identified for further assessment during the EIAr phase. It should be noted that some of the alternatives have been revisited and revised in light of new information that has become available since the publication of the Scoping Report.

The following alternatives as per the guideline exists

Site Alternatives
Portion 6 of Farm 187, Kenhardt, Northern Cape was identified for consideration within an Environmental Impact Assessment process during the site identification process. The area was chosen as the region is among the best “solar insolation” areas in South Africa and the capacity of the grid and the Aries substation will allow the electricity generated to be fed into the national grid. No other property alternatives were proposed for this project as the site is dependent on several factors including climatic conditions, site extent and topography.
The main determining factors for selecting the proposed location were: -

- Solar availability;
- Proximity to a grid connection point;

- Available land;
- The site is located in one of the Power Corridors identified in the Strategic Environmental Assessments (SEAs) for large-scale developments to support the SIPs.

The site was chosen as the preferred site due to the following characteristics:

Climatic conditions
The proposed site is among the best "solar insolation" in South Africa. This is the most important factor used in selecting a site to build a photovoltaic power plant. The energy output of a photovoltaic system is directly proportional to the insolation input. Other climatic and environmental factors such as temperature extremes, precipitation, wind and land topography, will limit and constrain a PV plant. These factors are all secondary when compared with the availability of insolation.

Size of the site
The site will be sufficient for the installation of a 300MW photovoltaic power plant. The area has lots of surplus land to accommodate project sensitive areas buffer zones.

Grid Connection
Eskom owns and operates a high voltage transmission and distribution network within the area. Various electrical connection points to the Aries Substation bordering the site were negotiated with Eskom for the proposed PV plant.

Site Access
The site can be accessed via the Kenhardt to Pofadder gravel road.

Topography
The site has a relatively flat area which is required for the construction of PV plant.

Preliminary investigations have identified that the proposed project site meets these specific criteria and so different locations for the current project will not be reasonable. The connectivity to the grid is a critical factor to the overall feasibility of the project; therefore, alternative locations will not be assessed.

The preferred site location is the most feasible and reasonable alternative as it is close to the ESKOM grid connections and will result in shorter line access routes. Alternative properties on which the proposed development could take place were not considered, but alternative siting on the chosen property was considered, this is dealt with under layout alternatives.

Activity Alternatives
The core business area of the project proponent, Solar Energy Land, is photovoltaic development for the generation of electricity. As such, the fundamental alternative of a development other than to construct and operate a solar energy facility is therefore not viable in this case, and will not be considered further in the EIA.

Design or layout alternatives
During the Scoping Phase, site-specific environmental attributes was used to identified potentially environmental sensitive areas for consideration in detail during the EIA phase. An initial layout was provided as the Scoping phase. See Appendix B2: Site Development Plan – Alternative 2 (Alternative layout) for details of the layout of the PV panels. The alternative

layout is not supported as it will have an impact on ecological sensitive features identified in this study. The layout assessed (alternative 2) will impact on Nama Karoo Bushmanland Flat Pan.

Environmentally sensitive features were mapped and used to determine the preferred layout (Appendix B1: Site Development Plan – Alternative 1 (Preferred layout)). Several assessments, i.e. heritage, biodiversity, flood lines were conducted to ensure that environmental and sensitive areas were avoided. The information from the studies in the EIAr phase informed the layout alternative for the proposed development site and provided recommendations regarding the preferred layout alternative. See Appendix B1: Site Development Plan – Alternative 1 (Preferred layout) for details of the layout of the PV panels. Alternative 1 avoids the Nama Karoo Bushmanland Flat Pan and sets out a 100m buffer for the Graafwater River.

Technology alternatives (e.g. to reduce resource demand and resource use efficiency)
There are three general families of photovoltaic (PV) modules (solar panels) on the market today. They are monocrystalline silicon also known as single-crystal silicon, polycrystalline silicon, and thin film Monocrystalline and Polycrystalline Solar panels represent the "traditional" technologies.

They can be grouped into the category "crystalline silicon". Monocrystalline is the original PV technology invented in 1955, and never known to wear out. Polycrystalline entered the market in 1981. It is similar in performance and reliability. Monocrystalline modules are composed of cells cut from a piece of continuous crystal. The material forms a cylinder which is sliced into thin circular wafers. To minimize waste, the cells may be fully round or they may be trimmed into other shapes, retaining more or less of the original circle. Because each cell is cut from a single crystal, it has a uniform colour which is dark blue.

Polycrystalline cells are made from similar silicon material except that instead of being grown into a single crystal, it is melted and poured into a mold. This forms a square block that can be cut into square wafers with less waste of space or material than round single-crystal or monocrystalline wafers. As the material cools it crystallizes in an imperfect manner, forming random crystal boundaries. The efficiency of energy conversion is slightly lower. This merely means that the size of the finished module is slightly greater per watt than most Monocrystalline modules. The cells look different from Monocrystalline cells. The polycrystalline surface has a jumbled look with many variations of blue colour. In fact, they are quite beautiful like sheets of gemstone.

In addition to the above processes, some companies have developed alternatives such as ribbon growth and growth of crystalline film on glass. Most crystalline silicon technologies yield similar results, with high durability. Twenty-year warranties are common for crystalline silicon modules. Monocrystalline tends to be slightly smaller in size per watt of power output, and slightly more expensive than polycrystalline.

The silicon used to produce crystalline solar modules is derived from sand. It is the second most common element on Earth, so why is it so expensive? The answer is that in order to produce the photovoltaic effect, it must be purified to an extremely high degree. Such pure "semiconductor grade" silicon is very expensive to produce. It is also in high demand in the electronics industry because it is the base material for computer chips and other devices. Crystalline solar cells are about the thickness of a human fingernail. They use a relatively large

amount of silicon.

Thin-Film or Amorphous Solar Panels
Imagine if a PV cell was made with a microscopically thin deposit of silicon, instead of a thick wafer. It would use very little of the precious material. Now, imagine if it was deposited on a sheet of metal or glass, without the wasteful work of slicing wafers with a saw. Imagine the individual cells deposited next to each other, instead of being mechanically assembled. That is the idea behind thin film technology. (It is also called amorphous, meaning "not crystalline.") The active material may be silicon, or it may be a more exotic material such as cadmium telluride.

Thin-film panels can be made flexible and lightweight by using plastic glazing. Some flexible panels can tolerate a bullet hole without failing. Some of them perform slightly better than crystalline modules under low light conditions. They are also less susceptible to power loss from partial shading of a module.

The disadvantages of thin-film technology are lower efficiency and uncertain durability. Lower efficiency means that more space and mounting hardware are required to produce the same power output. Thin film materials tend to be less stable than crystalline, causing degradation over time. PV experts generally agree that crystalline silicon will remain the "premium" technology for critical applications in remote areas. Thin film will be strong in the "consumer" market where price is a critical factor.

A portion of the ground mounted solar panels will be equipped with so called sun-trackers. This means that the Solar panels will follow the sun in order to increase the efficiency of the panel.

Benefit of a tracking system
Even though a fixed flat-panel can be set to collect a high proportion of available noon-time energy, significant power is also available in the early mornings and late afternoons when the misalignment with a fixed panel becomes excessive to collect a reasonable proportion of the available energy. For example, even when the Sun is only 10° above the horizon the available energy can already be around half the noon-time energy levels (or even greater depending on latitude, season, and atmospheric conditions). Thus, the primary benefit of a tracking system is to collect solar energy for the longest period of the day, and with the most accurate alignment as the Sun's position shifts with the seasons.

Several competing systems are available to support the sun-tracking technology. All systems are simple electrical mechanical devices that rotate the panel in a desired direction. Compared to complete fixed mounted panels, there is no different environmental impact other than:

- use of self-generated electricity which is over compensated by the improved efficiency of the solar panel
- some higher maintenance cost which will lead to higher employment

The three above technologies alternatives were considered. A combination of Polycrystalline panels and First Solar using cadmium based Thin-film solar cell technology will be preferred in the layout.

Grid Connection Alternatives
The PV plant consists of two PV blocks. At each of these blocks the DC input voltage from the PV panels is converted to AC by means of inverters. The AC output voltage from the inverter is then stepped up with a 400 V to 22 kV step-up transformer at each block. The electrical power

is then transported via aboveground cables to a central point substation on the southern edge of the PV block. At this central point the substation the underground cables connect to a central busbar above ground through the relevant protection switch gear, isolators and measurement devices in the constructed substation.

The plant will be connected to the ESKOM grid via a 132-kV overhead transmission line through the appropriate protection switch gear, ext. via an overhead transmission line.

Operational Alternatives
Operational alternatives were not considered as it is not feasible or reasonable. Eskom have specific requirements when electricity generated is connected to the national grid.

The option of not implementing the activity (the No-Go Option)
The No-Go option will result in the site remaining as it is presently, e.g. sheep farming activities.

The no-go alternative assumes that the proposed project will not go ahead i.e. it is the option of not constructing the proposed PV project. This alternative would result in no environmental impacts on the site or surrounding local area. It provides the baseline against which other alternatives are compared and will be considered throughout the report. The following implications will occur if the "no-go" alternative is implemented:

- No benefits will be derived from the implementation of an additional land-use;
- No additional power will be generated or supplied through means of renewable energy resources by this project at this location.
- The "no go" alternative will not contribute to and assist the government in achieving its proposed renewable energy target of 17 800 MW by 2030;
- No potential impact to the SKA project;
- Electricity generation will remain constant (i.e. no additional renewable energy generation will occur on the proposed site) and the local economy will not be diversified;
- Local communities will continue their dependence on agriculture production and government subsidies. The local municipality's vulnerability to economic downturns will increase because of limited access to capital;
- There will be no opportunity for additional employment in an area where job creation is identified as a key priority;
- There will be lost opportunity for skills transfer and education/training of local communities;
- The positive socio-economic impacts likely to result from the project such as increased local spending and the creation of local employment opportunities will not be realised; and

Converse to the above, the following benefits could occur if the "no-go" alternative is implemented:

- There will be no development of solar energy facilities at the proposed location;
- Only the agricultural land use will remain;
- No vegetation will be removed or disturbed during the development of these facilities;
- No change to the current landscape will occur;
- No heritage artefacts will be impacted on; and
- No additional water uses during the construction phase.

While the "no-go" alternative will not result in any negative environmental impacts; it will also not result in any positive community development or socio-economic benefits. It will also not assist

government in addressing climate change, reaching its set targets for renewable energy, nor will it assist in supplying the increasing electricity demand within the country. Hence the “no-go” alternative is not currently the preferred alternative.

8. IMPACT ASSESSMENT

8.1. Assessment Methodology

INTRODUCTION

Below is the assessment methodology utilized in determining the significance of the construction, operational and decommission impacts of the proposed activities, and where applicable the possible alternatives, on the biophysical and socio-economic environment. The methodology is broadly consistent to that described in DEA’s Guideline Document on the EIA Regulations (1998).

ASSESSMENT METHODOLOGY

This section outlines the methodology used to assess the significance of the potential environmental impacts. For each impact, the EXTENT (spatial scale), MAGNITUDE (size or degree scale) and DURATION (time scale) are used to ascertain the SIGNIFICANCE of the impact, firstly in the case of no mitigation and then with the most effective mitigation measure(s) in place. The mitigation described in the document represents the full range of plausible and pragmatic measures *but does not necessarily imply that they should or will all be implemented*. The decision as to which mitigation measures to implement lies with the applicant and ultimately with DEADP. The tables on the following pages show the scale used to assess these variables, and defines each of the rating categories.

Assessment criteria for the evaluation of impacts:

Criteria	**Description**		
Nature	a description of what causes the effect, what will be affected, and how it will be affected.		
	Type	**Score**	**Description**
Extent (E)	None (No)	1	Footprint
	Site (S)	2	On site or within 100 m of the site
	Local (L)	3	Within a 20 km radius of the centre of the site
	Regional (R)	4	Beyond a 20 km radius of the site
	National (Na)	5	Crossing provincial boundaries or on a national / land wide scale
Duration (D)	Short term (S)	1	0 – 1 years
	Short to medium (S-M)	2	2 – 5 years
	Medium term (M)	3	5 – 15 years
	Long term (L)	4	> 15 years
	Permanent(P)	5	Will not cease
Magnitude (M)	Small (S)	0	will have no effect on the environment
	Minor (Mi)	2	will not result in an impact on processes
	Low (L)	4	will cause a slight impact on processes
	Moderate (Mo)	6	processes continuing but in a modified way
	High (H)	8	processes are altered to the extent that they temporarily cease
	Very high (VH)	10	results in complete destruction of patterns and permanent cessation of processes.
Probability (P) the likelihood of the impact actually occurring. Probability is estimated on a scale, and a score assigned	Very improbable (VP)	1	probably will not happen
	Improbable (I)	2	some possibility, but low likelihood
	Probable (P)	3	distinct possibility
	Highly probable (HP)	4	most likely

Criteria	Description		
	Definite (D)	5	impact will occur regardless of any prevention measures
Significance (S)	Determined through a synthesis of the characteristics described above: **S = (E+D+M) x P** Significance can be assessed as low, medium or high		
Low: < 30 points:	The impact would not have a direct influence on the decision to develop in the area		
Medium: 30 – 60 points:	The impact could influence the decision to develop in the area unless it is effectively mitigated		
High: < 60 points:	The impact must have an influence on the decision process to develop in the area		
No significance	When no impact will occur or the impact will not affect the environment		
Status	Positive (+)		Negative (-)
The degree to which the impact can be reversed	Completely reversible (R)	90-100%	The impact can be mostly to completely reversed with the implementation of the correct mitigation and rehabilitation measures.
	Partly reversible (PR)	6-89%	The impact can be partly reversed providing that mitigation measures as stipulated in the EMP are implemented and rehabilitation measures are undertaken
	Irreversible (IR)	0-5%	The impact cannot be reversed, regardless of the mitigation or rehabilitation measures taking place
The degree to which the impact may cause irreplaceable loss of resources	Resource will not be lost (R)	1	The resource will not be lost or destroyed provided that mitigation and rehabilitation measures as stipulated in the EMP are implemented
	Resource may be partly destroyed (PR)	2	Partial loss or destruction of the resources will occur even though all management and mitigation measures as stipulated in the EMP are implemented
	Resource cannot be replaced (IR)	3	The resource cannot be replaced no matter which management or mitigation measures are implemented.
The degree to which the impact can be mitigated	Completely mitigable (CM)	1	The impact can be completely mitigated providing that all management and mitigation measures as stipulated in the EMP are implemented
	Partly mitigatible (PM)	2	The impact cannot be completely mitigated even though all management and mitigation measures as stipulated in the EMP are implemented. Implementation of these measures will provide a measure of mitigatibility
	Un-mitigatible (UM)	3	The impact cannot be mitigated no matter which management or mitigation measures are implemented.

8.2. Summary of Findings and Recommendations of specialist

8.2.1. Agricultural Impacts

The proposed developments are located on land zoned and used for agriculture. South Africa has very limited arable land and it is therefore critical to ensure that development does not lead to an inappropriate loss of land that may be valuable and important for agricultural production. The proposed site is however on land which has very low agricultural potential and is only suitable for low intensity grazing.

In general, the proposed infrastructure is unlikely to have a low significant agricultural impact on the area. The impacted area is not suitable for dry land crop production. However, 600ha of the 7011ha on the property will be lost to sheep farming.

The full farming unit consists of 6 cadastral units with a total of 7011ha. The current farmer stocks 600 ewes on the 7011 ha. This is a small stock carrying capacity of 12ha per small stock unit. On these cadastral units, 4 will eventually have PV electricity generation facilities should all of them be constructed. In total, 2000ha will be lost to agriculture and sheep farming should all the PV facilities be constructed. The remaining farming unit will still consist of 5 011 ha and will be able to stock 417 ewes. The income generated from the PV facility will however be much more that the income that will be generated from the ewes that will be lost and the farming unit will still be financially viable.

Because the undisturbed site already has extremely limited agricultural potential, it means that the consequence of any impact for agricultural production is limited with the result that the consequence and significance of agricultural impacts is low. Furthermore, the poor, very shallow soil conditions reduce the significance of loss of topsoil and 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 country. The confidence level of the assessment is considered high because there is certainty about the low agricultural potential of the land and the impacts are fairly easy to understand and predict. However, despite this cumulative impact, it is still agriculturally strategic from a national perspective to steer as much of the country's renewable energy development as possible to regions such as this one, with very low agricultural potential. It is preferable to incur a higher cumulative loss in such a region, than to lose agricultural land with a higher production potential elsewhere in the country.

This report has identified a number of issues of importance many of which, if effectively mitigated, are however unlikely to result in significant agricultural and environmental impacts.
The actual infrastructure is unlikely to have any significant impact on the viable agricultural activities in the area with the majority of impacts being related to the management of the activity. The development will not impact or lead to the loss of dry croplands.

In order to effectively deal with potential impacts, the management plan must deal with the mitigation measures described in this report. The most critical issue with respect to potential impact is the non-removal and rehabilitation of the area at the decommissioning phase.

It can be concluded that the proposed solar electricity generation facility will not have significant impact on agriculture and that no further specialist agricultural assessment will be required. The author did not make any assumptions nor are there any uncertainties or gaps in knowledge. The appointment of an Environmental Control Officer to monitor the EMP and its monitoring and mitigation measures must be included as an EA condition. The mitigation and monitoring requirements included must be included in the EMP.

8.2.2. Heritage Impact Assessments

Aside from palaeontological resources which are considered in a separate report, the only significant heritage concern is archaeology. Although stone artefacts are widespread across the landscape, certain areas have been identified as being denser and of greater significance. These consist of occasional Later Stone Age sites along water courses and around a pan and large scatters of Early Stone Age artefacts that include many large cutting tools. MSA artefacts are widespread and generally of little concern. The landscape will also be impacted, but its cultural component is very limited. Furthermore, the presence of power lines, a substation a small solar energy facility and the Sishen-Saldanha Railway Line have already compromised the landscape. Although a historical structure of medium significance is present, it will not be impacted.

Impacts to archaeological resources, and in particular ESA material, are thus the primary concern for this project. The LSA sites will likely be protected due to their close proximity to water courses and a pan. The cultural landscape is weakly developed and has already been compromised by the presence of the Sishen-Saldanha Railway Line, a substation, a large power line and a small solar energy facility. The site is very remote and landscape impacts are of little concern. No other aspects of heritage were found to be relevant. There are no fatal

flaws, although a follow-up survey and some mitigation work will very likely be required

Given that the archaeological resources are only of medium cultural significance and can easily be mitigated, it is concluded from a heritage point of view that the project should be authorised, but subject to the following conditions which should be incorporated into the conditions of approval:

- An archaeological survey of any areas approved for development and not yet surveyed must take place at least six months prior to the start of construction;
- Any significant archaeological sites and dense clusters of ESA material within the final development footprint should be excavated, sampled and collected as appropriate; and
- If any archaeological material or human burials are uncovered during the course of development then work in the immediate area should be halted. The find would need to be reported to the heritage authorities and may require inspection by an archaeologist. Such heritage is the property of the state and may require excavation and curation in an approved institution.

In sum, there are no different types of heritage that might be impacted by the revised layouts and the archaeological resources that will be impacted can be easily mitigated. The revised layouts are acceptable from a heritage point of view and there are no fatal flaws.

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 gravels and finer-grained alluvium as well as calcrete hardpans in these last settings might contain mammalian remains such as bones, teeth and horn cores in addition to abundant, low-diversity trace fossil assemblages but these are rare and inherently unpredictable.

It is concluded that the overall impact significance (pre-mitigation) of the proposed PV Solar Facility on Olyvenkolk 187 Portions 6 and 3 is LOW (-). This assessment applies equally to all the PV solar array site options as well as the proposed 132 kV transmission 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. Given the generally low impact significance assigned to other comparable solar facility projects in the Kenhardt region, the cumulative impact significance of the current project is likewise assessed as low. 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 grounds to authorisation of the proposed development.

The following mitigation measures to safeguard any fossils exposed on site during the construction phase of the development are proposed (See also tabulated Fossil Finds Procedure appended to this report):

- The ECO responsible for the development must remain aware that all sedimentary deposits have the potential to contain fossils and he/she should thus monitor all deeper (> 1 m) excavations into sedimentary bedrock for fossil remains on an on-going basis. If any substantial fossil remains (e.g. vertebrate bones, teeth, stromatolites, petrified wood, shells) are found during construction SAHRA should be notified immediately (Contact

details: SAHRA, 111 Harrington Street, Cape Town. PO Box 4637, Cape Town 8000, South Africa. Phone: +27 (0)21 462 4502. Fax: +27 (0)21 462 4509. Web: www.sahra.org.za). This is in order that that appropriate mitigation (i.e. recording, sampling or collection) by a palaeontological specialist can be considered and implemented, at the developer's expense.

- A chance-find procedure should be implemented so that, in the event of fossils being uncovered, the ECO/Site Engineer will take the appropriate action, which includes:
  - Stopping work in the immediate vicinity and fencing off the area with tape to prevent further access;
  - Reporting the discovery to the provincial heritage agency and/or SAHRA;
  - Appointing a palaeontological specialist to inspect, record and (if warranted) sample or collect the fossil remains;
  - Implementing further mitigation measures proposed by the palaeontologist; and
  - Allowing work to resume only once clearance is given in writing by the relevant authorities.
- During maintenance and servicing of infrastructure, if excavation is required, it shall be limited to the disturbed footprint as far as practicable. Should bulk works exceed the existing disturbed footprint, SAHRA shall be notified.

If the mitigation measures outlined above are adhered to, the residual impact significance of any construction phase impacts on local palaeontological resources is considered to be very low. The mitigation measures proposed here should be incorporated into the Environmental Management Plan (EMP) for the Olyvenkolk 187 (Portions 6 & 3) PV solar facility project.

The palaeontologist concerned with mitigation work will need a valid collection permit from SAHRA. All work would have to conform to international best practice for palaeontological fieldwork and the study (e.g. data recording fossil collection and curation, final report) should adhere to the minimum standards for Phase 2 palaeontological studies recently published by SAHRA (2013).

8.2.3. Biodiversity and Ecological Impact Assessment

The ecological and avifauna assessment of the proposed PV site included a comparative review of the entire property on the relevant portion of the Farm Olyvenkolk 187/7 which lies within the proposed PV complex. Such evaluation included consideration of the bio physical state of drainage systems, topographical features, avifauna and a holistic review of all components within the ecological landscape. The evaluation of the results of desktop and field surveys and sampling identified and served to develop a plan for the exclusion of particular areas from any proposed development of a PV facility. The sampling and analysis of the site during the early and late summer season, as well as other seasons provides suitable data and results to present an informed decision on the local ecology.

Included in the assessment was consideration of terrestrial and hydrological systems, as well as fauna and avifauna. Major impacts identified as a consequence of the development proceeding relate to, *inter alia*:

- Changes in the broader habitat as a consequence of variation in physical factors within the site (e.g. shading of vegetation, changes in surface water flow regime);
- Changes in the broader surface and possibly sub surface hydrology; and
- The ousting, and in some cases, recruitment of species, with subsequent variation in populations in and around the development.

- The possible impact of the powerlines on avifauna species.

The ecological evaluation has determined that with the exclusion of the identified non-perennial Graafwater River and Nama Karoo Bushmanland Flat Pan from the development, within the subject site, the requisite ecological components associated with these features will be retained in a broader perspective, with only subtle changes to the eco-geomorphology of these systems becoming evident on minor drainage features or where plant communities may have to be removed or relocated. There will be minor to moderate changes evident in the terrestrial environment resulting from the development, which in turn will be manifest in changes in faunal and avifauna components of the environment.

The alternative layout is not supported as it will have an impact on ecological features. The layout assessed will impact on a Nama Karoo Bushmanland Flat Pan.

Given the above information, it is evident that with the placement of the proposed solar PV facility as per the preferred layout and within the boundaries of the areas identified, this development and mitigation measures included in the EMPr, this development will have a low to medium impact on ecological features.

As such, authorisation may be granted for the proposed preferred layout and development of the site as a PV generation facility. Management of the site should however include:

- Avoidance of excessive clearance of vegetation within the site;
- Management of exotic weed invasion that may arise;
- Management of fauna and avifauna within the site and surrounds, as well as the incorporation of “wildlife” porosity into fence lines and the implementation of measures on the energised fence line to avoid mortalities to wildlife;
- General land management practices to avoid excessive erosion, dust emissions and possible sources of pollution to ground and surface water resources.
- Construction of powerlines within existing servitudes and next to existing powerlines as far as possible to avoid impacts on avifauna; and
- Monitoring of powerlines and PV facility in terms of the EMPr requirements

The report finds that the proposed development should not impact negatively on any conservation worthy species. No significant breeding, roosting or habitat on the site will be impacted upon. Most living organisms will move out of the area when construction starts and back when construction is finished. Those ones not mobile, such as tortoises, snakes, invertebrates, reptiles and plants, must be search and rescued. Areas disturbed during construction should be rehabilitated. The 100m buffer area next to the non-perennial Graafwater River and Nama Karoo Bushmanland Flat pan must be maintained.

Riparian and wetland systems were identified within 500m, and within 100m from a watercourse. An application in terms of Section 21 c and i, of the National Water Act (1998) is required to be submitted to the mandated authority.

8.2.4. Geo-Technical Assessments

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 and is suitable for limited grazing only, mainly due to the harsh climate, shallow soils and low annual rainfall.

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 by the digger loader. For the rest of the trial pits, the depth to refusal varied from 250mm to 1 600mm. An excavator should however be able to excavate through this layer.

Although the founding method (foundation screws or steel piles) for the solar panels is still to be determined, the dense nature of the soil poses a question mark whether the anchors will be able to penetrate the very dense material. The average depth to weathered rock for this portion is approximately 1000mm. We propose that additional tests be conducted by the specialist contractor responsible for the design and installation of the anchors. Alternative foundation designs should be investigated for areas where the weathered rock is shallow.

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

8.2.5. Service Requirements

Water (required in construction phase only) will be sourced from existing boreholes authorized in the EA for portion 3 and 13. One access road of ≤ 100m long, ≤8 m wide gravel access road running from the Kenhardt Pofadder gravel road to the security guard control point will be constructed. The existing farm tracks will be used as it is ease for access to the different PV sites on the farm. Service roads - ≤20 km of ≤4 m wide gravel internal service roads within the plant boundary (two different blocks).

8.2.6. Visual Impact

From a sub-regional perspective, a distinct viewshed cannot be defined with consequence that the facility will be alternately visible and hidden from view depending on the location of the viewpoint in the landscape. No views of the facility will be possible beyond ±10km from the site, with the only significant views thereof restricted to relative short distance of ±5km along the bypassing public road.

The landscape has a typical rural farmland character of peaceful tranquility, uninterrupted openness and isolation, simply organized by minimal farming infrastructure. The Aries substation and associated transmission lines though, dominates the landscape and along with a recently constructed Photo-Voltaic Electricity Generation facility directly to the west of the Aries substation, sets a precedent for large scale human intervention in the area and lowers the potential intensity of the visual impact considerably.

The sense of place within the surrounding area will be significantly altered; however, a new sense of place will be created which will represent South Africa's attempts to address the challenges of climate change in a responsible and sustainable manner. The visual impacts will therefore be experienced by many, including many who are sensitive to environmental issues, as being positive.

The visual impact is measured against the impact assessment criteria and the threshold of significance determined. The summary criteria like extent, duration, intensity, probability and

significance are considered important information in order to evaluate the impact. To conclude, management actions like avoidance, mitigation and rehabilitation are also proposed in order to reduce any visual impact.

A review as well as conclusions is made. The visual impact is assessed to **be of moderate significance with mitigation**. The reasons for this are mainly 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 the Pofadder – Kenhardt road. The implication of this situation is that views from the road will in any case be of short duration (travelers). Furthermore, during the operational phase, activities on-site will be minimal and will only include maintenance and security. Any mitigation measures as proposed will ensure that the impact will be reduced even further.

As no significant visual or aesthetic issues are present, the authors of this report recommend that approval for the proposal be granted, subject thereto that the proposed mitigation measures be implemented.

