ENVIRONMENTAL IMPACT ASSESSMENT PROCESS
FINAL ENVIRONMENTAL IMPACT REPORT

PROPOSED PRIESKA SOLAR ENERGY FACILITY & ASSOCIATED INFRASTRUCTURE, NORTHERN CAPE

NORTHERN CAPE PROVINCE
(DEA Ref No: 14/12/16/3/3/2/313)

FINAL FOR SUBMISSION TO DEA
January 2013

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PROJECT DETAILS

DEA Reference No.	:	14/12/16/3/3/2/313
Title	:	Environmental Impact Assessment Process Final Environmental Impact Assessment Report: Proposed Prieska Solar Energy Facility, Northern Cape Province
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Client	:	Jouren Solar (Pty) Ltd
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PURPOSE OF THE ENVIRONMENTAL IMPACT ASSESSMENT REPORT

Jouren Solar (Pty) Ltd is currently undertaking an Environmental Impact Assessment (EIA) process to determine the environmental feasibility of the proposed Prieska solar energy facility on a near Prieska, in the Northern Cape Province. Jouren Solar (Pty) Ltd has appointed Savannah Environmental, as independent environmental consultants, to undertake the EIA. The EIA process is being undertaken in accordance with the requirements of the National Environmental Management Act (NEMA; Act No. 107 of 1998).

The EIA Report consists of eight sections:

Chapter 1: Provides background to the proposed facility and the environmental impact assessment.

Chapter 2: Provides a description of the proposed project.

Chapter 3: Provides an overview of the regulatory and legal context for electricity generation projects and the EIA process.

Chapter 4: Outlines the process which was followed during the EIA Phase, including the consultation process that was undertaken and input received from interested parties.

Chapter 5: Describes the existing biophysical and socio-economic environment.

Chapter 6: Presents the assessment of environmental impacts associated with the proposed facility.

Chapter 7: Presents the conclusions of the EIA, as well as an impact statement on the proposed project.

Chapter 8: Provides a list of references and information sources used in undertaking the studies for this EIA Report.

The Scoping Phase of the EIA process identified potential issues associated with the proposed project, and defined the extent of the studies required within the EIA Phase. The EIA Phase addresses those identified potential environmental impacts and benefits associated with all phases of the project including design, construction and operation, and recommends appropriate mitigation measures for potentially significant environmental impacts. The EIA report aims to provide the environmental authorities with sufficient information to make an informed decision regarding the proposed project.

The release of a draft EIA Report provided stakeholders with an opportunity to verify that the issues they have raised to date have been captured and adequately considered within the study. The Final EIA Report incorporates all issues and responses prior to submission to the National Department of Environmental Affairs (DEA), the decision-making authority for the project.

INVITATION TO COMMENT ON THE DRAFT EIA REPORT

Members of the public, local communities and stakeholders were invited to comment on the draft EIA Report which was made available for public review and comment at the following locations from **27 November 2012 to 14 January 2013.**

» Prieska Public Library
» www.savannahsa.com

PUBLIC FEEDBACK MEETING

In order to facilitate comments on the draft EIA Report and provide feedback on the findings of the studies undertaken, a public feedback meeting was held during the review period for the draft EIA Report on 6 December 2012 at the Prieska Town Hall, Victoria Street, Prieska.

The project team members were present at the meeting and a presentation on the project was prepared. No members of the public however attended the public meeting. The presentation is included in Appendix E2.

EXECUTIVE SUMMARY

Jouren Solar (Pty) Ltd is proposing the establishment of a commercial solar energy generating facility and associated infrastructure on Portion 3 of the Farm Holsloot 47 which is located within the Siyathemba Local Municipality in the Northern Cape (refer to Figure 1).

The solar energy facility is proposed to accommodate several arrays of tracking or static **photovoltaic (PV) panels** and associated infrastructure on a portion of the proposed site. From a regional perspective, this area is considered technically favourable for the development of commercial solar electricity generating facilities by virtue of the **climatic conditions** (primarily as the economic viability of a solar energy facility is directly dependent on the annual direct solar irradiation values for a particular area), orographic conditions, relief and aspect, the extent of the site, and the availability of a direct **grid connection** (i.e. the point of connection to the National grid). The identified site is available for development, and has direct road access via the R357 and R369 regional routes which bisect the eastern corner of the proposed site.

The proposed facility and associated infrastructure (i.e. the development footprint) would be constructed over an area of approximately 275 hectares (ha) in extent. The larger project development site covers an area of approximately 3164 ha. **Figure 2** indicates the entire farm portion and proposed layout that is currently being assessed as part of this Environmental Impact Assessment (EIA).

The Prieska Solar Energy Facility is proposed to accommodate several arrays of photovoltaic (PV) panels with associated infrastructure in order to generate up to **75 MW** of electricity. The facility will comprise of PV panels and associated infrastructural requirements which will include:

» Solar panels (single or double axis).
» An on-site inverter to step up the power and a substation to facilitate the connection between the solar energy facility and the Eskom electricity grid.
» Two alternatives are being considered to evacuate the electricity from the facility.
  a) Alternative 1 a loop-in and loop out power line to connect into the existing Burchell-Mooidraai 1 132kV power line which traverses the site;
  b) Alternative 2 to connect directly into the existing Eskom Mooidraai Substation located on the site.
» Internal access roads.
» Workshop area for maintenance and storage.

The nature and extent of this facility, as well as potential environmental impacts associated with the

construction and operation of a facility of this nature are explored in more detail in this Environmental Impact Assessment (EIA) Report

In summary, the following conclusions have been drawn from the specialist studies undertaken:

» In terms of ecology, the potential significance was rated as having a predominately medium significance.
» In terms of geology, soil, and erosion potential, the potential significance was rated as having a predominately low to medium significance.
» In terms of heritage resources, the potential significance was rated as having a predominately low significance.
» In terms of visual impacts, the potential significance was rated as having a predominately medium significance. The potential impact on users of arterial and secondary roads and on residents of towns and homesteads in close proximity of the facility will be of high significance. It is important to note that there are two other proposed solar energy facilities that are located next to the proposed San Solar Energy Facility.
» In terms of social impacts, the potential significance was rated as having a predominately medium significance.

No environmental fatal flaws were identified with the establishment of the proposed Prieska Solar Energy Facility. However a number of issues requiring mitigation have been highlighted. Environmental specifications for the management of potential impacts are detailed within the draft Environmental Management Plan (EMP) included within Appendix L.

OVERALL CONCLUSION (IMPACT STATEMENT)

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

The technical viability of establishing a solar energy facility with a generating capacity of 75 MW on a site located on the Farm Holsloot 47 which is located within the Siyathemba Local Municipality has been established by Jouren Energy (Pty) Ltd. The positive implications of establishing a solar energy facility within the Northern Cape include the following:

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

At a local scale, the benefits associated with development on the proposed site (as established through this EIA process) include:

» The low to moderate impacts on ecology due to the planning of the majority of the proposed facility within the areas of low to no sensitivity (refer to Figure 3).
» No impact on agricultural potential and food production due to the low agricultural potential of the soils underlying the site and the low grazing capacity.
» Low impacts on archaeological, heritage and paleontological sites.
» Limited visual impacts to within 3km of the site as a result of the nature of the facility and the location of the site within the local topography.
» Minimisation of the extent of associated infrastructure (i.e. access roads and power lines) due to the close proximity of the site to main access roads and power line and substation infrastructure.

The findings of the specialist studies undertaken within this EIA to assess both the benefits and potential negative impacts anticipated as a result of the proposed project conclude that there are **no environmental fatal flaws** that should prevent the proposed project from proceeding, provided that the recommended mitigation and management measures are implemented. The significance levels of the majority of identified negative impacts can be reduced by implementing the recommended mitigation measures. The project is therefore considered to meet the requirements of sustainable development. Environmental specifications for the management of potential impacts are detailed within

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

With reference to the information available at this planning approval stage in the project cycle, the **confidence** in the environmental assessment undertaken is regarded as **acceptable**.

OVERALL RECOMMENDATION

Based on the nature and extent of the proposed project, the local level of disturbance predicted as a result of the construction and operation of the facility and associated infrastructure, the findings of the EIA, and the understanding of the significance level of potential environmental impacts, it is the opinion of the EIA project team that the developmental impacts of the Prieska Solar Energy Facility project can be mitigated to an acceptable level. In terms of this conclusion, the EIA project team support the decision for environmental authorisation.

The following conditions would be required to be included within an authorisation issued for the project:

» All relevant practical and reasonable mitigation measures detailed within this report and the specialist reports contained within Appendices F to K should be implemented to limit the negative impacts and enhance the positives.
» As far as possible, any component of the facility which could potentially affect sensitive areas (i.e. drainage lines) should be shifted in order to avoid these areas of high sensitivity (i.e. best practice is impact avoidance). Where this is not possible, alternative mitigation measures as detailed in this report must be implemented and relevant permits must be obtained.
» Avoid No Go Areas as far as possible by careful placement of panels.
» The riparian areas of vegetation unit 4, as well as lower-lying drainage lines and rivers that were not specifically assessed must be regarded as No Go Areas, and a buffer of the legal 32 m, preferably between 50 and 100 m, maintained between any development and these areas.
» Following the final design of the facility, a revised layout must be submitted to DEA for review and approval prior to commencing with construction.
» Both power line options are considered acceptable from an environmental point of view. The preferred option should be selected on the basis of Eskom's requirements.
» Use existing infrastructure where possible to minimise potential ecological impacts from disturbance of vegetation.
» An independent Environmental Control Officer (ECO) should be appointed to monitor compliance with the specifications of the EMP

for the duration of the construction period.

» The draft Environmental Management Programme (EMP) as contained within Appendix L of this report should form part of the contract with the Contractors appointed to construct and maintain the proposed facility, and will be used to ensure compliance with environmental specifications and management measures. The implementation of this EMP for all life cycle phases of the proposed project is considered key in achieving the appropriate environmental management standards as detailed for this project. This EMP should be viewed as a dynamic document that should be updated throughout the life cycle of the facility, as appropriate.
» Alien invasive plants should be controlled on site throughout the construction and operation of the facility.
» Disturbed areas should be rehabilitated as quickly as possible once construction is completed in an area, and an on-going monitoring programme should be established to detect, quantify, and manage any alien species.
» All relevant practical and reasonable mitigation measures detailed within this report and the specialist reports contained within Appendices F to K must be implemented.
» During construction, unnecessary disturbance to habitats should be strictly controlled and the footprint of the impact should be kept to a minimum.
» Disturbed areas should be rehabilitated as quickly as possible once construction is completed in an area, and an on-going monitoring programme should be established to detect, quantify, and manage any alien species.
» A comprehensive storm water management plan should be compiled and implemented for the developmental footprint prior to construction.
» A detailed geotechnical investigation should be undertaken before the engineering design phase to provide more detail. Specialist geotechnical input is recommended during the construction of foundations.
» A walk-though survey of final infrastructure positions for the solar energy facility and associated infrastructure (including the power line) should be undertaken by a specialist ecologist and heritage specialist prior to the commencement of construction. The EMP for construction must be updated to include site-specific information and specifications resulting from the final walk-though surveys. This EMP must be submitted to DEA for approval prior to the commencement of construction.
» Proper planning should be undertaken regarding the placement of lighting structures.

» Applications for all other relevant and required permits required to be obtained by Jouren Energy (Pty) Ltd must be submitted to the relevant regulating authorities.

Cumulative Impacts:

Other wind and solar energy facilities are proposed between Prieska and Copperton (Refer to Figure 4). At least one of these facilities has been awarded preferred bidder status by the DoE and will therefore be developed in the near future (i.e. the Mulilo Power Photovoltaic Power Generation Facility near Prieska-12/12/20/1722). Based on the findings of the specialist studies undertaken, the potential cumulative visual impacts are likely to be low. There are also likely to be opportunities to screen the other solar energy facilities from roads in the area.