General mitigation measures throughout the life expectancy of the facility

- Signage related to the facility should be discrete and confined to the entrance gates.
- No other corporate or advertising signs should be permitted.
- All structures should be kept as small and low as technically possible.
- All painted surfaces are to use earth tones chosen for its ability to blend into the background.
- Security fencing should be as transparent as possible and mimic agricultural fencing fond in the area.
- The fence should not be visually dominant over the solar arrays.
- The use of razor wire should be avoided.
- Screen planting in the form of tree lines should not be considered.
- Only in exceptional circumstances should vegetation screening be considered in clumps around structures to mimic farmsteads found in the region.
- Security lighting must be kept to the absolute minimum and be confined to only those sections of the facility that are necessary to be illuminated.
- No external up-lighting or flood-lighting of any part of the facility must be allowed.
- External, inclusive of perimeter security lighting must be by means of shielded down-lighters, minimizing light pollution beyond the extent of the area to be lit.
- Transmission lines to Aries substation should follow as far as technically possible the path of the existing power line.
- Underground cabling should be installed where possible.

Construction mitigation measures

- Flattening and grading of the site should be kept to the minimum.
- The natural profile and shape of the site is to be maintained.
- Provision should be made for the rehabilitation of areas damaged by construction activities.
- Measures should be implemented to prevent possible soils erosion.
- An attempt must be made to control dust generated during the construction phase.
- Litter and waste disposal, inclusive of construction rubble, must be controlled.
- Fires, inclusive of burning of waste, should not be allowed on site.
- If possible, laydown areas, storage of building materials and other off-site construction activities, should be accommodated at the Olyvenkolk farmstead or other low lying, visually inconspicuous area.

8.2.7. Traffic Impact

The development is located south west of Kenhardt, approximately 24 km west of the R27 along the Pofadder gravel road. Sight distances along the Pofadder gravel road are adequate to allow safe use of the access to the site. The proposed development will generate additional traffic on the surrounding road network in two distinct phases, namely the construction phase and the operational phase. The total number of trips that that will be generated during the construction phase in the AM and PM peak hours is 39 veh/hour. The total number of trips that that will be generated by the permanent workforce during the operational phase in the AM and PM peak hours is 11 veh/hour. The generated traffic by the development will be less than 150 vehicles per peak hour and do not require detailed traffic analysis.

The Pofadder gravel road is reasonably straight and flat, but includes several river crossings. The road is not ideal for large heavy vehicles, but with regular maintenance, it should be able to accommodate the additional traffic generated by the development. Sight distances along the Pofadder gravel road are adequate to allow safe use of the access to the site. Conflicting traffic flows on the road at the access are low and no significant safety concerns.

The study showed that the construction and operational phase of the proposed development will generate negligible volumes of traffic during AM and PM peak hours. The existing road network has sufficient capacity to accommodate these additional low volumes of traffic.

8.2.7. Socio- Economic Impact Assessment

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	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	R0.66	R 188 419 770
Skilled wages (6%) R 540 000/ employee/	18	R 9 720 000
Semi-skilled (38%) R 288 000/ employee/	108	R31 104 000
Unskilled (56%) R 144 000/	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.

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

It is anticipated that approximately 60 direct jobs (20 per 100 MW) 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/	1	R 540 000	R1 620 000	R 16 200
Semi-skilled (40%) R 288 000/ employee/	8	R 2 304 000	R6 912 000	R 69 120
Unskilled (55%) R 144 000/	11	R1 584 000	R4 752 000	R 47 520
Total	**20**	**R 4 428 000**	**R13 284 000**	**R 132 840**

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

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 wellbeing 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.

8.3. Impacts Assessed

The following impacts have been identified and assessed:

Geographical and physical aspects

1. Impact of noise on surrounding environment
2. Impact of dust on surrounding environment
3. Diesel or oil spillage

Heritage aspects

4. Impact on cultural landscape
5. Archaeology impacts
6. Palaeontological impacts
7. Visual impacts of the activity

Agricultural and Other

8. Removal of waste and rehabilitation
9. Disturbance and Impact on ESKOM power supply
10. Impact on existing and future agricultural activities
11. Impact of the loss of agricultural land for land reform purposes
12. Uncontrolled fires
13. Effect of Zero Sunlight on panel area
14. Erosion and Storm Water Management
15. Livestock Theft

Ecological aspects

16. Introduction of alien plant species
17. Alteration of habitat structure and composition (fauna and flora)
18. Freshwater impacts - alteration of surface drainage patterns
19. Changes in soils leading to the alteration of plant communities and fossorial species
20. Increased electrical light pollution (ELP), leading to changes in nocturnal behavioural patterns amongst fauna
21. Exclusion or entrapment of in particular large fauna, on account of the fencing
22. Habitat loss/alteration impacts on birds
23. Avifauna collusion with powerlines and electrocution

Socio-economic aspects

24. Population Influx, Community Stability and Homogeneousness
25. Influx of Unemployed People
26. Skills development, training and capacity building
27. Employment is generated
28. Demand for services increases
29. Traffic impacts
30. Crime increases
31. Health and Social Wellbeing – Noise and dust levels increase
32. Quality of living environment - Sense of place
33. Economic and Material Wellbeing – Inaccessibility and loss of heritage resources
34. Economic and Material Wellbeing – Competing Uses of Water
35. Economic and Material Wellbeing – Soil and Ecological potential - Alteration of soil profile and ecological processes
36. Economic and Material Wellbeing – Agricultural potential changes

37. Economic and Material Wellbeing – Increased household Income
38. Economic and Material Wellbeing – Sales volume and GGP will increase
39. Women and young people's self-esteem improve
40. Improve skills and educational levels
41. Cumulative - Energy generation replaces Agriculture and cause demographic changes

Other

42. Radio frequency interference

Listed activity as described in GN R 983, 984 and 985	Description of project activity that triggers listed activity	Impacts associated with the relevant listed activity
Provide the relevant Listed Activities as set out in Listing Notice 1 (GN No. R. 983 as amended by GN 327)		
Activity 11 The development of facilities or infrastructure for the transmission and distribution of electricity(i)outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts;	*A 132-kV powerline. The powerline is 9.570km in length*	*1-41*
Activity 19 The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse.	The proposed development will be constructed closer than 32 meters from watercourses.	*3, 5, 6, 14, 16, 17, 18, 22*
Activity 28 Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture, game farming, equestrian purposes or afforestation on or after 01 April 1998 and where such development: (i) will occur inside an urban area, where the total land to be developed is bigger than 5 hectares; excluding where such land has already been developed for residential, mixed, retail, commercial, industrial or institutional purposes.	The land is currently used for agricultural purposes (mainly grazing). The proposed 300 MW PV facility, which is considered to be a commercial/industrial development.	*8-15 and 24-41*
Provide the relevant Listed Activities as set out in Listing Notice 2 (GN No. R. 984 as amended by GN 325)		
Activity 1 The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more, excluding where such development of facilities or	The proposed PV facility generate 300MW.	*1-42*

infrastructure is for photovoltaic installations and occurs within an urban area.		
<u>Activity 15</u> The clearance of an area of 20 hectares or more of indigenous vegetation.	The proposed development area consists of indigenous vegetation that will be cleared. Block 3 - 146.5 hectares; Block 4 - 328.5 hectares; Block 5 – 301 hectares. Total area of PV facility: 776 hectares	*1-23, 31, 32, 33, 35 and 36*
Provide the relevant Listed Activities as set out in Listing Notice 3 (GN No. R. 985 as amended by GN 324)		
<u>Activity 14</u> The development of - (ii) infrastructure or structures with a physical footprint of 10 square metres or more; A) within a watercourse; B) in front of a development setback; or C) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse;	The proposed development will be constructed closer than 32 meters from watercourses.	*3, 5, 6, 14, 16, 17, 18, 22*

Alternative 1: Preferred Layout & Alternative 2	**Geographical and physical aspects**
PLANNING, DESIGN AND DEVELOPMENT PHASE	
Potential impact and risk:	**Impact of noise on surrounding environment.**
Nature of impact:	**Environmental noise pollution. Nuisance impacts could relate to the increase noise and disturbance associated with the proposed development, e.g. noise, traffic etc.** **Construction activities and construction personnel on the sites, and construction vehicles moving to and from the sites would cause an increase in noise in the area, which may impact negatively upon the adjoining landowners.**
Extent and duration of impact:	**3 Local & 1 Short term**
Consequence of impact or risk:	**Noise pollution**
Probability of occurrence:	**3 – Probable**
Magnitude:	**4**
Degree to which the impact may cause irreplaceable loss of resources:	**PR**
Degree to which the impact can be reversed:	**R**
Indirect impacts:	**Impacts on fauna and local residents**
Cumulative impact prior to mitigation:	**Low**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**24 – Low**
Degree to which the impact can be avoided:	**Medium**
Degree to which the impact can be managed:	**Medium**
Degree to which the impact can be mitigated:	**Medium**
Proposed mitigation:	**Working hours will be restricted to normal working hours.** **All noise and sounds generated by plant or machinery must adhere to SABS 0103 specifications for the maximum permissible noise levels.** **All plant and machinery are to be fitted with adequate silencers.** **No sound amplification equipment such as sirens, loud hailers or hooters may be used on site, after normal working hours, except in emergencies.** **If work is to be undertaken outside of normal work hours, permission must be obtained from the Local Authority.** **Prior to commencing any such activity, the Contractor is also to advise the potentially affected neighbouring residents. Dates, times and the nature of the work to be undertaken are to be provided. Notification could include letter-drops.**
Residual impacts:	**None**
Cumulative impact post mitigation:	**Noise of construction activities may affect surrounding environment.**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Low**
OPERATIONAL PHASE	
Potential impact and risk:	**Not applicable**
DECOMMISSIONING AND CLOSURE PHASE	
Potential impact and risk:	**Impact of noise on surrounding environment.**
Nature of impact:	**Environmental noise pollution. Nuisance impacts could relate to the increase noise and disturbance associated with the proposed development, e.g. noise, traffic etc.** **Construction activities and construction personnel on the sites, and construction vehicles moving to and from the sites would cause an increase in noise in the area, which may impact negatively upon the adjoining landowners.**
Extent and duration of impact:	**3 Local & 1 Short term**
Consequence of impact or risk:	**Noise pollution**
Probability of occurrence:	**3 – Probable**
Magnitude:	**4**

Degree to which the impact may cause irreplaceable loss of resources:	**PR**
Degree to which the impact can be reversed:	**R**
Indirect impacts:	**Impacts on fauna and local residents**
Cumulative impact prior to mitigation:	**Low**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**24 – Low**
Degree to which the impact can be avoided:	**Medium**
Degree to which the impact can be managed:	**Medium**
Degree to which the impact can be mitigated:	**Medium**
Proposed mitigation:	**Working hours will be restricted to normal working hours.** **All noise and sounds generated by plant or machinery must adhere to SABS 0103 specifications for the maximum permissible noise levels.** **All plant and machinery are to be fitted with adequate silencers.** **No sound amplification equipment such as sirens, loud hailers or hooters may be used on site, after normal working hours, except in emergencies.** **If work is to be undertaken outside of normal work hours, permission must be obtained from the Local Authority.** **Prior to commencing any such activity, the Contractor is also to advise the potentially affected neighbouring residents. Dates, times and the nature of the work to be undertaken are to be provided. Notification could include letter-drops.**
Residual impacts:	**None**
Cumulative impact post mitigation:	**Noise of construction activities may affect surrounding environment.**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Low**

Alternative 1: Preferred Layout & Alternative 2	**Geographical and physical aspects**
PLANNING, DESIGN AND DEVELOPMENT PHASE	
Potential impact and risk:	**Impact of dust on surrounding environment.**
Nature of impact:	**Dust**
Extent and duration of impact:	**3 Local & 1 Short term**
Consequence of impact or risk:	**High dust levels**
Probability of occurrence:	**5 – Definite**
Magnitude:	**4**
Degree to which the impact may cause irreplaceable loss of resources:	**PR**
Degree to which the impact can be reversed:	**PR**
Indirect impacts:	**Air pollution**
Cumulative impact prior to mitigation:	**Medium**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**40 – Medium**
Degree to which the impact can be avoided:	**High**
Degree to which the impact can be managed:	**High**
Degree to which the impact can be mitigated:	**High**
Proposed mitigation:	**Mitigation measures outlined in the EMP, including:** **Measures to ensure that material loads are properly covered during transportation.** **Minimisation of the areas disturbed at any one time and protection of exposed soil against wind erosion, e.g. by dampening with water. Location and treatment of material stockpiles shall take consideration of prevailing wind directions and dwellings as well as to prevent erosion and run off.** **Dust suppression measures in the form of dampening with water shall be used when particularly during dry periods of weather during the summer months.**

Residual impacts:	**None**
Cumulative impact post mitigation:	**Low**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Low**
OPERATIONAL PHASE	
Potential impact and risk:	**Not applicable**
DECOMMISSIONING AND CLOSURE PHASE	
Potential impact and risk:	**Impact of dust on surrounding environment.**
Nature of impact:	**Dust**
Extent and duration of impact:	**3 Local & 1 Short term**
Consequence of impact or risk:	**High dust levels**
Probability of occurrence:	**5 – Definite**
Magnitude:	**4**
Degree to which the impact may cause irreplaceable loss of resources:	**PR**
Degree to which the impact can be reversed:	**PR**
Indirect impacts:	**Air pollution**
Cumulative impact prior to mitigation:	**Medium**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**40 – Medium**
Degree to which the impact can be avoided:	**High**
Degree to which the impact can be managed:	**High**
Degree to which the impact can be mitigated:	**High**
Proposed mitigation:	**Mitigation measures outlined in the EMP, including:** **Measures to ensure that material loads are properly covered during transportation.** **Minimisation of the areas disturbed at any one time and protection of exposed soil against wind erosion, e.g. by dampening with water. Location and treatment of material stockpiles shall take consideration of prevailing wind directions and dwellings as well as to prevent erosion and run off.** **Dust suppression measures in the form of dampening with water shall be used when particularly during dry periods of weather during the summer months.**
Residual impacts:	**None**
Cumulative impact post mitigation:	**Low**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Low**

Alternative 1: Preferred Layout & Alternative 2	**Geographical and physical aspects**
PLANNING, DESIGN AND DEVELOPMENT PHASE	
Potential impact and risk:	**Diesel or oil spillage**
Nature of impact:	**Diesel or oil spillage causing soil (ground) pollution and or surface water and or ground water pollution.**
Extent and duration of impact:	**3 Local & 1 Short term**
Consequence of impact or risk:	**Contamination**
Probability of occurrence:	**3 – probable**
Magnitude:	**4**
Degree to which the impact may cause irreplaceable loss of resources:	**PR**
Degree to which the impact can be reversed:	**PR**
Indirect impacts:	**Resource degradation and affect on other water users**
Cumulative impact prior to mitigation:	**Diesel and oil spills affecting ground and surface water quality**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**24 – Low**
Degree to which the impact can be avoided:	**High**

Degree to which the impact can be managed:	**High**
Degree to which the impact can be mitigated:	**High**
Proposed mitigation:	**Mitigation measures outlined in the EMP** **Ground water will manifest itself during the wet season as a perched water table overlying transported materials.** **Storm Water Management:** **The following storm water management will be implemented:** **• Prevent storm water impacts on the receiving freshwater ecosystem** **• Manage storm water as a resource** **• Sustain the hydrologic balance (quantity and quality)** **• Storm water management is integrated into the initial site design process** **• Will preserve and utilize natural systems (soil, vegetation, etc.)** **• Manage storm water as close to the source as possible** **• Slow storm water flows down. The service roads around the PV blocks will act as a berm to slow down stormwater runoff. No other stormwater berms or structures will be constructed. The natural hydrology flow of the sites and surrounding areas will be preserved.** **• Inspect and maintain storm water systems** **In addition to the storm water management laid out above that would be applicable to management of storm water to minimise their impact on the receiving freshwater systems, the following mitigation measures relating to future storm water development adjacent to the stream are recommended:** **•Buffer zones must be maintained on either side of the stream** **•The banks of the stream should be kept clear of invasive alien plants, and as far as possible the banks should be landscaped and vegetated with indigenous plants** **•Habitat variability should be maintained and environmentally acceptable materials utilised. Design of the storm water systems should also allow for flow variability** **•Litter and pollutants transported in the storm water systems must be prevented from entering the streams.**
Residual impacts:	**None**
Cumulative impact post mitigation:	**Low**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**14 – Low**
OPERATIONAL PHASE	
Potential impact and risk:	**Not applicable**
DECOMMISSIONING AND CLOSURE PHASE	
Potential impact and risk:	**Not applicable**

Alternative 1: Preferred Layout & Alternative 2	**Heritage**
PLANNING, DESIGN AND DEVELOPMENT PHASE	
Potential impact and risk:	**Impact on cultural landscape. Direct intrusion of large machinery and electrical infrastructure in the landscape.**
Nature of impact:	**They would be direct impacts related to the presence of large construction and maintenance machinery, power lines, solar panels and related infrastructure in the landscape which otherwise has a generally rural/natural character. The nature and significance of the cultural landscape suggests that this impact would be of low intensity and felt locally. Despite being of long-term duration, the significance of the impact is likely to be low. Mitigation would still result in a significance of low. There are no fatal flaws in terms of impacts to the cultural landscape. The amount of development in the area is minimal and, even with the construction of other large solar energy facilities, the expected clustering of renewable energy developments around the substation allows for other areas to remain undeveloped.**

	Cumulative impacts can thus be expected to be of low significance.
Extent and duration of impact:	**3 Local & 4 Long term**
Consequence of impact or risk:	**Changes to the natural landscape**
Probability of occurrence:	**5 – Definite**
Magnitude:	**4 – Low**
Degree to which the impact may cause irreplaceable loss of resources:	**R**
Degree to which the impact can be reversed:	**High**
Indirect impacts:	**Impact on sense of place**
Cumulative impact prior to mitigation:	**Low**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Low**
Degree to which the impact can be avoided:	**Low**
Degree to which the impact can be managed:	**Low**
Degree to which the impact can be mitigated:	**Low**
Proposed mitigation:	**Ensure effective rehabilitation of any disturbed areas not required during operation. Ensure effective rehabilitation after decommissioning if this occurs.**
Residual impacts:	**Changes to natural landscape**
Cumulative impact post mitigation:	**Low**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Low**
OPERATIONAL PHASE	
Potential impact and risk:	**Direct intrusion of large machinery and electrical infrastructure in the landscape.**
Nature of impact:	**They would be direct impacts related to the presence of large construction and maintenance machinery, power lines, solar panels and related infrastructure in the landscape which otherwise has a generally rural/natural character. The nature and significance of the cultural landscape suggests that this impact would be of low intensity and felt locally. Despite being of long-term duration, the significance of the impact is likely to be low. Mitigation would still result in a significance of low. There are no fatal flaws in terms of impacts to the cultural landscape. The amount of development in the area is minimal and, even with the construction of other large solar energy facilities, the expected clustering of renewable energy developments around the substation allows for other areas to remain undeveloped. Cumulative impacts can thus be expected to be of low significance.**
Extent and duration of impact:	**3 Local & 4 Long term**
Consequence of impact or risk:	**Changes to the natural landscape**
Probability of occurrence:	**5 – Definite**
Magnitude:	**4 – Low**
Degree to which the impact may cause irreplaceable loss of resources:	**R**
Degree to which the impact can be reversed:	**High**
Indirect impacts:	**Impact on sense of place**
Cumulative impact prior to mitigation:	**Low**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Low**
Degree to which the impact can be avoided:	**Low**
Degree to which the impact can be managed:	**Low**
Degree to which the impact can be mitigated:	**Low**
Proposed mitigation:	**Ensure effective rehabilitation of any disturbed areas not required during operation. Ensure effective rehabilitation after decommissioning if this occurs.**
Residual impacts:	**Changes to natural landscape**

Cumulative impact post mitigation:	**Low**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Low**
DECOMMISSIONING AND CLOSURE PHASE	
Potential impact and risk:	**Direct intrusion of large machinery and electrical infrastructure in the landscape.**
Nature of impact:	**They would be direct impacts related to the presence of large construction and maintenance machinery, power lines, solar panels and related infrastructure in the landscape which otherwise has a generally rural/natural character. The nature and significance of the cultural landscape suggests that this impact would be of low intensity and felt locally. Despite being of long-term duration, the significance of the impact is likely to be low. Mitigation would still result in a significance of low. There are no fatal flaws in terms of impacts to the cultural landscape. The amount of development in the area is minimal and, even with the construction of other large solar energy facilities, the expected clustering of renewable energy developments around the substation allows for other areas to remain undeveloped. Cumulative impacts can thus be expected to be of low significance.**
Extent and duration of impact:	**3 Local & 4 Long term**
Consequence of impact or risk:	**Changes to the natural landscape**
Probability of occurrence:	**5 – Definite**
Magnitude:	**4 – Low**
Degree to which the impact may cause irreplaceable loss of resources:	**R**
Degree to which the impact can be reversed:	**High**
Indirect impacts:	**Impact on sense of place**
Cumulative impact prior to mitigation:	**Low**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Low**
Degree to which the impact can be avoided:	**Low**
Degree to which the impact can be managed:	**Low**
Degree to which the impact can be mitigated:	**Low**
Proposed mitigation:	**Ensure effective rehabilitation of any disturbed areas not required during operation. Ensure effective rehabilitation after decommissioning if this occurs.**
Residual impacts:	**Changes to natural landscape**
Cumulative impact post mitigation:	**Low**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Low**

Alternative 1: Preferred Layout	**Heritage**
PLANNING, DESIGN AND DEVELOPMENT PHASE	
Potential impact and risk:	**Archaeology impacts**
Nature of impact:	**Three sensitive areas in terms of Archaeology impacted by Alternative 1:** • **Block 1 – waypoint 058 – Small area of dense gravel with many background scatter artefacts in it. The vast majority of artefacts are of a pale quartzite and clearly originate from the same source. As already intimated, the bulk of the background scatter seems to be comprised of MSA artefacts. Such artefacts were found to occur throughout the study area and are far more extensively distributed than those from the ESA. Due to their widespread occurrence and lack of focal points, these artefacts are generally not considered significant. However, two areas were identified as being denser than usual. One of these – located close to the Sishen-Saldanha Railway – was a scatter of artefacts**

	almost all in the same pale-coloured quartzite at waypoint 058. It was quite extensive and clearly represents a short period of deposition. LOW-MEDIUM significances and requires MITIGATION, • **Block 2 – ESA 1 - Extensive area with dense background scatter that includes many LCTs. MEDIUM significances and requires MITIGATION,** • **Block 2 – ESA 2 - ESA artefact scatter with many LCTs. Only identified quickly by the presence of handaxes. MEDIUM significances and requires MITIGATION,** **Impacts to archaeological resources would only occur during the construction phase of the project. They would be direct impacts in which archaeological sites and/or artefacts would be damaged and/or destroyed. The significance and grading of the material suggests that this impact would be of medium intensity and felt locally. Despite being permanent, the significance of the impact is likely to be medium. With mitigation this would be reduced to low. There are no fatal flaws in terms of impacts to archaeology. The amount of development in the area is minimal and, even with the construction of other large solar energy facilities, the nature and likely extent of similar archaeological resources means that the cumulative impacts can be expected to be of low significance.**
Extent and duration of impact:	**3 Local & 5 Permanent**
Consequence of impact or risk:	**They would be direct impacts in which archaeological sites and/or artefacts would be damaged and/or destroyed.**
Probability of occurrence:	**5 – Definite**
Magnitude:	**4**
Degree to which the impact may cause irreplaceable loss of resources:	**IR**
Degree to which the impact can be reversed:	**PR**
Indirect impacts:	**None**
Cumulative impact prior to mitigation:	**Low**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**60 - Medium**
Degree to which the impact can be avoided:	**Medium**
Degree to which the impact can be managed:	**Medium**
Degree to which the impact can be mitigated:	**High**
Proposed mitigation:	**Because the survey was largely limited to specified target areas, there will need to be a follow up survey of any areas within the final development footprint that have not yet been covered. It is important that LCTs are individually plotted in order to provide an accurate indication of where the densest ESA scatters lie. The results of this survey along with those reported here will be used to determine which areas should be subjected to archaeological mitigation.** **For archaeological sites the mitigation would entail excavation and sampling of the sites to recover archaeological materials. Radiocarbon dating might be required if suitable organic materials are present. For the ESA scatters a thorough examination of the relevant areas with collection of all LCTs and other diagnostic elements (e.g. cores, large blades) should be carried out. Artefact locations can be recorded by GPS. All materials would require analysis and reporting and the work would need to be carried out under a permit issued by SAHRA.** • **Survey final layout footprint;** • **Excavation/sampling of significant sites; and**

<table>
<tr><td></td><td>
Collection of ESA artefacts and diagnostic elements from dense artefact clusters
<table>
<tr><td>1</td><td>058</td><td>Area of dense gravel with many

background scatter artefacts in it. The vast majority of artefacts are of a pale quartzite

and clearly

originate from the</td><td>Sample artefacts over an area of 30-40 m2. This would be via surface collection in a grid of 1 m squares because the substrate is rocky (c. 4 hours required).</td></tr>
<tr><td>Block 2</td><td>ESA1

S29 27 10.2 E20 53 36.9</td><td>Extensive area with dense background scatter that includes many LCTs.</td><td>Sample artefacts over one or more areas as appropriate. This can be done within large grid squares (2x2 m) because of the relatively low density. A detailed survey of the surrounding area should then be undertaken with all LCTs and other diagnostic artefacts collected (GPS points should be taken) (c. 6 hours required).</td></tr>
<tr><td>Block 2</td><td>ESA2

S29 26 47.2 E20 53 25.1</td><td>ESA artefact scatter with many LCTs. Only identified quickly by the presence of handaxes.</td><td>Sample artefacts over one or more areas as appropriate. This can be done within large grid squares (2x2 m) because of the relatively low density. A detailed survey of the surrounding area should then be undertaken with all LCTs and other diagnostic artefacts collected (GPS points should be taken) (c. 6 hours required).</td></tr>
</table>
</td></tr>
<tr><td>Residual impacts:</td><td>Archaeological sites and/or artefacts would be damaged and/or destroyed.</td></tr>
<tr><td>Cumulative impact post mitigation:</td><td>Archaeological sites and/or artefacts would be damaged and/or destroyed.</td></tr>
<tr><td>Significance rating of impact after mitigation
(e.g. Low, Medium, Medium-High, High, or Very-High)</td><td>Low</td></tr>
<tr><td colspan="2">OPERATIONAL PHASE</td></tr>
<tr><td>Potential impact and risk:</td><td>Not applicable</td></tr>
<tr><td colspan="2">DECOMMISSIONING AND CLOSURE PHASE</td></tr>
<tr><td>Potential impact and risk:</td><td>Not applicable</td></tr>
</table>

Alternative 2	**Heritage**
PLANNING, DESIGN AND DEVELOPMENT PHASE	
Potential impact and risk:	**Archaeology impacts**
Nature of impact:	***Three sensitive areas in terms of Archaeology impacted by Alternative 2:*** • ***Block 1 – waypoint 058 – Small area of dense gravel with many background scatter artefacts in it. The vast majority of artefacts are of a pale quartzite and clearly originate from the same source. As already intimated, the bulk of the background scatter seems to be comprised of MSA artefacts. Such artefacts were found to occur throughout the study area and are far more extensively distributed than those from the ESA. Due to***

	their widespread occurrence and lack of focal points, these artefacts are generally not considered significant. However, two areas were identified as being denser than usual. One of these – located close to the Sishen-Saldanha Railway – was a scatter of artefacts almost all in the same pale-coloured quartzite at waypoint 058. It was quite extensive and clearly represents a short period of deposition. **LOW-MEDIUM significances and requires MITIGATION.** • ***Block 2 – ESA 1 - Extensive area with dense background scatter that includes many LCTs.*** **MEDIUM significances and requires MITIGATION,** • ***Block 1 – Nama Karoo Bushmanland Flat Pan - Two small LSA sites were found around this pan, one to the north and the other to the south. The northern site, at waypoint 063, was comprised of stone artefacts and ostrich eggshell fragments. Although a few artefacts attributable to the background scatter are no doubt included, it is quite clear that the assemblage is different from the bulk of the archaeology seen in the area. The artefacts are small and largely of crypto-crystalline silica (CCS) with some quartz and hornfels. Also present was an anvil and a hammer stone. A single fragment of hand-painted refined white earthenware that likely dates to the late 19th century was also found but it cannot be known whether this is associated with the site or arrived there later. The second site, at waypoint 064, was located in a small 'clearing' between bushes. It had relatively few stone artefacts – all in quartz and quartzite – but there was a fair number of ostrich eggshell fragments across the site. An anvil and hammer stone were also present. LOW-MEDIUM significances and requires MITIGATION,*** ***Impacts to archaeological resources would only occur during the construction phase of the project. They would be direct impacts in which archaeological sites and/or artefacts would be damaged and/or destroyed. The significance and grading of the material suggests that this impact would be of medium intensity and felt locally. Despite being permanent, the significance of the impact is likely to be medium. With mitigation this would be reduced to low. There are no fatal flaws in terms of impacts to archaeology. The amount of development in the area is minimal and, even with the construction of other large solar energy facilities, the nature and likely extent of similar archaeological resources means that the cumulative impacts can be expected to be of low significance.***
Extent and duration of impact:	**3 Local & 5 Permanent**
Consequence of impact or risk:	**They would be direct impacts in which archaeological sites and/or artefacts would be damaged and/or destroyed.**
Probability of occurrence:	**5 – Definite**
Magnitude:	**6**
Degree to which the impact may cause irreplaceable loss of resources:	**IR**
Degree to which the impact can be reversed:	**PR**
Indirect impacts:	**None**
Cumulative impact prior to mitigation:	**Low**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Medium**
Degree to which the impact can be avoided:	**Medium**
Degree to which the impact can be managed:	**Medium**
Degree to which the impact can be mitigated:	**High**
Proposed mitigation:	**Because the survey was largely limited to specified target areas, there will need to be a follow up survey of any areas within the**

<table>
<tr><td></td><td>final development footprint that have not yet been covered. It is important that LCTs are individually plotted in order to provide an accurate indication of where the densest ESA scatters lie. The results of this survey along with those reported here will be used to determine which areas should be subjected to archaeological mitigation.