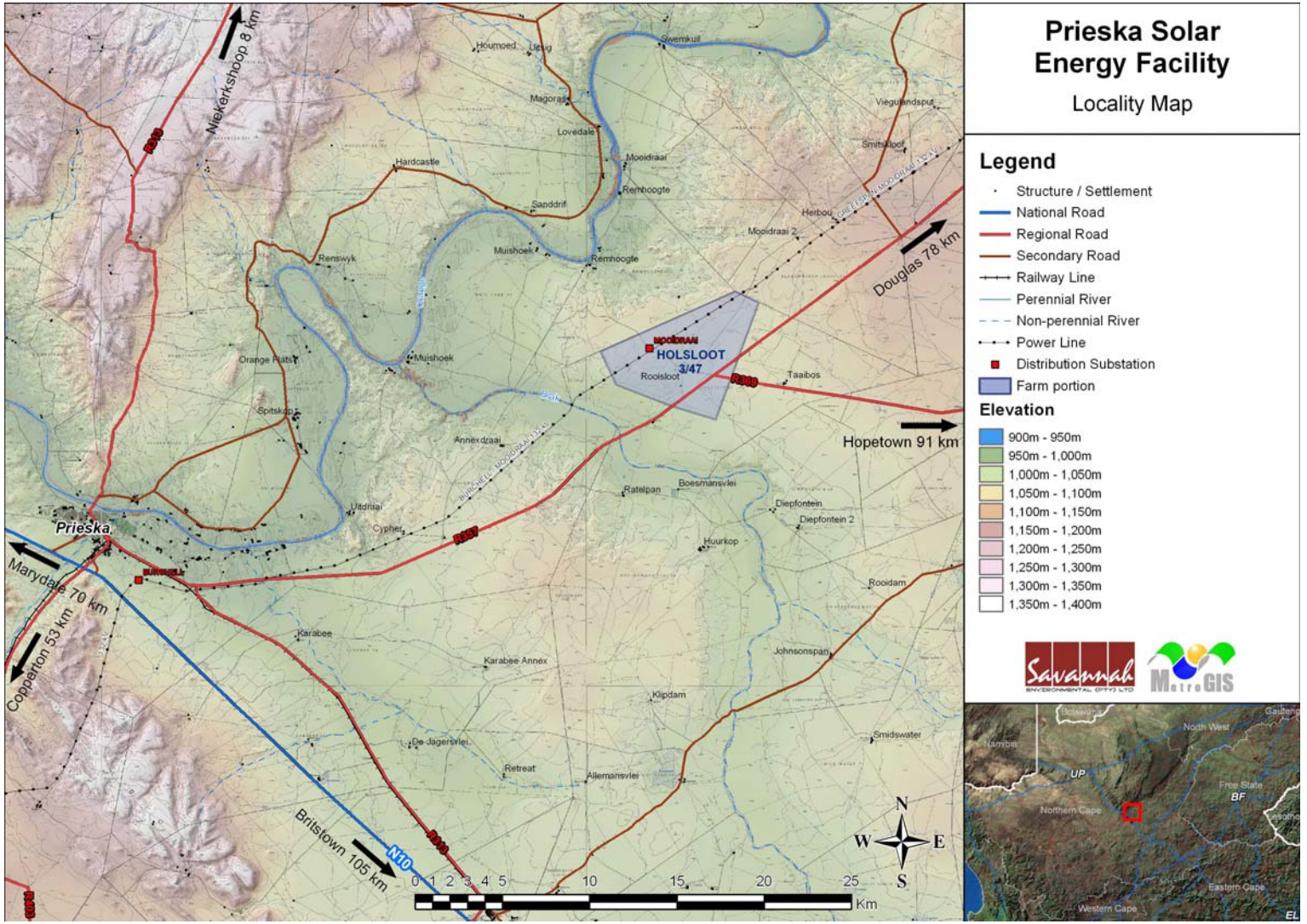

Figure 1: Locality Map

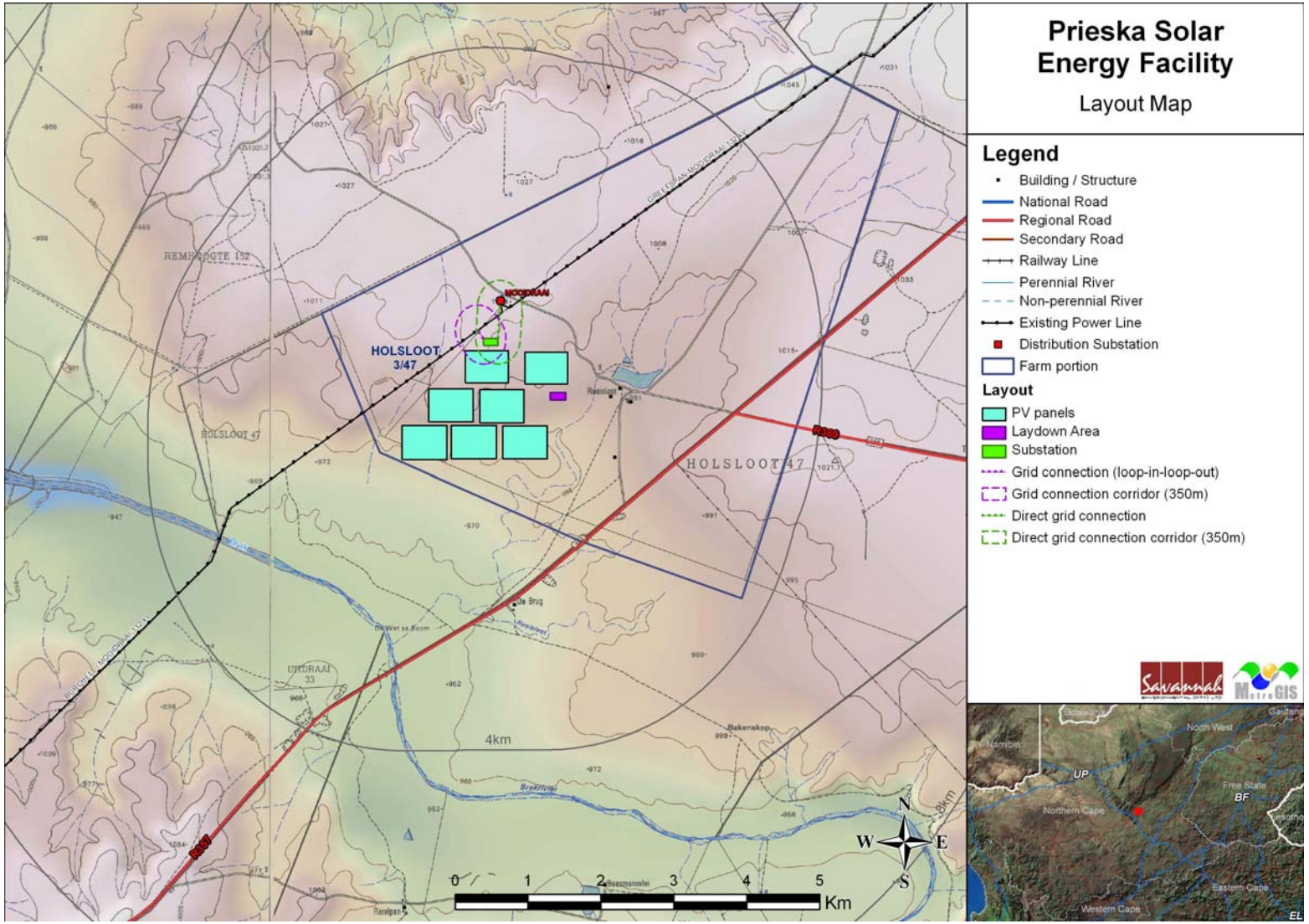

Figure 2: Preliminary layout of the proposed facility

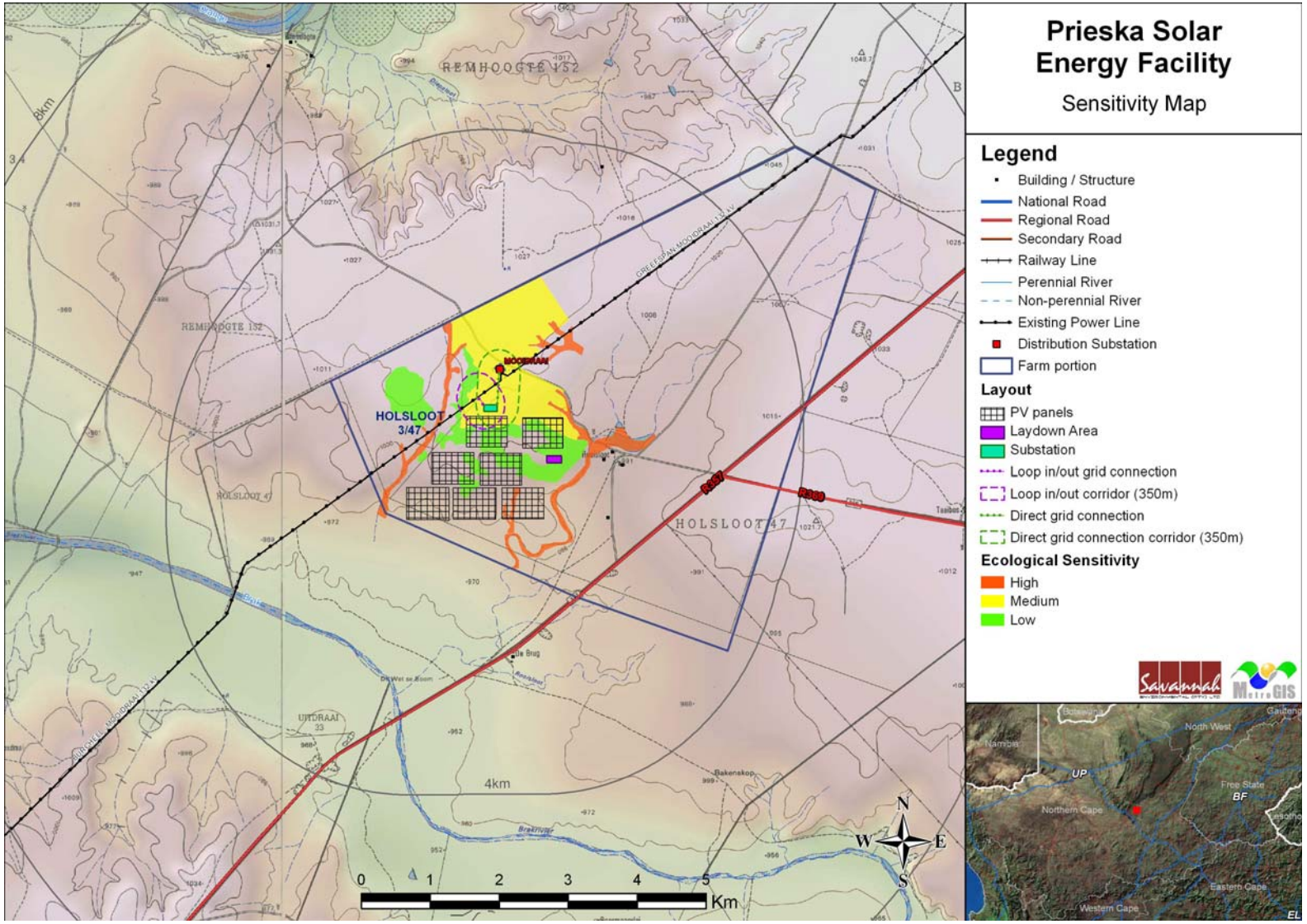

Figure 3: Sensitivity Map for the Prieska Solar Energy Facility.

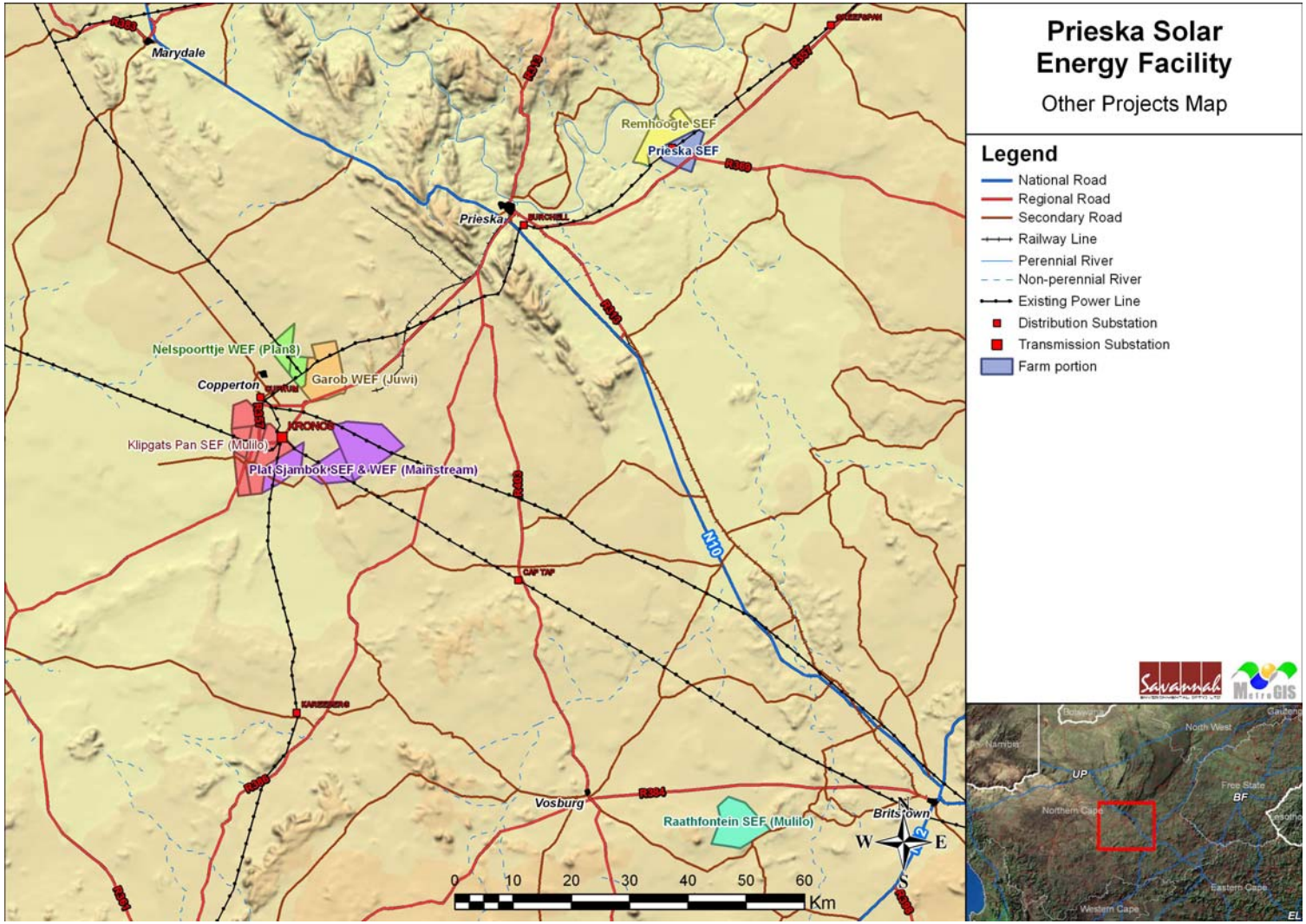

Figure 4: Locality map showing the adjacent Solar Energy Facilities proposed within the surrounding areas to the Prieska Solar Energy Facility.

TABLE OF CONTENTS

APPENDICES

Appendix A: EIA Project Consulting Team CVs
Appendix B: Correspondence with National and Provincial Authorities
Appendix C: I&AP Database
Appendix D: Newspaper Adverts & Site Notices
Appendix E: Public Particiption
Appendix E1: BID and Reply Form
Appendix E2: Stakeholder Correspondence
Appendix E3: Comments and Response Report
Appendix E4: Landowner map
Appendix F: Ecological Report
Appendix G: Soils and Agricultural Potential Report
Appendix H: Heritage Impact Assessment Report
Appendix I: Visual impact assessment Report
Appendix J: Palaeontology assessment Report
Appendix K: Social impact assessment Report
Appendix L: Draft Environmental Management Programme
Appendix M: Maps
Appendix N: Site Photos

DEFINITIONS AND TERMINOLOGY

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

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

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

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

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

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

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

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

i. The land, water and atmosphere of the earth;
ii. Micro-organisms, plant and animal life;
iii. Any part or combination of (i) and (ii) and the interrelationships among and between them; and

iv. The physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being.

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

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

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

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

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

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

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

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

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

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

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

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

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

ABBREVIATIONS AND ACRONYMS

BID	Background Information Document
CO_2	Carbon dioxide
DEA	National Department of Environmental Affairs
DEADP	Department of Environment Affairs and Development Planning
DoE	Department of Energy
DWA	Department of Water Affairs
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
GIS	Geographical Information Systems
GG	Government Gazette
GN	Government Notice
GHG	Green House Gases
GWh	Giga Watt Hour
I&AP	Interested and Affected Party
IDP	Integrated Development Plan
IPP	Independent Power Producer
km^2	Square kilometres
km/hr	Kilometres per hour
kV	Kilovolt
MAR	Mean Annual Rainfall
m^2	Square meters
m/s	Meters per second
MW	Mega Watt
NEMA	National Environmental Management Act (Act No. 107 of 1998)
NERSA	National Energy Regulator of South Africa
NHRA	National Heritage Resources Act (Act No. 25 of 1999)
NGOs	Non-Governmental Organisations
NWA	National Water Act (Act No. 36 of 1998)
SAHRA	South African Heritage Resources Agency
SANBI	South African National Biodiversity Institute
SANRAL	South African National Roads Agency Limited
SDF	Spatial Development Framework

INTRODUCTION CHAPTER 1

Jouren Solar (Pty) Ltd is proposing the establishment of a commercial solar energy generating facility and associated infrastructure on Portion 3 of the Farm Holsloot 47 which is located within the Siyathemba Local Municipality in the Northern Cape (refer to Figure 1.1).

The solar energy facility is proposed to accommodate several arrays of tracking or static **photovoltaic (PV) panels** and associated infrastructure on a portion of the proposed site. From a regional perspective, this area is considered technically favourable for the development of commercial solar electricity generating facilities by virtue of the **climatic conditions** (primarily as the economic viability of a solar energy facility is directly dependent on the annual direct solar irradiation values for a particular area), orographic conditions, relief and aspect, the extent of the site, and the availability of a direct **grid connection** (i.e. the point of connection to the National grid). The identified site is available for development, and has direct road access via the R357 and R369 regional routes which bisect the eastern corner of the proposed site.

The proposed facility and associated infrastructure (i.e. the development footprint) would be constructed over an area of approximately 275 hectares (ha) in extent. The larger project development site covers an area of approximately 3164 ha. **Figure 1.1** indicates the entire farm portion that is currently being assessed as part of this Environmental Impact Assessment (EIA).

The nature and extent of this facility, as well as the potential environmental impacts associated with the construction, operation and decommissioning phases are explored in more detail in this Final EIA Report. The Final EIA Report consists of eight chapters, which include:

Chapter 1: Provides background to the proposed facility and the environmental impact assessment.
Chapter 2: Provides a description of the proposed project.
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Chapter 4: Outlines the process which was followed during the EIA Phase, including the consultation process that was undertaken and input received from interested parties.
Chapter 5: Describes the existing biophysical and socio-economic environment.
Chapter 6: Presents the assessment of environmental impacts associated with the proposed facility.

Chapter 7: Presents the conclusions of the EIA, as well as an impact statement on the proposed project.

Chapter 8: Provides a list of references and information sources used in undertaking the studies for this EIA Report.

1.1. Summary of the proposed Development

The Prieska Solar Energy Facility is proposed to accommodate several arrays of photovoltaic (PV) panels with associated infrastructure in order to generate up to **75 MW** of electricity. The facility will comprise of PV panels and associated infrastructural requirements which will include:

» Solar panels (single or double axis).
» An on-site inverter to step up the power and a substation to facilitate the connection between the solar energy facility and the Eskom electricity grid.
» Two alternatives are being considered to evacuate the electricity from the facility.
  a) Alternative 1 a loop-in and loop out power line to connect into the existing Burchell-Mooidraai 1 132kV power line which traverses the site;
  b) Alternative 2 to connect directly into the existing Eskom Mooidraai Substation located on the site.
» Internal access roads.
» Workshop area for maintenance and storage.

Based on the information available at the time of undertaking this EIA, there are 6 proposed renewable energy projects that are currently proposed between Prieska and Copperton (refer to Table 1.1). Only one project has reached preferred bidder status, namely the Mulilo Power (Pty) Ltd, Proposed Photovoltaic Power Generation Facility near Prieska (DEA Reference No. 12/12/20/1722).

Table 1.1: A list of the proposed projects in the area are as follows:

Project	Project Developer	Location	Status of the Project	DEA Reference No.
1. Proposed Photovoltaic Power Generation Facility near Prieska	Mulilo Power (Pty) Ltd	Farm 104/1 near the Town of Prieska	EA issued Preferred Bidder	12/12/20/1722
2. Proposed establishment of a wind farm facility in Prieska,	South African Mainstream Renewable Power Development	Remainder of the Farm plat Sjambok No. 102; Portion 1 & 3 of the farm Kaffirs Kolk No.	EIA complete	12/12/20/2320/1

Project	Project Developer	Location	Status of the Project	DEA Reference No.
Siyathemba Local Municipality, Northern cape		118, near Prieska		
3. Proposed establishment of a PV Solar facility in Prieska, Siyathemba Local Municipality, Northern cape	South African Mainstream Renewable Power Development	Remainder of the Farm plat Sjambok No. 102; Portion 1 & 3 of the farm Kaffirs Kolk No. 118, near Prieska	EIA in process	12/12/20/2320/2
4. Proposed Photovoltaic Energy Plant On Farm Klipgats Pan Near Copperton, Northern Cape	Mulilo Power (Pty) Ltd	Farm Klipgats Pan Near Copperton	EIA in process	12/12/20/2501
5. Proposed Wind Energy Facility Near Copperton, Northern Cape	Plan 8	Portions 4 and 7 of Farm Nelspoortje ("Struisbult")~ 50 km southwest of Prieska	Unknown	12/12/20/2099
6. Proposed Garob Wind Energy Facility Project, Northern Cape Province	Juwi	Portion 5 of Farm Nelspoortje 103 east of Copperton	EIA in process	14/12/16/3/3/2/279

The overarching objective for the proposed solar energy facility under consideration in this EIA process is to maximise electricity production through exposure to the solar resource, while minimising infrastructure, operational and maintenance costs, as well as social and environmental impacts. In order to meet these objectives local level environmental and planning issues will be assessed through site-specific studies in order to delineate areas of sensitivity within the broader site of which will serve to inform the design of the facility.

The scope of the proposed Prieska Solar Energy Facility, including details of all elements of the project (for the design/planning, construction, operation and decommissioning Phases) is discussed in more detail in **Chapter 2.**

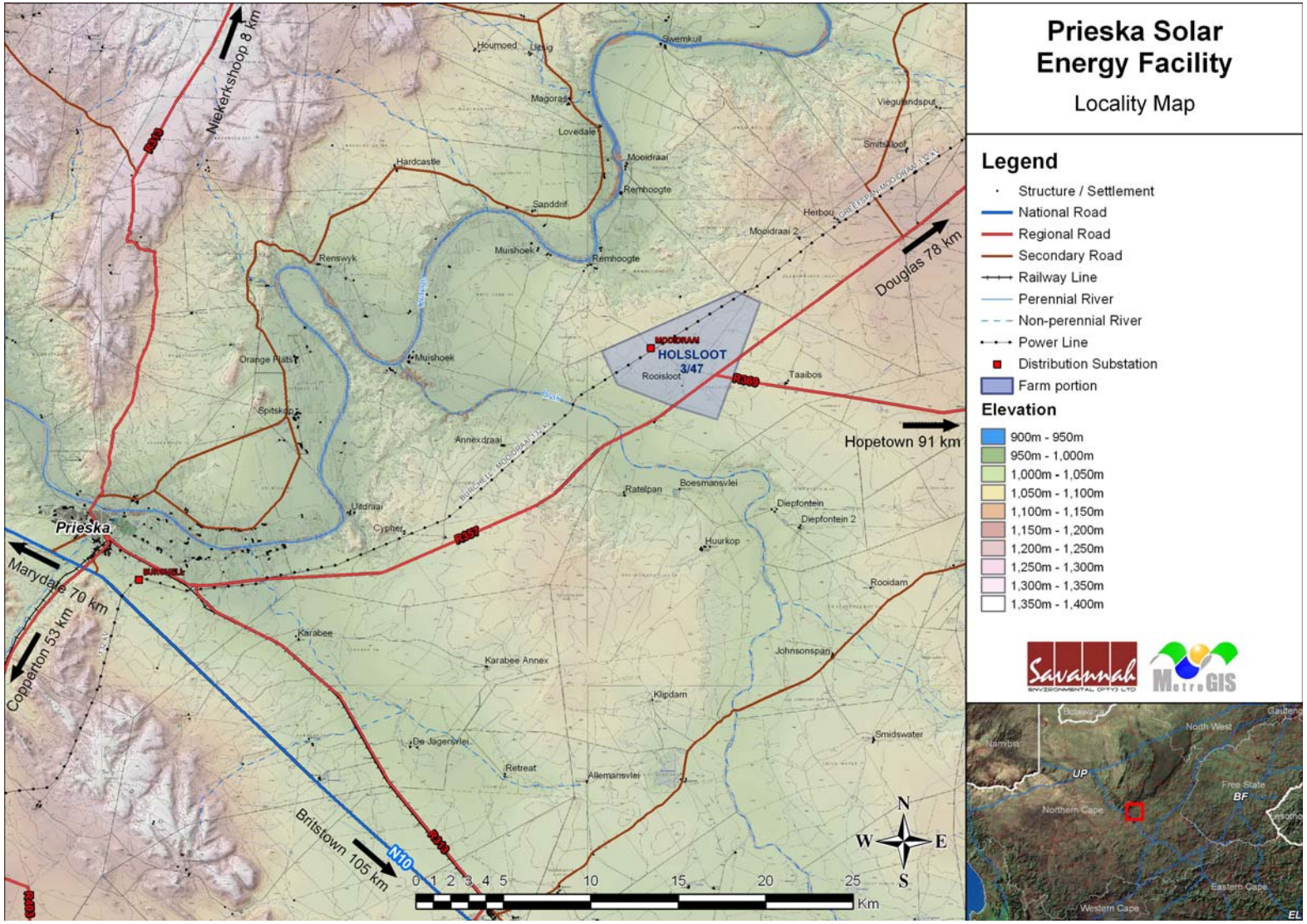

Figure 1.1: Locality map illustrating the location of the assessed development site for the proposed Prieska Solar Energy Facility

1.2. Conclusions from the Scoping Phase

The full extent of the project development site (i.e. the entire extent of the farm portion) was evaluated within the scoping study. It was found that:

» **Ecologically sensitive areas (terrestrial) that occur on the site:**
Protected and red-data plant and/ animal species could potentially occur on the site. However, once the final layout has been designed in accordance to findings of a field investigation, it is unlikely that the development will compromise the survival of any of the species of conservation concern. There are also low rocky ridges that could be remotely identified. These habitats are sensitive because of their ecosystem functions – providing specialised niches for fauna and flora, creating corridors in the landscape, catching sedimentation and concentrating water runoff.