For archaeological sites the mitigation would entail excavation and sampling of the sites to recover archaeological materials. Radiocarbon dating might be required if suitable organic materials are present. For the ESA scatters a thorough examination of the relevant areas with collection of all LCTs and other diagnostic elements (e.g. cores, large blades) should be carried out. Artefact locations can be recorded by GPS. All materials would require analysis and reporting and the work would need to be carried out under a permit issued by SAHRA.

• Survey final layout footprint;
• Excavation/sampling of significant sites; and
• Collection of ESA artefacts and diagnostic elements from dense artefact clusters

<table>
<tr><td>Block 1</td><td>058</td><td>Area of dense gravel with many background scatter artefacts in it. The vast majority of artefacts are of a pale quartzite and clearly originate from the same source.</td><td>Sample artefacts over an area of 30-40 m2. This would be via surface collection in a grid of 1 m squares because the substrate is rocky (c. 4 hours required).</td></tr>
<tr><td>Block 1</td><td></td><td>Nama Karoo Bushmanland Flat Pan - Two small LSA sites were found around this pan, one to the north and the other to the south. Area with dense background scatter close to a pan. LSA scatter with quartz, quartzite (incl. a hammer stone/core), CCS, hornfels and ostrich eggshell. The scatter is in an open area between bushes to the north of the pan.</td><td>Sample artefacts over entire area. This would be via surface collection in a grid of 1 m squares because the substrate is rocky.</td></tr>
<tr><td>Block 2</td><td>ESA1 S29 27 10.2 E20 53 36.9</td><td>Extensive area with dense background scatter that includes many LCTs.</td><td>Sample artefacts over one or more areas as appropriate. This can be done within large grid squares (2x2 m) because of the relatively low density. A detailed survey of the surrounding area should then be undertaken with all LCTs and other diagnostic artefacts collected (GPS points should be taken) (c. 6</td></tr>
</table>
</td></tr>
<tr><td>Residual impacts:</td><td>Archaeological sites and/or artefacts would be damaged and/or destroyed.</td></tr>
<tr><td>Cumulative impact post mitigation:</td><td>Archaeological sites and/or artefacts would be damaged and/or destroyed.</td></tr>
<tr><td>Significance rating of impact after mitigation
(e.g. Low, Medium, Medium-High, High, or Very-High)</td><td>Low</td></tr>
<tr><td colspan="2">OPERATIONAL PHASE</td></tr>
<tr><td>Potential impact and risk:</td><td>Not applicable</td></tr>
<tr><td colspan="2">DECOMMISSIONING AND CLOSURE PHASE</td></tr>
<tr><td>Potential impact and risk:</td><td>Not applicable</td></tr>
</table>

Alternative 1: Preferred Layout & Alternative 2	Heritage
PLANNING, DESIGN AND DEVELOPMENT PHASE	
Potential impact and risk:	**Palaeontological impacts**
Nature of impact:	**Disturbance, damage or destruction of scientifically-valuable fossils preserved at of beneath the ground surface due to ground clearance and excavations.**
Extent and duration of impact:	**2 Site & 5 Permanent**
Consequence of impact or risk:	**Loss of fossils**
Probability of occurrence:	**2 – Improbable**
Magnitude:	**4 – Low** **Sensitive fossil sites are very rare within the development footprint**
Degree to which the impact may cause irreplaceable loss of resources:	**PR**
Degree to which the impact can be reversed:	**IR**
Indirect impacts:	**Loss of fossils**
Cumulative impact prior to mitigation:	**Low. Region is of generally low palaeontological sensitivity.**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**22 – Low**
Degree to which the impact can be avoided:	**Medium**
Degree to which the impact can be managed:	**Medium**
Degree to which the impact can be mitigated:	**Medium**
Proposed mitigation:	**Monitoring of substantial excavations for fossil material by ECO on an on-going basis during construction phase. Application of Palaeontological Chance Finds Procedure. No specialist mitigation or monitoring necessary, pending the potential discovery of substantial new fossil material during the construction phase.**
Residual impacts:	**None**
Cumulative impact post mitigation:	**Low. Region is of generally low palaeontological sensitivity.**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**11 – Low** **New fossil data resulting from appropriate mitigation represents a positive impact that partially offsets any loss of palaeontological heritage.**
OPERATIONAL PHASE	
Potential impact and risk:	**Not applicable**
DECOMMISSIONING AND CLOSURE PHASE	
Potential impact and risk:	**Not applicable**

Alternative 1: Preferred Layout & Alternative 2	Visual*
PLANNING, DESIGN AND DEVELOPMENT PHASE	
Potential impact and risk:	**Visual impacts of the activity**
Nature of impact:	**Possible visual impacts of the activity are identified and assessed in respect of the receptors. This means that the likely consequences of impacts, the severity and those receptors affected by these impacts will be identified and analysed. The potentially direct impacts are predicted, assessed and evaluated. The evaluation of significance is linked to thresholds of significance. In this particular case the visual impact may be significant for the receiving site, but beyond the site boundaries, the impact may not be significant because of vast distances and the fact that the proposed development will not be visible from the larger environment.**
Extent and duration of impact:	**4 Regional** **The facility is located in a gently undulating plain with visibility extending beyond the immediate surroundings of the site. The visibility extent of visual impact will influence a sub-regional area as significant views of the facility will not extend beyond ±10km. It is not anticipated that the facility will be visible at a**

	distance of more than 10km from the site. **Although new transmission lines are proposed, these will be positioned alongside existing transmission lines and will thus add to an existing visual state and not introduce a new visual element in the landscape.** **1 Short term** **Once implemented the infrastructure will remain on the land for the duration of the 20 to 30-year life expectancy of the infrastructure. On decommissioning of the facility all infrastructure can be removed and the land returned to its original visual state.**
Consequence of impact or risk:	**Change of character of landscape**
Probability of occurrence:	**4 – HP**
Magnitude:	**8** **The intensity of the visual impact as perceived form the view corridor and viewpoints, the bypassing public road, is assessed as, depending on the distance from the facility, ranging from medium to high**
Degree to which the impact may cause irreplaceable loss of resources:	**2 – PR**
Degree to which the impact can be reversed:	**High** **On decommissioning of the facility all infrastructure can be removed and the land returned to its original visual state.**
Indirect impacts:	**NA**
Cumulative impact prior to mitigation:	**Renewable energy facilities tend to locate, due to economic factors, as close as possible to existing electricity infrastructure into which it feeds the power it generates. As Aries substation and the transmission lines that feed into it are major infrastructure connected to the national electricity grid, it can thus be expected that renewable energy facilities will locate around it.** **The facility that is the subject to this report is one of 6 photovoltaic electricity generation projects in the immediate vicinity of Aries substation, known to the authors, of which 3 has already been authorised and one built.** **If all 5 projects were to 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 though, the 5 facilities impact on the same viewshed and will the visual impact not be significantly enlarged.** **These possible future activities will however, consist of the same structural components, with similar visual characteristics and therefore, with similar visual impacts as the present activity. The nature of this future cumulative visual impact will have a horizontal, rather than a vertical characteristic.** **From a visual perspective it would be preferable to locate all similar visual impacts within sight of the substation rather than affecting more distant areas within the landscape.**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**52 – Medium** **Although the impact will be permanent of nature, will definitely occur, is of sub regional extent and will have a moderate intensity, it is overall of moderate significance and will require that management actions be implemented to mitigate the impacts.**
Degree to which the impact can be avoided:	**Low**
Degree to which the impact can be managed:	**Medium**
Degree to which the impact can be mitigated:	**Medium**
Proposed mitigation:	**• Flattening and grading of the site should be kept to the minimum.** **• The natural profile and shape of the site is to be maintained.** **• Provision should be made for the rehabilitation of areas damaged by construction activities.** **• Measures should be implemented to prevent possible soils erosion.**

	• An attempt must be made to control dust generated during the construction phase. **• Litter and waste disposal, inclusive of construction rubble, must be controlled.** **• Fires, inclusive of burning of waste, should not be allowed on site.** **• If possible, laydown areas, storage of building materials and other off-site construction activities, should be accommodated at the Olyvenkolk farmstead or other low lying, visually inconspicuous area.**
Residual impacts:	**Change of character of landscape**
Cumulative impact post mitigation:	**Renewable energy facilities tend to locate, due to economic factors, as close as possible to existing electricity infrastructure into which it feeds the power it generates. As Aries substation and the transmission lines that feed into it are major infrastructure connected to the national electricity grid, it can thus be expected that renewable energy facilities will locate around it.** **The facility that is the subject to this report is one of 6 photovoltaic electricity generation projects in the immediate vicinity of Aries substation, known to the authors, of which 3 has already been authorised and one built.** **If all 5 projects were to 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 though, the 5 facilities impact on the same viewshed and will the visual impact not be significantly enlarged.** **These possible future activities will however, consist of the same structural components, with similar visual characteristics and therefore, with similar visual impacts as the present activity. The nature of this future cumulative visual impact will have a horizontal, rather than a vertical characteristic.** **From a visual perspective it would be preferable to locate all similar visual impacts within sight of the substation rather than affecting more distant areas within the landscape.**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**39 – Medium**
OPERATIONAL PHASE	
Potential impact and risk:	**Visual impacts of the activity**
Nature of impact:	**Possible visual impacts of the activity are identified and assessed in respect of the receptors. This means that the likely consequences of impacts, the severity and those receptors affected by these impacts will be identified and analysed. The potentially direct impacts are predicted, assessed and evaluated. The evaluation of significance is linked to thresholds of significance. In this particular case the visual impact may be significant for the receiving site, but beyond the site boundaries, the impact may not be significant because of vast distances and the fact that the proposed development will not be visible from the larger environment.**
Extent and duration of impact:	**4 Regional** **The facility is located in a gently undulating plain with visibility extending beyond the immediate surroundings of the site. The visibility extent of visual impact will influence a sub-regional area as significant views of the facility will not extend beyond ±10km. It is not anticipated that the facility will be visible at a distance of more than 10km from the site.** **Although new transmission lines are proposed, these will be positioned alongside existing transmission lines and will thus add to an existing visual state and not introduce a new visual element in the landscape.** **4 Long term** **Once implemented the infrastructure will remain on the land for the duration of the 20 to 30-year life expectancy of the infrastructure. On decommissioning of the facility all infrastructure can be removed and the land returned to its original visual state.**

Consequence of impact or risk:	**Change of character of landscape**
Probability of occurrence:	**4 – HP**
Magnitude:	**6** **The intensity of the visual impact as perceived form the view corridor and viewpoints, the bypassing public road, is assessed as, depending on the distance from the facility, ranging from medium to high**
Degree to which the impact may cause irreplaceable loss of resources:	**2 – PR**
Degree to which the impact can be reversed:	**High** **On decommissioning of the facility all infrastructure can be removed and the land returned to its original visual state.**
Indirect impacts:	**NA**
Cumulative impact prior to mitigation:	**Renewable energy facilities tend to locate, due to economic factors, as close as possible to existing electricity infrastructure into which it feeds the power it generates. As Aries substation and the transmission lines that feed into it are major infrastructure connected to the national electricity grid, it can thus be expected that renewable energy facilities will locate around it.** **The facility that is the subject to this report is one of 6 photovoltaic electricity generation projects in the immediate vicinity of Aries substation, known to the authors, of which 3 has already been authorised and one built.** **If all 5 projects were to 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 though, the 5 facilities impact on the same viewshed and will the visual impact not be significantly enlarged.** **These possible future activities will however, consist of the same structural components, with similar visual characteristics and therefore, with similar visual impacts as the present activity. The nature of this future cumulative visual impact will have a horizontal, rather than a vertical characteristic.** **From a visual perspective it would be preferable to locate all similar visual impacts within sight of the substation rather than affecting more distant areas within the landscape.**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**56 – Medium** **Although the impact will be permanent of nature, will definitely occur, is of sub regional extent and will have a moderate intensity, it is overall of moderate significance and will require that management actions be implemented to mitigate the impacts.**
Degree to which the impact can be avoided:	**Low**
Degree to which the impact can be managed:	**Medium**
Degree to which the impact can be mitigated:	**Medium**
Proposed mitigation:	**Signage related to the facility should be discrete and confined to the entrance gates.** **• No other corporate or advertising signs should be permitted.** **• All structures should be kept as small and low as technically possible.** **• All painted surfaces are to use earth tones chosen for its ability to blend into the background.** **• Security fencing should be as transparent as possible and mimic agricultural fencing fond in the area.** **• The fence should not be visually dominant over the solar arrays.** **• The use of razor wire should be avoided.** **• Screen planting in the form of tree lines should not be considered.** **• Only in exceptional circumstances should vegetation screening be considered in clumps around structures to mimic farmsteads found in the region.** **• Security lighting must be kept to the absolute minimum and be confined to only those sections of the facility that are necessary to be illuminated.**

	• No external up-lighting or flood-lighting of any part of the facility must be allowed **• External, inclusive of perimeter security lighting must be by means of shielded down-lighters, minimizing light pollution beyond the extent of the area to be lit.** **• Transmission lines to Aries substation should follow as far as technically possible the path of the existing power line.** **• Underground cabling should be installed where possible.**
Residual impacts:	**Change of character of landscape**
Cumulative impact post mitigation:	**Renewable energy facilities tend to locate, due to economic factors, as close as possible to existing electricity infrastructure into which it feeds the power it generates. As Aries substation and the transmission lines that feed into it are major infrastructure connected to the national electricity grid, it can thus be expected that renewable energy facilities will locate around it.** **The facility that is the subject to this report is one of 6 photovoltaic electricity generation projects in the immediate vicinity of Aries substation, known to the authors, of which 3 has already been authorised and one built.** **If all 5 projects were to 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 though, the 5 facilities impact on the same viewshed and will the visual impact not be significantly enlarged.** **These possible future activities will however, consist of the same structural components, with similar visual characteristics and therefore, with similar visual impacts as the present activity. The nature of this future cumulative visual impact will have a horizontal, rather than a vertical characteristic.** **From a visual perspective it would be preferable to locate all similar visual impacts within sight of the substation rather than affecting more distant areas within the landscape.**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**42 – Medium**
DECOMMISSIONING AND CLOSURE PHASE	
Potential impact and risk:	**Not applicable**

***for full impact assessment refer to Appendix G7: Visual Impact Assessment.**

Alternative 1: Preferred Layout & Alternative 2	**Agricultural**
PLANNING, DESIGN AND DEVELOPMENT PHASE	
Potential impact and risk:	**Not applicable**
OPERATIONAL PHASE	
Potential impact and risk:	**Not applicable**
DECOMMISSIONING AND CLOSURE PHASE	
Potential impact and risk:	**Removal of waste and rehabilitation**
Nature of impact:	**Impact of the development on agriculture and land value. Potential waste as contained in the panels could be glass and silicon. The silicon is however in a sealed unit and will not leach out and both must be removed and be recycled.**
Extent and duration of impact:	**3 Local & 5 Permanent**
Consequence of impact or risk:	**Contamination of land**
Probability of occurrence:	**3 - Probable**
Magnitude:	**8**
Degree to which the impact may cause irreplaceable loss of resources:	**2 – PR**
Degree to which the impact can be reversed:	**PR**
Indirect impacts:	**Loss of agricultural land**
Cumulative impact prior to mitigation:	**Loss of agricultural land**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**48 – Medium**

Degree to which the impact can be avoided:	**High**
Degree to which the impact can be managed:	**High**
Degree to which the impact can be mitigated:	**High**
Proposed mitigation:	**Removal, clearing and rehabilitation of infrastructure. The silicon is however in a sealed unit and will not leach out and both must be removed and be recycled. All infrastructures must be removed and the site fully cleared and rehabilitated at the decommissioning phase.**
Residual impacts:	**Pollution**
Cumulative impact post mitigation:	**Degradation of soil quality**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Low**

Alternative 1: Preferred Layout & Alternative 2	**Agriculture**
PLANNING, DESIGN AND DEVELOPMENT PHASE	
Potential impact and risk:	**Not applicable**
OPERATIONAL PHASE	
Potential impact and risk:	**Disturbance and Impact on ESKOM power supply.**
Nature of impact:	**Impact of the solar panels on the existing and future surrounding agricultural activities as a result of electricity supply. The proposed solar electricity facility will feed directly into the ESKOM grid. Connection to the ESKOM network and maintenance will result in power outages. Must be communicated to the ESKOM network users.**
Extent and duration of impact:	**3 Local & 4 Long term**
Consequence of impact or risk:	**Power outages**
Probability of occurrence:	**3 - Probable**
Magnitude:	**4**
Degree to which the impact may cause irreplaceable loss of resources:	**1 – R**
Degree to which the impact can be reversed:	**R**
Indirect impacts:	**Disruption of agricultural activities**
Cumulative impact prior to mitigation:	**Power outages**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**33 – Medium**
Degree to which the impact can be avoided:	**Medium**
Degree to which the impact can be managed:	**Medium**
Degree to which the impact can be mitigated:	**Medium**
Proposed mitigation:	**Good communications. That the proposed development is aware of these possible impacts before approval.**
Residual impacts:	**Power outages**
Cumulative impact post mitigation:	**Power outages**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Low**
DECOMMISSIONING AND CLOSURE PHASE	
Potential impact and risk:	**Not applicable**

Alternative 1: Preferred Layout & Alternative 2	**Agriculture**
PLANNING, DESIGN AND DEVELOPMENT PHASE	
Potential impact and risk:	**Not applicable**
OPERATIONAL PHASE	
Potential impact and risk:	**Existing and future agricultural activities.**
Nature of impact:	**The farming unit consists of 6 cadastral units with a total of 7011ha. The current farmer stocks 600 ewes on the 7011 ha. This is a small stock carrying capacity of 12ha per small stock unit. The cadastral unit that the electricity generation facility will**

	impact upon is 728ha in extent. Of this 600ha will be impacted upon. The farmer currently stocks 59 ewes on this cadastre. The sterilization of the 600ha area will allow the farmer to stock 10 ewes on this section of the farm. The solar electricity generation facility will impact on 2 (K20 and K 21) camps. The camp fence will have to be realigned.
Extent and duration of impact:	**3 Local & 4 Long term**
Consequence of impact or risk:	**The proposed solar electricity facility will utilize less productive agricultural land and will not impact on the economic viability of the agricultural unit. Hence, it will have a positive impact. It will increase the economic viability of the property.**
Probability of occurrence:	**3 Probable**
Magnitude:	**2**
Degree to which the impact may cause irreplaceable loss of resources:	**1 – R**
Degree to which the impact can be reversed:	**R**
Indirect impacts:	**Impact on livelihoods**
Cumulative impact prior to mitigation:	**Loss of agricultural land**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**27 – Low**
Degree to which the impact can be avoided:	**Low**
Degree to which the impact can be managed:	**Low**
Degree to which the impact can be mitigated:	**Low**
Proposed mitigation:	**Good communications. That the proposed development is aware of these possible impacts before approval.**
Residual impacts:	**Loss of agricultural land**
Cumulative impact post mitigation:	**Loss of agricultural land**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Low**
DECOMMISSIONING AND CLOSURE PHASE	
Potential impact and risk:	**Not applicable**

Alternative 1: Preferred Layout & Alternative 2	**Agricultural**
PLANNING, DESIGN AND DEVELOPMENT PHASE	
Potential impact and risk:	**Land Reform**
Nature of impact:	**Impact of the loss of agricultural land for land reform purposes. Land redistribution is about making land available for:** **• agricultural production** **• settlement and** **• non-agricultural enterprises** **During the first five years (1994-1999) the main emphasis of land redistribution was to provide the disadvantaged and the poor with land for housing and small-scale farming purposes. The proposed property is not identified nor in process of a land reform project to meet the targets set by District Assessment Committees to achieve the required transfer of agricultural land to historically disadvantaged individuals. As far as the author knows, no land claim for the restoration of land rights is in process or has been submitted.**
Extent and duration of impact:	**2 Site & 5 Permanent**
Consequence of impact or risk:	**Loss of agricultural land for land reform purposes**
Probability of occurrence:	**3 Probable**
Magnitude:	**2**
Degree to which the impact may cause irreplaceable loss of resources:	**1 Resources will not be lost**
Degree to which the impact can be reversed:	**R**
Indirect impacts:	**Unrest**
Cumulative impact prior to mitigation:	**Loss of land for land reform purposes**
Significance rating of impact prior to mitigation	**27 – Low**

(e.g. Low, Medium, Medium-High, High, or Very-High)	
Degree to which the impact can be avoided:	**Low**
Degree to which the impact can be managed:	**Low**
Degree to which the impact can be mitigated:	**Low**
Proposed mitigation:	**20% of this solar electricity generation project will be owned by BEE certified partners who will lead to the redistribution of non-agricultural land.**
Residual impacts:	**Land Reform in South Africa is a complex issue, with several dimensions, including the settlement and development of previously disadvantaged rural communities, as well as the restoration of land rights.** **Integral to this is the quantification and qualification of the agricultural land transfer target in order to determine the scale and nature of land reform to be implemented. Included in such quantification and qualification is also the consideration of other targets as set by the Concept Black Economic Empowerment Framework for Agriculture (2004) for employment, enterprise equity, procurement, etc. in the agricultural sector.**
Cumulative impact post mitigation:	**Loss of land for land reform purposes**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Low**
OPERATIONAL PHASE	
Potential impact and risk:	**Land Reform**
Nature of impact:	**Impact of the loss of agricultural land for land reform purposes. Land redistribution is about making land available for:** **• agricultural production** **• settlement and** **• non-agricultural enterprises** **During the first five years (1994-1999) the main emphasis of land redistribution was to provide the disadvantaged and the poor with land for housing and small-scale farming purposes. The proposed property is not identified nor in process of a land reform project to meet the targets set by District Assessment Committees to achieve the required transfer of agricultural land to historically disadvantaged individuals. As far as the author knows, no land claim for the restoration of land rights is in process or has been submitted.**
Extent and duration of impact:	**2 Site & 5 Permanent**
Consequence of impact or risk:	**Loss of agricultural land for land reform purposes**
Probability of occurrence:	**3 Probable**
Magnitude:	**3**
Degree to which the impact may cause irreplaceable loss of resources:	**1 Resources will not be lost**
Degree to which the impact can be reversed:	**R**
Indirect impacts:	**Unrest**
Cumulative impact prior to mitigation:	**Loss of land for land reform purposes**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**27 – Low**
Degree to which the impact can be avoided:	**Low**
Degree to which the impact can be managed:	**Low**
Degree to which the impact can be mitigated:	**Low**
Proposed mitigation:	**20% of this solar electricity generation project will be owned by BEE certified partners who will lead to the redistribution of non-agricultural land.**
Residual impacts:	**Land Reform in South Africa is a complex issue, with several dimensions, including the settlement and development of previously disadvantaged rural communities, as well as the restoration of land rights.** **Integral to this is the quantification and qualification of the agricultural land transfer target in order to determine the scale and nature of land reform to be implemented. Included in such quantification and qualification is also the consideration of other**

	targets as set by the Concept Black Economic Empowerment Framework for Agriculture (2004) for employment, enterprise equity, procurement, etc. in the agricultural sector.
Cumulative impact post mitigation:	**Loss of land for land reform purposes**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Low**
DECOMMISSIONING AND CLOSURE PHASE	
Potential impact and risk:	**Not applicable**

Alternative 1: Preferred Layout & Alternative 2	**Agriculture**
PLANNING, DESIGN AND DEVELOPMENT PHASE	
Potential impact and risk:	**Fire**
Nature of impact:	**Uncontrolled fires. Must ensure that the requirements of the National Veld and Forest Fire Act are met to ensure proper fire management and prevention. Especially veld fires that may spread from the property or enter and threaten infrastructure on site. This is however very unlikely and of very low significance since this is not a fire driven ecological system and no history of a veld fire on site has ever been recorded.**
Extent and duration of impact:	**4 Regional & 2 Short term**
Consequence of impact or risk:	**May cause significant damage to agricultural areas and infrastructure.**
Probability of occurrence:	**2**
Magnitude:	**8**
Degree to which the impact may cause irreplaceable loss of resources:	**2 PR**
Degree to which the impact can be reversed:	**CR**
Indirect impacts:	**Impact on livelihoods**
Cumulative impact prior to mitigation:	**Not applicable**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**26 – Low**
Degree to which the impact can be avoided:	**High**
Degree to which the impact can be managed:	**High**
Degree to which the impact can be mitigated:	**High**
Proposed mitigation:	**Ensure proper fire control measures on site and during hot periods. Ensure staff is trained in fire drill. In drier months the areas are more likely to burn. Any open fires on site present a risk of fire spreading into nearby areas which could significantly impact on the on-going agriculture in the surrounding areas. With a proper fire drills in place and as long as no fires are allowed in unauthorised areas and fire extinguishers are available during any hot period, the risk of veld fires can be significantly reduced.**
Residual impacts:	**Uncontrolled fires**
Cumulative impact post mitigation:	**Loss of agricultural land**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**14 – Low**
OPERATIONAL PHASE	
Potential impact and risk:	**Fire**
Nature of impact:	**Uncontrolled fires. Must ensure that the requirements of the National Veld and Forest Fire Act are met to ensure proper fire management and prevention. Especially veld fires that may spread from the property or enter and threaten infrastructure on site. This is however very unlikely and of very low significance since this is not a fire driven ecological system and no history of a veld fire on site has ever been recorded.**
Extent and duration of impact:	**4 Regional & 2 Short term**
Consequence of impact or risk:	**May cause significant damage to agricultural areas and infrastructure.**
Probability of occurrence:	**2**

Magnitude:	**8**
Degree to which the impact may cause irreplaceable loss of resources:	**2 PR**
Degree to which the impact can be reversed:	**CR**
Indirect impacts:	**Impact on livelihoods**
Cumulative impact prior to mitigation:	**Not applicable**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**26 – Low**
Degree to which the impact can be avoided:	**High**
Degree to which the impact can be managed:	**High**
Degree to which the impact can be mitigated:	**High**
Proposed mitigation:	**Ensure proper fire control measures on site and during hot periods. Ensure staff is trained in fire drill. In drier months the areas are more likely to burn. Any open fires on site present a risk of fire spreading into nearby areas which could significantly impact on the on-going agriculture in the surrounding areas. With a proper fire drills in place and as long as no fires are allowed in unauthorised areas and fire extinguishers are available during any hot period, the risk of veld fires can be significantly reduced.**
Residual impacts:	**Uncontrolled fires**
Cumulative impact post mitigation:	**Loss of agricultural land**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**14 – Low**
DECOMMISSIONING AND CLOSURE PHASE	
Potential impact and risk:	**Fire**
Nature of impact:	**Uncontrolled fires. Must ensure that the requirements of the National Veld and Forest Fire Act are met to ensure proper fire management and prevention. Especially veld fires that may spread from the property or enter and threaten infrastructure on site. This is however very unlikely and of very low significance since this is not a fire driven ecological system and no history of a veld fire on site has ever been recorded.**
Extent and duration of impact:	**4 Regional & 2 Short term**
Consequence of impact or risk:	**May cause significant damage to agricultural areas and infrastructure.**
Probability of occurrence:	**2**
Magnitude:	**8**
Degree to which the impact may cause irreplaceable loss of resources:	**2 PR**
Degree to which the impact can be reversed:	**CR**
Indirect impacts:	**Impact on livelihoods**
Cumulative impact prior to mitigation:	**Not applicable**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**26 – Low**
Degree to which the impact can be avoided:	**High**
Degree to which the impact can be managed:	**High**
Degree to which the impact can be mitigated:	**High**
Proposed mitigation:	**Ensure proper fire control measures on site and during hot periods. Ensure staff is trained in fire drill. In drier months the areas are more likely to burn. Any open fires on site present a risk of fire spreading into nearby areas which could significantly impact on the on-going agriculture in the surrounding areas. With a proper fire drills in place and as long as no fires are allowed in unauthorised areas and fire extinguishers are available during any hot period, the risk of veld fires can be significantly reduced.**
Residual impacts:	**Uncontrolled fires**
Cumulative impact post mitigation:	**Loss of agricultural land**
Significance rating of impact after mitigation	**14 – Low**