» **Drainage lines within the site:**
The site is in a very arid area. There are a number of dry stream beds and drainage areas. Drainage lines (water resources) represent particularly vital natural corridors as they function both as wildlife habitat, providing resources needed for survival, reproduction and movement, and as biological corridors, providing for movement between habitat patches. The drainage lines shown in the desktop sensitivity map have been mapped as linear features only. The actual extent will be identified during field work on the next phase of the assessment.

» **Potential visual receptors / homesteads around the site:**
The study area is sparsely populated (approximately 1.4 persons per km^2), with the highest concentration of people living in towns such as Prieska. However, there are homesteads and settlements present within the study area that could experience visual impacts from the solar panels and/or disturbances during construction of the facility. These homesteads include: Rooisloot, Taaibos, Ratelpan, Annexdraai, Diepfontein, Diepfontein 2, Rooidam, Johnsonspan and Herbou, which all occur within a 16km radius of the proposed facility[1]. The town of Prieska lies 30km from the proposed site, and will not be visually exposed to the proposed facility.

No environmental fatal flaws were identified to be associated with the development of a solar energy facility on the proposed site. It was recommended that

[1] It is uncertain whether all of the potentially affected farmsteads are inhabited or not. It stands to reason that farmsteads that are not currently inhabited will not be visually impacted upon at present. These farmsteads do, however retain the potential to be affected visually should they ever become inhabited again in the future. For this reason, the VIA report operates under the assumption that all the homesteads are inhabited.

infrastructure should be placed considering the implementation of mitigation measures to minimise impacts to identified sensitive areas. These areas of sensitivity relate only to the ecological aspects of the site and are illustrated in the sensitivity map (refer to Figure 1.2).

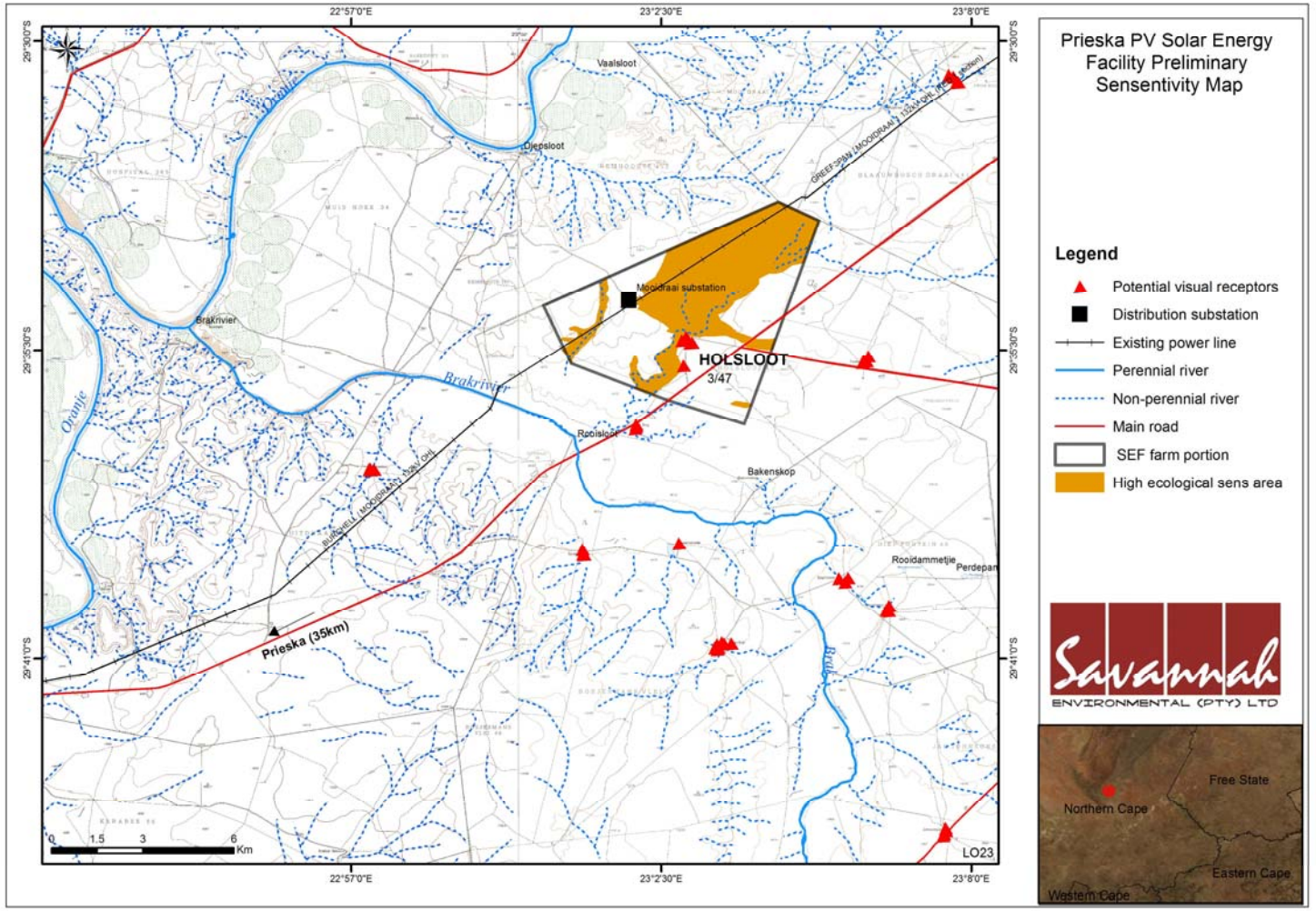

Figure 1.3: Preliminary environmental sensitivity map for the proposed Prieska Solar Energy Facility indicating ecological sensitivity

From the conclusions of the Scoping Study, the potentially significant issues identified as being related to the **construction** of the Prieska Solar Energy Facility include, *inter alia*:

» Effects on protected flora and fauna (local and site specific)
» Impacts on soils
» Impacts on water courses and drainage lines
» Socio-economic impacts, both positive and negative (including job creation and business opportunities, impacts associated with construction workers in the area)

The potentially significant issues related to the **operation** of the Prieska Solar Energy Facility include, *inter alia*:

» Visual impacts and impacts on "sense of place" on nearby residential areas and observers travelling on main roads
» Positive socio-economic impacts
» Impacts on land use of the site
» Increased use of clean, renewable energy (positive)

1.3. Requirement for an Environmental Impact Assessment Process

The proposed solar energy facility is subject to the requirements of the EIA Regulations published in terms of Section 24(5) of the National Environmental Management Act (NEMA, Act No. 107 of 1998). This section provides a brief overview of the EIA Regulations and their application to this project.

NEMA is the national legislation that provides for the authorisation of "listed activities". In terms of Section 24(1) of NEMA, the potential impact on the environment associated with these activities must be considered, investigated, assessed and reported on to the competent authority who has been charged by NEMA with the responsibility of granting environmental authorisations. As this is a proposed electricity generation project and thereby considered to be of national importance, the National Department of Environmental Affairs (DEA) is the competent authority and the Northern Cape Department of Environmental and Nature Conservation (DENC) will act as a commenting authority for the application. An application for authorisation has been accepted by DEA under application reference number **14/12/16/3/3/2/313.**

Compliance with the requirements of the EIA Regulations ensures that decision-makers are provided with an opportunity to consider the potential environmental impacts of a project early in the project development process and to assess if potential environmental impacts can be avoided, minimised or mitigated to

acceptable levels. Comprehensive, independent environmental studies are required in accordance with the EIA Regulations to provide the competent authority with sufficient information in order to make an informed decision. Prieska Energy Facility (Pty) Ltd appointed Savannah Environmental (Pty) Ltd as the independent Environmental Assessment Practitioner (EAP) to conduct the EIA process for the proposed project.

An EIA is an effective planning and decision-making tool for the project developer as it allows for the identification and management of potential environmental impacts. It provides the developer with the opportunity of being fore-warned of potential environmental issues. Subsequently it may assist with the resolution of issues reported on in the Scoping and EIA Phases as well as promoting dialogue with interested and affected parties (I&APs) and stakeholders. In terms of sections 24 and 24D of NEMA, as read with the EIA Regulations R543, a Scoping Phase and an EIA are required to be undertaken for this proposed project as the proposed project includes the following "listed activities" in terms of GN R544, R545 and R546 (GG No 33306 of 18 June 2010).

Relevant Notice	Activity No	Description of listed activity
GN 544, 18 June 2010	10	The construction of facilities or infrastructure for the transmission and distribution of electricity- i. Outside urban areas or industrial complexes with a capacity of more than 33kV but less than 275 kV **The proposed facility will be required to evacuate electricity into the national grid using a distribution line of less than 275kV**
GN 544, 18 June 2010	11	The construction of: x. Buildings exceeding 50 square metres in size; or xi. Infrastructure or structures covering 50 square metres or more Where such construction occurs within a watercourse or within 32 metres of a watercourse, measures from the edge of a watercourse, excluding where such construction will occur behind the development setback line **Canals, channels, or buildings exceeding 50m^2 may be required to be built within 32m of a watercourse.. There are drainage lines on site that lie within 32 m of the proposed solar panels.**

Relevant Notice	Activity No	Description of listed activity
GN 544, 18 June 2010	18	The infilling or deposition of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shell, shell grit, pebbles or rock or more than 5 cubic metres from: i. A watercourse; **The development of the facility may require the excavation, removal or moving of soil from a watercourse.**
GN 545, 18 June 2010	1	The construction of facilities or infrastructure, for the generation of electricity where the output is 20 megawatts or more. **The proposed facility will have a generation capacity of 75MW**
GN 545, 18 June 2010	15	Physical alteration of undeveloped, vacant or derelict land for residential, retail, commercial, recreational, industrial or institutional use where the total area to be transformed is 20 hectares or more; except where such physical alteration takes place for: (i) linear development activities; or (ii).agricultural or afforestation where activity 16 in this Schedule will apply. **The total area to be transformed will be more than 20 ha.**
GN 546, 18 June 2010	10(ii)	The construction of facilities or infrastructure for the storage, or storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of 30 but not exceeding 80 cubic metres. **Hazardous substances to be used during construction will need to be stored on-site**.
GN 546, 18 June 2010	16(iii)& (iv)	(a) In Northern Cape: The construction of: (iii) buildings with a footprint exceeding 10 square metres in size or (iv) infrastructure covering 10 square metres or more where such construction occurs within a watercourse or within 32 metres of a watercourse, measured from the edge of a watercourse, excluding where such construction will occur behind the development setback line.

Relevant Notice	Activity No	Description of listed activity
		Building larger than 10 m^2 within 32 m of a watercourse may be required to be built.

The EIA phase was conducted in accordance with the requirements of the EIA Regulations in terms of Section 24(5) of NEMA.

1.4. Objectives of the EIA Process

The Scoping Phase was completed in November 2012 with the receipt of the acceptance of scoping from DEA. The scoping phase served to identify potential impacts associated with the proposed project and to define the extent of studies required within the EIA Phase. The Scoping Phase included input from the project proponent, specialists with experience in the study area and in EIAs for similar projects, as well as a public consultation process with key stakeholders that included both government authorities and interested and affected parties (I&APs).

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

1.5. Details of the Environmental Assessment Practitioner

Savannah Environmental was contracted by to Jouren Solar (Pty) Ltd as the independent EAP to undertake the EIA process for the proposed project. Neither Savannah Environmental nor any of its specialist sub-consultants are subsidiaries of or are affiliated to to Jouren Solar (Pty) Ltd. Furthermore, Savannah Environmental does not have any interests in secondary developments that may arise out of the authorisation of the proposed project.

Savannah Environmental is a specialist environmental consultancy which provides a holistic environmental management service, including environmental assessment and planning to ensure compliance with relevant environmental legislation. Savannah Environmental benefits from the pooled resources, diverse skills and experience in the environmental field held by its team that has been actively involved in undertaking environmental studies for a wide variety of projects

throughout South Africa and neighbouring countries. Strong competencies have been developed in project management of environmental processes, as well as strategic environmental assessment and compliance advice, and the assessment of environmental impacts, the identification of environmental management solutions and mitigation/risk minimising measures.

The EAPs from Savannah Environmental who are responsible for this project are:

» Karen Jodas - a registered Professional Natural Scientist and holds a Master of Science degree. She has 16 years of experience consulting in the environmental field. Her key focus is on strategic environmental assessment and advice; management and co-ordination of environmental projects, which includes integration of environmental studies and environmental processes into larger engineering-based projects and ensuring compliance to legislation and guidelines; compliance reporting; the identification of environmental management solutions and mitigation/risk minimising measures; and strategy and guideline development. She is currently responsible for the project management of EIAs for several renewable energy projects across the country.

» Alicia Govender – the principle author of this report, holds an Honours Bachelor of Science degree in Environmental Management and has 5 years of experience in environmental management. She is currently the responsible EAP for several renewable energy projects and other EIAs across the country.

In order to adequately identify and assess potential environmental impacts associated with the proposed project, Savannah Environmental has appointed the following specialist sub-consultants to conduct specialist impact assessments:

» Ecology – Marianne Strohbach of Savannah Environmental;
» Soils and agricultural potential – Dr L G du Pisani of Eduplan CC;
» Heritage resources – Stephan Gaigher of GA Heritage;
» Palaeontology - Dr JF Durand
» Visual – Lourens du Plessis of MetroGIS; and
» Social – Tony Barbour of Tony Barbour Environmental Consulting and Research.

Savannah Environmental has developed a detailed understanding of impacts associated with the construction and operation of renewable energy facilities through their involvement in numerous EIA processes for these projects. In order to adequately identify and assess potential environmental impacts, Savannah Environmental has appointed specialist consultants as required. Curricula vitae for the Savannah Environmental project team and its specialist sub-consultants are included in Appendix A.

DESCRIPTION OF THE PROPOSED PROJECT CHAPTER 2

This chapter provides an overview of the proposed Prieska Solar Energy Facility on a site located approximately 30 km north-east of Prieska in the Northern Cape. The project scope includes the planning/design, construction, operation and decommissioning phases during which potential impacts will vary in terms of their nature and significance. This chapter also explores the "Do-Nothing" alternative - that is the alternative of not establishing the facility.

2.1. Description of the Proposed Solar Energy Facility

The facility is proposed to accommodate several photovoltaic (PV) arrays, to make use of the solar resource on the site. The facility is proposed to have a generating capacity of up to 75 MW. An area of approximately 275 ha in extent is being investigated within the EIA process within which the facility is proposed.

The following table details the project components

Component	Description
Location of the site	~ 30 km north-east of Prieska
Municipal Jurisdiction	» Siyathemba Local Municipality » Pixley ka Seme District Municipality
Extent of the proposed development footprint	~275 ha
Extent of broader site available for development	~3 164 ha
Site access	Existing direct road access via the R357 and R369 regional routes which bisect the eastern corner of the proposed site
Generating capacity	Up to 75 MW
Proposed technology	Photovoltaic panels
Associated infrastructure	» Solar panels (single or double axis). » An on-site inverter to step up the power and a substation to facilitate the connection between the solar energy facility and the Eskom electricity grid. » Two alternatives are being considered to evacuate the electricity from the facility. a) Alternative 1 a loop-in and loop out power line to connect into the existing Burchell-Mooidraai No 1 132kV power

Component	Description
	line which traverses the site; b) Alternative 2 to connect directly into the existing Eskom Mooidraai Substation located on the site. » Internal access roads. » Workshop area for maintenance and storage.
Water use	» borehole

A preliminary layout of the proposed facility has been provided by the project developer, and is indicated in Figure 2.1. This is the layout which has been assessed within this EIA Report.

2.2. Purpose of the Proposed Project

The Prieska Solar Energy Facility is proposed to be developed as a commercial energy facility. The purpose of the proposed facility is to add new capacity for generation of renewable energy to the national electricity supply (which is short of generation capacity to meet current and expected demand) and to aid in achieving the goal of a 30% share of all new power generation being derived from independent power producers (IPPs), as targeted by the Department of Energy (DoE).

Globally there is increasing pressure on countries to increase their share of renewable energy generation due to concerns such as climate change and exploitation of non-renewable resources. In order to meet the long-term goal of a sustainable renewable energy industry, a goal of 17,8GW of renewables by 2030 has been set by the Department of Energy (DoE) within the Integrated Resource Plan (IRP) 2010. This energy will be produced mainly from wind, solar, biomass, and small-scale hydro (with wind and solar comprising the bulk of the power generation capacity). This amounts to ~42% of all new power generation being derived from renewable energy forms by 2030. This is however dependent on the assumed learning rates and associated cost reductions for renewable options.

In responding to the growing electricity demand within South Africa, as well as the country's targets for renewable energy, Jouren Solar (Pty) Ltd is proposing the establishment of the Prieska Solar Energy Facility to add new capacity to the national electricity grid. Jouren Solar (Pty) Ltd will be required to apply for a generation license from the National Energy Regulator of South Africa (NERSA), as well as a power purchase agreement from Eskom (typically for a period of 20 years) in order to build and operate the proposed facility. As part of the agreement, Jouren Solar (Pty) Ltd will be remunerated per kWh by Eskom who will be

financially backed by government. Depending on the economic conditions following the lapse of this period, the facility can either be decommissioned or the power purchase agreement may be renegotiated and extended.

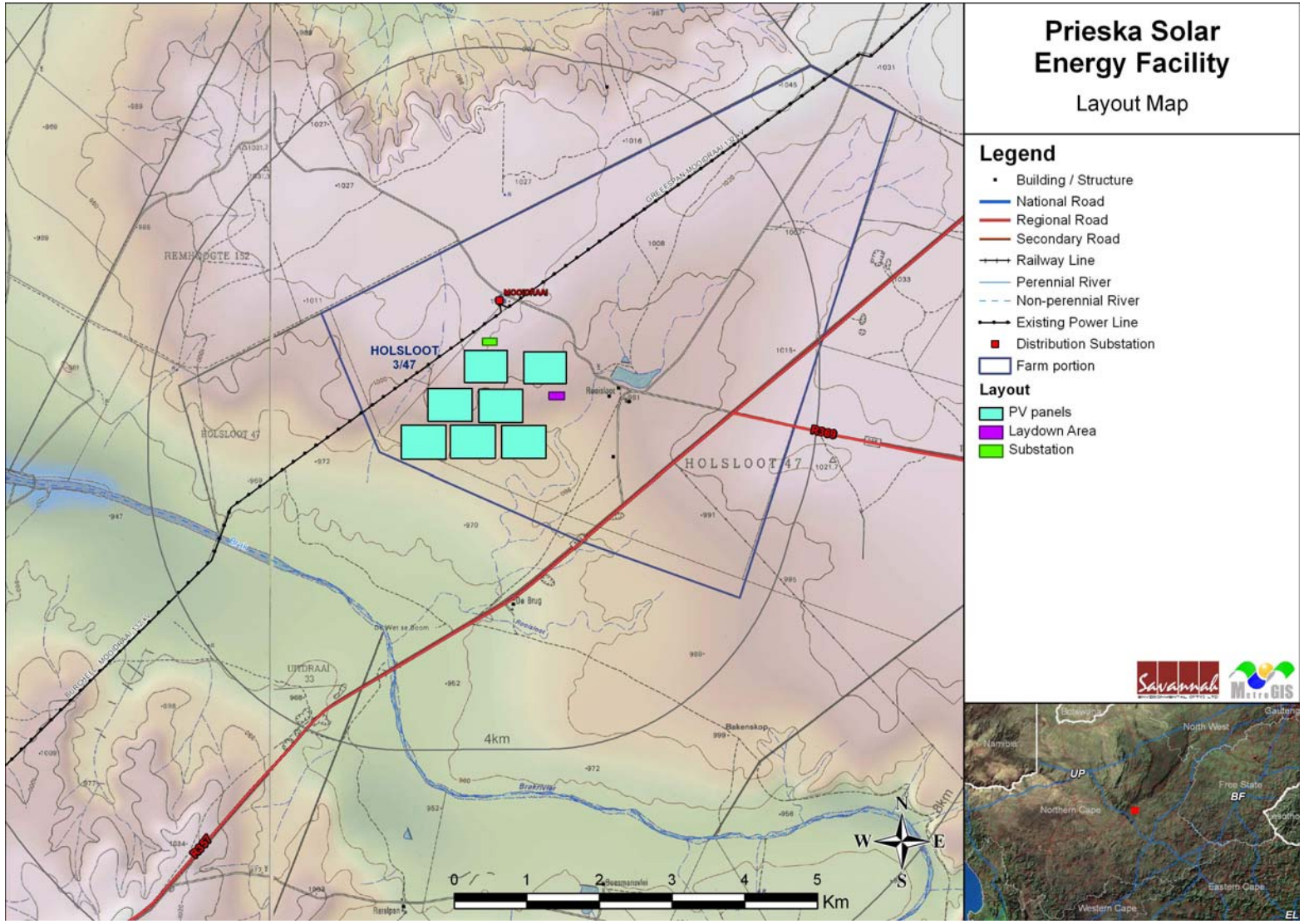

Figure 2.1: Preliminary layout for the proposed Prieska Solar Energy Facility.

It is considered viable that long-term benefits for the community and/or society in general can be realised should the site identified prove to be acceptable from a technical and environmental perspective for the establishment of the proposed PV facility. The Prieska Solar Energy Facility has the potential to contribute to national electricity supply and to increase the security of supply to consumers. In addition, it may provide both economic stimulus to the local economy through the construction process and long term employment (i.e. management and maintenance) during the operation phase.

2.3. Solar Energy as a Power Generation Technology

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

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

2.3.1 How do Grid Connected Photovoltaic Facilities Function?

Solar energy facilities, such as those using PV technology use the energy from the sun to generate electricity through a process known as the Photovoltaic Effect (see Figure 2.1). This effect refers to photons of light colliding with electrons, and therefore placing the electrons into a higher state of energy to create electricity. This is achieved using the following components:

The **Photovoltaic Cell**
Individual PV cells are linked and placed behind a protective glass sheet to form a photovoltaic panel. Other technologies that can be used include thin film.

The **Inverter**
The photovoltaic effect produces electricity in direct current. Therefore an inverter must be used to change it to alternating current.

The **Support Structure**

The photovoltaic (PV) panels will be attached to a **support structure approximately 6 meters off the ground** set at an angle so to receive the maximum amount of solar radiation. The angle of the panel is dependent on the latitude of the proposed facility and the angles may be adjusted to optimise for summer or winter solar radiation characteristics. The PV panels are designed to operate continuously for more than 20 years, unattended and with low maintenance.

Figure 2.2: Illustration of a photovoltaic solar facility

2.4. Project Alternatives

Due to the nature of the development (i.e. a renewable energy facility), the location of the project is largely dependent on technical factors such as solar irradiation (i.e. the fuel source), climatic conditions, available extent and the relief/topography of the site, and available grid connection. The proposed site was identified by the proposed developer as being technically feasible.

The following characteristics were considered in determining the feasibility of the proposed site. Based on these considerations, Jouren Solar Energy (Pty) Ltd considers the proposed site as their highly preferred site for the development of the Prieska Solar Energy Facility.

Site extent: Space is a restraining factor for a PV solar facility installation. The PV solar facility of 75 MW will require an area < 275 ha. There is sufficient space for the proposed project within the area under consideration.

Site access: The site can be directly accessed via the existing R357 and R369 regional routes which bisect the eastern corner of the proposed site.

Climatic conditions: The economic viability of a PV facility is directly dependent on the annual direct solar irradiation values. The Northern Cape receives the highest average daily direct normal irradiation in South Africa which indicates that the regional location of the project is appropriate to a solar energy facility.

Site slope and aspect: A level surface area (i.e. with a minimal gradient in the region of 1%) is preferred for the installation of PV panels (Fluri, 2009) (refer to Figure 2.3).

Technology Alternatives: Static or Tracking PV technology is being considered for the project. Photovoltaic Solar Panels point directly due south or due north depending upon their location. In order to increase efficiency the photovoltaic panel needs to produce the maximum amount of solar energy for the maximum amount of time during sunlight hours. Static PV panels are fixed at an angle and do not "track" the sun. However, tracking PV panels follow the suns rotational path all day, every day of the year giving it the best solar panel orientation and generating the maximum possible output power

Figure 2.3: Illustration of a tracking photovoltaic panel

2.4.1. Electricity Evacuation Infrastructure

Energy generated by the Prieska Solar Energy Facility will be evacuated to the national grid via a new on-site substation; a line will be constructed from the new substation. Two alternatives are being considered to evacuate the electricity from the facility to either a loop-in and loop out power line to connect into the existing Burchell-Mooidraai No 1 132kV power line which traverses the site (alternative 1) or alternatively to connect directly into the existing Eskom Mooidraai Substation located on the site (alternative 2).

2.4.2. The 'do-nothing' Alternative

The 'do-nothing' alternative is the option of not constructing the Prieska solar energy facility on the proposed site.

The primary considerations pertaining to the do-nothing alternative relate to:
1. The current land-use regime of the site; and
2. The need to diversify the energy mix is South Africa.

These are discussed in further detail below.

The site for the proposed solar energy facility falls within the land capability class *Non-Arable with Low Potential Grazing Land*. The ''best use'' for the area is for grazing with sheep and goats. The "do nothing" alternative would however leave current land-use and livestock grazing, with losing out the opportunity to generate renewable energy from the solar energy and at the development of the solar energy facility will allow current livestock grazing on areas of the farm portions which will not be occupied by solar panels and associated infrastructure. Therefore the current land-use will be retained, while also generating renewable energy from the solar energy. This represents a win-win situation of landowners, the site and the developer. Therefore, from a land-use perspective, the do-nothing alternative is not preferred.

1. The electricity demand in South Africa is placing increasing pressure on the country's existing power generation capacity. There is, therefore, a need for additional electricity generation options to be developed throughout the country. The decision to expand South Africa's electricity generation capacity, and the mix of generation technologies is based on **national policy** and informed by on-going strategic planning undertaken by the national Department of Energy (DoE), the National Energy Regulator of South Africa (NERSA) and Eskom Holdings Limited (as the primary electricity supplier in South Africa). The support for renewable energy policy is guided by a rationale that South Africa has a very attractive range of renewable resources, particularly solar and wind and that renewable applications are in fact the least-cost energy service in many cases - and more so when social and environmental costs are taken into account.

   The generation of electricity from renewable energy in South Africa offers a number of socio-economic and environmental benefits. These benefits are explored in further by NERSA (March 2009), and include:

- **Increased energy security:** The current electricity crisis in South Africa highlights the significant role that renewable energy can play in terms of supplementing the power available. In addition, given that renewables can often be deployed in a decentralised manner close to consumers, they offer the opportunity for improving grid strength and supply quality, while reducing expensive transmission and distribution losses.
- **Resource saving:** Conventional coal fired plants are major consumers of water during their requisite cooling processes. It is estimated that the achievement of the targets in the Renewable Energy White Paper will result in water savings of approximately 16.5 million kilolitres, where compared with wet cooled conventional power stations. This translates into revenue saving of R26.6 million. As an already water stressed nation, it is critical that South Africa engages in a variety of water conservation measures, particularly as the detrimental effects of climate change on water availability are experienced in the future.
- **Exploitation of our significant renewable energy resource:** At present, valuable national resources (including biomass by-products, solar insulation and wind) remain largely unexploited. The use of these energy flows will strengthen energy security through the development of a diverse energy portfolio.
- **Pollution reduction:** The releases of by-products of fossil fuel burning for electricity generation have a particularly hazardous impact on human health, and contribute to ecosystem degradation.
- **Climate friendly development:** The uptake of renewable energy offers the opportunity to address energy needs in an environmentally responsible manner, contributing to the mitigation of climate change through the reduction of greenhouse gas emissions. South Africa as a nation is estimated to be responsible for 1% of global GHG emissions and is currently ranked 9th worldwide in terms of per capita CO_2 emissions.
- **Support for international agreements and enhanced status within the international community:** The effective deployment of renewable energy provides a tangible means for South Africa to demonstrate its commitment to its international agreements under the Kyoto Protocol, and for cementing its status as a leading player within the international community.
- **Employment creation:** The sale, development, installation, maintenance and management of renewable energy facilities has significant potential for job creation in South Africa.
- **Acceptability to society:** Renewable energy offers a number of tangible benefits to society including reduced pollution concerns, improved human and ecosystem health and climate friendly development.
- **Support to a new industry sector:** The development of renewable energy offers an opportunity to establish a new industry within the South African economy.

» **Protecting the natural foundations of life for future generations:** Actions to reduce our disproportionate carbon footprint can play an important part in ensuring our role in preventing dangerous anthropogenic climate change; thereby securing the natural foundations of life for generations to come.

At present, South Africa is some way off from exploiting the diverse gains from renewable energy and from achieving a considerable market share in the renewable energy industry. South Africa's electricity supply remains heavily dominated by coal-based power generation, with the country's significant renewable energy potential largely untapped to date.

Within a policy framework, the development of renewable energy in South Africa is supported by the White Paper on Renewable Energy (November 2003), which has set a target of 10 000 GWh renewable energy contributions to final energy consumption by 2013. Furthermore the IRP 2010 states that 42% share of all new power generation should be derived from renewable energy forms, as targeted by the Department of Energy (DoE) (Integrated Resource Plan 2010 – 2030). The target is to be achieved primarily through the development of wind, biomass, solar and small-scale hydro. DME's macroeconomic study on renewable energy, developed under the now completed Capacity Building in Energy Efficiency and Renewable Energy (CaBEERE) project, has established that the achievement of this target would provide a number of economic benefits, including increased government revenue amounting to R299 million, increased GDP of up to R1 billion per year and the creation of an estimated 20 500 new jobs. In addition, the development of renewable energy beyond the 10 000 GWh target holds further employment benefits and would maximise the number of jobs created per TWh (NERSA, March 2009).

Through research, the viability of the Prieska Solar Energy Facility has been established, and the developer proposes that a solar energy facility up to 75 MW can be established. The 'do nothing' alternative will not assist the South African government in reaching the set targets for renewable energy. In addition the Nothern Cape's power supply will not be strengthened by the additional generated power being evacuated directly into the Provinces' electricity grid.

The 'do nothing' alternative is not a preferred alternative, as the result of not developing the solar energy facility will be that the following positive impacts will not be realised:

» Job creation from the construction and operational phases.
» Economic benefit to participating landowners due to the revenue that will be gained from leasing the land to the developer.

» Utilisation of clean, renewable energy in an area where it is optimally available.

2.5. Proposed Activities during the Project Development Stages

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

2.5.1. Construction Phase

The construction of the facility is unlikely to be phased, with the full 75 MW most likely being installed in one phase (75 MW is the current limit for solar projects set by the Department of Energy). The construction phase is expected to extend over a period of 18- 24 months and create approximately 291 employment opportunities at peak construction. It is anticipated that approximately 60% (175) of the employment opportunities will be available to low skilled (construction labourers, security staff etc), 15% (43) semi-skilled workers (drivers, equipment operators etc) and 25% (73) to skilled personnel (engineers, land surveyors, project managers etc). The majority of the employment opportunities, specifically the low and semi-skilled opportunities, are likely to be available to local residents in the area, specifically residents from the towns of Prieska, Upington, De Aar and Britstown. The majority of the beneficiaries are likely to be historically disadvantaged (HD) members of the community. This would represent a significant positive social benefit in an area with limited employment opportunities

The construction phase will entail a series of activities including:

Conduct Surveys

Prior to initiating construction, a number of surveys will be required including, but not limited to confirmation of the micro-siting footprint (i.e. the precise location of the PV panels, substation and the plant's associated infrastructure) and a geotechnical survey. Geotechnical surveys are executed by geotechnical engineers and geologists to acquire information regarding the physical characteristics of soil and rocks underlying a proposed site. The purpose is to design earthworks and foundations for structures and to execute earthwork repairs necessitated due to changes in the subsurface environment.

A power line servitude survey will also be conducted for the proposed Eskom Burchell-Mooidraai No 1 132kV power line, or alternatively the power line to the Mooidraai substation. If necessary, a walk through survey will be undertaken for

ecological, archaeology and heritage resources which may necessitate certain towers to be shifted to avoid on-the-ground sensitivities.

Establishment of Access Roads

The R357 and R369 regional routes bisect the eastern corner of the proposed site. Access to the site will be directly from these roads. Within the site itself, access will be constructed to the individual facility components for construction purposes (and later limited access for maintenance). Access track construction would normally comprise of compacted rock-fill with a layer of higher quality surfacing stone on top.

Undertake Site Preparation

Site preparation activities will include clearance of vegetation for most of the proposed area. In addition, site preparation will require the stripping of topsoil which will need to be stockpiled, backfilled and/or spread on site. If the terrain is undulating, then the ground may have to be levelled to one slope. Rocks may also be removed.

Transport of Components and Construction Equipment to Site

The components for the proposed facility will be transported to site by road. Some of the substation components may be defined as abnormal loads in terms of the Road Traffic Act (Act No. 29 of 1989)[2] by virtue of the dimensional limitations (i.e. size and weight). The typical civil engineering construction equipment will need to be brought to the site (e.g. excavators, trucks, graders, compaction equipment, cement trucks, etc.), as well as the components required for the establishment of the substation and power line.

Establishment of Construction Equipment Camp

Once the required equipment has been transported to site, a construction equipment camp will need to be established. The purpose of this camp is to confine activities and storage of equipment to one designated area to limit the potential ecological impacts associated with this phase of the project. The laydown area(s) will be used for assembly purposes and the general placement/storage of construction equipment. The storage of fuel for the on-site construction vehicles and equipment will need to be secured in a temporary bunded facility so as to prevent the possibility of leakages and soil contamination.

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

Establishment of the PV Panels

The PV panels will be mounted via steel structures which will be attached to uprights which are stabilised by concrete foundations where necessary. Ground screws or drive h section piles are the preferred fixation method. If the ground conditions are not suitable, then concrete foundations will be used. The foundation holes will be mechanically excavated to a depth of approximately 100 - 150 cm. The concrete foundations where necessary will be poured and then left for up to a week to cure. The installation of underground cables will require the excavation of trenches of approximately 40 cm – 100 cm deep within which they can then be laid.

Establishment of Ancillary Infrastructure

Ancillary infrastructure for the proposed development includes; Workshop, office and a change house. 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.

Construct on-site substation and Power line

An on-site substation of approximately 200 m x 150 m will be required to be established on the site. The construction of the substation would include the construction of the foundations, erection and installation of equipment (including the transformer) and connection of the necessary conductors.

A new power line will connect the new substation either to the Burchell- Mooidraai No 1 132kV power line or directly to the existing Mooidraai substation.

Undertake Site Rehabilitation

As construction is completed in an area, and as all construction equipment is removed from the site, 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 operation phase will be closed and prepared for rehabilitation.

2.5.2. Operational Phase

Either a loop-in, loop-out connection on the Eskom Burchell-Mooidraai No 1 132kV power line or power line directly to the Mooidraai substation, will evacuate the facility to the Eskom grid.

The proposed operational phase is expected to extend for a period of approximately 20 years with plant maintenance. It is anticipated that during this time, full time security, maintenance, supervision and monitoring teams will be required on site. Maintenance activities will include *inter alia*, replacement and cleaning of the panels (using water and/or pressurised air). The photovoltaic plant will be operational during daylight hours only. However, it will not be operational under circumstances of mechanical breakdown, extreme weather conditions or maintenance activities. No energy storage mechanisms (i.e. batteries) which would allow for continued generation at night or on cloudy days are proposed.

2.5.3. Decommissioning Phase

Depending on the economics of the development following the operational period, the plant will either be decommissioned or the operational phase will be extended. If it is deemed financially viable to continue, existing components would be dissembled and replaced with more appropriate technology/infrastructure available at that time. However, if the decision is made to decommission the facility the following activities will form part of the project scope.

Site Preparation

Site preparation activities will include confirming the integrity of the access to the site to accommodate the required decommissioning equipment.

Disassemble and Remove Existing Components

The components of the plant will be disassembled and removed. Thereafter they will be reused and recycled (where possible) or disposed of in accordance with regulatory requirements.

REGULATORY AND LEGAL CONTEXT CHAPTER 3

3.1 Policy and Planning Context

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

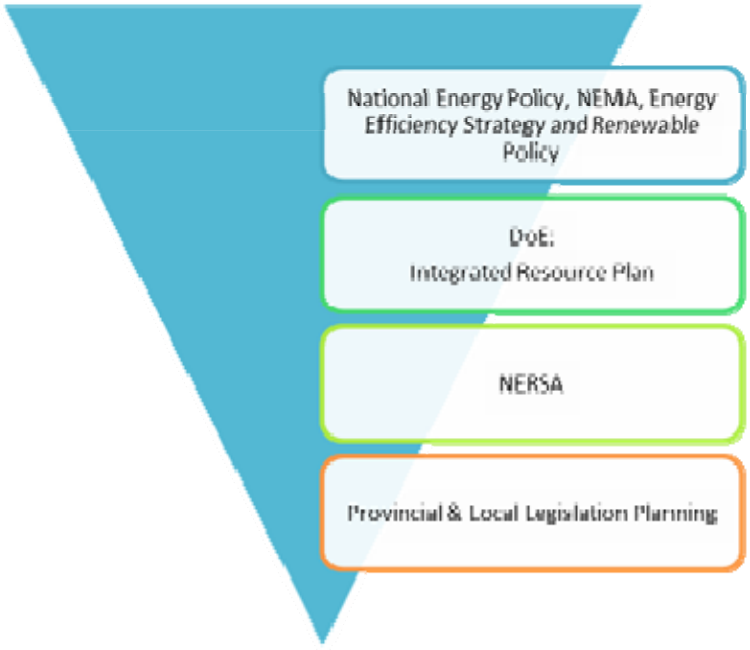

Figure 3.1: Hierarchy of electricity policy and planning documents

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

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

As such, investment in renewable energy initiatives is supported, based on an understanding that renewable energy sources have significant medium - long-term commercial potential and can increasingly contribute towards a long-term sustainable energy future.

3.1.2 Renewable Energy Policy in South Africa, 1998

Internationally there is increasing development of the use of renewable technologies for the generation of electricity due to concerns such as climate change and exploitation of resources. In response, the South African government ratified the United Nations Framework Convention on Climate Change (UNFCCC) in August 1997 and acceded to the Kyoto Protocol, the enabling mechanism for the convention, in August 2002. In addition, national response strategies have been developed for both climate change and renewable energy.

Investment in renewable energy initiatives, such as the proposed solar energy facility, is supported by the National Energy Policy (DME, 1998). This policy recognises that renewable energy applications have specific characteristics which need to be considered. The Energy Policy is "*based on the understanding that renewables are energy sources in their own right, and are not limited to small-scale and remote applications, and have significant medium- and long-term commercial potential*." In addition, the National Energy Policy states that "*Renewable resources generally operate from an unlimited resource base and, as such, can increasingly contribute towards a long-term sustainable energy future*".

The White Paper on Renewable Energy (DME, 2003) supplements the Energy Policy, and sets out Government's vision, policy principles, strategic goals and objectives for promoting and implementing renewable energy in South Africa. It also informs the public and the international community of the Government's vision, and how the Government intends to achieve these objectives; and informs Government agencies and organs of their roles in achieving the objectives.