(e.g. Low, Medium, Medium-High, High, or Very-High)	

Alternative 1: Preferred Layout & Alternative 2	**Agriculture**
PLANNING, DESIGN AND DEVELOPMENT PHASE	
Potential impact and risk:	**Not applicable**
OPERATIONAL PHASE	
Potential impact and risk:	**Effect of Zero Sunlight on panel area.**
Nature of impact:	**Limited sunlight to shaded areas under the panel. The panels are fitted off the ground, approximately 1,8m above the ground. Sunlight will not be fully blocked out in the area. Areas under the panels will be in shade during periods of the day. The panels are fixed. Sunlight will be able to penetrate the shade areas during limited periods of the day. The blocking of sunlight will however not affect the productivity of the soil. An extreme example of the effect of zero sunlight on soil productivity and rehabilitation is the construction of a tar road. Some roads may be rehabilitated after 30 years. There is evidence recorded of tar roads which are rehabilitated and ploughed after years. These ploughed roads quickly recover and plant growth is evident at these areas. The area impacted upon by the solar panels will not be exposed to a zero-sunlight effect, and they will quickly recover after the panels are removed.**
Extent and duration of impact:	**3 Local & 4 Long term**
Consequence of impact or risk:	**Loss of income for farmers**
Probability of occurrence:	**3 Probable**
Magnitude:	**6 Moderate**
Degree to which the impact may cause irreplaceable loss of resources:	**PR – 2**
Degree to which the impact can be reversed:	**PR**
Indirect impacts:	**Degradation of land**
Cumulative impact prior to mitigation:	**As above**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**39 – Medium**
Degree to which the impact can be avoided:	**High**
Degree to which the impact can be managed:	**High**
Degree to which the impact can be mitigated:	**CM**
Proposed mitigation:	**Ensure that the panels are placed on structures and lifted off the ground to allow sunlight penetration. Natural Vegetation that grows on site must be maintained.**
Residual impacts:	**Loss of habitat**
Cumulative impact post mitigation:	**Loss of habitat**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Low**
DECOMMISSIONING AND CLOSURE PHASE	
Potential impact and risk:	**Not applicable**

Alternative 1: Preferred Layout & Alternative 2	**Agriculture**
PLANNING, DESIGN AND DEVELOPMENT PHASE	
Potential impact and risk:	**Erosion and Storm Water Management**
Nature of impact:	**Impact of the development on soil conservation, erosion and storm water management. Erosion potential is low due to the nature of the soil being dominated by quaternary to recent sands and sandy soil of the Gordonia Formation (Kalahari Group) and Mbizane Formation (Permo-Carboniferous Dwyka Group, Karoo Supergroup) which is stony/rocky.**
Extent and duration of impact:	**3 Local & 5 Permanent**
Consequence of impact or risk:	**Loss of income for farmers**

Probability of occurrence:	**3 Probable**
Magnitude:	**8 High**
Degree to which the impact may cause irreplaceable loss of resources:	**PR – 2**
Degree to which the impact can be reversed:	**PR**
Indirect impacts:	**Degradation of land leading to reduction in carrying capacity of land.**
Cumulative impact prior to mitigation:	**As above**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**48 – Medium**
Degree to which the impact can be avoided:	**High**
Degree to which the impact can be managed:	**High**
Degree to which the impact can be mitigated:	**CM**
Proposed mitigation:	**Erosion monitoring and maintenance. Rehabilitate site after use. Areas disturbed during construction must be re-vegetated as soon as possible. Natural vegetated buffer areas in between solar panels must be maintained to reduce water runoff and to prevent erosion. All roads need to be maintained and monitored and visible signs of possible erosion immediately rehabilitated. In other words, unless working areas are fenced and road access carefully considered, unnecessary disturbance to the agricultural land may occur during construction. To a large degree good management of personnel on construction sites can significantly reduce potential impacts on the agricultural environment. Personnel should be restricted to the camp site and immediate construction areas only. Prior to disturbance of a site, topsoil which will contain a seed bank of the local species should be stored for use during the rehabilitation process.**
Residual impacts:	**Erosion**
Cumulative impact post mitigation:	**Not applicable**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Low**
OPERATIONAL PHASE	
Potential impact and risk:	**Erosion and Storm Water Management**
Nature of impact:	**Impact of the development on soil conservation, erosion and storm water management. Erosion potential is low due to the nature of the soil being dominated by quaternary to recent sands and sandy soil of the Gordonia Formation (Kalahari Group) and Mbizane Formation (Permo-Carboniferous Dwyka Group, Karoo Supergroup) which is stony/rocky. Water runoff from panels will penetrate soil and runoff will be reduced by the vegetation cover. There will be no impact of the proposed development on the pre-development storm water. Storm water runoff or siltation of the drainage lines and systems will not be affected.**
Extent and duration of impact:	**3 Local & 5 Permanent**
Consequence of impact or risk:	**Loss of income for farmers**
Probability of occurrence:	**3 Probable**
Magnitude:	**8 High**
Degree to which the impact may cause irreplaceable loss of resources:	**PR – 2**
Degree to which the impact can be reversed:	**PR**
Indirect impacts:	**Degradation of land leading to reduction in carrying capacity of land.**
Cumulative impact prior to mitigation:	**As above**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**48 – Medium**
Degree to which the impact can be avoided:	**High**
Degree to which the impact can be managed:	**High**
Degree to which the impact can be mitigated:	**CM**
Proposed mitigation:	**Implement proper site management Rehabilitate site and erosion maintenance measures in place. Erosion monitoring and**

	maintenance. Natural vegetated buffer areas in between solar panels must be maintained to reduce water runoff and to prevent erosion. All roads need to be maintained and monitored and visible signs of possible erosion immediately rehabilitated.
Residual impacts:	**Erosion**
Cumulative impact post mitigation:	**Not applicable**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Low**
DECOMMISSIONING AND CLOSURE PHASE	
Potential impact and risk:	**Erosion and Storm Water Management**
Nature of impact:	**Impact of the development on soil conservation, erosion and storm water management. Erosion potential is low due to the nature of the soil being dominated by quaternary to recent sands and sandy soil of the Gordonia Formation (Kalahari Group) and Mbizane Formation (Permo-Carboniferous Dwyka Group, Karoo Supergroup) which is stony/rocky.**
Extent and duration of impact:	**3 Local & 5 Permanent**
Consequence of impact or risk:	**Loss of income for farmers**
Probability of occurrence:	**3 Probable**
Magnitude:	**8 High**
Degree to which the impact may cause irreplaceable loss of resources:	**PR – 2**
Degree to which the impact can be reversed:	**PR**
Indirect impacts:	**Degradation of land leading to reduction in carrying capacity of land.**
Cumulative impact prior to mitigation:	**As above**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**48 – Medium**
Degree to which the impact can be avoided:	**High**
Degree to which the impact can be managed:	**High**
Degree to which the impact can be mitigated:	**CM**
Proposed mitigation:	**Erosion monitoring and maintenance. Rehabilitate site after decommissioning. Areas disturbed must be re-vegetated as soon as possible. Natural vegetated buffer areas in between solar panels must be maintained to reduce water runoff and to prevent erosion. In other words, unless working areas are fenced and road access carefully considered, unnecessary disturbance to the agricultural land may occur. To a large degree good management of personnel can significantly reduce potential impacts on the agricultural environment. Personnel should be restricted to the site and immediate areas only. Prior to disturbance of a site, topsoil which will contain a seed bank of the local species should be stored for use during the rehabilitation process.**
Residual impacts:	**Erosion**
Cumulative impact post mitigation:	**Not applicable**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Low**

Alternative 1: Preferred Layout & Alternative 2	**Agriculture**
PLANNING, DESIGN AND DEVELOPMENT PHASE	
Potential impact and risk:	**Livestock Theft**
Nature of impact:	**Impact of the development on livestock theft on surrounding properties. Theft of livestock is possible during the construction and decommissioning phases. Likelihood of occurrence is improbable if mitigation measures are fully implemented**
Extent and duration of impact:	**3 Local & 5 Permanent**
Consequence of impact or risk:	**Loss of income for farmers**
Probability of occurrence:	**3 Probable**

Magnitude:	**4 Low**
Degree to which the impact may cause irreplaceable loss of resources:	**Resources will not be lost**
Degree to which the impact can be reversed:	**PR**
Indirect impacts:	**Loss of income and effect on livelihoods**
Cumulative impact prior to mitigation:	**As above**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**36 – Medium**
Degree to which the impact can be avoided:	**High**
Degree to which the impact can be managed:	**High**
Degree to which the impact can be mitigated:	**CM**
Proposed mitigation:	**In other words, unless working areas are demarcated, security and control measures are in place and enforced carefully, unnecessary disturbance to the livestock may occur during construction. To a large degree good management of personnel on construction sites can significantly reduce potential impacts to the agricultural environment. Construction personnel must be restricted by the EMP and site ECO to the site and immediate construction areas only. ECO and security control measures to be put in place. Fine structures in the EMP should reflect livestock value to ensure replacement value should theft occur.**
Residual impacts:	**Stock theft undermines the profitability and sustainability of the stock farmers and it interferes with the government's land reform process and the empowerment of emerging farmers. For each stock theft incident on a commercial farm, it is estimated that three similar incidents take place amongst emerging farmers. What makes it worse is that many emerging farmers suffer a total loss of stock as kraals are often literally emptied.**
Cumulative impact post mitigation:	**Not applicable**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**No significance**
OPERATIONAL PHASE	
Potential impact and risk:	**Not applicable**
DECOMMISSIONING AND CLOSURE PHASE	
Potential impact and risk:	**Livestock Theft**
Nature of impact:	**Impact of the development on livestock theft on surrounding properties**
Extent and duration of impact:	**3 Local & 5 Permanent**
Consequence of impact or risk:	**Loss of income for farmers**
Probability of occurrence:	**3 Probable**
Magnitude:	**4 Low**
Degree to which the impact may cause irreplaceable loss of resources:	**Resources will not be lost**
Degree to which the impact can be reversed:	**PR**
Indirect impacts:	**Loss of income and effect on livelihoods**
Cumulative impact prior to mitigation:	**As above**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**36 – Medium**
Degree to which the impact can be avoided:	**High**
Degree to which the impact can be managed:	**High**
Degree to which the impact can be mitigated:	**CM**
Proposed mitigation:	**In other words, unless working areas are demarcated, security and control measures are in place and enforced carefully, unnecessary disturbance to the livestock may occur. To a large degree good management of personnel on construction sites can significantly reduce potential impacts to the agricultural environment. Personnel must be restricted by the EMP and site ECO to the site and immediate construction areas only. ECO and security control measures to be put in place. Fine structures in the EMP should reflect livestock value to ensure replacement**

	value should theft occur.
Residual impacts:	**Stock theft undermines the profitability and sustainability of the stock farmers and it interferes with the government's land reform process and the empowerment of emerging farmers. For each stock theft incident on a commercial farm, it is estimated that three similar incidents take place amongst emerging farmers. What makes it worse is that many emerging farmers suffer a total loss of stock as kraals are often literally emptied.**
Cumulative impact post mitigation:	**Not applicable**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**No significance**

Alternative 1: Preferred Layout & Alternative 2	**Ecological Impacts**
PLANNING, DESIGN AND DEVELOPMENT PHASE	
Potential impact and risk:	**Introduction of alien plant species**
Nature of impact:	**Declared Weeds may be transported onto the site and spread to surrounding agricultural properties which may have management and cost impacts on the surrounding properties. Introduction of alien plant species through building material and vehicular traffic is an important aspect that needs to be considered. Alien grass seeds for example may become attached to vehicles and be transported to site or be brought on to site in building materials such as sand to be used for roads. Without monitoring this could become problematic.**
Extent and duration of impact:	**Extent 2 (On site or within 100 m of the site) & Duration 4 (>15 years)**
Consequence of impact or risk:	**Loss impacted on indigenous vegetation and habitat.**
Probability of occurrence:	**4 (most likely)**
Magnitude:	**6**
Degree to which the impact may cause irreplaceable loss of resources:	**High**
Degree to which the impact can be reversed:	**The impact can be partly reversed providing that mitigation measures as stipulated in the EMP are implemented and rehabilitation measures are undertaken**
Indirect impacts:	**Loss impacted on indigenous vegetation and habitat.**
Cumulative impact prior to mitigation:	**Loss impacted on indigenous vegetation and habitat.**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**48 - Medium**
Degree to which the impact can be avoided:	**Low**
Degree to which the impact can be managed:	**High**
Degree to which the impact can be mitigated:	**Moderate**
Proposed mitigation:	**The following measures will assist in reducing the potential for the introduction of alien species into new areas and will help to prevent infestation of these areas should the introductions occur. Materials such as sand and stone should, wherever possible, be sourced from areas which are free of alien plants. Wherever possible rehabilitation of disturbed area should be done with seeds collected in the area requiring rehabilitation. An important aspect of on-going maintenance is the monitoring of the rehabilitated sites and access road verges for alien plant species. Should alien species be identified then these should immediately be removed.**
Residual impacts:	**Loss impacted on indigenous vegetation and habitat.**
Cumulative impact post mitigation:	**In terms of cumulative impacts, the construction of multiple additional facilities will result in the overall cumulative impact being Medium negative. The cumulative impact assessment assumes the worst-case scenario of up to 7 solar facilities being constructed in this 10km radius. However, if all the mitigation measures in the EMP are adhered to, this would reduce the significance of the impacts by approximately half. This would probably result in the significance being rated as low rather than the current medium.**

Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**24 -Low**
OPERATIONAL PHASE	
Potential impact and risk:	**Not applicable**
DECOMMISSIONING AND CLOSURE PHASE	
Potential impact and risk:	**Not applicable**

Alternative 1: Preferred Layout	**Ecological Impacts**
PLANNING, DESIGN AND DEVELOPMENT PHASE	
Potential impact and risk:	**Alteration of habitat structure and composition**
Nature of impact:	**The ousting of fauna through anthropogenic activities, disturbance of refugia and general change in habitat.** **Increased shading, as a consequence of the PV arrays, will lead to changes in plant water relations and possible changes in plant community structures within the site.**
Extent and duration of impact:	**Extent 2 (On site or within 100 m of the site) & Duration 4 (>15 years)**
Consequence of impact or risk:	**Loss impacted on indigenous vegetation and habitat.**
Probability of occurrence:	**4 (most likely)**
Magnitude:	**8**
Degree to which the impact may cause irreplaceable loss of resources:	**High**
Degree to which the impact can be reversed:	**The impact can be partly reversed providing that mitigation measures as stipulated in the EMP are implemented and rehabilitation measures are undertaken**
Indirect impacts:	**Loss impacted on indigenous vegetation and habitat.**
Cumulative impact prior to mitigation:	**Loss impacted on indigenous vegetation and habitat.**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**56 - Medium**
Degree to which the impact can be avoided:	**Low**
Degree to which the impact can be managed:	**High**
Degree to which the impact can be mitigated:	**Moderate**
Proposed mitigation:	**Non-perennial rivers, pans and sensitive areas as identified in this report and their buffer areas should be avoided and a no-go buffer be applied around them.** **All staff, vehicle and machinery activities should be strictly controlled at all times so as to ensure that the absolute minimum of surface area is impacted on.** **Care should be taken not to introduce or propagate alien plant species/weeds during construction.** **Plant rescue operations** **Exotic weed control** **Fauna and avifauna sweep of site** **The maintenance of vegetation and avoidance of the "blading" or clearance.**
Residual impacts:	**Loss impacted on indigenous vegetation and habitat.**
Cumulative impact post mitigation:	**In terms of cumulative impacts, the construction of multiple additional facilities will result in the overall cumulative impact being HIGH negative. The cumulative impact assessment assumes the worst-case scenario of up to 7 solar facilities being constructed in this 10km radius. However, if all the mitigation measures in the EMP are adhered to, this would reduce the significance of the impacts by approximately half. This would probably result in the significance being rated as MODERATE rather than the current HIGH.**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**48 - Medium**
OPERATIONAL PHASE	
Potential impact and risk:	**Alteration of habitat structure and composition**
Nature of impact:	**Alteration of ecological processes on account of the exclusion of certain fauna, inherent to the functional state of the land**

	within the PV facility
Extent and duration of impact:	**Extent 2 (On site or within 100 m of the site) & Duration 4 (>15 years)**
Consequence of impact or risk:	**Loss impacted on indigenous vegetation and habitat.**
Probability of occurrence:	**3 (Probable)**
Magnitude:	**10**
Degree to which the impact may cause irreplaceable loss of resources:	**Moderate**
Degree to which the impact can be reversed:	**The impact can be partly reversed providing that mitigation measures as stipulated in the EMP are implemented and rehabilitation measures are undertaken**
Indirect impacts:	**Loss impacted on indigenous vegetation and habitat.**
Cumulative impact prior to mitigation:	**Loss impacted on indigenous vegetation and habitat.**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**48 - Medium**
Degree to which the impact can be avoided:	**Low**
Degree to which the impact can be managed:	**High**
Degree to which the impact can be mitigated:	**Moderate**
Proposed mitigation:	**Provision of critter paths within the fencing should be considered in the design.** **Promote and support faunal presence and activities within the proposed PV facility**
Residual impacts:	**Loss impacted on indigenous vegetation and habitat.**
Cumulative impact post mitigation:	**In terms of cumulative impacts, the construction of multiple additional facilities will result in the overall cumulative impact being HIGH negative. The cumulative impact assessment assumes the worst-case scenario of up to 7 solar facilities being constructed in this 20km radius. However, if all the mitigation measures in the EMP are adhered to, this would reduce the significance of the impacts by approximately half. This would probably result in the significance being rated as MODERATE rather than the current HIGH.**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**36 – Medium**
DECOMMISSIONING AND CLOSURE PHASE	
Potential impact and risk:	**Ecological Processes**
Nature of impact:	**A reversion of present faunal population states within the study area;**
Extent and duration of impact:	**Extent 2 (On site or within 100 m of the site) & Duration 1 (0 – 1 years)**
Consequence of impact or risk:	**Loss impacted on indigenous vegetation and habitat.**
Probability of occurrence:	**4 (most likely)**
Magnitude:	**10**
Degree to which the impact may cause irreplaceable loss of resources:	**High**
Degree to which the impact can be reversed:	**High**
Indirect impacts:	**Loss impacted on indigenous vegetation and habitat.**
Cumulative impact prior to mitigation:	**Loss impacted on indigenous vegetation and habitat.**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**52 - Medium**
Degree to which the impact can be avoided:	**Low**
Degree to which the impact can be managed:	**High**
Degree to which the impact can be mitigated:	**Moderate**
Proposed mitigation:	**Non-perennial rivers, pans and sensitive areas as identified in this report and their buffer areas should be avoided and a no-go buffer be applied around them.** **All staff, vehicle and machinery activities should be strictly controlled at all times so as to ensure that the absolute minimum of surface area is impacted.** **Care should be taken not to introduce or propagate alien plant**

	species/weeds during construction. **Plant rescue operations** **Exotic weed control** **Fauna and avifauna sweep of site** **The maintenance of vegetation and avoidance of the "blading" or clearance.**
Residual impacts:	**Loss impacted on indigenous vegetation and habitat.**
Cumulative impact post mitigation:	**In terms of cumulative impacts, the construction of multiple additional facilities will result in the overall cumulative impact being HIGH negative. The cumulative impact assessment assumes the worst-case scenario of up to 7 solar facilities being constructed in this 10km radius. However, if all the mitigation measures in the EMP are adhered to, this would reduce the significance of the impacts by approximately half. This would probably result in the significance being rated as MODERATE rather than the current HIGH.**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**48 - Medium**

Alternative 2	**Ecological Impacts**
PLANNING, DESIGN AND DEVELOPMENT PHASE	
Potential impact and risk:	**Alteration of habitat structure and composition**
Nature of impact:	**<u>Note: Alternative 2's layout does not exclude Bushmanland Basin pan identified during the field survey.</u>** **The ousting of fauna through anthropogenic activities, disturbance of refugia and general change in habitat.** **Increased shading, as a consequence of the PV arrays, will lead to changes in plant water relations and possible changes in plant community structures within the site.**
Extent and duration of impact:	**Extent 2 (On site or within 100 m of the site) & Duration 5**
Consequence of impact or risk:	**Loss impacted on indigenous vegetation and habitat.**
Probability of occurrence:	**5 (Definite)**
Magnitude:	**10**
Degree to which the impact may cause irreplaceable loss of resources:	**High**
Degree to which the impact can be reversed:	**The impact can be partly reversed providing that mitigation measures as stipulated in the EMP are implemented and rehabilitation measures are undertaken**
Indirect impacts:	**Loss impacted on indigenous vegetation and habitat.**
Cumulative impact prior to mitigation:	**Loss impacted on indigenous vegetation and habitat.**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**85 - High**
Degree to which the impact can be avoided:	**Low**
Degree to which the impact can be managed:	**High**
Degree to which the impact can be mitigated:	**Moderate**
Proposed mitigation:	**Non-perennial rivers, pans and sensitive areas as identified in this report and their buffer areas should be avoided and a no-go buffer be applied around them.** **All staff, vehicle and machinery activities should be strictly controlled at all times so as to ensure that the absolute minimum of surface area is impacted.** **Care should be taken not to introduce or propagate alien plant species/weeds during construction.** **Plant rescue operations** **Exotic weed control** **Fauna and avifauna sweep of site** **The maintenance of vegetation and avoidance of the "blading" or clearance.**
Residual impacts:	**Loss impacted on indigenous vegetation and habitat.**
Cumulative impact post mitigation:	**In terms of cumulative impacts, the construction of multiple additional facilities will result in the overall cumulative impact**

	being HIGH negative. The cumulative impact assessment assumes the worst-case scenario of up to 7 solar facilities being constructed in this 10km radius. However, if all the mitigation measures in the EMP are adhered to, this would reduce the significance of the impacts by approximately half. This would probably result in the significance being rated as MODERATE rather than the current HIGH.
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**80 - High**
OPERATIONAL PHASE	
Potential impact and risk:	**Alteration of habitat structure and composition**
Nature of impact:	**Alteration of ecological processes on account of the exclusion of certain fauna, inherent to the functional state of the land within the PV facility**
Extent and duration of impact:	**Extent 2 (On site or within 100 m of the site) & Duration 4 (>15 years)**
Consequence of impact or risk:	**Loss impacted on indigenous vegetation and habitat.**
Probability of occurrence:	**3 (Probable)**
Magnitude:	**8**
Degree to which the impact may cause irreplaceable loss of resources:	**Moderate**
Degree to which the impact can be reversed:	**The impact can be partly reversed providing that mitigation measures as stipulated in the EMP are implemented and rehabilitation measures are undertaken**
Indirect impacts:	**Loss impacted on indigenous vegetation and habitat.**
Cumulative impact prior to mitigation:	**Loss impacted on indigenous vegetation and habitat.**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**42 - Medium**
Degree to which the impact can be avoided:	**Low**
Degree to which the impact can be managed:	**High**
Degree to which the impact can be mitigated:	**Moderate**
Proposed mitigation:	**Provision of critter paths within the fencing should be considered in the design.** **Promote and support faunal presence and activities within the proposed PV facility**
Residual impacts:	**Loss impacted on indigenous vegetation and habitat.**
Cumulative impact post mitigation:	**In terms of cumulative impacts, the construction of multiple additional facilities will result in the overall cumulative impact being HIGH negative. The cumulative impact assessment assumes the worst-case scenario of up to 7 solar facilities being constructed in this 20km radius. However, if all the mitigation measures in the EMP are adhered to, this would reduce the significance of the impacts by approximately half. This would probably result in the significance being rated as MODERATE rather than the current HIGH.**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**36 – Medium**
DECOMMISSIONING AND CLOSURE PHASE	
Potential impact and risk:	**Ecological Processes**
Nature of impact:	**A reversion of present faunal population states within the study area**
Extent and duration of impact:	**Extent 2 (On site or within 100 m of the site) & Duration 1 (0 – 1 years)**
Consequence of impact or risk:	**Loss impacted on indigenous vegetation and habitat.**
Probability of occurrence:	**4 (most likely)**
Magnitude:	**8**
Degree to which the impact may cause irreplaceable loss of resources:	**High**
Degree to which the impact can be reversed:	**High**
Indirect impacts:	**Loss impacted on indigenous vegetation and habitat.**
Cumulative impact prior to mitigation:	**Loss impacted on indigenous vegetation and habitat.**

Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**44 - Medium**
Degree to which the impact can be avoided:	**Low**
Degree to which the impact can be managed:	**High**
Degree to which the impact can be mitigated:	**Moderate**
Proposed mitigation:	**Non-perennial rivers, pans and sensitive areas as identified in this report and their buffer areas should be avoided and a no-go buffer be applied around them.** **All staff, vehicle and machinery activities should be strictly controlled at all times so as to ensure that the absolute minimum of surface area is impacted.** **Care should be taken not to introduce or propagate alien plant species/weeds during construction.** **Plant rescue operations** **Exotic weed control** **Fauna and avifauna sweep of site** **The maintenance of vegetation and avoidance of the "blading" or clearance.**
Residual impacts:	**Loss impacted on indigenous vegetation and habitat.**
Cumulative impact post mitigation:	**In terms of cumulative impacts, the construction of multiple additional facilities will result in the overall cumulative impact being HIGH negative. The cumulative impact assessment assumes the worst-case scenario of up to 7 solar facilities being constructed in this 10km radius. However, if all the mitigation measures in the EMP are adhered to, this would reduce the significance of the impacts by approximately half. This would probably result in the significance being rated as MODERATE rather than the current HIGH.**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**33 - Medium**