The support for the Renewable Energy Policy is guided by a rationale that South Africa has a very attractive range of renewable resources, particularly solar and wind, and that renewable applications are, in fact, the least cost energy service in many cases from a fuel resource perspective (i.e. the cost of fuel in generating electricity from such technology); more so when social and environmental costs are taken into account. In spite of this range of resources, the National Energy Policy acknowledges that the development and implementation of renewable energy applications has been neglected in South Africa.

Government policy on renewable energy is therefore concerned with meeting the following challenges:

» Ensuring that economically feasible technologies and applications are implemented;

» Ensuring that an equitable level of national resources is invested in renewable technologies, given their potential and compared to investments in other energy supply options; and
» Addressing constraints on the development of the renewable industry.

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

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

3.1.3 Final Integrated Resource Plan, 2010 - 2030

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

» Improve the long term reliability of electricity supply through meeting adequacy criteria over and above keeping pace with economic growth and development;
» Ascertain South Africa's capacity investment needs for the medium term business planning environment;
» Consider environmental and other externality impacts and the effect of renewable energy technologies; and
» Provide the framework for Ministerial determination of new generation capacity (inclusive of the required feasibility studies).

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

The outcome of the process confirmed that coal-fired options are still required over the next 20 years and that additional base load plants will be required from 2010. The first and interim IRP was developed in 2009 by the Department of Energy. The initial four years of this plan was promulgated by the Minister of Energy on 31 December 2009, and updated on 29 January 2010. The Department of Energy released the Final IRP in March 2011, which was accepted by Parliament at the end of the same month. This Policy-Adjusted IRP is recommended for adoption by Cabinet and subsequent promulgation as the final IRP. In addition to all existing and committed power plants (including 10 GW committed coal), the plan includes 9.6 GW of nuclear; 6.3 GW of coal; 17.8 GW of renewables (including 8,4GW solar); and 8.9 GW of other generation sources.

3.1.4 Electricity Regulation Act, 2006

Under the National Energy Regulator Act, 2004 (Act No 40 of 2004), the Electricity Regulation Act, 2006 (Act No 4 of 2006) and all subsequent relevant Acts of Amendment, NERSA has the mandate to determine the prices at and conditions under which electricity may be supplied by licence to Independent Power Producers (IPPs). NERSA has recently awarded electricity generation licences for new generation capacity projects under the IPP procurement programme.

3.2 Provincial, District and Local Level Planning and Spatial Policy Context

3.2.1. Northern Cape Provincial Spatial Development Framework (2011)

The Provincial Spatial Development Framework (PDSF) for the Northern Cape Province (NCP) is was completed on 31 July 2012 and is valid from the date of approval by the Member of the Executive Council (MEC) for the Department of Co-operative Governance, Human Settlements and Traditional Affairs (COGHSTA).

The PSDF is the product of an integrated process facilitated by a dedicated organisational structure. The latter comprised three forums which collectively represented and addressed the interests and mandates of the full spectrum of government departments, district and local municipalities, and key Non-Governmental Organisations (NGOs). All of the institutions that formed part of the project forums have endorsed the PSDF and are accordingly committed to the implementation thereof. The purpose and function of the PDSF is to; ensure

» Spatial land use directive which aims to promote environmental, economic, and social
» Sustainability through sustainable development.
» Guideline for instilling a developmental state.
» Basis for prioritising governmental programmes and projects.

» Premise for governmental performance management.
» Manual for integrated land□use planning.

Renewable Energy

The PSDF (Volume 2) notes that, at present, the Eskom Vanderkloof hydro station on the Orange River (240 MW) represents the only large energy-generating facility in the Northern Cape Province (NCP). Most of the energy used in the Province is generated by Eskom plants located elsewhere in South Africa, mainly Mpumalanga Province. The PSDF therefore notes that the NCP's major energy challenges include securing energy supply to meet growing demand, providing everybody with access to energy services and tackling the causes and impacts of climate change (as per Provincial Growth and Development Strategy). In this regard, the development of large scale renewable energy supply schemes is strategically important for increasing the diversity of domestic energy supplies for the NCP, and avoiding energy imports while minimising the environmental impacts.

The PSDF further notes that renewable energy has been identified as a mechanism to diversify the economy and thereby promoting a green economy in the province. According to the Provincial Growth and Development Strategy (PGDS), greening the economy is characterised by substantially increased investments in economic sectors.

Tourism

The PSDF notes that the tourism sector is identified in the Draft 4 PGDS as one of the key sectors with the capacity to 'grow, transform and diversify the provincial economy'. According to the PGDS, the vision for tourism is underpinned by a number of broad, essential and specific drivers. The 'broad drivers' consider the 'big picture' focusing on tourism's contribution to a larger development purpose, including overall economic growth, addressing social upliftment and poverty alleviation through facilitating job creation, and striving for more equitable ownership and participation in tourism through transformation.

Comparative advantages of the NCP are identified as mainly eco-tourism opportunities, including unique sectoral or nature-based routes; National parks, nature reserves and game reserves, Natural and cultural manifestations, as well as festivals and cultural events (PGNC; 2011b).

3.2.2. Pixley ka Seme District Municipality Integrated Development Plan (2010-2011)

The vision for the Pixley ka Seme District Municipality (PKSDM) as set out in the IDP is to "commit ourselves to be a developmental municipality where the quality of life of all people in the district will be improved".

In terms of the mission statement, the PKSDM sets out to achieve:

» Efficient service delivery;
» Optimal human and natural resource development;
» Local economic growth and development, job creation and poverty alleviation;
» A vibrant tourism industry and;
» A safe, secure and community friendly environment.

Key developmental challenges, objectives and strategies of relevance to the proposed SEF development include:

LED, Tourism and Poverty Alleviation:

Key identified challenges include high levels of poverty and low skills levels; and a relatively undiversified economy, relying mainly on primary sector activities.

Key interventions would include promoting SMMEs; attracting and retaining investors in the region; development of identified development corridors; value-adding to/ beneficiation of local produce; and the promotion of tourism development. Policies/ targets aimed at addressing these challenges include:

» LED1: Promote Local Economic Development in the region;
» LED 2: Increase SMME promotion;
» LED 4: Increased tourism promotion – a Tourism Market Strategy should be compiled to attract investments and tourists;
» LED 6: Reduce employment and poverty by 50% each, respectively in the region by 2014.

HIV/ AIDS:

Key identified challenges include low awareness levels, inadequate health care facilities, including a lack of trained professionals, mobile clinics, a hospice, etc.

» Policy HIV 1 focuses on reducing the level HIV/AIDS infections amongst young men and women in the District.

Education, Youth and development:

Key identified challenges include limited or no access to higher learner institutions; lack of IT skills in the region; poor qualification and skills of the community limiting their entry to institutions of higher learning; very few training facilities in the region; and a lack of funds available to the majority of learners.

» Policy Y1 focuses on improving the well-being of young men and women, including improving access to vocational training (Y1.2).

Safety and security:

Key identified challenges include high endemic levels of family and child abuse; and high levels of alcohol abuse.

» Policy SS1 provides for the promotion of a safe and secure environment in the District.

3.2.3. Siyathemba Local Municipality Integrated Development Plan (2010/ 2011)

The 2010/2011 Revision appears to be the most recent review of the Siyathemba Local Municipality (SLM) IDP. Key aspects of relevance to the proposed Prieska Solar Energy Facility development are discussed below.

The IDP identifies the following Key Performance Areas (KPAs) as critical to achieving Council's vision:

» Local economic development and job creation;
» Municipal Financial Viability and Management;
» Tourism and marketing;
» Municipal health ;
» Combating HIV/Aids;
» Crime and security, including disaster management.

With regard to local economic development (LED), goals identified in the IDP include:

» The promotion of Agriculture, Tourism, Mining and Infrastructure development;
» The promotion of economic diversification, including Industry based on value-adding to local produce;
» Attracting and retaining capital in the SLM.

Commercial renewable energy generation is not addressed in the IDP.

3.1.4. Siyathemba Local Municipality Local Economic Development (LED) Strategy (2004)

The Siyathemba IDP 2010/2011 Revision document contains a Local Economic Development (LED) Strategy. The document is undated, but appears to have been prepared around 2004. It is unclear whether the document has been revised since then.

According to the document, the main purpose of the LED was to develop an integrated planning framework, based on KPAs, and that outlines plans, projects and programmes to be implemented in the Municipal area towards 2010 and beyond in order to meet the 2014 national objectives. The ultimate goal of the LED is to improve the standard of living of the local community by identifying opportunities aimed at addressing job creation and economic growth.

With regard to the SLM economic context, the LED notes that the local economy has been in significant decline since the closure of asbestos and copper mines (e.g. Copperton) in the Municipality during the early 1990's.

Key challenges facing economic development in the SLM include:

» Lack of diversification within the regional economy;
» Attracting and retaining investment in the region;
» Lack of employment opportunities;
» Rising levels of poverty;
» Low skills levels;
» Lack of entrepreneurship, as reflected by the small number of SMME's active in the region;
» Underutilization of the region's natural resources and economic opportunities; and
» Lack of water for expanding irrigation operations.

The LED notes that the SLM's economy is largely based on the primary sector (agriculture and mining), with very little local value-adding/ beneficiation.

Siyathemba Local Municipality's LED strategy is focused on developing the economic and natural resources of the area. Its goals are to promote agriculture, industries, marketing of the region, and creating a safe environment for business. The agricultural strategy includes providing for the land needs of PDIs, and empowering farm workers to access farmland. Renewable energy resources (wind, insolation) are not addressed in the LED.

3.3. Regulatory Hierarchy for Energy Generation Projects

The South African energy industry is evolving rapidly, with regular changes to legislation and industry role-players. The regulatory hierarchy for an energy generation project of this nature consists of three tiers of authority who exercise control through both statutory and non-statutory instruments – that is National, Provincial and local levels. As solar energy development is a multi-sectorial issue (encompassing economic, spatial, biophysical, and cultural dimensions) various

statutory bodies are likely to be involved in the approval process for solar energy facility project and the related statutory environmental assessment process.

3.3.1. Regulatory Hierarchy

At **National Level**, the main regulatory agencies are:

» *Department of Energy:* This Department is responsible for policy relating to all energy forms, including renewable energy, and are responsible for forming and approving the IRP (Integrated Resource Plan for Electricity)
» *National Energy Regulator of South Africa (NERSA):* This body is responsible for regulating all aspects of the electricity sector, and will ultimately issue licenses for solar energy developments to generate electricity.
» *Department of Environmental Affairs (DEA):* This department is responsible for environmental policy and is the controlling authority in terms of NEMA and the EIA Regulations. The DEA is the competent authority for this project, and charged with granting the relevant environmental authorisation.
» *The South African Heritage Resources Agency (SAHRA):* The National Heritage Resources Act (Act No 25 of 1999) and the associated provincial regulations provides legislative protection for listed or proclaimed sites, such as urban conservation areas, nature reserves and proclaimed scenic routes.
» *National Department of Agriculture, Forestry, and Fisheries (DAFF):* This department is responsible for activities pertaining to subdivision and rezoning of agricultural land. The forestry section is responsible for the protection of tree species under the National Forests Act (Act No 84 of 1998).
» *South African National Roads Agency (SANRAL):* This department is responsible for all national routes.

At the Provincial Level, the main regulatory agencies are:

» *Provincial Government of the Northern Cape – Department of Environmental and Nature Conservation (DENC):* This department is the commenting authority for this project.
» *Department of Transport and Public Works:* This department is responsible for roads and the granting of exemption permits for the conveyance of abnormal loads on public roads.
» *Provincial Department of Water Affairs:* This department is responsible for water use licensing and permits.
» *Ngwao Boswa ya Kapa Bokone (Northern Cape Heritage Authority):* This body is responsible for all heritage related issues in the Northern Cape Province.
» *The Department of Agriculture:* This Department is responsible for all matters which affect agricultural land.

At the local level, the local and municipal authorities are the principal regulatory authorities responsible for planning, land use and the environment. In the Northern Cape, both the local and district municipalities play a role. The local municipality is the Siyathemba Local Municipality which forms part of the Pixley ka Seme District Municipality. There are also numerous non-statutory bodies such as environmental non-governmental organisations (NGOs) and community based organisations (CBO) working groups that play a role in various aspects of planning and environmental monitoring that will have some influence on proposed solar energy development in the area.

3.3.2 Legislation and Guidelines that have informed the preparation of this EIA Report

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

- National Environmental Management Act (Act No 107 of 1998).
- EIA Regulations, published under Chapter 5 of the NEMA (GNR543, GNR544, GNR545, and GNR546 in Government Gazette 33306 of 18 June 2010).
- Guidelines published in terms of the NEMA EIA Regulations, in particular:
  - Companion to the National Environmental Management Act (NEMA) Environmental Impact Assessment (EIA) Regulations of 2010 (Draft Guideline; DEA, 2010).
  - Public Participation in the EIA Process (DEA, 2010).
- International guidelines – the Equator Principles

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

Table 3.1: Relevant legislative permitting requirements applicable to the proposed solar energy facility

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
National Legislation			
National Environmental Management Act (Act No 107 of 1998)	The EIA Regulations have been promulgated in terms of Chapter 5 of the Act. Listed activities which may not commence without an environmental authorisation are identified within these Regulations. In terms of S24(1) of NEMA, the potential impact on the environment associated with these listed activities must be assessed and reported on to the competent authority charged by NEMA with granting of the relevant environmental authorisation. In terms of GN R543, R544, R545 and R546 of 18 June 2010, a Scoping and EIA Process is required to be undertaken for the proposed project.	Department of Environmental Affairs – competent authority Department of Environmental and Nature Conservation (DENC)- commenting authority	The listed activities triggered by the proposed solar energy facility have been identified and assessed in the EIA process being undertaken (i.e. Scoping and EIA). This EIA Report will be submitted to the competent and commenting authority in support of the application for authorisation.
National Environmental Management Act (Act No 107 of 1998)	In terms of the Duty of Care Provision in S28(1) the project proponent must ensure that reasonable measures are taken throughout the life cycle of this project to ensure that any pollution or degradation of the environment associated with this project is avoided, stopped or minimised. In terms of NEMA, it has become the legal duty of a project proponent to consider a project holistically, and to consider the cumulative effect of a variety of impacts.	Department of Environmental Affairs	While no permitting or licensing requirements arise directly by virtue of the proposed project, this section has found application during the EIA Phase through the consideration of potential impacts (cumulative, direct, and indirect). It will continue to apply throughout the life cycle of

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
			the project.
Environment Conservation Act (Act No 73 of 1989)	National Noise Control Regulations (GN R154 dated 10 January 1992)	Department of Environmental Affairs Department of Environmental and Nature Conservation (DENC)- Local Authorities	Noise impacts are expected to be associated with the construction phase of the project and are not likely to present a significant intrusion to the local community. Therefore is no requirement for a noise permit in terms of the legislation. On-site activities should be limited to 6:00am - 6:00pm, Monday – Saturday (excluding public holidays). Should activities need to be undertaken outside of these times, the surrounding communities will need to be notified and appropriate approval will be obtained from DEA and the Local Municipality.
National Water Act (Act No 36 of 1998)	Water uses under S21 of the Act must be licensed, unless such water use falls into one of the categories listed in S22 of the Act or falls under the general authorisation (and then registration of the water use is	Department of Water Affairs Provincial Department	A water use license (WUL) is required to be obtained if wetlands or drainage lines are impacted on, or if

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	required). Consumptive water uses may include the taking of water from a water resource - Sections 21a and b. Non-consumptive water uses may include impeding or diverting of flow in a water course - Section 21c; and altering of bed, banks or characteristics of a watercourse - Section 21i.	of Water Affairs	infrastructure lies within 500m of such features. Pans occur on the project site, but outside of the development footprint. Should water be abstracted from ground water/ a borehole on site for use within the facility, a water use license may be required.
Minerals and Petroleum Resources Development Act (Act No 28 of 2002)	A mining permit or mining right may be required where a mineral in question is to be mined (e.g. materials from a borrow pit) in accordance with the provisions of the Act. Requirements for Environmental Management Programmes and Environmental Management Plans are set out in S39 of the Act. S53 Department of Mineral Resources: Approval from the Department of Mineral Resources (DMR) may be required to use land surface contrary to the objects of the Act in terms of section 53 of the Mineral and Petroleum Resources Development Act, (Act No 28 of 2002): In terms of the Act approval from the Minister of Mineral Resources is required to ensure that proposed activities do not sterilise a mineral resources that might occur on site.	Department of Mineral Resources	As no borrow pits are expected to be required for the construction of the facility, no mining permit or right is required to be obtained. A Section 53 application will be submitted the Northern Cape DMR office.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
National Environmental Management: Air Quality Act (Act No 39 of 2004)	Measures in respect of dust control (S32) – no regulations promulgated yet. Measures to control noise (S34) - no regulations promulgated yet.	Department of Environmental Affairs	No permitting or licensing requirements arise from this legislation. The Act provides that an air quality officer may require any person to submit an atmospheric impact report if there is reasonable suspicion that the person has failed to comply with the Act.
National Heritage Resources Act (Act No 25 of 1999)	» Stipulates assessment criteria and categories of heritage resources according to their significance (S7). » Provides for the protection of all archaeological and palaeontological sites, and meteorites (S35). » Provides for the conservation and care of cemeteries and graves by SAHRA where this is not the responsibility of any other authority (S36). » Lists activities which require developers any person who intends to undertake to notify the responsible heritage resources authority and furnish it with details regarding the location, nature, and extent of the proposed development (S38). » Requires the compilation of a Conservation Management Plan as well as a permit from SAHRA for the presentation of archaeological sites as part of tourism attraction (S44).	South African Heritage Resources Agency	An HIA and PIA has been undertaken as part of the EIA Process to identify heritage sites.(See Appendix H and J

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
National Environmental Management: Biodiversity Act (Act No 10 of 2004)	» Provides for the MEC/Minister to identify any process or activity in such a listed ecosystem as a threatening process (S53) » A list of threatened and protected species has been published in terms of S 56(1) - Government Gazette 29657. » Three government notices have been published, i.e. GN R 150 (Commencement of Threatened and Protected Species Regulations, 2007), GN R 151 (Lists of critically endangered, vulnerable and protected species) and GN R 152 (Threatened or Protected Species Regulations). » Provides for listing threatened or protected ecosystems, in one of four categories: critically endangered (CR), endangered (EN), vulnerable (VU) or protected. The first national list of threatened terrestrial ecosystems has been gazetted, together with supporting information on the listing process including the purpose and rationale for listing ecosystems, the criteria used to identify listed ecosystems, the implications of listing ecosystems, and summary statistics and national maps of listed ecosystems (National Environmental Management: Biodiversity Act: National list of ecosystems that are threatened and in need of protection, (G 34809, GN 1002), 9 December 2011). » This Act also regulates alien and invader species.	Department of Environmental Affairs	As the applicant will not carry out any restricted activity, as is defined in S1 of the Act, no permit is required to be obtained in this regard. Specialist flora and fauna studies have been undertaken as part of the EIA Phase. As such the potentially occurrence of critically endangered, endangered, vulnerable, and protected species and the potential for them to be affected has been considered. This report is contained in Appendix F