Alternative 1: Preferred Layout & Alternative 2	**Ecological Impacts**
PLANNING, DESIGN AND DEVELOPMENT PHASE	
Potential impact and risk:	**Alteration of surface drainage patterns on account of construction activities leading to change in plant communities and general habitat structure**
Nature of impact:	**The ousting of fauna through anthropogenic activities, disturbance of refugia and general change in habitat. Changes in the geomorphological state of drainage lines as hydraulic changes arise within the catchment.**
Extent and duration of impact:	**Extent 2 (On site or within 100 m of the site) & Duration 4 (>15 years)**
Consequence of impact or risk:	**Loss impacted on indigenous vegetation and habitat.**
Probability of occurrence:	**4 (most likely)**
Magnitude:	**8**
Degree to which the impact may cause irreplaceable loss of resources:	**High**
Degree to which the impact can be reversed:	**The impact can be partly reversed providing that mitigation measures as stipulated in the EMP are implemented and rehabilitation measures are undertaken**
Indirect impacts:	**Loss impacted on indigenous vegetation and habitat.**
Cumulative impact prior to mitigation:	**Loss impacted on indigenous vegetation and habitat.**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**56 - Medium**
Degree to which the impact can be avoided:	**Low**
Degree to which the impact can be managed:	**High**
Degree to which the impact can be mitigated:	**Moderate**
Proposed mitigation:	**Non-perennial rivers, pans and sensitive areas as identified in this report and their buffer areas should be avoided and a no-go buffer be applied around them.** **All staff, vehicle and machinery activities should be strictly controlled at all times so as to ensure that the absolute minimum**

	of surface area is impacted. **Undertaking and completion of earthworks and road construction outside of the high rainfall period (if possible).** **Avoidance of significant sculpting of land and maintenance of the general topography of the site.** **Maintenance of a high level of housekeeping onsite during the construction phase.** **Inspection of drainage features immediately outside of the footprint of the proposed PV facility and undertakes removal of solid waste and litter on a regular basis.**
Residual impacts:	**Loss impacted on indigenous vegetation and habitat.**
Cumulative impact post mitigation:	**In terms of cumulative impacts, the construction of multiple additional facilities will result in the overall cumulative impact being HIGH negative. The cumulative impact assessment assumes the worst-case scenario of up to 7 solar facilities being constructed in this 10km radius. However, if all the mitigation measures in the EMP are adhered to, this would reduce the significance of the impacts by approximately half. This would probably result in the significance being rated as MODERATE rather than the current HIGH.**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**48 - Medium**
OPERATIONAL PHASE	
Potential impact and risk:	**Alteration of surface drainage patterns on account of construction activities leading to change in plant communities and general habitat structure** **Changes in the geomorphological state of drainage lines as hydraulic changes arise within the catchment**
Nature of impact:	**Alteration of ecological processes on account of the exclusion of certain fauna, inherent to the functional state of the land within the PV facility**
Extent and duration of impact:	**Extent 2 (On site or within 100 m of the site) & Duration 4 (>15 years)**
Consequence of impact or risk:	**Loss impacted on indigenous vegetation and habitat.**
Probability of occurrence:	**3 (Probable)**
Magnitude:	**10**
Degree to which the impact may cause irreplaceable loss of resources:	**Moderate**
Degree to which the impact can be reversed:	**The impact can be partly reversed providing that mitigation measures as stipulated in the EMP are implemented and rehabilitation measures are undertaken**
Indirect impacts:	**Loss impacted on indigenous vegetation and habitat.**
Cumulative impact prior to mitigation:	**Loss impacted on indigenous vegetation and habitat.**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**48 - Medium**
Degree to which the impact can be avoided:	**Low**
Degree to which the impact can be managed:	**High**
Degree to which the impact can be mitigated:	**Moderate**
Proposed mitigation:	**Non-perennial Graafwater River and the pan should be avoided and a no-go buffer of 100m be applied around them.** **All staff, vehicle and machinery activities should be strictly controlled at all times so as to ensure that the absolute minimum of surface area is impacted.** **Undertaking and completion of earthworks and road construction outside of the high rainfall period (if possible).** **Avoidance of significant sculpting of land and maintenance of the general topography of the site** **Maintenance of a high level of housekeeping onsite during the construction phase.** **Inspection of drainage features immediately outside of the footprint of the proposed PV facility and undertakes removal of solid waste and litter on a regular basis.**
Residual impacts:	**Loss impacted on indigenous vegetation and habitat.**
Cumulative impact post mitigation:	**In terms of cumulative impacts, the construction of multiple**

	additional facilities will result in the overall cumulative impact being HIGH negative. The cumulative impact assessment assumes the worst-case scenario of up to 7 solar facilities being constructed in this 10km radius. However, if all the mitigation measures in the EMP are adhered to, this would reduce the significance of the impacts by approximately half. This would probably result in the significance being rated as MODERATE rather than the current HIGH.
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**36 – Medium**
DECOMMISSIONING AND CLOSURE PHASE	
Potential impact and risk:	**Ecological Processes**
Nature of impact:	**Alteration of surface drainage patterns on account of construction activities leading to change in plant communities and general habitat structure** **Changes in the geomorphological state of drainage lines as hydraulic changes arise within the catchment**
Extent and duration of impact:	**Extent 2 (On site or within 100 m of the site) & Duration 1 (0 – 1 years)**
Consequence of impact or risk:	**Loss impacted on indigenous vegetation and habitat.**
Probability of occurrence:	**4 (most likely)**
Magnitude:	**10**
Degree to which the impact may cause irreplaceable loss of resources:	**High**
Degree to which the impact can be reversed:	**High**
Indirect impacts:	**Loss impacted on indigenous vegetation and habitat.**
Cumulative impact prior to mitigation:	**Loss impacted on indigenous vegetation and habitat.**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**52 - Medium**
Degree to which the impact can be avoided:	**Low**
Degree to which the impact can be managed:	**High**
Degree to which the impact can be mitigated:	**Moderate**
Proposed mitigation:	**Non-perennial rivers, pans and sensitive areas as identified in this report and their buffer areas should be avoided and a no-go buffer be applied around them.** **All staff, vehicle and machinery activities should be strictly controlled at all times so as to ensure that the absolute minimum of surface area is impacted.** **Undertaking and completion of earthworks and road construction outside of the high rainfall period (if possible).** **Avoidance of significant sculpting of land and maintenance of the general topography of the site** **Maintenance of a high level of housekeeping onsite during the construction phase.** **Inspection of drainage features immediately outside of the footprint of the proposed PV facility and undertakes removal of solid waste and litter on a regular basis.**
Residual impacts:	**Loss impacted on indigenous vegetation and habitat.**
Cumulative impact post mitigation:	**In terms of cumulative impacts, the construction of multiple additional facilities will result in the overall cumulative impact being HIGH negative. The cumulative impact assessment assumes the worst-case scenario of up to 7 solar facilities being constructed in this 20km radius. However, if all the mitigation measures in the EMP are adhered to, this would reduce the significance of the impacts by approximately half. This would probably result in the significance being rated as MODERATE rather than the current HIGH.**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**48 - Medium**

Alternative 1: Preferred Layout & Alternative 2	Ecological Impacts
PLANNING, DESIGN AND DEVELOPMENT PHASE	
Potential impact and risk:	**Changes in edaphics (soils) on account of excavation of soils, leading to the alteration of plant communities and fossorial species in and around these points.**
Nature of impact:	**Habitat change and alteration in fauna and faunal behaviour**
Extent and duration of impact:	**Extent 1 & Duration 1**
Consequence of impact or risk:	**Loss impacted on indigenous vegetation and habitat.**
Probability of occurrence:	**2 (most likely)**
Magnitude:	**2**
Degree to which the impact may cause irreplaceable loss of resources:	**Low**
Degree to which the impact can be reversed:	**The impact can be partly reversed providing that mitigation measures as stipulated in the EMP are implemented and rehabilitation measures are undertaken**
Indirect impacts:	**Loss impacted on indigenous vegetation and habitat.**
Cumulative impact prior to mitigation:	**Loss impacted on indigenous vegetation and habitat.**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**8 - Low**
Degree to which the impact can be avoided:	**Low**
Degree to which the impact can be managed:	**High**
Degree to which the impact can be mitigated:	**Moderate**
Proposed mitigation:	**Ripping of compact soils when and where extensive compaction arises**
Residual impacts:	**Loss impacted on indigenous vegetation and habitat.**
Cumulative impact post mitigation:	**Low**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**6 - Low**
OPERATIONAL PHASE	
Potential impact and risk:	**Not applicable to operational phase**
Residual impacts:	**Loss impacted on indigenous vegetation and habitat.**
DECOMMISSIONING AND CLOSURE PHASE	
Potential impact and risk:	**Not applicable**

Alternative 1: Preferred Layout & Alternative 2	Ecological Impacts
PLANNING, DESIGN AND DEVELOPMENT PHASE	
Potential impact and risk:	**Increased electrical light pollution (ELP), leading to changes in nocturnal behavioural patterns amongst fauna**
Nature of impact:	**Habitat change and alteration in fauna and Faunal behaviour**
Extent and duration of impact:	**Extent 1 & Duration 1**
Consequence of impact or risk:	**Loss of significantly impacted upon indigenous vegetation and habitat.**
Probability of occurrence:	**2 (most likely)**
Magnitude:	**2**
Degree to which the impact may cause irreplaceable loss of resources:	**Low**
Degree to which the impact can be reversed:	**The impact can be partly reversed providing that mitigation measures as stipulated in the EMP are implemented and rehabilitation measures are undertaken**
Indirect impacts:	**Loss of significantly impacted upon indigenous vegetation and habitat.**
Cumulative impact prior to mitigation:	**Loss of significantly impacted upon indigenous vegetation and habitat.**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**8 - Low**

Degree to which the impact can be avoided:	**Low**
Degree to which the impact can be managed:	**High**
Degree to which the impact can be mitigated:	**Moderate**
Proposed mitigation:	**Reduce level of lighting and placement of lighting to be judiciously considered at time of implementation**
Residual impacts:	**Loss of significantly impacted upon indigenous vegetation and habitat.**
Cumulative impact post mitigation:	**Low**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**6 - Low**
OPERATIONAL PHASE	
Potential impact and risk:	**Increased ELP, leading to changes in nocturnal behavioural patterns amongst fauna**
Nature of impact:	**Habitat change and alteration in fauna and Faunal behaviour**
Extent and duration of impact:	**Extent 1 & Duration 1**
Consequence of impact or risk:	**Loss of indigenous vegetation and habitat.**
Probability of occurrence:	**2 (most likely)**
Magnitude:	**2**
Degree to which the impact may cause irreplaceable loss of resources:	**Low**
Degree to which the impact can be reversed:	**The impact can be partly reversed providing that mitigation measures as stipulated in the EMP are implemented and rehabilitation measures are undertaken**
Indirect impacts:	**Loss of indigenous vegetation and habitat.**
Cumulative impact prior to mitigation:	**Loss of indigenous vegetation and habitat.**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**8 - Low**
Degree to which the impact can be avoided:	**Low**
Degree to which the impact can be managed:	**High**
Degree to which the impact can be mitigated:	**Moderate**
Proposed mitigation:	**Reduce level of lighting and placement of lighting to be judiciously considered at time of implementation**
Residual impacts:	**Loss of indigenous vegetation and habitat.**
Cumulative impact post mitigation:	**Low**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**6 - Low**

Alternative 1: Preferred Layout & Alternative 2	**Ecological Impacts**
PLANNING, DESIGN AND DEVELOPMENT PHASE	
Potential impact and risk:	**Exclusion or entrapment of in particular large fauna, on account of the fencing of the site.**
Nature of impact:	**Habitat change and alteration in fauna and faunal behaviour**
Extent and duration of impact:	**Extent 1 & Duration 1**
Consequence of impact or risk:	**Loss of indigenous vegetation and habitat.**
Probability of occurrence:	**2 (most likely)**
Magnitude:	**2**
Degree to which the impact may cause irreplaceable loss of resources:	**Low**
Degree to which the impact can be reversed:	**The impact can be partly reversed providing that mitigation measures as stipulated in the EMP are implemented and rehabilitation measures are undertaken**
Indirect impacts:	**Loss of indigenous vegetation and habitat.**
Cumulative impact prior to mitigation:	**Loss of indigenous vegetation and habitat.**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**8 - Low**
Degree to which the impact can be avoided:	**Low**

Degree to which the impact can be managed:	**High**
Degree to which the impact can be mitigated:	**Moderate**
Proposed mitigation:	**Ensure that the 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**
Residual impacts:	**Loss of indigenous vegetation and habitat.**
Cumulative impact post mitigation:	**Low**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**6 - Low**
OPERATIONAL PHASE	
Potential impact and risk:	**Exclusion or entrapment of in particular large fauna, on account of the fencing of the site.**
Nature of impact:	**Habitat change and alteration in fauna and faunal behaviour. 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, is likely to impact on faunal behaviour, leading to the exclusion of certain** **species and possible mortalities**
Extent and duration of impact:	**Extent 1 & Duration 1**
Consequence of impact or risk:	**Loss of indigenous vegetation and habitat.**
Probability of occurrence:	**2 (most likely)**
Magnitude:	**2**
Degree to which the impact may cause irreplaceable loss of resources:	**Low**
Degree to which the impact can be reversed:	**The impact can be partly reversed providing that mitigation measures as stipulated in the EMP are implemented and rehabilitation measures are undertaken**
Indirect impacts:	**Loss of indigenous vegetation and habitat.**
Cumulative impact prior to mitigation:	**Loss of indigenous vegetation and habitat.**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**8 - Low**
Degree to which the impact can be avoided:	**Low**
Degree to which the impact can be managed:	**High**
Degree to which the impact can be mitigated:	**Moderate**
Proposed mitigation:	**Ensure that the 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** **Provision of critter paths within the fencing should be considered in the design.** **Promote and support faunal presence and activities within the proposed PV facility**
Residual impacts:	**Loss of indigenous vegetation and habitat.**
Cumulative impact post mitigation:	**Low**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**6 - Low**

Alternative 1: Preferred Layout	**Avifauna Impacts**
PLANNING, DESIGN AND DEVELOPMENT PHASE	
Potential impact and risk:	**Habitat loss/alteration.**
Nature of impact:	**Impact of layout on birds - exclusion of bird species from habitats. Loss of habitat and disturbance of resident bird species.**
Extent and duration of impact:	**Extent 2 (On site or within 100 m of the site) & Duration 4 (>15 years)**
Consequence of impact or risk:	**Loss of significantly impacted upon indigenous vegetation and habitat.**

Probability of occurrence:	**4 (most likely)**
Magnitude:	**8**
Degree to which the impact may cause irreplaceable loss of resources:	**High**
Degree to which the impact can be reversed:	**The impact can be partly reversed providing that mitigation measures as stipulated in the EMP are implemented and rehabilitation measures are undertaken**
Indirect impacts:	**Loss of indigenous vegetation and habitat.**
Cumulative impact prior to mitigation:	**Loss of indigenous vegetation and habitat.**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**56 - Medium**
Degree to which the impact can be avoided:	**Low**
Degree to which the impact can be managed:	**High**
Degree to which the impact can be mitigated:	**Moderate**
Proposed mitigation:	**Non-perennial rivers, pans and sensitive areas as identified in this report and their buffer areas should be avoided and a no-go buffer be applied around them.** **All staff, vehicle and machinery activities should be strictly controlled at all times so as to ensure that the absolute minimum of surface area is impacted.** **Care should be taken not to introduce or 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, so as to ensure that no sensitive bird species have started breeding on or near site. If any such sites are found case specific mitigation measures will need to be designed.** **Facility lighting during construction & operation should be kept to a minimum and should make use of latest technology to ensure that light disturbance is minimised. This will also reduce the attraction of insects (and in turn insectivorous birds) to the facility.**
Residual impacts:	**Loss of significantly impacted upon indigenous vegetation and habitat.**
Cumulative impact post mitigation:	**In terms of cumulative impacts, the construction of multiple additional facilities will result in the overall cumulative impact being HIGH negative. The cumulative impact assessment assumes the worst-case scenario of up to 7 solar facilities being constructed in this 10km radius. However, if all the mitigation measures in the EMP are adhered to, this would reduce the significance of the impacts by approximately half. This would probably result in the significance being rated as MODERATE rather than the current HIGH.**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**48 - Medium**
OPERATIONAL PHASE	
Potential impact and risk:	**Habitat loss/alteration.**
Nature of impact:	**Impact of layout on birds - exclusion of bird species from habitats. Loss of habitat and disturbance of resident bird species.**
Extent and duration of impact:	**Extent 2 (On site or within 100 m of the site) & Duration 4 (>15 years)**
Consequence of impact or risk:	**Loss of indigenous vegetation and habitat.**
Probability of occurrence:	**3 (Probable)**
Magnitude:	**10**
Degree to which the impact may cause irreplaceable loss of resources:	**Moderate**
Degree to which the impact can be reversed:	**The impact can be partly reversed providing that mitigation measures as stipulated in the EMP are implemented and rehabilitation measures are undertaken**
Indirect impacts:	**Loss of indigenous vegetation and habitat.**
Cumulative impact prior to mitigation:	**Loss of indigenous vegetation and habitat.**
Significance rating of impact prior to mitigation	**48 - Medium**

(e.g. Low, Medium, Medium-High, High, or Very-High)	
Degree to which the impact can be avoided:	**Low**
Degree to which the impact can be managed:	**High**
Degree to which the impact can be mitigated:	**Moderate**
Proposed mitigation:	**None required for the impact of the facility on birds. For the impact of the birds nesting on the facility, we recommend nest management on a case by case basis under the supervision of an avifaunal specialist and in conformance with all relevant national and provincial legislation.** **We recommend that the operational phase EMP include provision for application to the provincial authority for permits for any necessary nest management.** **Facility lighting during operation should be kept to a minimum and should make use of latest technology to ensure that light disturbance is minimised. This will also reduce the attraction of insects (and in turn insectivorous birds) to the facility.**
Residual impacts:	**Loss of indigenous vegetation and habitat.**
Cumulative impact post mitigation:	**In terms of cumulative impacts, the construction of multiple additional facilities will result in the overall cumulative impact being HIGH negative. The cumulative impact assessment assumes the worst-case scenario of up to 7 solar facilities being constructed in this 10km radius. However, if all the mitigation measures in the EMP are adhered to, this would reduce the significance of the impacts by approximately half. This would probably result in the significance being rated as MODERATE rather than the current HIGH.**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**36 – Medium**
DECOMMISSIONING AND CLOSURE PHASE	
Potential impact and risk:	**Habitat loss/alteration.**
Nature of impact:	**Impact of layout on birds - exclusion of bird species from habitats. Loss of habitat and disturbance of resident bird species.**
Extent and duration of impact:	**Extent 2 (On site or within 100 m of the site) & Duration 4 (>15 years)**
Consequence of impact or risk:	**Loss of indigenous vegetation and habitat.**
Probability of occurrence:	**4 (most likely)**
Magnitude:	**8**
Degree to which the impact may cause irreplaceable loss of resources:	**High**
Degree to which the impact can be reversed:	**The impact can be partly reversed providing that mitigation measures as stipulated in the EMP are implemented and rehabilitation measures are undertaken**
Indirect impacts:	**Loss of indigenous vegetation and habitat.**
Cumulative impact prior to mitigation:	**Loss of indigenous vegetation and habitat.**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**56 - Medium**
Degree to which the impact can be avoided:	**Low**
Degree to which the impact can be managed:	**High**
Degree to which the impact can be mitigated:	**Moderate**
Proposed mitigation:	**Non-perennial rivers, pans and sensitive areas as identified in this report and their buffer areas should be avoided and a no-go buffer be applied around them.** **All staff, vehicle and machinery activities should be strictly controlled at all times so as to ensure that the absolute minimum of surface area is impacted.** **Care should be taken not to introduce or 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, so as to ensure that no sensitive bird species have started breeding on or near site. If any such sites are found case specific mitigation measures will need to be designed.**

	Facility lighting during construction & operation should be kept to a minimum and should make use of latest technology to ensure that light disturbance is minimised. This will also reduce the attraction of insects (and in turn insectivorous birds) to the facility.
Residual impacts:	**Loss of indigenous vegetation and habitat.**
Cumulative impact post mitigation:	**In terms of cumulative impacts, the construction of multiple additional facilities will result in the overall cumulative impact being HIGH negative. The cumulative impact assessment assumes the worst-case scenario of up to 7 solar facilities being constructed in this 10km radius. However, if all the mitigation measures in the EMP are adhered to, this would reduce the significance of the impacts by approximately half. This would probably result in the significance being rated as MODERATE rather than the current HIGH.**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**48 - Medium**

Alternative 2	**Avifauna Impacts**
PLANNING, DESIGN AND DEVELOPMENT PHASE	
Potential impact and risk:	**Habitat loss/alteration.**
Nature of impact:	**Note: Alternative 2's layout does not exclude Bushmanland Basin pan identified during the field survey.** **Impact of layout on birds - exclusion of bird species from habitats. Loss of habitat and disturbance of resident bird species.**
Extent and duration of impact:	**Extent 2 (On site or within 100 m of the site) & Duration 4 (>15 years)**
Consequence of impact or risk:	**Loss of indigenous vegetation and habitat.**
Probability of occurrence:	**5 Definite**
Magnitude:	**8**
Degree to which the impact may cause irreplaceable loss of resources:	**High**
Degree to which the impact can be reversed:	**The impact can be partly reversed providing that mitigation measures as stipulated in the EMP are implemented and rehabilitation measures are undertaken**
Indirect impacts:	**Loss of indigenous vegetation and habitat.**
Cumulative impact prior to mitigation:	**Loss of indigenous vegetation and habitat.**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**70 - High**
Degree to which the impact can be avoided:	**Low**
Degree to which the impact can be managed:	**High**
Degree to which the impact can be mitigated:	**Moderate**
Proposed mitigation:	**Non-perennial rivers, pans and sensitive areas as identified in this report and their buffer areas should be avoided and a no-go buffer be applied around them.** **All staff, vehicle and machinery activities should be strictly controlled at all times so as to ensure that the absolute minimum of surface area is impacted.** **Care should be taken not to introduce or 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, so as to ensure that no sensitive bird species have started breeding on or near site. If any such sites are found case specific mitigation measures will need to be designed.** **Facility lighting during construction & operation should be kept to a minimum and should make use of latest technology to ensure that light disturbance is minimised. This will also reduce the attraction of insects (and in turn insectivorous birds) to the facility.**
Residual impacts:	**Loss of indigenous vegetation and habitat.**

Cumulative impact post mitigation:	**In terms of cumulative impacts, the construction of multiple additional facilities will result in the overall cumulative impact being HIGH negative. The cumulative impact assessment assumes the worst-case scenario of up to 7 solar facilities being constructed in this 10km radius. However, if all the mitigation measures in the EMP are adhered to, this would reduce the significance of the impacts by approximately half. This would probably result in the significance being rated as MODERATE rather than the current HIGH.**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**70 - High**
OPERATIONAL PHASE	
Potential impact and risk:	**Habitat loss/alteration.**
Nature of impact:	**Note: Alternative 2's layout does not exclude Bushmanland Basin pan identified during the field survey.** **Impact of layout on birds - exclusion of bird species from habitats. Loss of habitat and disturbance of resident bird species.**
Extent and duration of impact:	**Extent 2 (On site or within 100 m of the site) & Duration 4 (>15 years)**
Consequence of impact or risk:	**Loss of indigenous vegetation and habitat.**
Probability of occurrence:	**3 (Probable)**
Magnitude:	**8**
Degree to which the impact may cause irreplaceable loss of resources:	**Moderate**
Degree to which the impact can be reversed:	**The impact can be partly reversed providing that mitigation measures as stipulated in the EMP are implemented and rehabilitation measures are undertaken**
Indirect impacts:	**Loss of indigenous vegetation and habitat.**
Cumulative impact prior to mitigation:	**Loss of indigenous vegetation and habitat.**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**42 - Medium**
Degree to which the impact can be avoided:	**Low**
Degree to which the impact can be managed:	**High**
Degree to which the impact can be mitigated:	**Moderate**
Proposed mitigation:	**None required for the impact of the facility on birds. For the impact of the birds nesting on the facility, we recommend nest management on a case by case basis under the supervision of an avifaunal specialist, and in conformance with all relevant national and provincial legislation.** **We recommend that the operational phase EMP include provision for application to the provincial authority for permits for any necessary nest management.** **Facility lighting during construction & operation should be kept to a minimum and should make use of latest technology to ensure that light disturbance is minimised. This will also reduce the attraction of insects (and in turn insectivorous birds) to the facility.**
Residual impacts:	**Loss of indigenous vegetation and habitat.**
Cumulative impact post mitigation:	**In terms of cumulative impacts, the construction of multiple additional facilities will result in the overall cumulative impact being HIGH negative. The cumulative impact assessment assumes the worst-case scenario of up to 7 solar facilities being constructed in this 10km radius. However, if all the mitigation measures in the EMP are adhered to, this would reduce the significance of the impacts by approximately half. This would probably result in the significance being rated as MODERATE rather than the current HIGH.**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**36 – Medium**
DECOMMISSIONING AND CLOSURE PHASE	
Potential impact and risk:	**Habitat loss/alteration.**

Nature of impact:	**Note: Alternative 2's layout does not exclude Bushmanland Basin pan identified during the field survey.** **Impact of layout on birds - exclusion of bird species from habitats. Loss of habitat and disturbance of resident bird species.**
Extent and duration of impact:	**Extent 2 (On site or within 100 m of the site) & Duration 4 (>15 years)**
Consequence of impact or risk:	**Loss of indigenous vegetation and habitat.**
Probability of occurrence:	**5 Definite**
Magnitude:	**8**
Degree to which the impact may cause irreplaceable loss of resources:	**High**
Degree to which the impact can be reversed:	**The impact can be partly reversed providing that mitigation measures as stipulated in the EMP are implemented and rehabilitation measures are undertaken**
Indirect impacts:	**Loss of indigenous vegetation and habitat.**
Cumulative impact prior to mitigation:	**Loss of indigenous vegetation and habitat.**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**70 - High**
Degree to which the impact can be avoided:	**Low**
Degree to which the impact can be managed:	**High**
Degree to which the impact can be mitigated:	**Moderate**
Proposed mitigation:	**Non-perennial rivers, pans and sensitive areas as identified in this report and their buffer areas should be avoided and a no-go buffer be applied around them.** **All staff, vehicle and machinery activities should be strictly controlled at all times so as to ensure that the absolute minimum of surface area is impacted.** **Care should be taken not to introduce or 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, so as to ensure that no sensitive bird species have started breeding on or near site. If any such sites are found case specific mitigation measures will need to be designed.** **Facility lighting during construction & operation should be kept to a minimum and should make use of latest technology to ensure that light disturbance is minimised. This will also reduce the attraction of insects (and in turn insectivorous birds) to the facility.**
Residual impacts:	**Loss of indigenous vegetation and habitat.**
Cumulative impact post mitigation:	**In terms of cumulative impacts, the construction of multiple additional facilities will result in the overall cumulative impact being HIGH negative. The cumulative impact assessment assumes the worst-case scenario of up to 7 solar facilities being constructed in this 10km radius. However, if all the mitigation measures in the EMP are adhered to, this would reduce the significance of the impacts by approximately half. This would probably result in the significance being rated as MODERATE rather than the current HIGH.**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**70 - High**

Alternative 1: Preferred & Alternative 2	**Avifauna Impacts**
PLANNING, DESIGN AND DEVELOPMENT PHASE	
Potential impact and risk:	**Collusion with powerlines and electrocution.**
Nature of impact:	**Loss of bird species**
Extent and duration of impact:	**Extent 2 (On site or within 100 m of the site) & Duration 4 (>15 years)**
Consequence of impact or risk:	**Loss of indigenous vegetation and habitat.**
Probability of occurrence:	**4 (most likely)**

Magnitude:	**10**
Degree to which the impact may cause irreplaceable loss of resources:	**High**
Degree to which the impact can be reversed:	**The impact can be partly reversed providing that mitigation measures as stipulated in the EMP are implemented and rehabilitation measures are undertaken**
Indirect impacts:	**Loss of indigenous vegetation and habitat.**
Cumulative impact prior to mitigation:	**Loss of indigenous vegetation and habitat.**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**64 - High**
Degree to which the impact can be avoided:	**Low**
Degree to which the impact can be managed:	**High**
Degree to which the impact can be mitigated:	**Moderate**
Proposed mitigation:	**Construct powerlines in existing and approved servitudes and routes.**
Residual impacts:	**Loss of bird species**
Cumulative impact post mitigation:	**In terms of cumulative impacts, the construction of multiple additional facilities will result in the overall cumulative impact being HIGH negative. The cumulative impact assessment assumes the worst-case scenario of up to 7 solar facilities being constructed in this 10km radius. However, if all the mitigation measures in the EMP are adhered to, this would reduce the significance of the impacts by approximately half. This would probably result in the significance being rated as MODERATE rather than the current HIGH.**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**60 - Medium**
OPERATIONAL PHASE	
Potential impact and risk:	**Collusion with powerlines and electrocution.**
Nature of impact:	**Loss of bird species**
Extent and duration of impact:	**Extent 2 (On site or within 100 m of the site) & Duration 4 (>15 years)**
Consequence of impact or risk:	**Loss of indigenous vegetation and habitat.**
Probability of occurrence:	**3 (Probable)**
Magnitude:	**10**
Degree to which the impact may cause irreplaceable loss of resources:	**Moderate**
Degree to which the impact can be reversed:	**The impact can be partly reversed providing that mitigation measures as stipulated in the EMP are implemented and rehabilitation measures are undertaken**
Indirect impacts:	**Loss of indigenous vegetation and habitat.**
Cumulative impact prior to mitigation:	**Loss of indigenous vegetation and habitat.**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**48 - Medium**
Degree to which the impact can be avoided:	**Low**
Degree to which the impact can be managed:	**High**
Degree to which the impact can be mitigated:	**Moderate**
Proposed mitigation:	**Bird monitoring is required. Bird striking's must be recorded and reflectors installed at collusion zones.**
Residual impacts:	**Loss of indigenous vegetation and habitat.**
Cumulative impact post mitigation:	**In terms of cumulative impacts, the construction of multiple additional facilities will result in the overall cumulative impact being HIGH negative. The cumulative impact assessment assumes the worst-case scenario of up to 7 solar facilities being constructed in this 10km radius. However, if all the mitigation measures in the EMP are adhered to, this would reduce the significance of the impacts by approximately half. This would probably result in the significance being rated as MODERATE rather than the current HIGH.**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**36 – Medium**

DECOMMISSIONING AND CLOSURE PHASE	
Potential impact and risk:	**Impact removed. Not applicable.**

***Usually the scores are in ascending order from 1 to 5 (site to national) but given the levels of poverty and remoteness the scores for this project has been changed to a descending order of 5 to 1 (site to national).

Alternative 1: Preferred Layout & Alternative 2	**Socio-economic**
PLANNING, DESIGN AND DEVELOPMENT PHASE	
Potential impact and risk:	**Population Influx, Community Stability and Homogeneousness**
Nature of impact:	**<u>Presence of skilled outsiders introduces job option possibilities</u> During the construction and demolition phases, the presence of skilled and semiskilled outsiders will: a) increase the population for a 2 – 3-year period, yet they will contribute to the local economy. b) introduce different job options to the local community**
Extent and duration of impact:	**2 Regional & 1 Short term**
Consequence of impact or risk:	**Temporary increase in the local population numbers.**
Probability of occurrence:	**4 – Highly probable**
Magnitude:	**4 (POSITIVE)**
Degree to which the impact may cause irreplaceable loss of resources:	**Positive**
Degree to which the impact can be reversed:	**Positive**
Indirect impacts:	**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.**
Cumulative impact prior to mitigation:	**Positive**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**28 - Low (POSITIVE)**
Degree to which the impact can be avoided:	**Positive**
Degree to which the impact can be managed:	**High**
Degree to which the impact can be mitigated:	**High**
Proposed mitigation:	**Mitigation measures Construction and Demolition Phases:** • **Contractor appointed to announce the project so that the municipality, local community and local community organizations should be informed of potential job opportunities** • **Ensure that 90% of the semi- and unskilled employees contracted by Contractor are local;** • **Of locals employed, 90% has to be previously disadvantaged;** • **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;** • **Should employees not be suitably qualified, skill transfer should take place.** • **Where suitable and appropriately qualified local employees are not available, employ females and provide the appropriate training skills transfer.** • **Involve schools to visit site during the construction phase to inspire youngsters to join the construction industry.** • **Contractor appointed to announce the project so that the municipality, local community and local community organizations should be informed of potential job opportunities** • **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. • **Contractor to act as reference for locals employed.** • **Contractor to liaise with existing or future projects to access employment for locals.**
Residual impacts:	**None**
Cumulative impact post mitigation:	**Positive**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Low**
OPERATIONAL PHASE	
Potential impact and risk:	**Not applicable**
DECOMMISSIONING AND CLOSURE PHASE	
Potential impact and risk:	**Population Influx, Community Stability and Homogeneousness**
Nature of impact:	**<u>Presence of skilled outsiders introduces job option possibilities</u>** **During the construction and demolition phases, the presence of skilled and semiskilled outsiders will:** **a) increase the population for a 2 – 3-year period, yet they will contribute to the local economy.** **b) introduce different job options to the local community**
Extent and duration of impact:	**4 Regional & 1 Short term**
Consequence of impact or risk:	**Temporary increase in the local population numbers.**
Probability of occurrence:	**4 – Highly probable**
Magnitude:	**4 (POSITIVE)**
Degree to which the impact may cause irreplaceable loss of resources:	**Positive**
Degree to which the impact can be reversed:	**Positive**
Indirect impacts:	**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.**
Cumulative impact prior to mitigation:	**Positive**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**28 - Low (POSITIVE)**
Degree to which the impact can be avoided:	**Positive**
Degree to which the impact can be managed:	**High**
Degree to which the impact can be mitigated:	**High**
Proposed mitigation:	**Mitigation measures Construction and Demolition Phases:** • **Contractor appointed to announce the project so that the municipality, local community and local community organizations should be informed of potential job opportunities** • **Ensure that 90% of the semi- and unskilled employees contracted by Contractor are local;** • **Of locals employed, 90% has to be previously disadvantaged;** • **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;** • **Should employees not be suitably qualified, skill transfer should take place.** • **Where suitable and appropriately qualified local employees are not available, employ females and provide the appropriate training skills transfer.** • **Involve schools to visit site during the construction phase to inspire youngsters to join the construction industry.** • **Contractor appointed to announce the project so that the municipality, local community and local community**

	organizations should be informed of potential job opportunities • **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.** • **Contractor to act as reference for locals employed.** • **Contractor to liaise with existing or future projects to access employment for locals.**
Residual impacts:	**None**
Cumulative impact post mitigation:	**Positive**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Low**

Alternative 1: Preferred Layout & Alternative 2	**Socio-economic**
PLANNING, DESIGN AND DEVELOPMENT PHASE	
Potential impact and risk:	**Influx of Unemployed People. Increase in local population numbers and presence of unemployed outsiders looking for work.**
Nature of impact:	**<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 is sellable material encouraging unemployed to migrate to Kenhardt.**
Extent and duration of impact:	**3 Local & 1 Short term**
Consequence of impact or risk:	**The influx of unemployed persons will cause a degree of social instability of the local community.**
Probability of occurrence:	**4 – Highly probable**
Magnitude:	**2**
Degree to which the impact may cause irreplaceable loss of resources:	**R**
Degree to which the impact can be reversed:	**PR**
Indirect impacts:	**Crime**
Cumulative impact prior to mitigation:	**Social instability**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**24 – Low**
Degree to which the impact can be avoided:	**Low**
Degree to which the impact can be managed:	**Medium**
Degree to which the impact can be mitigated:	**Low**
Proposed mitigation:	**None**
Residual impacts:	**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. 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.**
Cumulative impact post mitigation:	**Low**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Low**
OPERATIONAL PHASE	

Potential impact and risk:	**Influx of Unemployed People. Increase in local population numbers and presence of unemployed outsiders looking for work.**
Nature of impact:	**<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 is sellable material encouraging unemployed to migrate to Kenhardt.**
Extent and duration of impact:	**3 Local & 4 Long term**
Consequence of impact or risk:	**The influx of unemployed persons will cause a degree of social instability of the local community.**
Probability of occurrence:	**3 – Probable**
Magnitude:	**2**
Degree to which the impact may cause irreplaceable loss of resources:	**R**
Degree to which the impact can be reversed:	**PR**
Indirect impacts:	**Crime**
Cumulative impact prior to mitigation:	**Social instability**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**27 – Low**
Degree to which the impact can be avoided:	**Low**
Degree to which the impact can be managed:	**Medium**
Degree to which the impact can be mitigated:	**Low**
Proposed mitigation:	**None**
Residual impacts:	**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. 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.**
Cumulative impact post mitigation:	**Low**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Low**
DECOMMISSIONING AND CLOSURE PHASE	
Potential impact and risk:	**Influx of Unemployed People. Increase in local population numbers and presence of unemployed outsiders looking for work.**
Nature of impact:	**<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 is sellable material encouraging unemployed to migrate to Kenhardt.**
Extent and duration of impact:	**3 Local & 1 Short term**
Consequence of impact or risk:	**The influx of unemployed persons will cause a degree of social instability of the local community.**
Probability of occurrence:	**4 – Highly probable**

Magnitude:	**2**
Degree to which the impact may cause irreplaceable loss of resources:	**R**
Degree to which the impact can be reversed:	**PR**
Indirect impacts:	**Crime**
Cumulative impact prior to mitigation:	**Social instability**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**24 – Low**
Degree to which the impact can be avoided:	**Low**
Degree to which the impact can be managed:	**Medium**
Degree to which the impact can be mitigated:	**Low**
Proposed mitigation:	**Keep security employed until demolition is completed to prohibit the erection of temporary structures.**
Residual impacts:	**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. 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.**
Cumulative impact post mitigation:	**Low**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Low**

Alternative 1: Preferred Layout & Alternative 2	**Socio-economic**
PLANNING, DESIGN AND DEVELOPMENT PHASE	
Potential impact and risk:	**Skills development, training and capacity building are offered.**
Nature of impact:	**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.** **<u>Skills base of local population expands and deepens.</u>** **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.**

Extent and duration of impact:	**3 local & 4 long term**
Consequence of impact or risk:	**Increase in household income**
Probability of occurrence:	**3 – Probable**
Magnitude:	**6**
Degree to which the impact may cause irreplaceable loss of resources:	**Positive**
Degree to which the impact can be reversed:	**Positive**
Indirect impacts:	**Economic growth**
Cumulative impact prior to mitigation:	**Positive**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**39 – Medium (POSITIVE)**
Degree to which the impact can be avoided:	**Positive**
Degree to which the impact can be managed:	**Positive**
Degree to which the impact can be mitigated:	**Positive**
Proposed mitigation:	**Mitigation measures during the Construction Phase:** **Requires contractor to** • **Reserve 90% of the unskilled jobs for local labour.** • **Apply mechanisms to enable locals to access jobs offered during the construction phase.** • **Offer formal and informal skills transfer:** • **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 University of Technology.**
Residual impacts:	**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.**
Cumulative impact post mitigation:	
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**High (POSITIVE)** **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.**
OPERATIONAL PHASE	
Potential impact and risk:	**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.**
DECOMMISSIONING AND CLOSURE PHASE	
Potential impact and risk:	**Not applicable (as above).**

Alternative 1: Preferred Layout & Alternative 2	**Socio-economic**
PLANNING, DESIGN AND DEVELOPMENT PHASE	
Potential impact and risk:	**Employment is generated**
Nature of impact:	**The average number of direct jobs the development will create over a period of two years is 381 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. **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 ±R216 million. Of this amount 90% or R194 788 800 (R195 million) should benefit the local and regional community over three years (R64.93million per annum). However, the employment of contract workers or outside job seekers may have an impact on the community stability and homogeneousness. Conflict between locals and outsiders may be experienced given the unemployment rate (10% of employable population) in Kai! Garib Municipality.** **At a local level as many as 321 out of 295 unemployed people could be employed. Thus, as all the locally unemployed could be employed, the community rates creating jobs as highly significant.** **90% of 213 jobs in the unskilled category and 144 Jobs in the semi-skilled** **category (thus 192 and 130) being created, will be earmarked for locals.**
Extent and duration of impact:	**3 Local & 1 Short term**
Consequence of impact or risk:	**Increase in household income levels**
Probability of occurrence:	**4 – High probability**
Magnitude:	**8 (POSITIVE)**
Degree to which the impact may cause irreplaceable loss of resources:	**R**
Degree to which the impact can be reversed:	**Positive**
Indirect impacts:	**Improves economy**
Cumulative impact prior to mitigation:	**Positive**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**48 – Medium (POSITIVE)**
Degree to which the impact can be avoided:	**Positive**
Degree to which the impact can be managed:	**Medium**
Degree to which the impact can be mitigated:	**Positive**
Proposed mitigation:	**· Contractor should be required to employ 90% (322) local and at least 90% (290) 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.** **· The municipality, local community and local community organizations should be informed of the project and potential job opportunities by the developer;** **· 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;** **· 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.**
Residual impacts:	**None**
Cumulative impact post mitigation:	**Positive**
Significance rating of impact after mitigation	**Medium (POSITIVE)**

(e.g. Low, Medium, Medium-High, High, or Very-High)	
OPERATIONAL PHASE	
Potential impact and risk:	**Employment is generated**
Nature of impact:	**The proposed development will generate 80 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.** **Jobs (80 or less) will be created, benefitting locals. The formal jobs will involve maintenance and cleaning the solar facility.**
Extent and duration of impact:	**3 Local & 4 Long term**
Consequence of impact or risk:	**Increase in household income levels**
Probability of occurrence:	**3 – Probable**
Magnitude:	**2**
Degree to which the impact may cause irreplaceable loss of resources:	**R**
Degree to which the impact can be reversed:	**Positive**
Indirect impacts:	**Improves economy**
Cumulative impact prior to mitigation:	**Positive**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**27 – Low (POSITIVE)**
Degree to which the impact can be avoided:	**Positive**
Degree to which the impact can be managed:	**Medium**
Degree to which the impact can be mitigated:	**Positive**
Proposed mitigation:	**· Jobs are reserved for youth.** **· Youth are afforded an opportunity to enhance their skills and/ or improve their education.** **· Youth are afforded opportunity to access start up or seed capital to establish own businesses.**
Residual impacts:	**None**
Cumulative impact post mitigation:	**Positive**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Low (POSITIVE)**
DECOMMISSIONING AND CLOSURE PHASE	
Potential impact and risk:	
Nature of impact:	**During the demolition phase the impact rates low at regional level and medium at local level. No mitigation is proposed. Some jobs are generated during the Demolition Phase, but the involvement of locals stay limited and the impact rates low.**
Extent and duration of impact:	**3 Local & 1 Short term**
Consequence of impact or risk:	**Increase in household income levels**
Probability of occurrence:	**3 – Probable**
Magnitude:	**4**
Degree to which the impact may cause irreplaceable loss of resources:	**R**
Degree to which the impact can be reversed:	**Positive**
Indirect impacts:	**Improves economy**
Cumulative impact prior to mitigation:	**Positive**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**25 – Low (POSITIVE)**
Degree to which the impact can be avoided:	**Positive**
Degree to which the impact can be managed:	**Medium**
Degree to which the impact can be mitigated:	**Positive**
Proposed mitigation:	**None**
Residual impacts:	**None**

Cumulative impact post mitigation:	**Positive**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Low (POSITIVE)**

Alternative 1: Preferred Layout & Alternative 2	**Socio-economic**
PLANNING, DESIGN AND DEVELOPMENT PHASE	
Potential impact and risk:	**Demand for services increases**
Nature of impact:	**<u>Increased uptake of services and less reserves</u>** **Demand for services may increase slightly and emergency capacity is required to cope with any construction related accidents.** **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.**
Extent and duration of impact:	**3 Local & 1 Short term**
Consequence of impact or risk:	**Strain on infrastructure**
Probability of occurrence:	**3 – Probable**
Magnitude:	**2**
Degree to which the impact may cause irreplaceable loss of resources:	**R**
Degree to which the impact can be reversed:	**PR**
Indirect impacts:	**Nuisance**
Cumulative impact prior to mitigation:	**Strain on municipal services**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**18 – Low**
Degree to which the impact can be avoided:	**Medium**
Degree to which the impact can be managed:	**Medium**
Degree to which the impact can be mitigated:	**Medium**
Proposed mitigation:	**Mitigation measures:** **· To adhere to international construction, health and safety standards and precaution measures.** **· To provide health and social training for the project team and in the community, which include HIV/AIDs awareness training.** **· Foreign employees are restricted to limited work cycles and have to return home regularly.**
Residual impacts:	**Dissimilar social practices (undesirable sexual behaviour).**
Cumulative impact post mitigation:	**Strain on municipal services**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Low** **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 coped with similar impacts on health amenities and municipal services during projects of the same scale. In future, additional pressure may be placed on community health services to deal with the consequences of dissimilar social practices (i.e. undesirable sexual behaviour 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.**

OPERATIONAL PHASE	
Potential impact and risk:	**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.**
DECOMMISSIONING AND CLOSURE PHASE	
Potential impact and risk:	**Not applicable**

Alternative 1: Preferred Layout & Alternative 2	**Socio-economic**
PLANNING, DESIGN AND DEVELOPMENT PHASE	
Potential impact and risk:	**Increase in regular and heavy, slow moving traffic**
Nature of impact:	**<u>Disruption and changes in movement patterns and road safety</u> Traffic will increase 52 veh/h 2x per day. 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 13 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 (8) taxis will drop and pick up employees as will three (4) busses and thirty-seven (37) private vehicles. It is unlikely that the increased traffic (39 veh/hour) will impact on the movement patterns of pedestrians. An increase of 52 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.**
Extent and duration of impact:	**3 Local & 1 Short rem**
Consequence of impact or risk:	**Increased traffic**
Probability of occurrence:	**3 – Probable**
Magnitude:	**4**
Degree to which the impact may cause irreplaceable loss of resources:	**R**
Degree to which the impact can be reversed:	**R**
Indirect impacts:	**Vehicular accidents**
Cumulative impact prior to mitigation:	**Low**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**24 – Low**
Degree to which the impact can be avoided:	**Low**
Degree to which the impact can be managed:	**Medium**
Degree to which the impact can be mitigated:	**Medium**
Proposed mitigation:	**· Upgrade road signs to address the conflict that could be caused by movement. · Provide transport to and from work to decrease pedestrian traffic. · Restrict heavy vehicles to specific hours. · Erect road signs signalling times when heavy vehicles will make use of the road. · Adhere to national traffic safety standards and precaution measures. · 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.**
Residual impacts:	**Increase in pedestrian traffic along R27 into Kenhardt and on the gravel road between Pofadder and R27**

Cumulative impact post mitigation:	**Low**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Low** **The intensity of the impact caused by the increase of traffic is of low significance but negative. Mitigation measures will decrease the negative experience.**
OPERATIONAL PHASE	
Potential impact and risk:	**Increase in regular and heavy, slow moving traffic**
Nature of impact:	**<u>Disruption and changes in movement patterns and road safety</u>** **Traffic will increase 13 veh/h 2x per day.** **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 15 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.**
Extent and duration of impact:	**3 Local & 4 Long term**
Consequence of impact or risk:	**Increased traffic**
Probability of occurrence:	**3 – Probable**
Magnitude:	**2**
Degree to which the impact may cause irreplaceable loss of resources:	**R**
Degree to which the impact can be reversed:	**R**
Indirect impacts:	**Vehicular accidents**
Cumulative impact prior to mitigation:	**Low**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**27 – Low**
Degree to which the impact can be avoided:	**Low**
Degree to which the impact can be managed:	**Medium**
Degree to which the impact can be mitigated:	**Medium**
Proposed mitigation:	**None**
Residual impacts:	**Increase in pedestrian traffic along R27 into Kenhardt and on the gravel road between Pofadder and R27.**
Cumulative impact post mitigation:	**Low**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Low**
DECOMMISSIONING AND CLOSURE PHASE	
Potential impact and risk:	**Increase in regular and heavy, slow moving traffic**
Nature of impact:	**<u>Disruption and changes in movement patterns and road safety</u>** **Traffic will increase 28veh/h 2x per day** **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 15 vehicle trips transporting people and 13 vehicle trips to transport material, will be made during AM and PM peak hour totalling twenty-eight (28) trips per day. An increase of 28 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.
Extent and duration of impact:	**3 Local & 1 Short rem**
Consequence of impact or risk:	**Increased traffic**
Probability of occurrence:	**3 – Probable**
Magnitude:	**4**
Degree to which the impact may cause irreplaceable loss of resources:	**R**
Degree to which the impact can be reversed:	**R**
Indirect impacts:	**Vehicular accidents**
Cumulative impact prior to mitigation:	**Low**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**24 – Low**
Degree to which the impact can be avoided:	**Low**
Degree to which the impact can be managed:	**Medium**
Degree to which the impact can be mitigated:	**Medium**
Proposed mitigation:	**· Upgrade road signs to address the conflict that could be caused by movement.** **· Provide transport to and from work to decrease pedestrian traffic.** **· Restrict heavy vehicles to specific hours.** **· Erect road signs signalling times when heavy vehicles will make use of the road.** **· Adhere to national traffic safety standards and precaution measures.** **· 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.**
Residual impacts:	**Increase in pedestrian traffic along R27 into Kenhardt and on the gravel road between Pofadder and R27**
Cumulative impact post mitigation:	**Low**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Low** **The intensity of the impact caused by the increase of traffic is of low significance but negative. Mitigation measures will decrease the negative experience.**

Alternative 1: Preferred Layout & Alternative 2	**Socio-economic**
PLANNING, DESIGN AND DEVELOPMENT PHASE	
Potential impact and risk:	**Crime increases**
Nature of impact:	**<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.** **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.**
Extent and duration of impact:	**3 Local & 1 Short term**
Consequence of impact or risk:	**Crime rates increase**
Probability of occurrence:	**2 – Improbable**
Magnitude:	**2**

Degree to which the impact may cause irreplaceable loss of resources:	**R**
Degree to which the impact can be reversed:	**R**
Indirect impacts:	**Impacts on local community**
Cumulative impact prior to mitigation:	**Low**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**12 – Low**
Degree to which the impact can be avoided:	**Low**
Degree to which the impact can be managed:	**Medium**
Degree to which the impact can be mitigated:	**Medium**
Proposed mitigation:	**· Fine structures for livestock theft** **· Restrict movement to inside the site.** **· Demarcate work areas which are safeguarded with a fence.** **· Keep security control to enter and exit premise.**
Residual impacts:	**None**
Cumulative impact post mitigation:	**Low**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Low**
OPERATIONAL PHASE	
Potential impact and risk:	**Not applicable**
DECOMMISSIONING AND CLOSURE PHASE	
Potential impact and risk:	**Not applicable**

Alternative 1: Preferred Layout & Alternative 2	**Socio-economic**
PLANNING, DESIGN AND DEVELOPMENT PHASE	
Potential impact and risk:	**Health and Social Well-Being-Noise and dust levels increase**
Nature of impact:	**<u>Health and well-being of the local population may be affected</u>** **Sporadic & intensified dust & 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. The location of the proposed solar facility is removed from the town environment and will not cause an impact on the receiving community.** **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.**
Extent and duration of impact:	**3 Local & 1 Short term**
Consequence of impact or risk:	**Nuisance**
Probability of occurrence:	**3 -Probable**
Magnitude:	**2**
Degree to which the impact may cause irreplaceable loss of resources:	**R**
Degree to which the impact can be reversed:	**CR**
Indirect impacts:	**Health impacts**
Cumulative impact prior to mitigation:	**Low**
Significance rating of impact prior to mitigation	**Low**

(e.g. Low, Medium, Medium-High, High, or Very-High)	
Degree to which the impact can be avoided:	**High**
Degree to which the impact can be managed:	**High**
Degree to which the impact can be mitigated:	**High**
Proposed mitigation:	**· Dust creation must be controlled as per construction and demolition management and control code.** **· Noise creation should be controlled as per construction and demolition management and control code.** **· Appoint an Environmental Control Officer to supervise construction and building and demolition.** **· Adhere to the Environmental Management Plan (EMPr) for the Construction and Demolition Phase.** **· All workers and management must undergo an induction course for both phases.** **· 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 must be removed off site.** **Divert impact to make Kenhardt the focus point:** **a) 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.** **b) Plant indigenous and historic alien (that is currently part of the urban landscape) trees.**
Residual impacts:	**None**
Cumulative impact post mitigation:	**Low**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Low** **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 neighbourhoods. Mitigation will neutralize the impact as the intensity decreases and the likelihood of the impact to occur becomes less.**
OPERATIONAL PHASE	
Potential impact and risk:	**Noise and dust will not be generated during the operational phase.**
DECOMMISSIONING AND CLOSURE PHASE	
Potential impact and risk:	**Health and Social Well-Being-Noise and dust levels increase**
Nature of impact:	**<u>Health and well-being of the local population may be affected</u>** **Sporadic & intensified dust & 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.** **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.**
Extent and duration of impact:	**3 Local & 1 Short term**
Consequence of impact or risk:	**Nuisance**

Probability of occurrence:	**3 -Probable**
Magnitude:	**2**
Degree to which the impact may cause irreplaceable loss of resources:	**R**
Degree to which the impact can be reversed:	**CR**
Indirect impacts:	**Health impacts**
Cumulative impact prior to mitigation:	**Low**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Low**
Degree to which the impact can be avoided:	**High**
Degree to which the impact can be managed:	**High**
Degree to which the impact can be mitigated:	**High**
Proposed mitigation:	**· Dust creation must be controlled as per construction and demolition management and control code.** **· Noise creation should be controlled as per construction and demolition management and control code.** **· Appoint an Environmental Control Officer to supervise construction and building and demolition.** **· Adhere to the Environmental Management Plan (EMPr) for the Construction and Demolition Phase.** **· All workers and management must undergo an induction course for both phases.** **· 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 must be removed off site.** **Divert impact to make Kenhardt the focus point:** **a) 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.** **b) Plant indigenous and historic alien (that is currently part of the urban landscape) trees.**
Residual impacts:	**None**
Cumulative impact post mitigation:	**Low**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Low** **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 neighbourhoods. Mitigation will neutralize the impact as the intensity decreases and the likelihood of the impact to occur becomes less.**

Alternative 1: Preferred Layout & Alternative 2	**Socio-economic**
PLANNING, DESIGN AND DEVELOPMENT PHASE	
Potential impact and risk:	**Changes in visual appearance and the sense of place** **The change of sense of place will impact on people's relationship to environment.**
Nature of impact:	**<u>Changes in the quality of the living environment</u>** **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.**
Extent and duration of impact:	**3 Local & 1 Short term**
Consequence of impact or risk:	**Loss of sense of place**
Probability of occurrence:	**4 – Highly probable**
Magnitude:	**2**
Degree to which the impact may cause irreplaceable	**PR**

loss of resources:	
Degree to which the impact can be reversed:	**R**
Indirect impacts:	**None**
Cumulative impact prior to mitigation:	**Low**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**24 – Low**
Degree to which the impact can be avoided:	**Low**
Degree to which the impact can be managed:	**Low**
Degree to which the impact can be mitigated:	**Low**
Proposed mitigation:	**- 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.** **- Outdoor lighting must be strictly controlled so as to prevent 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 buildings or structures i.e. steel frames.** **- Use only minimum wattage light fixtures.**
Residual impacts:	**None**
Cumulative impact post mitigation:	**Low**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Low**
OPERATIONAL PHASE	
Potential impact and risk:	**Changes in visual appearance and the sense of place** **The change of sense of place will impact on people's relationship to environment.**
Nature of impact:	**<u>Changes in the quality of the living environment</u>** **The visual environment of the area will change as the impact is direct and additive.**
Extent and duration of impact:	**3 Local & 4 Long term**
Consequence of impact or risk:	**Loss of sense of place**
Probability of occurrence:	**4 – Highly probable**
Magnitude:	**10**
Degree to which the impact may cause irreplaceable loss of resources:	**PR**
Degree to which the impact can be reversed:	**R**
Indirect impacts:	**None**
Cumulative impact prior to mitigation:	**High**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**80 – High**
Degree to which the impact can be avoided:	**Low**
Degree to which the impact can be managed:	**Low**
Degree to which the impact can be mitigated:	**Low**
Proposed mitigation:	**· The use of lighting is 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:** **a) Amplify the Eucalyptus Trees at corner of Main and Lourens**

	Street as a focus point; **b) Link older precinct to one another i.e. Brussels street** **c) Plant indigenous and historic alien (that is currently part of the urban landscape) trees.**
Residual impacts:	**None**
Cumulative impact post mitigation:	**Renewable energy facilities tend to 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. Renewable energy facilities tend to 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.**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Medium**
DECOMMISSIONING AND CLOSURE PHASE	
Potential impact and risk:	**Changes in visual appearance and the sense of place** **The change of sense of place will impact on people's relationship to environment.**
Nature of impact:	**Changes in the quality of the living environment** **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.**
Extent and duration of impact:	**3 Local & 4 Long term**
Consequence of impact or risk:	**Loss of sense of place**
Probability of occurrence:	**3 - Probable**
Magnitude:	**8**
Degree to which the impact may cause irreplaceable loss of resources:	**PR**
Degree to which the impact can be reversed:	**R**
Indirect impacts:	**None**
Cumulative impact prior to mitigation:	**Medium**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**45 – Medium**
Degree to which the impact can be avoided:	**Low**
Degree to which the impact can be managed:	**Low**
Degree to which the impact can be mitigated:	**Low**
Proposed mitigation:	**Ensure that demolition is made a condition of development and form part of Environmental Management Programme**
Residual impacts:	**None**
Cumulative impact post mitigation:	**Neutral**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Neutral**

Alternative 1: Preferred Layout & Alternative 2	**Socio-economic**
PLANNING, DESIGN AND DEVELOPMENT PHASE	
Potential impact and risk:	**Economic and Material Wellbeing – Inaccessibility and loss of heritage resources**
Nature of impact:	**Loss historic cultural changes and tourism opportunities**
Extent and duration of impact:	**3 Local & 1 Short term**
Consequence of impact or risk:	**Loss of heritage resources**
Probability of occurrence:	**4 – Highly probable**
Magnitude:	**2**
Degree to which the impact may cause irreplaceable loss of resources:	**PR**
Degree to which the impact can be reversed:	**IR**