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	» Under this Act, a permit would be required for any activity which is of a nature that may negatively impact on the survival of a listed protected species.		
Conservation of Agricultural Resources Act (Act No 43 of 1983)	» Prohibition of the spreading of weeds (S5) » Classification of categories of weeds & invader plants (Regulation 15 of GN R1048) & restrictions in terms of where these species may occur. » Requirement & methods to implement control measures for alien and invasive plant species (Regulation 15E of GN R1048).	Department of Agriculture	This Act will find application throughout the life cycle of the project. In this regard, soil erosion prevention and soil conservation strategies must be developed and implemented. In addition, a weed control and management plan must be implemented. The permission of agricultural authorities will be required if the Project requires the draining of vleis, marshes or water sponges on land outside urban areas.
National Forests Act (Act No. 84 of 1998)	According to this act, the Minister may declare a tree, group of trees, woodland or a species of trees as protected. The prohibitions provide that 'no person may cut, damage, disturb, destroy or remove any protected tree, or collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of	National Department of Forestry	There are a few protected trees on the proposed development site. A permit is required to impact on these species.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	any protected tree, except under a licence granted by the Minister'.		
National Veld and Forest Fire Act (Act 101 of 1998)	In terms of S12 the applicant must ensure that the firebreak is wide and long enough to have a reasonable chance of preventing the fire from spreading, not causing erosion, and is reasonably free of inflammable material. In terms of S17, the applicant must have such equipment, protective clothing, and trained personnel for extinguishing fires.	Department of Agriculture, Forestry and Fisheries (DAFF)	While no permitting or licensing requirements arise from this legislation, this act will find application during the construction and operational phase of the project.
Hazardous Substances Act (Act No 15 of 1973)	This Act regulates the control of substances that may cause injury, or ill health, or death due to their toxic, corrosive, irritant, strongly sensitising or inflammable nature or the generation of pressure thereby in certain instances and for the control of certain electronic products. To provide for the rating of such substances or products in relation to the degree of danger; to provide for the prohibition and control of the importation, manufacture, sale, use, operation, modification, disposal or dumping of such substances and products. Group I and II: Any substance or mixture of a substance that might by reason of its toxic, corrosive etc, nature or because it generates pressure through decomposition, heat or other means, cause extreme risk of injury etc., can be declared as Group I or Group II substance	Department of Health	It is necessary to identify and list all the Group I, II, III, and IV hazardous substances that may be on the site and in what operational context they are used, stored or handled. If applicable, a license is required to be obtained from the Department of Health.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	Group IV: any electronic product; and Group V: any radioactive material. The use, conveyance, or storage of any hazardous substance (such as distillate fuel) is prohibited without an appropriate license being in force.		
Development Facilitation Act (Act No 67 of 1995)	Provides for the overall framework and administrative structures for planning throughout the Republic. S (2 - 4) provide general principles for land development and conflict resolution.	Local Municipality	The applicant must submit a land development application in the prescribed manner and form as provided for in the Act. A land development applicant who wishes to establish a land development area must comply with procedures set out in the Act.
Subdivision of Agricultural Land Act (Act No 70 of 1970)	Details land subdivision requirements and procedures. Applies for subdivision of all agricultural land in the province	Department of Agriculture	Subdivision will have to be in place prior to any subdivision approval in terms of S24 and S17 of the Act.
National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008)	The Minister may by notice in the *Gazette* publish a list of waste management activities that have, or are likely to have, a detrimental effect on the environment. The Minister may amend the list by – » Adding other waste management activities to the	National Department of Water and Environmental Affairs Provincial Department of Environmental Affairs (general	As no waste disposal site is to be associated with the proposed project, no permit is required in this regard. Waste handling, storage

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	list. » Removing waste management activities from the list. » Making other changes to the particulars on the list. In terms of the Regulations published in terms of this Act (GN 718), A Basic Assessment or Environmental Impact Assessment is required to be undertaken for identified listed activities. Any person who stores waste must at least take steps, unless otherwise provided by this Act, to ensure that: » The containers in which any waste is stored, are intact and not corroded or in » any other way rendered unlit for the safe storage of waste. » Adequate measures are taken to prevent accidental spillage or leaking. » The waste cannot be blown away. » Nuisances such as odour, visual impacts and breeding of vectors do not arise; and » Pollution of the environment and harm to health are prevented.	waste)	and disposal during construction and operation is required to be undertaken in accordance with the requirements of the Act, as detailed in the EMP (refer to Appendix L). The volumes of waste to be generated and stored on the site during construction and operation of the facility will not require a waste license (provided these remain below the prescribed thresholds).
National Road Traffic Act (Act No 93 of 1996)	» The technical recommendations for highways (TRH 11): "Draft Guidelines for Granting of Exemption Permits for the Conveyance of Abnormal Loads and for other Events on Public Roads" outline the rules and conditions which apply to the transport of	» South African National Roads Agency Limited (national roads) » Provincial	An abnormal load/vehicle permit may be required to transport the various components to site for construction. These

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	abnormal loads and vehicles on public roads and the detailed procedures to be followed in applying for exemption permits are described and discussed. » Legal axle load limits and the restrictions imposed on abnormally heavy loads are discussed in relation to the damaging effect on road pavements, bridges, and culverts. » The general conditions, limitations, and escort requirements for abnormally dimensioned loads and vehicles are also discussed and reference is made to speed restrictions, power/mass ratio, mass distribution, and general operating conditions for abnormal loads and vehicles. Provision is also made for the granting of permits for all other exemptions from the requirements of the National Road Traffic Act and the relevant Regulations.	Department of Transport	include route clearances and permits will be required for vehicles carrying abnormally heavy or abnormally dimensioned loads. Transport vehicles exceeding the dimensional limitations (length) of 22m. Depending on the trailer configuration and height when loaded, some of the power station components may not meet specified dimensional limitations (height and width).
Promotion of Access to Information Act (Act No 2 of 2000)	All requests for access to information held by state or private body are provided for in the Act under S11.	Department of Environmental Affairs	No permitting or licensing requirements.
Promotion of Administrative Justice Act (Act No 3 of 2000)	In terms of S3 the government is required to act lawfully and take procedurally fair, reasonable, and rational decisions. Interested and affected parties have a right to be heard.	Department of Environmental Affairs	No permitting or licensing requirements.
Provincial Legislation			
Northern Cape Nature Conservation Act, Act No. 9 of 2009	This Act provides for the sustainable utilisation of wild animals, aquatic biota and plants; provides for the implementation of the Convention on International	Provincial Department of Environmental Affairs	Permitting or licensing requirements arise from this legislation for the

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	Trade in Endangered Species of Wild Fauna and Flora; provides for offences and penalties for contravention of the Act; provides for the appointment of nature conservators to implement the provisions of the Act; and provides for the issuing of permits and other authorisations. Amongst other regulations, the following may apply to the current project: » Boundary fences may not be altered in such a way as to prevent wild animals from freely moving onto or off of a property; » Aquatic habitats may not be destroyed or damaged; » The owner of land upon which an invasive species is found (plant or animal) must take the necessary steps to eradicate or destroy such species. » The Act provides lists of protected species for the Province.		proposed activities to be undertaken for the proposed project as there are a few protected plants and trees on the proposed development site. A permit is required to remove the protected plants and trees.

APPROACH TO UNDERTAKING THE EIA PHASE CHAPTER 4

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

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

4.1. Phase 1: Scoping Phase

The Scoping Study, which was completed in November 2012 with the acceptance of Scoping by the DEA, served to identify potential issues associated with the proposed project, and define the extent of studies required within the EIA Phase. This was achieved through an evaluation of the proposed project, involving the project proponent, specialist consultants, and a consultation process with key stakeholders that included both relevant government authorities and interested and affected parties (I&APs).

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

The Scoping Report was submitted to the National Department of Environmental Affairs in October 2012. The Final Scoping Report and Plan of Study for the EIA were accepted by the DEA, as the competent authority, in November 2012. In terms of this acceptance, an EIA was required to be undertaken for the proposed project.

4.2. Phase 2: Environmental Impact Assessment Phase

Through the Scoping Study, a number of issues requiring further study for all components of the project were highlighted. These issues have been assessed in detail within the EIA Phase of the process (refer to Chapter 6). The EIA Phase aims to achieve the following:

» Provide a comprehensive assessment of the social and biophysical environments affected by the proposed alternatives put forward as part of the project.
» Assess potentially significant impacts (direct, indirect, and cumulative, where required) associated with the proposed facility.
» Comparatively assess any alternatives put forward as part of the project (i.e. in this case the options of storage versus no storage were assessed).
» Identify and recommend appropriate mitigation measures for potentially significant environmental impacts.
» Undertake a fully inclusive public participation process to ensure that I&AP are afforded the opportunity to participate, and that their issues and concerns are recorded.

The EIA Report addresses potential direct, indirect, and cumulative[3] impacts (both positive and negative) associated with all phases of the project including design, construction, operation and decommissioning. In this regard the EIA Report aims to provide the relevant authorities with sufficient information to make an informed decision regarding the proposed project.

4.2.1. Tasks to be completed during the EIA Phase

The EIA Phase has been undertaken in accordance with the EIA Regulations published in GN 33306 of 18 June 2010, in terms of NEMA. Key tasks undertaken within the EIA phase included:

» Consultation with relevant decision-making and regulating authorities (at National, Provincial and Local levels).
» Undertaking a public participation process throughout the EIA process in accordance with Regulation 54 of GN R543 of 2010 in order to identify any additional issues and concerns associated with the proposed project.

[3] "Cumulative environmental change or cumulative effects may result from the additive effect of individual actions of the same nature or the interactive effect of multiple actions of a different nature" (Spaling and Smit, 1993).

» Preparation of a Comments and Response Report detailing key issues raised by I&APs as part of the EIA Process (in accordance with Regulation 57 of GN R543 of 2010).
» Undertaking of independent specialist studies in accordance with Regulation 32 of GN R543 of 2010.
» Preparation of a Draft EIA Report in accordance with the requirements of the Regulation 31 of GN R543 of 2010.
» Comments and Response Report detailing key issues raised by I&APs as part of the EIA Process (in accordance with Regulation 57 of GN R543 of 2010).
» Undertaking of independent specialist studies in accordance with Regulation 32 of GN R543 of 2010.
» Preparation of a Draft EIA Report in accordance with the requirements of the Regulation 31 of GN R543 of 2010.

4.2.2 Authority Consultation

The National DEA is the competent authority for this application. A record of all authority consultation undertaken prior to the commencement of the EIA Phase is included within the Scoping Report and this EIA report. Consultation with the regulating authorities (i.e. DEA and NC DENC) has continued throughout the EIA process. On-going consultation included the following:

» Submission of a final Scoping Report following a 30-day public review period and consideration of stakeholder comments received.
» Ad hoc discussions with DEA in order to clarify the findings of the Scoping Report and the issues identified for consideration in the EIA Phase.

The following will also be undertaken as part of this EIA process:

» Submission of a final EIA Report following the 30-day public review period.
» Provision of an opportunity for DEA and NC DENC representatives to visit and inspect the proposed site, and the study area.
» Consultation with Organs of State that may have jurisdiction over the project, including:
    * Provincial and local government departments (including South African Heritage Resources Agency, Department of Water Affairs, South African National Roads Agency Limited, Department of Agriculture, etc.).
    * Government Structures (including the Department of Public Works, Roads and Transport, etc)

A record of all authority consultation undertaken prior to the commencement of the EIA Phase is included within the Scoping Report. A record of the consultation in the EIA process is included within **Appendix B**.

4.3.1 Public Involvement and Consultation

The aim of the public participation process was primarily to ensure that:

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

Below is a summary of the key public participation activities conducted thus far.

» **Identification of I&APs and establishment of a database**
Identification of I&APs was undertaken by **Sustainable Futures** (specialist public participation consultants) through existing contacts and databases, recording responses to site notices and the newspaper advertisement, as well as through the process of networking. The key stakeholder groups identified include authorities, local and district municipalities, public stakeholders, Parastatals and Non-Governmental Organisations (refer to Table 4.1 below).

Table 4.1: Key stakeholder groups identified during the EIA Process

Stakeholder Group	Department
National and Provincial Authorities	» Northern Cape – Department of Environmental and Nature Conservation (DENC) » Northern Cape - Agriculture and Rural Development » Northern Cape - Public Works, Roads and Transport » Northern Cape - Water Affairs » South African Heritage Resources Agency » National Department of Agriculture, Forestry and Fisheries » South African National Roads Agency Limited » Department of Energy
Municipalities	» Siyathemba Local Municipality » Pixley Ka Seme District Municipality
Parastatals & service providers	» Eskom Transmission and Distribution » South African Heritage Resources Agency – » Ngwao Boswa ya Kapa Bokone (Northern Cape Heritage Authority):
NGOs/Business forums	» Wildlife Environment Society of South Africa

Through on-going consultation with key stakeholders and I&APs, issues raised through the Scoping Phase for inclusion within the EIA Phase were confirmed. All relevant stakeholder and I&AP information has been recorded within a database of affected parties (refer to Appendix C). While I&APs were encouraged to register their interest in the project from the onset of the process, the identification and registration of I&APs has been on-going for the duration of the EIA Process and the project database has been updated on an on-going basis.

» **Newspaper Advertisements**

During the scoping phase, in order to notify and inform the public of the proposed project notices were placed in the local media (Die Volksblad and Gemsbok), on site and in public places. In addition, adverts were placed in the local media in order to notify the public of the commencement of the EIA process, the availability of the Draft Scoping report for public review and the public meeting.

* Die Volksblad (Friday, 31 August 2012)
* Gemsbok (Friday, 31 August 2012)
* Die Volksblad (Thursday, 21 November 2012)
* Gemsboks (Friday, 30 November 2012)

» **Site Notices**

Site advertisements were posted at various accessible locations throughout the study area and included locations on-site, on accessible farm portions; and in the town of Prieska itself (refer to Appendix D).

The following site notices were placed around the study area:

A3 notices:

* Fence of Farm Holsloot 3/47

A4 notices:

* Priskab coffee shop
* Siyathemba Local Municipality
* Prieska Public Library

(Refer to Appendix K for all pictures of site notices)

BIDs:

* Priskab coffee shop
* Siyathemba Local Municipality
* Christa Muller (Landowner)
* Prieska Public Library

» **Meetings with stakeholders**

The public participation process has been structured in a manner which allows for consultation with I&APs at various levels and with different stakeholder groups.

Stakeholders were invited to attend a public meeting held on 12 September 2012. Focus group meetings were held with key stakeholders. The following focus group meetings took place on 12 and 13 September 2012:

* Christa Muller (Landowner)
* Siyathemba Local Municipality (Municipal Manager- Mr Basson)

A public meeting was also held on 6 December 2012 for the EIA phase.

Records of all consultation undertaken are included within **Appendix D**.

4.3.2 Identification and Recording of Issues and Concerns

Issues and comments raised by I&APs over the duration of the EIA process have been synthesised into Comments and Response Reports (refer to **Appendix D** for the Comments and Response Reports compiled from the EIA Process to date).

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

4.3.3 Assessment of Issues Identified through the Scoping Process

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

Table 4.1: Specialist studies undertaken within the EIA Phase

Specialist	Area of Expertise	Refer Appendix
Marianne Strohbach of Savannah Environmental	Ecological impact assessment	Appendix F
Dr L G du Pisani of Eduplan CC	Soils and agricultural potential	Appendix G
Stephan Gaigher of GA Heritage	Heritage resources	Appendix H
Lourens du Plessis of MetroGIS	Visual impact assessment	Appendix I
Dr JF Durand	Palaeontology assessment	Appendix J

Tony Barbour of Tony Barbour Environmental Consulting and Research	Social impact assessment	Appendix K

Specialist studies considered direct, indirect, cumulative, and residual environmental impacts associated with the development of the proposed Prieska Solar Energy Facility. Issues were assessed in terms of the following criteria:

» The **nature**, a description of what causes the effect, what will be affected, and how it will be affected
» The **extent**, wherein it is indicated whether the impact will be local (limited to the immediate area or site of development), regional, national or international. A score of between 1 and 5 is assigned as appropriate (with a score of 1 being low and a score of 5 being high)
» The **duration**, wherein it is indicated whether:
  * The lifetime of the impact will be of a very short duration (0–1 years) – assigned a score of 1
  * The lifetime of the impact will be of a short duration (2-5 years) - assigned a score of 2
  * Medium-term (5–15 years) – assigned a score of 3
  * Long term (> 15 years) - assigned a score of 4
  * Permanent - assigned a score of 5
» The **magnitude**, quantified on a scale from 0-10, where a score is assigned:
  * 0 is small and will have no effect on the environment
  * 2 is minor and will not result in an impact on processes
  * 4 is low and will cause a slight impact on processes
  * 6 is moderate and will result in processes continuing but in a modified way
  * 8 is high (processes are altered to the extent that they temporarily cease)
  * 10 is very high and results in complete destruction of patterns and permanent cessation of processes
» The **probability of occurrence**, which describes the likelihood of the impact actually occurring. Probability is estimated on a scale, and a score assigned:
  * Assigned a score of 1–5, where 1 is very improbable (probably will not happen)
  * Assigned a score of 2 is improbable (some possibility, but low likelihood)
  * Assigned a score of 3 is probable (distinct possibility)
  * Assigned a score of 4 is highly probable (most likely)
  * Assigned a score of 5 is definite (impact will occur regardless of any prevention measures)
» The **significance**, which is determined through a synthesis of the characteristics described above (refer formula below) and can be assessed as low, medium or high
» The **status**, which is described as either positive, negative or neutral

» The degree to which the impact can be reversed
» The degree to which the impact may cause irreplaceable loss of resources
» The degree to which the impact can be mitigated

The **significance** is determined by combining the criteria in the following formula:

S = (E+D+M) P; where

S = Significance weighting
E = Extent
D = Duration
M = Magnitude
P = Probability

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

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

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

4.3.4 Assumptions and Limitations

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

» All information provided by the developer and I&APs to the environmental team was correct and valid at the time it was provided.
» It is assumed that the development site identified by the developer represents a technically suitable site for the establishment of the proposed solar facility.
» It is assumed correct that the proposed connection to the National Grid is correct in terms of viability and need.
» Studies assume that any potential impacts on the environment associated with the proposed development will be avoided, mitigated, or offset.

» This report and its investigations are project-specific, and consequently the environmental team did not evaluate any other power generation alternatives.

Refer to the specialist studies in **Appendices F – K** for specialist study specific limitations.

DESCRIPTION OF THE RECEIVING ENVIRONMENT CHAPTER 5

This section of the Final EIA Report provides a description of the environment that may be affected by the proposed Prieska Solar Energy Facility project. This information is provided in order to assist the reader in understanding the receiving environment within which the proposed facility is situated. Features of the biophysical, social and economic environment that could directly or indirectly be affected by, or could affect, the proposed development have been described. This information has been sourced from both existing information available for the area as well as collected field data, and aims to provide the context within which this EIA is being conducted. A more detailed description of each aspect of the affected environment is included within the specialist scoping reports contained within Appendices F – J.

5.1 Regional Setting: Location of the Study Area

The site identified for the proposed Prieska Solar Energy Facility and associated infrastructure is situated on Portion 3 of the Farm Holsloot 47 which is located within the Siyathemba Local Municipality (SLM) in the Northern Cape Province. The town of Prieska, which functions as the administrative seat of the SLM, is located ~ 30 km south-west of the site. The Siyathemba Local Municipality is one of eight local municipalities that make up the Pixley Ka Seme District Municipality (PKSDM).

The main settlements in the Siyathemba Local Municipality are the towns of Prieska, Marydale, Niekerkshoop, Draghoender and Copperton. The town of Prieska is located on the southern bank of the Orange (Gariep) River, approximately 30 km south-west of the proposed solar energy facility site. Prieska is the largest town in the Siyathemba Local Municipality.

5.2 Climatic conditions

The climate for the study area has been derived from climatic data summarised for Prieska (SA Explorer), located about 30 km west of the proposed site. The area normally receives about 132 mm of rain per year. From May to December rainfall is minimal, with most rainfall occurring from January to April, peaking in autumn - March. Temperatures in summer peak during December and January at a daily average of 32.7°C, with an average of 17.9°C for June. During July night temperatures are on average 1.3°C, with an average of 37 frost days per annum (Mucina and Rutherford, 2006).

5.3. Land-Use

Livestock farming accounts for ~98.7% of agricultural land use and ~75% of the Siyathemba Local Municipality's agricultural GDP. At least 12 major crop types are cultivated in the Gariep Valley (mainly east of Prieska), the most important of which are maize and wheat, peanuts, lucerne (alfalfa) and table grapes. Stock farming operations are mainly based on small stock (sheep, goats) on spatially extensive commercial farms. Both wool and carcasses are produced. Game farming (hunting) is emerging as a key diversification strategy. The main land uses in the study area are linked to extensive agriculture (stock farming), mining and game farming. Due to climatic conditions of the study area it is therefore greatly devoid of any rain fed agriculture or cultivation. Sheep, goat and game farming occur throughout the region at a less intensive scale.

The farm upon which the solar facility is planned is currently used exclusively for grazing with sheep, cattle and goats, with sheep and goat farming being the main enterprise.

Water for livestock consumption is extracted from bore-holes dispersed over the property. There are no cultivated lands on the property. The average annual rainfall for the region is ~250mm (which is too low for dryland cropping).

There are no agricultural important infrastructure (i.e. silos, irrigation lines, pivot points, channels and feeding structures, etc.) or any conservation works (i.e. contour banks, waterways, etc.), that will be interfered with by the solar energy facility, visible on the 1:50,000 topographical maps or Google Earth images of the site. There are no formally protected or conservation areas present within the study area.

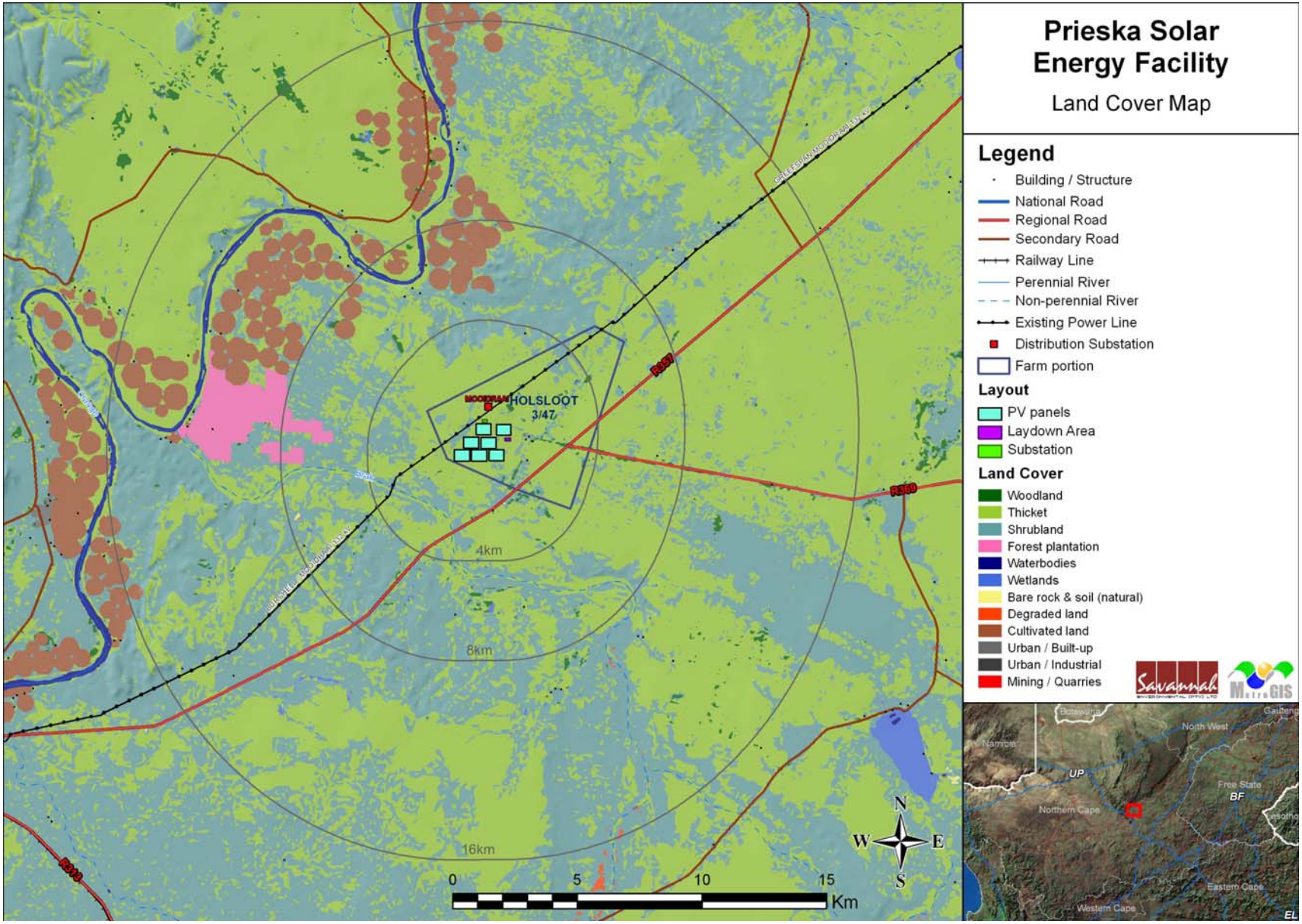

Figure 5.1: Broad land cover and land use patterns of the study area

5.4. Land Cover of the Study Area

As indicated on Figure 5.1, land cover consists primarily of *thicket* (concentrated in the north and east), interspersed with *shrubland* (concentrated in the west and south). The area along the Orange River is dominated by *cultivated land*, and some very small patches of *woodland* are dotted throughout the study area, as well as on the proposed site. A *plantation* is indicated as being present to the west of the site.

5.5. Infrastructure, Access and Transport Routes in the Study Area

The site is located adjacent to the intersection between the R357 and the R369. These roads are regional connectors leading to Douglas and Hopetown respectively. Other connectors include the R313 in the west of the study area leading to Niekerkshoop in the north and Britstown in the south. The R369 provides access to Hopetown. The infrastructure includes the Burchell-Mooidraai No 1 132kV power line, which traverses the site from the south west to the north east, and two substations. The Moodraai Substation is located on the proposed site.

5.6. Biophysical Characteristics of the Study Area

5.6.1. Topography and Drainage

The study area is situated on land that has an elevation that varies from 950m above sea level along the Orange River to about 1400m in the mountains in the north west and south west. The topography of the study site can be described as undulating to flat and located on the plains. The *Plains* are situated in the central and eastern part of the study area, and the *Hills* in the north west and south west. These hills form part of the *Asberge* and the *Doringberge* respectively. There are no obvious topographical features on site nor are there any obvious drainage lines and/or wetland features (refer to Figure 5.2 below).

The highest portion of the proposed site is in the north-eastern portion of the study area, draining in a south-westerly direction. This drainage is channelled through several tributaries of variable slope and size to ultimately link up to the Orange River beyond the study area. Within these drainage lines, few small dams have been created for agricultural purposes, but with the generally very low rainfall of the area, are often dry. Substrate ranges from red sandy deposits, surface calcretes, and Dwyka diamictites to exposed alluvial deposits. Soil depth and erodibility ranges accordingly.

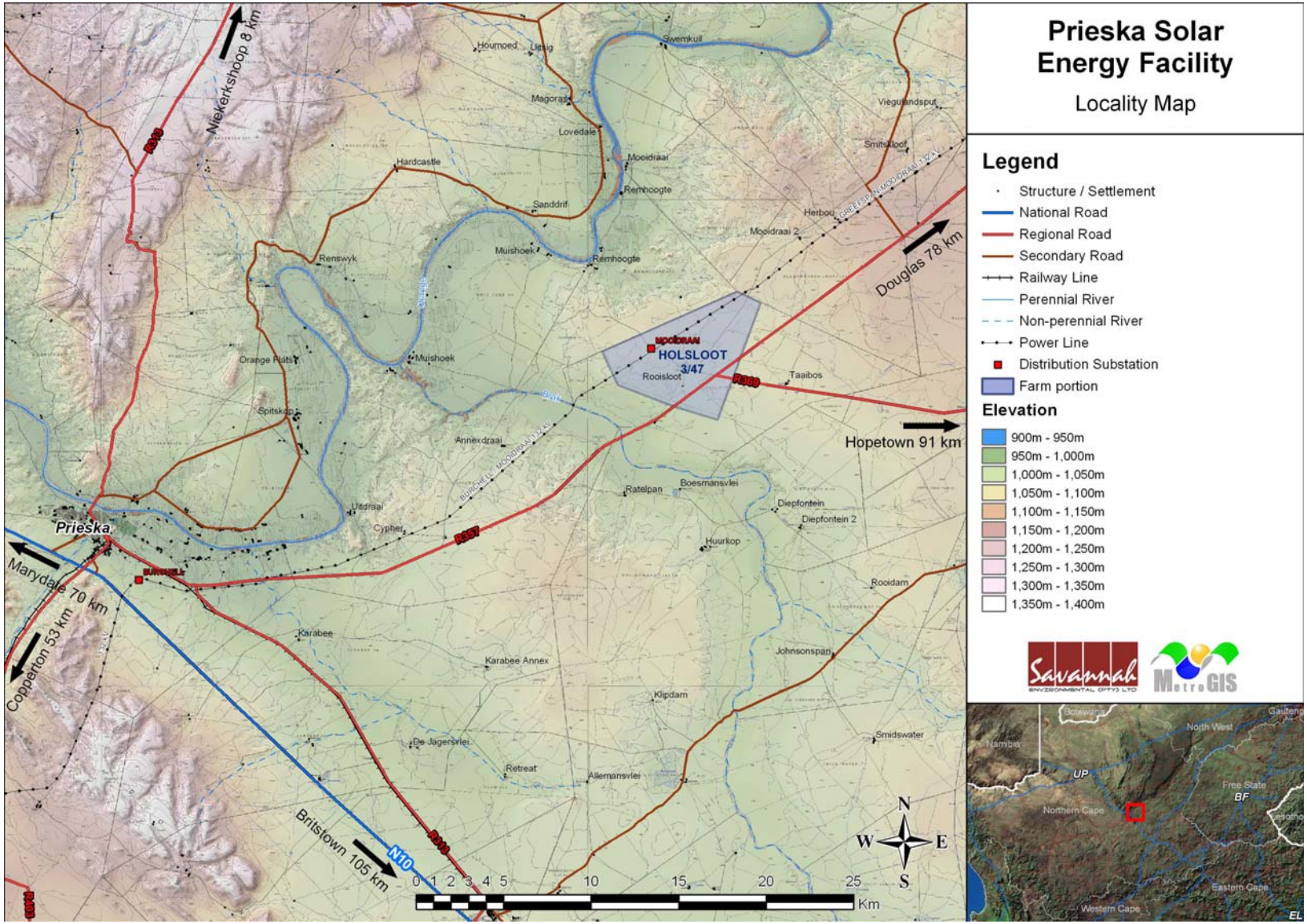

Figure 5.2: Location of the proposed facility indicating shaded relief (topography and elevation above sea level) of the study area

5.6.2. Land Types (Soils) & Agricultural Potential

The study site falls into the **Ag, Ae**, and **Fc** land types (Land Type Survey Staff, 1987). Table 4.1 summarises the land types applicable and their coverage in percentage on site.

Table 4.1: Land types and their coverage expressed as a percentage on site

Land Types	Coverage in Percentage (%)
Ag136	70
Ae301	20
Fc567	5
Fc568	5

Figure 5.3 provides the land type map of the site. It can be seen from the map that most of the site falls within the Ag136 land type and that only a small portion of the Prieska Solar Energy Facility falls within the Fc567 and 568 land types. A brief description of the land types Ag136, Ae301, Fc567 and Fc568 in terms of soils, land capability, land use and agricultural potential is provided below:

Land Type Ag136

Soils: Ag land types denote areas where there are red-yellow apedal soils which are freely drained. This type of soil has a high base status with an effective depth of less than 300mm deep on average.

Land capability and land use: The site lies in an area that is non-arable with low potential grazing land.

Agricultural potential: There is low agricultural potential due to soil conditions on site hence it is expected to be generally ''not suited'' for cultivation

Land Type Ae301

Soils: Ae land types denote an area that has red-yellow apedal soils that is freely drained with a high base status and with an effective depth of more than 300mm deep on average.

Land capability and land use: The site lies in an area that is non-arable with low potential grazing land.

Agricultural potential: There is low agricultural potential due to soil conditions on site hence it is expected to be generally ''not suited'' for cultivation.

Land Type Fc567

Soils: The Fc group of land types has Glenrosa and/or Mispah soil forms (other soils may occur), with an effective depth of less than 300mm deep on average.

Land capability and land use: The site lies in an area that is non-arable with low potential grazing land.

Agricultural potential: There is low agricultural potential due to soil conditions on site hence it is expected to be generally ''not suited'' for cultivation.

Land Type Fc568

Soils: The Fc group of land types has Glenrosa and/or Mispah soil forms (other soils may occur), with an effective depth of less than 300mm deep on average.
Land capability and land use: The site lies in an area that is non-arable with low potential grazing land.
Agricultural potential: There is low potential due to soil-conditions on site hence it is expected to be generally ''not suited'' for cultivation.

According to the classification of the AGIS Website of the Department of Agriculture, Fisheries & Forestry – www.agis.agric.za - and Department of Agricultural Development (1991) the site falls within an area with (i) soils with minimum development, usually shallow, on hard or weathering rock, with or without intermittent diverse soils, and where lime is generally present in the landscape and (ii) red soils with a high base status. The following soil forms are to be expected to be present on the site, i.e. Hutton, Oakleaf, Mispah, Glenrosa, Clovelly, Valsrivier and Swartland.

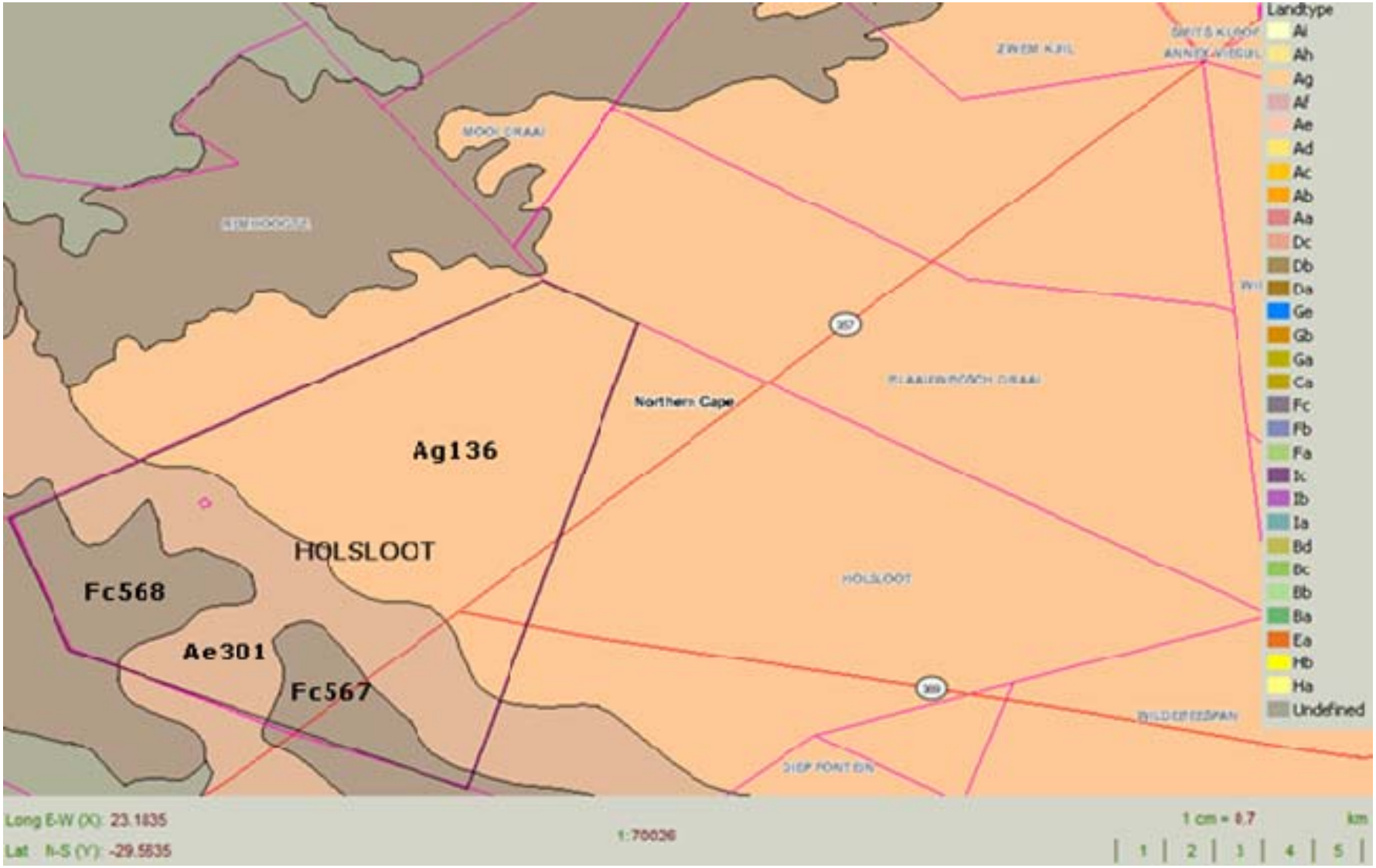

Figure 5.3: Land types map of the Prieska Solar Energy Facility and surrounding area

5.7. Ecological Profile

5.7.1. Vegetation

A map showing the vegetation of the study area and site is shown in Figure 5.4. The study site falls within the Northern Upper Karoo as described by Mucina and Rutherford (2006). Surrounding the study area are larger tracts of Upper Gariep Alluvial Vegetation. Although not mapped as such by Mucina and Rutherford, it can be expected that transitions of this vegetation into the Northern Upper Karoo can be expected along the larger drainage channels on the study area.

The Northern Upper Karoo is described as a shrubland dominated by dwarf Karoo shrubs and grasses. On deeper soils, higher shrubs of *Acacia mellifera* subsp. *detinens* and *Rhigozum trichotomum* can become invasive, forming dense stands where the grass and low shrub layer has been significantly weakened. Other prominent taller shrubs and trees include *Boscia albitrunca* (nationally protected) ad several *Lycium* species.

The dwarf shrub layer is mostly dominated by *Chrysocoma ciliata*, *Pentzia* species, *Eriocephalus* species, *Salsola* species, and *Zygophyllum* species. Prominent grasses are of the genera *Aristida*, *Eragrostis*, *Enneapogon*, and *Stipagrostis* (Mucina and Rutherford 2006).

This vegetation type is regarded as least threatened, even though none of it is officially protected, with only about 4% transformed by cultivation or infrastructure. Erosion throughout the range of this vegetation type ranges from very low to moderate, and the degree of erosion on the study area can only be determined during a field study (Mucina and Rutherford 2006). Several areas of this vegetation type are infested with alien *Prosopis* species, especially along drainage lines.

The Upper Gariep Alluvial vegetation ranges from riparian thickets or gallery forests to denser tall shrublands dominated by *Acacia karroo* and *Diospyros lycioides*, generally associated with a dense ephemeral (short-lived) herb layer underneath the canopy (Mucina and Rutherford 2006). The persistence of this vegetation depends on moisture levels in the drainage lines. Apart from large tracts being transformed by cultivation, outliers of this vegetation, as are expected on the study area, are often excessively used, and accordingly trampled by livestock due to the ephemeral herb layer, making these areas prone to invasion by alien invasive species such as *Prosopis*.