Indirect impacts:	**Loss of historical heritage**
Cumulative impact prior to mitigation:	**Low**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**24 – Low**
Degree to which the impact can be avoided:	**Low**
Degree to which the impact can be managed:	**Medium**
Degree to which the impact can be mitigated:	**Medium**
Proposed mitigation:	• **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.** • **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 endeavour could become one of the local youth driven businesses.** • **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 (>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.** • **A chance-find procedure should be implemented**
Residual impacts:	**None**
Cumulative impact post mitigation:	**Low**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Low**
OPERATIONAL PHASE	
Potential impact and risk:	**Economic and Material Wellbeing – Inaccessibility and loss of heritage resources**
Nature of impact:	**Loss historic cultural changes and tourism opportunities**
Extent and duration of impact:	**3 Local & 4 Long term**
Consequence of impact or risk:	**Loss of heritage resources**
Probability of occurrence:	**3 - Probable**
Magnitude:	**6**
Degree to which the impact may cause irreplaceable loss of resources:	**PR**
Degree to which the impact can be reversed:	**IR**
Indirect impacts:	**Loss of historical heritage**
Cumulative impact prior to mitigation:	**Low**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**39 – Medium**
Degree to which the impact can be avoided:	**Low**
Degree to which the impact can be managed:	**Medium**
Degree to which the impact can be mitigated:	**Medium**
Proposed mitigation:	• **A chance-find procedure should be implemented** • **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.**
Residual impacts:	**None**
Cumulative impact post mitigation:	**Low**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Low**
DECOMMISSIONING AND CLOSURE PHASE	

Potential impact and risk:	**Economic and Material Wellbeing – Inaccessibility and loss of heritage resources**
Nature of impact:	**Loss historic cultural changes and tourism opportunities**
Extent and duration of impact:	**3 Local & 4 Long term**
Consequence of impact or risk:	**Loss of heritage resources**
Probability of occurrence:	**4 – Highly probable**
Magnitude:	**10**
Degree to which the impact may cause irreplaceable loss of resources:	**PR**
Degree to which the impact can be reversed:	**IR**
Indirect impacts:	**Loss of historical heritage**
Cumulative impact prior to mitigation:	**Low**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**68 – High**
Degree to which the impact can be avoided:	**Low**
Degree to which the impact can be managed:	**Medium**
Degree to which the impact can be mitigated:	**Medium**
Proposed mitigation:	**The trails and archaeological 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.**
Residual impacts:	**None**
Cumulative impact post mitigation:	**Low**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Medium** **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.**

Alternative 1: Preferred Layout & Alternative 2	**Socio-economic**
PLANNING, DESIGN AND DEVELOPMENT PHASE	
Potential impact and risk:	**Economic and Material Wellbeing – Competing Uses of Water**
Nature of impact:	**<u>Lack of water as domestic resource</u>** **Competing uses i.e. industrial and agricultural can adversely affect water sources and availability for domestic use. Kenhardt'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.**
Extent and duration of impact:	**3 Local & 1 Short term**
Consequence of impact or risk:	**Inadequate water supply**
Probability of occurrence:	**3 – Probable**
Magnitude:	**2**
Degree to which the impact may cause irreplaceable loss of resources:	**PR**
Degree to which the impact can be reversed:	**PR**
Indirect impacts:	**Impacts of surrounding agriculture**
Cumulative impact prior to mitigation:	**Low**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**18 – Low**
Degree to which the impact can be avoided:	**High**
Degree to which the impact can be managed:	**High**
Degree to which the impact can be mitigated:	**High**
Proposed mitigation:	**- Where required and applicable harvest rain water to clean panels.** **- Use recycled/ grey water for dust suppression.** **- 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**
Residual impacts:	**None**
Cumulative impact post mitigation:	**Low**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Low** **The impact of the proposed solar facility is low negative before and after mitigation during the construction phase.**
OPERATIONAL PHASE	
Potential impact and risk:	**Economic and Material Wellbeing – Competing Uses of Water**
Nature of impact:	**<u>Lack of water as domestic resource</u>** **Competing uses i.e. industrial and agricultural can adversely affect water sources and availability for domestic use. Kenhardt'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.**
Extent and duration of impact:	**3 Local & 4 Long term**
Consequence of impact or risk:	**Inadequate water supply**
Probability of occurrence:	**3 – Probable**
Magnitude:	**6**
Degree to which the impact may cause irreplaceable loss of resources:	**PR**
Degree to which the impact can be reversed:	**PR**
Indirect impacts:	**Impacts of surrounding agriculture**
Cumulative impact prior to mitigation:	**Low**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**39 – Medium**
Degree to which the impact can be avoided:	**High**
Degree to which the impact can be managed:	**High**
Degree to which the impact can be mitigated:	**High**
Proposed mitigation:	**- Implement self-cleaning technology** **- Where required and applicable harvest rain water to clean panels.** **- 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**
Residual impacts:	**None**
Cumulative impact post mitigation:	**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.**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Low** **During operations, the impact is medium negative before mitigation and change to low negative after mitigation.** **The mitigation measures are neutralizing competing uses.**
DECOMMISSIONING AND CLOSURE PHASE	
Potential impact and risk:	**Not applicable**

Alternative 1: Preferred Layout & Alternative 2	**Socio-economic**
PLANNING, DESIGN AND DEVELOPMENT PHASE	
Potential impact and risk:	**Economic and Material Wellbeing – Soil and Ecological potential** **- Alteration of soil profile and ecological processes**

Nature of impact:	**Geotechnical condition will not change:** **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.** **Ecological processes will alter as:** **Water (drainage) and sunlight (shading) availability change and habitat structure and composition alter.** **Changes in soils leading to loss of vegetation and habitat alter ecological processes.** **i.e. nocturnal patterns, exclusion or entrapment alter fauna and faunal behaviour, collusion with powerlines, solar panels (mistaken for water) and electrocution cause bird fatalities.**
Extent and duration of impact:	**3 Local & 1 Short term**
Consequence of impact or risk:	**Habitat alternation**
Probability of occurrence:	**3 – Probable**
Magnitude:	**4**
Degree to which the impact may cause irreplaceable loss of resources:	**PR**
Degree to which the impact can be reversed:	**PR**
Indirect impacts:	**Impact on fauna and flora**
Cumulative impact prior to mitigation:	**Low**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**24 – Low**
Degree to which the impact can be avoided:	**Medium**
Degree to which the impact can be managed:	**Medium**
Degree to which the impact can be mitigated:	**Medium**
Proposed mitigation:	**Geotechnical** **Conventional galvanising of steel frames and pedestals should be applied to protect critical elements in contact with the ground from corrosion.** **Alteration of habitat structure and composition** **· 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 plan 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 behaviour** **· 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** **o Non-perennial Graafwater River and pan should be avoided and a no-go buffer of 100 should be applied.** **o Staff and Vehicles to be kept off pan and restricted movement**

	otherwise i.e. keeping on existing roads. **o Prohibit propagate alien plan species / weeds during construction** **o 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.** **o 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.** **o 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**
Residual impacts:	**None**
Cumulative impact post mitigation:	**Low**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Neutral**
OPERATIONAL PHASE	
Potential impact and risk:	**Economic and Material Wellbeing – Soil and Ecological potential - Alteration of soil profile and ecological processes**
Nature of impact:	**Geotechnical condition will not change:** **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.** **Ecological processes will alter as:** **Water (drainage) and sunlight (shading) availability change and habitat structure and composition alter.** **Changes in soils leading to loss of vegetation and habitat alter ecological processes.** **i.e. nocturnal patterns, exclusion or entrapment alter fauna and faunal behaviour, collusion with powerlines, solar panels (mistaken for water) and electrocution cause bird fatalities.**
Extent and duration of impact:	**3 Local & 4 Long term**
Consequence of impact or risk:	**Habitat alternation**
Probability of occurrence:	**3 – Probable**
Magnitude:	**6**
Degree to which the impact may cause irreplaceable loss of resources:	**PR**
Degree to which the impact can be reversed:	**PR**
Indirect impacts:	**Impact on fauna and flora**
Cumulative impact prior to mitigation:	**Low**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**39 – Medium**
Degree to which the impact can be avoided:	**Medium**
Degree to which the impact can be managed:	**Medium**
Degree to which the impact can be mitigated:	**Medium**
Proposed mitigation:	**Geotechnical** **Conventional galvanising of steel frames and pedestals should be applied to protect critical elements in contact with the ground from corrosion.** **Alteration of habitat structure and composition** **· 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 plan 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 behaviour** **· 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** **o Non-perennial Graafwater River and pan should be avoided and a no-go buffer of 100 m should be applied.** **o Staff and Vehicles to be kept off pan and restricted movement otherwise i.e. keeping on existing roads.** **o Prohibit propagate alien plan species / weeds during construction** **o 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.** **o 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.** **o 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.**
Residual impacts:	**None**
Cumulative impact post mitigation:	**Low**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Neutral**
DECOMMISSIONING AND CLOSURE PHASE	
Potential impact and risk:	**Not applicable**

Alternative 1: Preferred Layout & Alternative 2	**Socio-economic**
PLANNING, DESIGN AND DEVELOPMENT PHASE	
Potential impact and risk:	**Economic and Material Wellbeing – Agricultural potential changes**
Nature of impact:	**Change of economic sector.** **Impacts occurring during** **Construction Phase:** **- 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. **- 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.** **- 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.** **- 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.** **- Disturbances of and impacts on ESKOM power supply**
Extent and duration of impact:	**3 Local & 1 Short term**
Consequence of impact or risk:	**Impact on agriculture**
Probability of occurrence:	**4 – Highly probable**
Magnitude:	**2**
Degree to which the impact may cause irreplaceable loss of resources:	**PR**
Degree to which the impact can be reversed:	**R**
Indirect impacts:	**Impact on the livelihoods**
Cumulative impact prior to mitigation:	**Low**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**24 – Low**
Degree to which the impact can be avoided:	**Medium**
Degree to which the impact can be managed:	**Medium**
Degree to which the impact can be mitigated:	**Medium**
Proposed mitigation:	**None**
Residual impacts:	**Change of economic sectors contributing to the GDP**
Cumulative impact post mitigation:	**Low**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Low** **The impact on the agricultural potential of the farm is low negative during construction.**
OPERATIONAL PHASE	
Potential impact and risk:	**Economic and Material Wellbeing – Agricultural potential changes**
Nature of impact:	**Change of economic sector.** **Impacts occurring during** **Operational Phase:** **- Effect of zero sunlight on specific areas – unlikely to occur as sunlight can penetrate in between the panels.** **- 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.** **- Fire** **- Sense of place** **- Impact on existing agricultural activities: The proposed facility will improve the economic viability of the agricultural land unit. The agricultural entity consists of 6 units 7011ha in extend. This land carries 600 ewes and has a carrying capacity of 12ha per small stock unit. The farmer currently stocks 59 ewes on this cadastre. The sterilization of the 600ha area will allow the farmer to stock 10 ewes on this section of the farm.** **- 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.**
Extent and duration of impact:	**3 Local & 4 Long term**
Consequence of impact or risk:	**Impact on agriculture**

Probability of occurrence:	**3 - Probable**
Magnitude:	**2**
Degree to which the impact may cause irreplaceable loss of resources:	**PR**
Degree to which the impact can be reversed:	**R**
Indirect impacts:	**Impact on the livelihoods**
Cumulative impact prior to mitigation:	**Low**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**27 – Low**
Degree to which the impact can be avoided:	**Medium**
Degree to which the impact can be managed:	**Medium**
Degree to which the impact can be mitigated:	**Medium**
Proposed mitigation:	**None**
Residual impacts:	**Change of economic sectors contributing to the GDP**
Cumulative impact post mitigation:	**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 it 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.**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Low** **The impact on the agricultural potential of the farm is low negative during operations.**
DECOMMISSIONING AND CLOSURE PHASE	
Potential impact and risk:	**Economic and Material Wellbeing – Agricultural potential changes**
Nature of impact:	**Change of economic sector.** **Impacts occurring during Decommissioning Phase:** **- Removal of equipment and rehabilitation of impacts: Waste could include glass and silicon and both should be removed.** **- Waste removal and waste management of panels, electrical wires, concrete and metal**
Extent and duration of impact:	**3 Local & 4 Long term**
Consequence of impact or risk:	**Impact on agriculture**
Probability of occurrence:	**3 - Probable**
Magnitude:	**6**
Degree to which the impact may cause irreplaceable loss of resources:	**PR**
Degree to which the impact can be reversed:	**R**
Indirect impacts:	**Impact on the livelihoods**
Cumulative impact prior to mitigation:	**Positive**

Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**39 – Medium (POSITIVE)**
Degree to which the impact can be avoided:	**Positive**
Degree to which the impact can be managed:	**Medium**
Degree to which the impact can be mitigated:	**Positive**
Proposed mitigation:	**None**
Residual impacts:	**Change of economic sectors contributing to the GDP**
Cumulative impact post mitigation:	**Positive**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Medium (POSITIVE)**

Alternative 1: Preferred Layout & Alternative 2	**Socio-economic**
PLANNING, DESIGN AND DEVELOPMENT PHASE	
Potential impact and risk:	**Economic and Material Wellbeing – Increased household Income**
Nature of impact:	**<u>Improved standard of living</u> The 322 (357) 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. During Construction, a wage bill of R234 million (R67 996 800 per annum) over three years will benefit the locals directly. [R251 million wage bill – skilled wages and 10% of semi- and unskilled]**
Extent and duration of impact:	**3 Local & 1 Short term**
Consequence of impact or risk:	**Reduced poverty**
Probability of occurrence:	**3 – Probable**
Magnitude:	**6**
Degree to which the impact may cause irreplaceable loss of resources:	**Positive**
Degree to which the impact can be reversed:	**Positive**
Indirect impacts:	**Reduced crime, Improved quality of life**
Cumulative impact prior to mitigation:	**Low**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**30 – Low (POSITIVE)**
Degree to which the impact can be avoided:	**Positive**
Degree to which the impact can be managed:	**Low**
Degree to which the impact can be mitigated:	**Positive**
Proposed mitigation:	**Reserve jobs for locals and vulnerable groups i.e. women**
Residual impacts:	**None**
Cumulative impact post mitigation:	**Low**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Low (POSITIVE) 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.**
OPERATIONAL PHASE	
Potential impact and risk:	**Economic and Material Wellbeing – Increased household Income**
Nature of impact:	**<u>Improved standard of living</u> The 76 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. During Operations, the expected current value of direct employment for the first ten (10) years is R183 million of which 90% or R165 million rand will benefit previously disadvantaged individuals. Households may now have an**

	income or additional income. Overall household income increases.
Extent and duration of impact:	**3 Local & 4 Long term**
Consequence of impact or risk:	**Reduced poverty**
Probability of occurrence:	**4 – Highly probable**
Magnitude:	**8**
Degree to which the impact may cause irreplaceable loss of resources:	**Positive**
Degree to which the impact can be reversed:	**Positive**
Indirect impacts:	**Reduced crime, Improved quality of life**
Cumulative impact prior to mitigation:	**Low**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**60 - Medium (POSITIVE)**
Degree to which the impact can be avoided:	**Positive**
Degree to which the impact can be managed:	**Low**
Degree to which the impact can be mitigated:	**Positive**
Proposed mitigation:	**Mitigation measures Operations Phase:** **· Developer and contractor to liaise with existing or future projects to enhance employment opportunities for locals.** **· Limit employees to locals only.** **· Offer training to develop employee's skills levels.**
Residual impacts:	**None**
Cumulative impact post mitigation:	**Medium (POSITIVE)**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Medium (POSITIVE)** **The operation of the proposed solar facility will impact moderately positively on the income on some local households as a member(s) of these households find employment.**
DECOMMISSIONING AND CLOSURE PHASE	
Potential impact and risk:	**Economic and Material Wellbeing – Increased household Income**
Nature of impact:	**<u>Improved standard of living</u>** **The 322 (357) 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.** **During Demolition, household income for families at the lower end of the income range will "increase" as the wage bill will be close to R85 million. The sales of the demolished material will contribute to the income of the lower end of the income range households.**
Extent and duration of impact:	**3 Local & 1 Short term**
Consequence of impact or risk:	**Reduced poverty**
Probability of occurrence:	**3 – Probable**
Magnitude:	**6**
Degree to which the impact may cause irreplaceable loss of resources:	**Positive**
Degree to which the impact can be reversed:	**Positive**
Indirect impacts:	**Reduced crime, Improved quality of life**
Cumulative impact prior to mitigation:	**Low**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**30 – Low (POSITIVE)**
Degree to which the impact can be avoided:	**Positive**
Degree to which the impact can be managed:	**Low**
Degree to which the impact can be mitigated:	**Positive**
Proposed mitigation:	**Reserve jobs for locals and vulnerable groups i.e. women**
Residual impacts:	**None**

Cumulative impact post mitigation:	**Low**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Low (POSITIVE)** **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.**

Alternative 1: Preferred Layout & Alternative 2	**Socio-economic**
PLANNING, DESIGN AND DEVELOPMENT PHASE	
Potential impact and risk:	**Economic and Material Wellbeing –Sales volume and GGP will increase**
Nature of impact:	**GGP & Sales increases** **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.**
Extent and duration of impact:	**4 Regional & 1 Short term**
Consequence of impact or risk:	**Impact on the economy**
Probability of occurrence:	**4 – Highly probable**
Magnitude:	**2**
Degree to which the impact may cause irreplaceable loss of resources:	**Positive**
Degree to which the impact can be reversed:	**Positive**
Indirect impacts:	**Impact on the economy**
Cumulative impact prior to mitigation:	**Low (Positive)**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**28 – Low (Positive)**
Degree to which the impact can be avoided:	**Positive**
Degree to which the impact can be managed:	**Medium**
Degree to which the impact can be mitigated:	**Positive**
Proposed mitigation:	**· Contractor 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.**
Residual impacts:	**None**
Cumulative impact post mitigation:	**Low (Positive)**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Low (Positive)**
OPERATIONAL PHASE	
Potential impact and risk:	**Economic and Material Wellbeing –Sales volume and GGP will increase**
Nature of impact:	**GGP & Sales increases** **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.**
Extent and duration of impact:	**3 Local & 4 Long term**
Consequence of impact or risk:	**Impact on the economy**

Probability of occurrence:	**3 - Probable**
Magnitude:	**2**
Degree to which the impact may cause irreplaceable loss of resources:	**Positive**
Degree to which the impact can be reversed:	**Positive**
Indirect impacts:	**Impact on the economy**
Cumulative impact prior to mitigation:	**Low (Positive)**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**27 – Low (Positive)**
Degree to which the impact can be avoided:	**Positive**
Degree to which the impact can be managed:	**Medium**
Degree to which the impact can be mitigated:	**Positive**
Proposed mitigation:	**· 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 offers 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.**
Residual impacts:	**None**
Cumulative impact post mitigation:	**Low (Positive)**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Low (Positive)**
DECOMMISSIONING AND CLOSURE PHASE	
Potential impact and risk:	**Economic and Material Wellbeing –Sales volume and GGP will increase**
Nature of impact:	**GGP & Sales increases** **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.**
Extent and duration of impact:	**4 Regional & 1 Short term**
Consequence of impact or risk:	**Impact on the economy**
Probability of occurrence:	**4 – Highly probable**
Magnitude:	**2**
Degree to which the impact may cause irreplaceable loss of resources:	**Positive**
Degree to which the impact can be reversed:	**Positive**
Indirect impacts:	**Impact on the economy**
Cumulative impact prior to mitigation:	**Low (Positive)**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**28 – Low (Positive)**
Degree to which the impact can be avoided:	**Positive**
Degree to which the impact can be managed:	**Medium**
Degree to which the impact can be mitigated:	**Positive**
Proposed mitigation:	**· Contractor 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.**
Residual impacts:	**None**
Cumulative impact post mitigation:	**Low (Positive)**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Low (Positive)**

Alternative 1: Preferred Layout & Alternative 2	**Socio-economic**
PLANNING, DESIGN AND DEVELOPMENT PHASE	
Potential impact and risk:	**Women and young people's self-esteem improves**
Nature of impact:	**Job reservation for youth and for women provides them with a different meaning of their role in society.** **Construction Phase:** **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.**
Extent and duration of impact:	**3 Local & 3 Medium term**
Consequence of impact or risk:	**Community upliftment**
Probability of occurrence:	**3 – Probable**
Magnitude:	**4**
Degree to which the impact may cause irreplaceable loss of resources:	**Positive**
Degree to which the impact can be reversed:	**Positive**
Indirect impacts:	**Community dynamics and structures improve**
Cumulative impact prior to mitigation:	**Low (positive)**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**30 – Low (Positive)**
Degree to which the impact can be avoided:	**Positive**
Degree to which the impact can be managed:	**Medium**
Degree to which the impact can be mitigated:	**Positive**
Proposed mitigation:	**Mitigation measures Construction Phase:** **Requires contractor to** **· Reserve 70% of jobs for youth (18 – 35)** **· Reserve 50% of jobs for women.** **· Apply mechanisms to enable youth and women to access employment.** **· Pay youth and women market-related salaries and wages.** **· Provide youth and women equal access to training and education opportunities.** **Mitigation measures All Phases** **· Provide recreational and sport facilities for youngsters i.e. restore swimming pool and provide skateboard park.** **· Provide recreational activities and sport programmes during school holidays.** **· Enhance sport activities during school terms.**
Residual impacts:	**Families develop hope.** **Decreased dependencies i.e. substance abuse and teenage pregnancies.**
Cumulative impact post mitigation:	**Medium (Positive)**

Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Medium (Positive)** **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.**
OPERATIONAL PHASE	
Potential impact and risk:	**Women and young people's self-esteem improves**
Nature of impact:	**Job reservation for youth and for women provides them with a different meaning of their role in society.** **Operational and Demolition Phase:** **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.**
Extent and duration of impact:	**3 Local & 4 Long term**
Consequence of impact or risk:	**Community upliftment**
Probability of occurrence:	**3 – Probable**
Magnitude:	**2**
Degree to which the impact may cause irreplaceable loss of resources:	**Positive**
Degree to which the impact can be reversed:	**Positive**
Indirect impacts:	**Community dynamics and structures improve**
Cumulative impact prior to mitigation:	**Low (positive)**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**27 – Low (Positive)**
Degree to which the impact can be avoided:	**Positive**
Degree to which the impact can be managed:	**Medium**
Degree to which the impact can be mitigated:	**Positive**
Proposed mitigation:	**Mitigation measures Operational Phase: None** **· Avail bursaries and seed capital for entrepreneurs;** **· Establish an education and skills centre (youngsters to improve their future options).** **· Enabling youngsters and women to pursue opportunities.** **· Facilitate access to employment in main sectors i.e. tourism.** **Mitigation measures All Phases** **· Provide recreational and sport facilities for youngsters i.e. restore swimming pool and provide skateboard park.** **· Provide recreational activities and sport programmes during school holidays.** **· Enhance sport activities during school terms.**
Residual impacts:	**Families develop hope.** **Decreased dependencies i.e. substance abuse and teenage pregnancies.**
Cumulative impact post mitigation:	**Medium (Positive)**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Medium (Positive)** **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.
DECOMMISSIONING AND CLOSURE PHASE	
Potential impact and risk:	**Women and young people's self-esteem improves**
Nature of impact:	**Job reservation for youth and for women provides them with a different meaning of their role in society.** **Operational and Demolition Phase:** **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.**
Extent and duration of impact:	**3 Local & 1 Short term**
Consequence of impact or risk:	**Community upliftment**
Probability of occurrence:	**3 – Probable**
Magnitude:	**2**
Degree to which the impact may cause irreplaceable loss of resources:	**Positive**
Degree to which the impact can be reversed:	**Positive**
Indirect impacts:	**Community dynamics and structures improve**
Cumulative impact prior to mitigation:	**Low (positive)**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**18 – Low (Positive)**
Degree to which the impact can be avoided:	**Positive**
Degree to which the impact can be managed:	**Medium**
Degree to which the impact can be mitigated:	**Positive**
Proposed mitigation:	**Mitigation measures All Phases** **· Provide recreational and sport facilities for youngsters i.e. restore swimming pool and provide skateboard park.** **· Provide recreational activities and sport programmes during school holidays.** **· Enhance sport activities during school terms.**
Residual impacts:	**Families develop hope.** **Decreased dependencies i.e. substance abuse and teenage pregnancies.**
Cumulative impact post mitigation:	**Medium (Positive)**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Medium (Positive)** **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.**

Alternative 1: Preferred Layout & Alternative 2	**Socio-economic**
PLANNING, DESIGN AND DEVELOPMENT PHASE	
Potential impact and risk:	**Not applicable**
OPERATIONAL PHASE	
Potential impact and risk:	**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.**
Extent and duration of impact:	**3 Local & 4 Long term**
Consequence of impact or risk:	**Higher income levels**
Probability of occurrence:	**3 – Probable**
Magnitude:	**8**
Degree to which the impact may cause irreplaceable loss of resources:	**Positive**
Degree to which the impact can be reversed:	**Positive**
Indirect impacts:	**Improved social dynamics**
Cumulative impact prior to mitigation:	**Positive**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**45 – Medium (POSITIVE)**
Degree to which the impact can be avoided:	**Positive**
Degree to which the impact can be managed:	**Medium**
Degree to which the impact can be mitigated:	**Positive**
Proposed mitigation:	**· Provide recreational and sport facilities for youngsters i.e. restore swimming pool and provide skateboard park.** **· Provide recreational activities and sport programmes during school holidays.** **· Enhance sport activities during school terms.**
Residual impacts:	**None**
Cumulative impact post mitigation:	**Positive**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Medium (POSITIVE)** **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.**
DECOMMISSIONING AND CLOSURE PHASE	
Potential impact and risk:	**Not applicable**

Alternative 1: Preferred Layout & Alternative 2	Socio-economic
OVERALL	
Potential impact and risk:	**Cumulative - Energy generation replaces Agriculture and cause demographic changes**
Nature of impact:	**The cumulative impact of the total solar facility 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.** **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.** **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 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.**
Extent and duration of impact:	**3 Local & 4 Long term**
Consequence of impact or risk:	**As above**
Probability of occurrence:	**4 – Highly probable**
Magnitude:	**6**
Degree to which the impact may cause irreplaceable loss of resources:	**PR**
Degree to which the impact can be reversed:	**PR**
Indirect impacts:	**In the long term, the solar facilities will impact cumulatively on the social history of the area as it will affect agriculture and it processes, structures and patterns that the area values as part of the social history of the area**
Cumulative impact prior to mitigation:	**Medium**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**54 – Medium**
Degree to which the impact can be avoided:	**Low**
Degree to which the impact can be managed:	**Medium**
Degree to which the impact can be mitigated:	**High**
Proposed mitigation:	**- 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 the improvement of educational levels and skills** **- Enhance and contribute to the development of the skills centre supporting and building local businesses.**
Residual impacts:	**None**
Cumulative impact post mitigation:	**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 it processes, structures and patterns that area values as part of the social history of the area.**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Low (POSITIVE)** **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.**

Alternative 1: Preferred Layout & Alternative 2	**Other**
PLANNING, DESIGN AND DEVELOPMENT PHASE	
Potential impact and risk:	**Not applicable**
OPERATIONAL PHASE	
Potential impact and risk:	**The study area falls potentially within the ambit of the Square Kilometre Array- South Africa. Impacts associated with radio frequency interference on the SKA.**
Nature of impact:	**The purpose of the Astronomy Geographic Advantage Act is to preserve the geographic advantage areas that attract investment in astronomy. The entire Northern Cape Province excluding the Sol Plaatjie Municipality had been declared an astronomy advantage area. The Northern Cape optical and radio telescope sites were declared core astronomy advantage areas. The Act allowed for the declaration of the Southern Africa Large Telescope (SALT), MeerKAT and Square Kilometre Array {SKA) as astronomy and related scientific endeavours that had to be protected.**
Extent and duration of impact:	**3 Local & 4 Long term**
Consequence of impact or risk:	**The preliminary assessment based on the SANS211 limits, indicates that the emissions levels from the facility will marginally fall below the required spectral density threshold for protection of the telescope against electromagnetic interference.**
Probability of occurrence:	**3 – Probable**
Magnitude:	**Based on the location, the facility will generate medium-to-low risk of interference on the nearest telescope (SKA005) on the SKA spiral arm.**
Degree to which the impact may cause irreplaceable loss of resources:	**R**
Degree to which the impact can be reversed:	**R**
Indirect impacts:	**Scientific endeavours impacted**
Cumulative impact prior to mitigation:	**Medium**
Significance rating of impact prior to mitigation	**45 – Medium**

(e.g. Low, Medium, Medium-High, High, or Very-High)	
Degree to which the impact can be avoided:	**Medium**
Degree to which the impact can be managed:	**Medium**
Degree to which the impact can be mitigated:	**Medium**
Proposed mitigation:	• **Ensure that electromagnetic emissions do not exceed limits prescribed in SANS211 standards** • **Any radio communication services and equipment located within the declared Karoo Central Astronomy Advantage Area shall be required to comply with the relevant regulations as promulgated**
Residual impacts:	**None**
Cumulative impact post mitigation:	**Medium**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Medium**
DECOMMISSIONING AND CLOSURE PHASE	
Potential impact and risk:	**Not applicable**

No Go Alternative

The impact that will result from the no-go option will mean that the additional electricity generated from the solar electricity generation facility will not be evacuated into the ESKOM grid. In context of coal fire power stations, some of which generate in excess of 3 GW, the loss of the proposed electricity generation is not significant in the regional and national context. However, the integration of an additional 300 MW should alleviate the pressure on the local grid to a small extent and would contribute in a small way to meeting the government's targets for renewable energy.

The site will remain as is, agricultural land with low potential soil, supporting only grazing due to the shallow soils. The farming unit consists of 6 cadastral units with a total of 7011ha. The current farmer stocks 600 ewes on the 7011 ha. This is a small stock carrying capacity of 12ha per small stock unit. The no-go option will mean the farmer will not have to stock 66 less ewes no that section of the farm and will be able to keep the number of ewes as it is presently.

8.4. Environmental Impact Statement

IMPACT SUMMARY

Summary of impacts assessed:

This section provides a summary of the assessment conclusions for the proposed development site. In doing so, it draws on the information gathered as part of the Assessment process and the knowledge gained by the environmental assessment practitioner during the course of the process and presents an informed opinion of the environmental impacts associated with the proposed project.

The below is based on the phases of the project and scoring based on the implementation of mitigation measures.

Construction

The construction phase is likely to result in a number of negative impacts on the biophysical and social environments. These impacts relate to the short-term impacts that occur during the construction phase. The significance of construction phase impacts is likely to be curtailed by their relatively short duration and the degraded nature of much of the receiving environment.

Furthermore, many of the construction phase impacts can be mitigated by the implementation of an Environmental Management Plan and the appointment of an Environmental Control Officer.

Construction – Positive

- Population Influx, Community Stability and Homogeneousness (low positive)
- Skills development, training and capacity building (high positive)
- Employment is generated (medium positive)
- Economic and Material Wellbeing – Increased household Income (low positive)
- Economic and Material Wellbeing – Sales volume and GGP will increase (low positive)
- Women and young people's self-esteem improve (medium positive)

Construction – No Significant / Neutral

- Livestock Theft
- Economic and Material Wellbeing – Soil and Ecological potential - Alteration of soil profile and ecological processes

Construction - Low significance

- Impact of noise on surrounding environment
- Impact of dust on surrounding environment
- Diesel or oil spillage
- Impact on cultural landscape
- Archaeology impacts
- Palaeontological impacts
- Impact on existing and future agricultural activities
- Impact of the loss of agricultural land for land reform purposes
- Uncontrolled fires
- Erosion and Storm Water Management
- Introduction of alien plant species
- Changes in soils leading to the alteration of plant communities and fossorial species
- Increased electrical light pollution (ELP), leading to changes in nocturnal behavioural patterns amongst fauna
- Exclusion or entrapment of in particular large fauna, on account of the fencing
- Influx of Unemployed People
- Demand for services increases
- Traffic impacts
- Crime increases
- Health and Social Wellbeing – Noise and dust levels increase
- Quality of living environment - Sense of place
- Economic and Material Wellbeing – Inaccessibility and loss of heritage resources
- Economic and Material Wellbeing – Competing Uses of Water
- Economic and Material Wellbeing – Agricultural potential changes

Construction – Medium significance

- Visual impacts of the activity
- Alteration of habitat structure and composition (fauna and flora) – alternative 1 (preferred)
- Freshwater impacts - alteration of surface drainage patterns
- Habitat loss/alteration impacts on birds – alternative 1 (preferred)
- Avifauna collusion with powerlines and electrocution

Construction - High

- Alteration of habitat structure and composition (fauna and flora) – alternative 2
- Habitat loss/alteration impacts on birds – alternative 2

Operations

Operations – No significance / neutral

- Economic and Material Wellbeing – Soil and Ecological potential - Alteration of soil profile and ecological processes

Operations – Low significance

- Impact on cultural landscape
- Disturbance and Impact on ESKOM power supply
- Impact on existing and future agricultural activities
- Impact of the loss of agricultural land for land reform purposes
- Uncontrolled fires
- Effect of Zero Sunlight on panel area
- Erosion and Storm Water Management
- Increased electrical light pollution (ELP), leading to changes in nocturnal behavioural patterns amongst fauna
- Exclusion or entrapment of in particular large fauna, on account of the fencing
- Influx of Unemployed People
- Traffic impacts
- Economic and Material Wellbeing – Inaccessibility and loss of heritage resources
- Economic and Material Wellbeing – Competing Uses of Water
- Economic and Material Wellbeing – Agricultural potential changes

Operation – Medium significance

- Visual impacts of the activity
- Alteration of habitat structure and composition (fauna and flora)
- Freshwater impacts - alteration of surface drainage patterns
- Habitat loss/alteration impacts on birds
- Avifauna collusion with powerlines and electrocution
- Quality of living environment - Sense of place
- Impacts associated with radio frequency interference

Operations – Positive

- Employment is generated (low positive)
- Economic and Material Wellbeing – Increased household Income (medium positive)
- Economic and Material Wellbeing – Sales volume and GGP will increase (low positive)
- Women and young people's self-esteem improve (medium positive)
- Improve skills and educational levels (medium positive)
- Cumulative - Energy generation replaces Agriculture and cause demographic changes (low positive)

Decommissioning

Decommissioning - Positive

- Population Influx, Community Stability and Homogeneousness (Low positive)
- Employment is generated (Low positive)
- Economic and Material Wellbeing – Increased household Income (Low positive)
- Economic and Material Wellbeing – Sales volume and GGP will increase (Low positive)
- Economic and Material Wellbeing – Agricultural potential changes (Medium positive)
- Women and young people's self-esteem improve (Medium positive)

Decommissioning- No significance / neutral

- Livestock Theft

- Quality of living environment - Sense of place

Decommissioning- Low significance

- Impact of noise on surrounding environment
- Impact of dust on surrounding environment
- Impact on cultural landscape
- Removal of waste and rehabilitation
- Uncontrolled fires
- Erosion and Storm Water Management
- Influx of Unemployed People
- Traffic impacts
- Health and Social Wellbeing – Noise and dust levels increase

Decommissioning -Medium significance

- Alteration of habitat structure and composition (fauna and flora)
- Freshwater impacts - alteration of surface drainage patterns
- Exclusion or entrapment of in particular large fauna, on account of the fencing
- Habitat loss/alteration impacts on birds – Alternative 1 (preferred)
- Economic and Material Wellbeing – Inaccessibility and loss of heritage resources

Decommissioning – High significance

- Habitat loss/alteration impacts on birds – Alternative 2

Additional Management, Mitigation and Monitoring Measures

Refer to Appendix B for more details in EMP.

Adequacy of the Assessment Methods Used

Based on the EAP's assessment, issues raised by I&AP's and the project team, specialist studies were undertaken to provide information to address the concerns and assess the impacts of the proposed development on the environment.

The various specialists have provided baseline information. This information has been used by the planning team to inform the current development proposals. The specialists are provided with set criteria for undertaking their assessments, to allow for comparative assessment of all issues. These criteria are detailed in the Terms of Reference to each specialist. These criteria are based on the EIA Regulations.

Gaps in Knowledge

The EAP has no detailed knowledge regarding the other specialist studies conducted. She is only familiar with the environmental aspects.

Underlying Assumptions

Qualified Specialists were appointed and guided by the terms of reference for specialists and the EAP presumes that the information and assessment findings are correct and feasible.

Subjectivity in Assigning Significance

To facilitate informed decision-making, EIAs must endeavour to come to terms with the significance of the potential environmental impacts associated with particular development activities. Despite their attempts at providing a completely objective and impartial assessment of the environmental implications of development activities, EIA processes can never completely escape the subjectivity inherent in attempting to define significance. Recognising this, we have attempted to address potential subjectivity in the current process as

follows:

- Being explicit about the difficulty of being completely objective in the determination of significance, as outlined above.
- Developing an explicit methodology for assigning significance to impacts and outlining this methodology in detail in the Plan of Study for EIA and in this EIAr. Having an explicit methodology not only forces the assessor to come to terms with the various facets contributing toward determination of significance, thereby avoiding arbitrary assignment, but also provides the reader of the EIAr with a clear summary of how the assessor derived the assigned significance.
- Wherever possible, differentiating between the likely significance of potential environmental impacts as experienced by the various affected parties.

Although these measures may not totally eliminate subjectivity, they provide an explicit context within which to review the assessment of impacts.

Consideration of Cumulative Impacts

Various cumulative impacts could be associated with the proposed Development, namely:

- **Agricultural impacts**
  Despite the cumulative impact, it is still agriculturally strategic from a national perspective to steer as much of the country's renewable energy development as possible to regions such as this one, with very low agricultural potential. It is preferable to incur a higher cumulative loss in such a region, than to lose agricultural land with a higher production potential elsewhere in the country.
- **Archaeology**
  There are no fatal flaws in terms of impacts to archaeology. The amount of development in the area is minimal and, even with the construction of other large solar energy facilities, the nature and likely extent of similar archaeological resources means that the cumulative impacts can be expected to be of low significance.
- **Palaeontology**
  Given the generally low impact significance assigned to other comparable solar facility projects in the Kenhardt region, the cumulative impact significance of the current project is likewise assessed as low.
- **Social impacts**
  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 farming sheep changing to green energy production and teams of workers going off to maintain and clean solar panels. However, the overall cumulative social impact is a positive one.
- **Visual impacts**
  Renewable energy facilities tend to locate, due to economic factors3, as close as possible to existing electricity infrastructure into which it feeds the power it generates. As Aries substation and the transmission lines that feed into it are major infrastructure connected to the national electricity grid, it can thus be expected that renewable energy facilities will locate around it. The facility that is the subject to this report is one of 6 photovoltaic electricity generation projects in the immediate vicinity of Aries substation, known to the authors, of which 3 has already been authorised and one built. If all 5 projects were to 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

though, the 5 facilities impact on the same viewshed and will the visual impact not be significantly enlarged. These possible future activities will however, consist of the same structural components, with similar visual characteristics and therefore, with similar visual impacts as the present activity. The nature of this future cumulative visual impact will have a horizontal, rather than a vertical characteristic.

From a visual perspective it would be preferable to locate all similar visual impacts within sight of the substation rather than affecting more distant areas within the landscape.

- **Ecological impacts**

The cumulative impacts associated with the proposed PV Projects must be seen against the background of the establishment of other, similar PV projects and ESKOM powerlines within the region. It is evident that the incorporation of other land use changes within the region cannot be applied in terms of evaluating cumulative impacts on account of the nature of the prevailing land use (primarily livestock ranching) and the rural and hence sparse and sporadic nature of such changes as they may apply to the region. The consideration of cumulative impacts is of relevance to expansive projects such as this on account of the fact that they generally result in the loss of habitat. A total of 7 other large-scale PV facilities were identified (within 10km of the proposed PV project) as having been authorised or are currently under consideration by one or more authorities. Significant ESKOM powerlines, up to 400kV dissect surrounding area. All if this has an already cumulative impact on the surrounding environment.

Cumulative impacts from a terrestrial ecology perspective
The identified sites have not been subject to further interrogation. Some areas within these sites have been set aside or excluded from development.

However, based on the information at hand, it is evident that:

- Individual PV sites vary between 150ha and 500ha in extent
- All sites fall within the Bushmanland Arid Grassland and Bushmanland Basin Shrublandveld types
- Significant ESKOM powerlines, up to 400kV dissect surrounding area.

While the habitat affected by the PV facilities may be small from a quantitative perspective, some consideration should be given to the following qualitative but cumulative impacts that are likely to arise, these include:

- The increased dissection of habitat on account of increasing levels of infrastructure. The proposed PV facilities and powerlines, as well as associated service roads and other infrastructure will give rise to the further dissection of habitat within the region.
- The increased presence of exotic and disturbance driven plant species. With increasing levels of anthropogenic activity on various sites and within the surrounding area, the propensity for plant invasion or the dominance of species that are tolerant of higher levels of disturbance will see such species dominating and perhaps ousting other less tolerant species.
- Increased and expanded anthropogenic influences across the region. The nature of the surrounding PV facilities, electrical infrastructure and other support infrastructure suggests that human activity will arise at points that are presently only intermittently visited by a farmer or his staff. Greater levels of human activity can be anticipated across the area, with the likely influence of ousting particular species of fauna and avifauna.
- Vegetation and habitat alteration - change in ecological processes and habitat –

reversion to secondary habitat structure at transformed sites.
- Recruitment and behavioural change in fauna and avifauna- changes in ecological processes and habitat.

Uncertainties
- None identified at this stage

ENVIRONMENTAL IMPACT STATEMENT

Taking the assessment of potential impacts into account, please provide an environmental impact statement that summarises the impact that the proposed activity and its alternatives may have on the environment after the management and mitigation of impacts have been taken into account. This section provides a summary of the assessment conclusions for the proposed development. In doing so, it draws on the information gathered as part of the Assessment process and the knowledge gained by the environmental assessment practitioner during the course of the process and presents an informed opinion of the environmental impacts associated with the proposed project.

Alternative 1 (Preferred alternative)

The overall **heritage** impact (archaeology, palaeontology and cultural landscape) is likely to be of **low significance** as the sites, features or objects of cultural heritage significance were identified in the study area and excluded from the developable area. However, the **visual impacts and impacts on sense of place** have a **medium significance** even after mitigation. 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.

The overall impact on **soil and agricultural potential (inclusive of land reform)** during the construction and operation is likely to be of **low significance** given the implementation of the recommended mitigation measures. In general, the proposed infrastructure is unlikely to have a low significant agricultural impact on the area. The impacted area is not suitable for dry land crop production. The full farming unit consists of 6 cadastral units with a total of 7011ha. The current farmer stocks 600 ewes on the 7011 ha. This is a small stock carrying capacity of 12ha per small stock unit. On these cadastral units, 4 will eventually have PV electricity generation facilities should all of them be constructed. In total, 2000ha will be lost to agriculture and sheep farming should all the PV facilities be constructed. The remaining farming unit will still consist of 5 011 ha and will be able to stock 417 ewes. The income generated from the PV facility will however be much more that the income that will be generated from the ewes that will be lost and the farming unit will still be financially viable. Because the undisturbed site already has extremely limited agricultural potential, it means that the consequence of any impact for agricultural production is limited with the result that the consequence and significance of agricultural impacts is low. Furthermore, the poor, very

shallow soil conditions reduce the significance of loss of topsoil and 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 country.

The overall impact on **ecology** is likely to be of a **medium significance** given the implementation of mitigation measures. The habitats, such as drainage lines and rare endangered species are being regarded to be of high importance in terms of ecological sensitivity. The proposed facility (preferred layout) will not impact on any of these high ecological sensitive areas, including their set buffer area. Changes in the broader habitat as a consequence of variation in physical factors within the site (e.g. shading of vegetation, changes in surface water flow regime), changes in the surface hydrology (freshwater impacts) and possible impacts on avifauna species are rated as medium significance.

The overall **social and socio-economic** impact in terms of positive and negative impacts is likely to be of a **low significance** during both the construction and operational phases when assessed regionally but of high significance if assessed locally. The potential negative impacts associated with the construction phase are typical of construction related projects and are expected to respond to the mitigation measures proposed. The possible job creation and skills development are regarded as a **significant positive** injection into the area. The project would result in significant positive economic spin-offs for the local area and region primarily because of the labour-intensive operational practices that would be associated with it.

The proposed facility maintains a very low profile and follows the natural lay of the land. Facility fits only partially into surroundings. The Aries substation and associated transmission lines, as well as other similar facilities authorized in the direct vicinity of the proposal, sets a precedent for the development of similar activities in the area. The visual impact is assessed to be of **moderate significance** with mitigation. The reasons for this are mainly 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 the Pofadder – Kenhardt road. The implication of this situation is that views from the road will in any case be of short duration (travellers). Furthermore, during the operational phase, activities on-site will be minimal and will only include maintenance and security. Mitigation measures as proposed will ensure that the impact will be reduced even further.

The establishment of the facility will have positive benefits as the integration of an additional 300 MW may alleviate the pressure on the local grid to a small extent and would contribute to the national target of renewable energy.

Therefore, based on the findings of the studies undertaken, in terms of environmental constrains identified through the initial Environmental Assessment process, **no environmental fatal flaws** were identified with the establishment of the proposed PV plant and it is recommended that the project should be authorised. However, a number of issues requiring mitigation have been highlighted. Environmental specifications for the management of these issues / impacts are detailed within the draft Environmental Management Programme (EMP).

Alternative 2

Alternative 2 is not significant different to the layout in Alternative 1 however there are some differences in the impacts associated with the alternatives.

- Alternative 2 has a higher impact on the alteration of habitat structure and composition (fauna and flora) this is because Alternative 2's layout does not exclude the Nama Karoo Bushmanland Flat Pan.

- This is turn also results in higher impacts on avifauna (Habitat loss/alteration impacts on birds)

- Alternative 2 has a slightly higher impact on Archaeology. Although Alternative 1 impacts on 3 sensitive areas in terms of Archaeology, Alternative 2 impacts also impacts on 3 sensitive areas in terms of Archaeology one of which is the Nama Karoo Bushmanland Flat Pan. The Nama Karoo Bushmanland Flat Pan is a larger sensitive area in terms of Archaeology.

Three sensitive areas in terms of Archaeology impacted by Alternative 1:

- Block 1 – waypoint 058 – Small area of dense gravel with many background scatter artefacts in it. The vast majority of artefacts are of a pale quartzite and clearly originate from the same source. As already intimated, the bulk of the background scatter seems to be comprised of MSA artefacts. Such artefacts were found to occur throughout the study area and are far more extensively distributed than those from the ESA. Due to their widespread occurrence and lack of focal points, these artefacts are generally not considered significant. However, two areas were identified as being denser than usual. One of these – located close to the Sishen-Saldanha Railway – was a scatter of artefacts almost all in the same pale-coloured quartzite at waypoint 058. It was quite extensive and clearly represents a short period of deposition.
- Block 2 – ESA 1 - Extensive area with dense background scatter that includes many LCTs.
- Block 2 – ESA 2 - ESA artefact scatter with many LCTs. Only identified quickly by the presence of handaxes.

Three sensitive areas in terms of Archaeology impacted by Alternative 2:

- Block 1 – waypoint 058 – Small area of dense gravel with many background scatter artefacts in it. The vast majority of artefacts are of a pale quartzite and clearly originate from the same source. As already intimated, the bulk of the background scatter seems to be comprised of MSA artefacts. Such artefacts were found to occur throughout the study area and are far more extensively distributed than those from the ESA. Due to their widespread occurrence and lack of focal points, these artefacts are generally not considered significant. However, two areas were identified as being denser than usual. One of these – located close to the Sishen-Saldanha Railway – was a scatter of artefacts almost all in the same pale-coloured quartzite at waypoint 058. It was quite extensive and clearly represents a short period of deposition.
- Block 2 – ESA 1 - Extensive area with dense background scatter that includes many LCTs.
- Block 1 – Nama Karoo Bushmanland Flat Pan - Two small LSA sites were found around this pan, one to the north and the other to the south. The northern site, at waypoint 063, was comprised of stone artefacts and ostrich eggshell fragments. Although a few artefacts attributable to the background scatter are no doubt included, it is quite clear that the assemblage is different from the bulk of the archaeology seen in the area. The artefacts are small and largely of crypto-crystalline silica (CCS) with

some quartz and hornfels. Also present was an anvil and a hammer stone. A single fragment of hand-painted refined white earthenware that likely dates to the late 19th century was also found but it cannot be known whether this is associated with the site or arrived there later. The second site, at waypoint 064, was located in a small 'clearing' between bushes. It had relatively few stone artefacts – all in quartz and quartzite – but there was a fair number of ostrich eggshell fragments across the site. An anvil and hammer stone were also present.

Alternative 2 is not preferred due to the higher impacts on archaeology, habitat loss and impacts on avifauna.

No-go alternative (compulsory)

The impact that will result from the no-go option will mean that the additional electricity generated from the solar electricity generation facility will not be evacuated into the ESKOM grid. In context of coal fire power stations, some of which generate in excess of 3 GW, the loss of the proposed electricity generation is not significant in the regional and national context. However, the integration of an additional 300 MW should alleviate the pressure on the local and national grid to a small extent and would contribute in a small way to meeting the government's targets for renewable energy.

9. CONCLUSIONS AND RECOMMENDATIONS

Conclusions

This EIAr has provided a comprehensive assessment of the potential environmental impacts, identified by the EIA team and I&APs, associated with the development proposed.

The significance of the potential environmental (biophysical and social) impacts associated with the proposed project is summarised as follows:

Level of Confidence in Assessment

For all of the impacts assessed in this report, and for all of the proposed developments, the EIA team is confident in their assessment, with a confidence rating of either "sure" or "certain". Accordingly, the information contained within the Final Scoping Report and this EIAr is deemed adequate to inform the applicant's decision regarding which options to pursue and DEA determination of the environmental acceptability of the chosen options.

Considerations in the Identification of the Preferred Option

Following the finalisation of the EIAr the next step in the EIA process would be for the applicant to identify their preferred options, utilising this EIAr together with the relevant technical and financial considerations to inform their decision. It should be noted that it is not the role of the EIAr to recommend the preferred option, but to provide a comparison between the various options considered, specifically in terms of their potential environmental impacts. However, it is appropriate to guide the applicant in their identification of their preferred option by highlighting the following environmental implications of the various alternative options assessed in this investigation:

In terms of the Development:

- None of the impacts are so significant or unmanageable as to suggest that the development should not proceed. Failure to implement the project would preclude the realisation of certain significant socio- economic benefits and renewable energy generation.

Alternative 1 as per Appendix B1: Site Development Plan – Alternative 1 is the Preferred layout.

Recommendations

The EIAr has outlined various mitigation measures, which, if implemented, could minimise the negative impacts, and enhance the positive effects associated with the proposed projects. Careful consideration must be given to the implementation of these measures, especially those relating to the design and layout of the proposed projects, and where appropriate, these, and any others identified by DEA must be enforced as Conditions of Approval in the Environmental Authorization. The most pertinent mitigation measures for each of the proposed developments are included in the EMP.

EA Conditions

The construction of the proposed facility should be implemented according to the EMP to adequately mitigate and manage potential impacts associated with construction activities. The construction activities and relevant rehabilitation of disturbed areas should be monitored against the approved EMP, the Environmental Authorization and all other relevant environmental legislation.

Relevant conditions to be adhered to include:

Design, Construction and Decommissioning Phase:

The following mitigation and management measures should be implemented during the construction phase in order to minimise potential environmental impacts:

- If a heritage object is found, work in that area must be stopped immediately, and appropriate specialist brought in to assess the site, notify the administering authority of the item/site, and undertake due/required processes.
- Mitigation measures outlined in the EMP, shall be adhered to.
- Measures to ensure that material loads are properly covered during transportation must be in place.
- Minimisation of the areas disturbed at any one time and protection of exposed soil against wind erosion, e.g. by dampening with water. Location and treatment of material stockpiles shall take consideration of prevailing wind directions and dwellings as well as to prevent erosion and run off.
- Dust suppression measures in the form of dampening with water shall be used when particularly during dry periods of weather during the summer months.
- Adherence to provisions of the Occupational Health and Safety Act.
- As a proclaimed work site, the public is not entitled to legal access. Provision will be made for sign boards/ wire perimeter identification/ danger taping of sites. Public access will need to be overtly discouraged via some security presence.

- The use of local labour for low- semi skilled jobs should be maximised as far as possible.
- All noise and sounds generated by plant or machinery must adhere to SABS 0103 specifications for the maximum permissible noise levels.
- No sound amplification equipment such as sirens, loud hailers or hooters may be used on site, after normal working hours, except in emergencies.
- If work is to be undertaken outside of normal work hours, permission must be obtained from the Local Authority.
- Prior to commencing any such activity, the Contractor is also to advise the potentially affected neighbouring residents. Dates, times and the nature of the work to be undertaken are to be provided. Notification could include letter-drops.
- Ensure that the slope of the stockpiled material is such that surface runoff is minimal.
- Appoint an Environmental Control Officer (ECO).
- Demarcate all areas where no impacts will be allowed, clearly marking these areas with high visibility signs, inform all contractors and construction workers to refrain from entering / affecting these areas
- Prevent impacts on any surface water as a result of hazardous materials, contamination, unnecessary crossing by vehicles or personnel, extraction, drinking or other uses, construction and maintenance activities
- Implement a weed monitoring and control programme
- All declared aliens must be identified and managed in accordance with the EMPr, the implementation of a monitoring programme in this regard is recommended
- The removal or picking of any protected or unprotected plant shall not be permitted and no horticultural specimens (even within demarcated working areas) shall be removed, damaged, or tampered with unless agreed to by the ECO
- No painting or marking of rocks or vegetation to identify locality or other information shall be allowed as it will disfigure the natural setting. Marking shall be done by steel stakes with tags, if required
- Make use of existing access roads, ensuring proper upgrade/ construction/ maintenance in order to limit erosion, proliferation of weeds
- Use of branches of trees and shrubs for fire making purposes is strictly prohibited
- Prevent open fire; provide demarcated fire-safe zones, facilities, and fire control measures
- Firefighting equipment shall be made available on all vehicles and at various suitable points within the development site
- No animals may be hunted, trapped, or killed for any purpose whatsoever
- In the event that animals are present that may pose a risk to human safety, a suitable animal handler must be requested to remove the animal in an environmentally responsible manner. This specifically refers to snakes, spiders and scorpions
- Use only local indigenous species in the rehabilitation / re-vegetation process
- Should substantial fossil remains be exposed during construction, however, these should be recorded (GPS, photos), safeguarded if possible, *in situ*, and SAHRA should be notified by the ECO so that appropriate mitigation can be considered.

Operation Phase:
The following mitigation and management measures should be implemented during the operation phase in order to minimise potential environmental impacts:

- Ensure proper fire control measures on site and during hot periods. Ensure staff are trained on the fire drill.
- Implement a weed monitoring and control programme.

- The use of local labour for low- semi skilled jobs should be maximised as far as possible.
- Maintenance of erosion control measures.
- Maintenance of roads and fire breaks.
- Maintenance of solar panels and electricity generation a connection infrastructure.

The Way Forward

The next stage of the public participation process involves the submitting of this EIAr to all key departments and registered I&APs

Cognisance will be taken of all comments when compiling the final report, and the comments, together with the study team and client's responses thereto, will be included as an appendix in the Final EIAr. Where necessary, the report will be updated accordingly.

Once the Final EIAr has been completed and all I&AP comments have been incorporated into the report, it will be submitted to the applicant for review. On the basis of the findings of the EIAr as well as other financial and technical considerations, the applicant will decide whether they would like to proceed with the project and if so which of the alternatives they would like to seek authorisation for. At this point, the Final EIAr together with a letter from the applicant motivating for their preferred options and indicating which mitigation measures they are prepared to commit to, would be submitted to DEA for their review and decision.

Once they have reviewed the document and are satisfied that it contains sufficient information to make an informed decision, DEA will use the information contained within the EIAr to determine the environmental acceptability of applicant's preferred options. Thereafter DEA will issue an Environmental Authorization outlining the nature of their decision and the Conditions of Approval attached to any authorisation should the proposed activity be approved.

Following the issuing of the Environmental Authorization, I&APS will be notified of DEA decision and there will be an appeal period during which I&APs will have an opportunity to appeal against the decision to the Minister of Environmental Affairs and Tourism in terms of the National Environment Management Act.

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