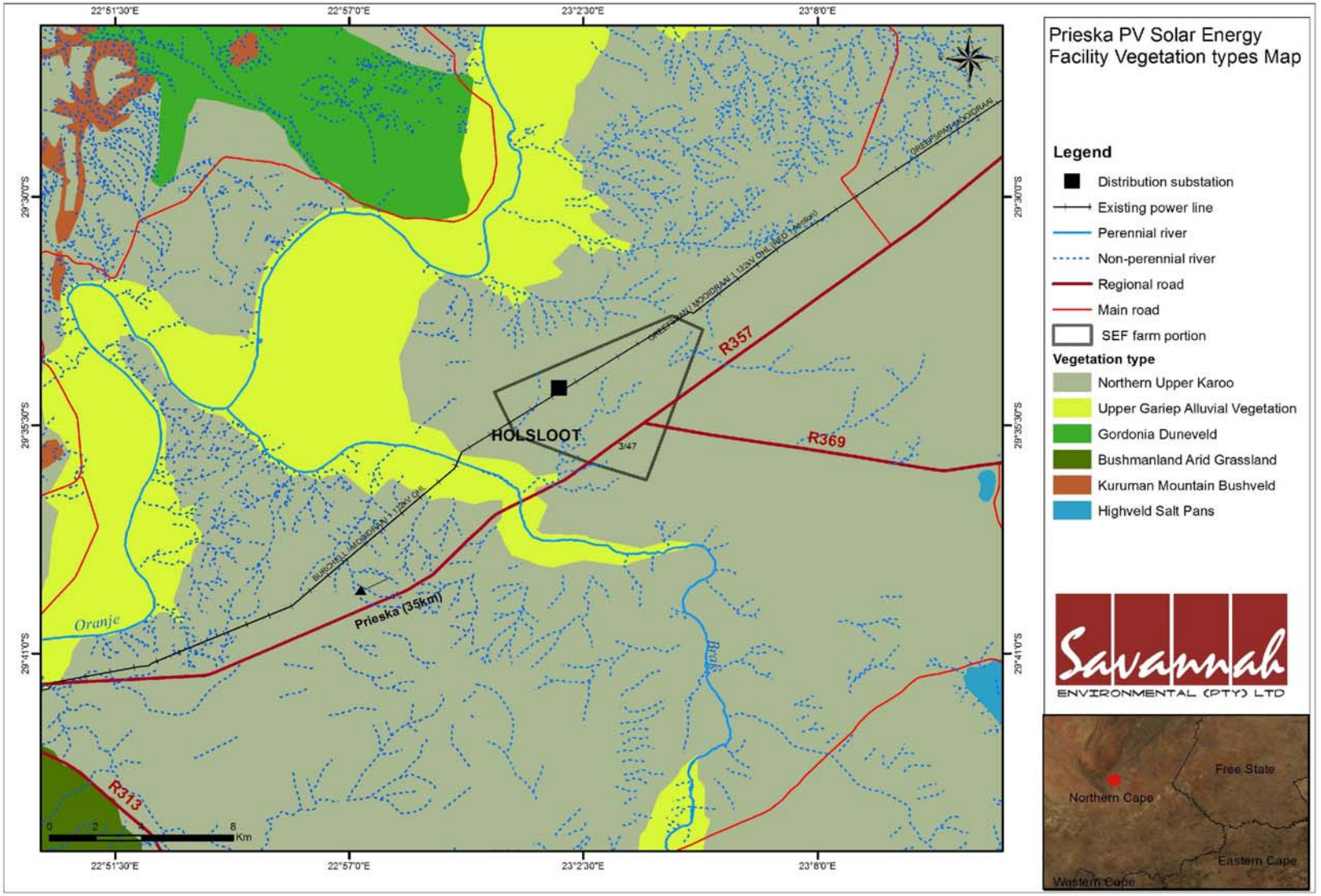

Figure 5.4: Vegetation map types for the study area

Vegetation of the study area was historically an open savanna, consisting of a dominant grass layer – mostly *Stipagrostis* and *Eragrostis* species - with groups of higher and lower shrubs and trees in-between. Changing land use and associated grazing patterns have, over the years, contributed to the grass layer becoming heavily encroached with either *Rhigozum trichotomum* (Driedoring) or *Acacia mellifera* subsp. *detinens* (Swarthaak), with the associated decline in grazing and agricultural value. This phenomenon is not restricted to the study area, but is widespread within the Prieska Region. Current high levels of shrub-encroachment are further supported by global change: The encroaching shrubs present have a different photosynthetic pathway to the majority of grasses, and higher CO_2 levels act as an air-borne fertiliser to the shrubs, enabling them to compete even stronger for light and moisture. Species composition and structure changes with substrate: deeper sands are dominated by perennial grasses and lower shrubs; shallow sands and rocky areas are dominated by higher shrubs, a higher component of dwarf shrubs and succulents, and fewer grasses.

At the time of the vegetation survey, the herbaceous layer overall was still very poorly developed and several more species can be expected to emerge after sufficient rainfalls. Of such species, remnants could be found on site.
It is estimated that approximately 197 species and more can be present on the study area. However, this is a rough estimate only and has been used as a comparative tool to help assess the conservation value and sensitivities of habitats.

Vegetation units identified during this study are based on the overall similarity in species composition, vegetation structure and biophysical attributes that are part of an ecosystem, but smaller phytosociological differences within each vegetation unit are present. The edges of vegetation units are generally relatively vague (except the riparian areas), and it can thus be expected that some degree of species overlap may occur between the mapped edges of the vegetation units.

Description of vegetation units and associated habitats

Four vegetation units could be identified (Figure 5.5):

» Unit 1: The *Boscia albitrunca – Pentzia incana* shrublands are restricted to more rocky areas with red sandy loams or pockets of shallow sand. The shrubland ranges from relatively open to patches of dense high shrubs, mostly *Acacia mellifera*. Several species are restricted to these habitats, including several protected succulents – amongst the latter isolated specimens of *Hoodia gordonii.*

» Unit 2: The *Rhigozum trichotomum – Stipagrostis uniplumis* shrublands are widespread on the gently undulating plains towards the north and west of the study area. Species composition is very variable, influenced to a large degree by soil depth, but also level of shrub encroachment by *Rhigozum trichotomum*, the latter reaching densities that are starting to seriously limit ecosystem functionality.

» Unit 3: The *Acacia mellifera – Aptosimum marlothii* shrublands create a transition between vegetation units 1 and 2. It generally occurs on slightly raised localities, typically with shallower sands and underlying calcrete. Density of *Acacia mellifera* varies from sparse to densely encroached – the denser these shrubs, the less grass underneath. In general, there is also a higher diversity of low shrubs that are better adapted to the more shady conditions below high shrubs.

» Unit 4: The *Hertia pallens – Stipagrostis namaquensis* riparian areas are typical for more distinct drainage lines along the depressions between the surrounding undulating plains. The depth to which such drainage lines are incised varies significantly, hence also the level of base rock exposed and the number of additional niches facilitating higher species diversity. Shallower channels are very prone to invasion by ruderal (weedy) and alien invasive species. Surface runoff after heavy precipitation events from the undulating sandy plains will be limited due to the high infiltrability of the sand. However, water will collect under the soil surface on top of the base rock and then seep out in these drainage lines, which then channel the water into lower-lying rivers that drain into the nearby Gariep (Orange) River. As the Gariep River is economically important for a multitude of irrigation schemes and settlements downstream, it is important to maintain the intactness of these upper drainage lines to reduce sediment loads and filter possible pollutants that may end up disturbing the Gariep ecosystem.

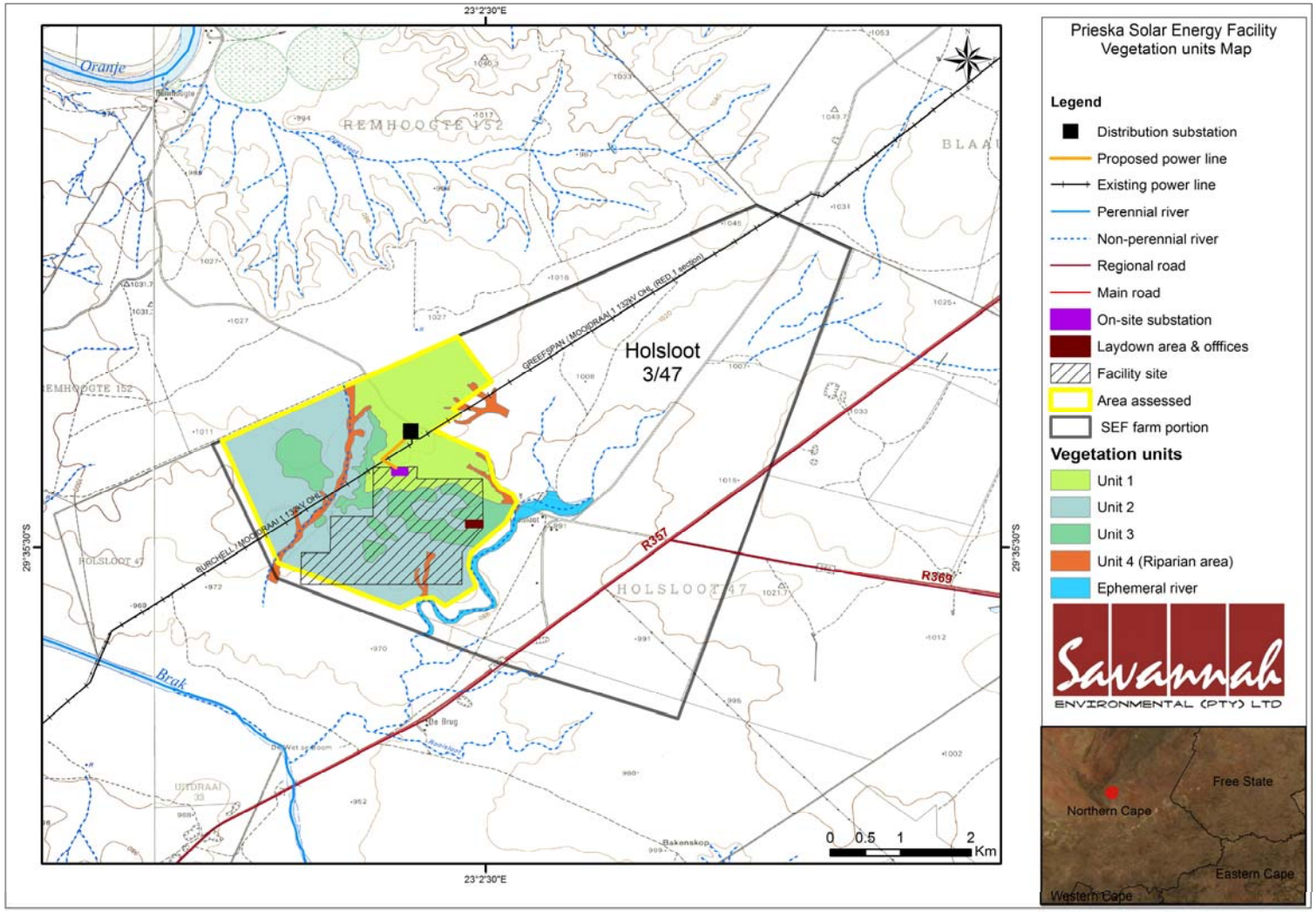

Figure 5.5: The distribution of the four vegetation units as surveyed on the study area. Indicated are also the existing substation and lower-lying rivers.

5.7.2. Red List and Protected Fauna and Avifauna

Bird and mammal species of conservation concern (red-listed) are mostly restricted to birds and small mammals. There are a number of vulnerable and one endangered species that could occur in the study area, but they are no threatened, near threatened or protected species that occur in available habitats in the proposed study area although this will be confirmed in the EIA phase. The following red data bird species may utilised habitat on the site:

Common Name	Species Name	Status
Blue Crane	*Anthropoides paradiseus*	Endangered
Tawny Eagle	*Aquila rapax*	Vulnerable
Kori Bustard	*Ardeotis kori*	Vulnerable
Black Stork	*Ciconia nigra*	Vulnerable
Saddlebill Stork	*Ephippiorhynchus senegalensis*	Endangered
Cape Vulture	*Gyps coprotheres*	Endangered
Ludwig's Bustard	*Neotis ludwigii*	Vulnerable

The following red data fauna may occur on the site:

Common Name	Species Name	Status
Sclater's Golden Mole	*Chlorotalpa sclateri*	Little known
Spectacled Dormouse	*Graphiurus ocularis*	Rocky areas, rare
Black-footed Cat	*Felis nigripes*	Rare
African Wild Cat	*Felis lybica*	Vulnerable
Honey Badger	*Mellivora capensis*	Vulnerable
Aardwolf	*Proteles cristatus*	Rare
Antbear / Aardvark	*Orycteropus afer*	Vulnerable
Pangolin	*Mani temminckii*	Vulnerable

5.7.3. Water Resources

The site is located approximately 5km from the Orange River at its closest point. There are no major rivers on the site itself, however drainage is channelled through several tributaries / drainage lines of variable slope and size to ultimately link up to the Orange River beyond the study area. Drainage areas and dams that could be remotely identified on the site and are shown in Figure 5.4. Within these drainage lines, few small dams have been created for agricultural purposes, but with the generally very low rainfall of the area, are often dry. According to the National Water Act, the drainage lines (most likely non-perennial) which travers the site, are classified as wetlands or water resources. These habitats are sensitive because of their ecosystem functions – providing specialised niches for

fauna, creating corridors in the landscape, filtering water, catching sedimentation and concentrating water runoff from catchments.

5.8. Social Characteristics of the Study Area and Surrounds

5.8.1. Administrative and Regional Background

The proposed Prieska Solar Energy Facility is located in the Siyathemba Local Municipality (SLM) (which is one of eight local municipalities which make up the PKSDM (NCDC7), and is located in the south-east of the Northern Cape Province. The other seven local municipalities are Emthanjeni, Kareeberg, Thembelihle, Siyancuma, Renosterberg, Ubuntu and Umsobomvu.

The PKSDM and SLM are located in the vast, arid (<250 mm/a), sparsely populated Karoo region of inland South Africa. Both the PkSDM and SLM are traversed (east to west) by the Gariep (Orange) river, the country's largest river. The majority of towns and settlements in the area are located along the Gariep. The river also supports significant irrigation agriculture (~75% of the SLM's agricultural GDP). Two of the three largest dams in Southern Africa are located on the Gariep inside the PKSDM area.

As in other parts of the Karoo, the trend in the PKSDM and SLM has been towards the progressive concentration of the population in towns and settlements. This is linked to labour/ tenure shedding on commercial farms and increasing diversification into game farming (mainly for hunting) - which provides fewer employment (and tenure) opportunities. However, opportunities in agri-tourism and eco-tourism have created scope for new and more sophisticated types of employment (UOFS; 2007).

5.8.2. Siyathemba Local Municipality

The main settlements in the Siyathemba Local Municipality are the towns of Prieska, Marydale, Niekerkshoop, Draghoender and Copperton. The town of Prieska, which is the administrative seat of the SLM, is located on the southern bank of the Gariep, approximately 30 km south-west of the proposed Solar Energy Facility site. Prieska is by far the largest town in the SLM, and functions as the leader town in the SLM. The town promotes itself as "the gem of the Northern Cape", based on its setting at the foot of the Doringberg, within the Gariep valley, and surrounded by large scale irrigation agriculture operations along the Gariep (SLM IDP 2010/2011).

As in the PKSDM, key activities in the SLM are related to primary sector activities, mainly agriculture and mining. Little local beneficiation takes place. Tourism and game farming (mainly for hunting) are significant emerging land uses.

Agricultural activity is by far the spatially most dominant land use in the SLM. While extensive stock farming accounts for ~98.7% of agricultural land use, it accounts for ~75% of the SLM' agricultural GDP. At least 12 major crop types are extensively cultivated in the Gariep valley (mainly east of Prieska), the most important of which are maize and wheat, peanuts, lucerne (alfalfa) and table grapes. Stock farming operations are mainly based on small stock (sheep, goats) on spatially extensive commercial farms. Both wool and carcasses are produced. Game farming (hunting) is emerging as a key diversification strategy (UOFS; 2007 and SLM IDP 2010/ 2011 Revision).

The mining sector historically played a major role in the local economy, with asbestos and copper/ silver (Copperton) mining the key activities. Currently, mining activities are mainly related to alluvial diamond mining activities along the Gariep River. The closure of asbestos mines (mainly to the north of Prieska) as well as the Copperton mine around the early 1990's has had a major lasting negative impact on the SLM economy.

The SLM tourism industry is in a fledgling stage, and largely based around the Gariep valley, and specifically the town of Prieska. A number of guest accommodation facilities are located in or near (<20 km) Prieksa – 13 according to the 2010/ 2010 SLM IDP. Tourism development (mainly focusing on Die Bos resort in Prieska, agro-tourism and game farming) is currently promoted as a key diversification strategy. Other established attractions in the SLM include its succulent/ xerophytic vegetation, interesting geology and semi-precious gemstones, sites of historical interest, and the "Karoo experience" – the sense of wilderness and desolation cherished by many South Africans and visitors alike. The R357 (Van Wyksvlei – Prieska, via Copperton) has been proposes as a scenic drive with touristic potential in the 2006 PKSDM SDF.

5.8.3. Demographic Profile

The total population of the PKSDM is ~ 165 000 (Census 2001). Of the total population Coloureds make up ~ 62% of the total, followed by Black Africans (~27%) and Whites (~10%). For the SLM the figures are ~ 64 % Coloured, 26 % Black African and 8 % Whites. The Siyathemba Local Municipality makes up ~ 22 % (36 000) of the total making it the most populated LM in the DM. The demographic makeup of the SLM is similar to that of the region. The population density for the region is 2.1 people per square kilometre. The age structure of the PkSDM population is similar to that of the Northern Cape Province, with ~ 16% of the population between 0-6 years old, while 8% are 60 years old or older. A further 31% are in the school going age group of 7 to 19 years. The economically active age group of 20 to 59 years old accounts for almost half the population (46%). The implications of this population structure are a higher demand on the

provision of social and physical facilities, like schools, primary health care centres, etc. in the district (PKSDM IDP 2008/2009).

5.8.4. Employment

According to the Census 2001 data, the unemployment rate in the PKSDM was 21% and SLM had a rate of 14%. In terms of employment the agricultural sector was the most important economic sector in the PKSDM accounting for ~ 39 % of the total working population. The commercial services sector accounted for ~ 23 % of the employment opportunities. These two sectors combined therefore accounted for ~ 62 % of all the employment opportunities in the area. Although the PkSDM only had an official unemployment rate of ~ 21%, household income levels in the region are low. In this regard ~ 64% of households had an income of R1 000 or less per month compared to the Northern Cape average of 54% of households below this level. The figure for the SLM is ~ 69% (PKSDM IDP 2008/2009).

5.8.5. Education levels

The education levels in the region are low and can be attributed to the rural nature of the area together with the substantial number of previously disadvantaged population groups who did not have equal access to education in the past era. Based on Census 2001 data, ~ 25 % of the PkSDM population had no education, while 35% only had primary level of qualifications. Of the total population only 5.0 % had gained a matric qualification and 2.6% had a degree. The figures are essential the same for the SLM, namely 26% and 35% respectively. On the other hand, according to the Municipal Profiles of 2002, the primary school population represented 46.3 % of the total population of the district. There are 49 primary schools and 18 secondary schools and combined schools in the district. While the actual number of schools is generally satisfactory there is an acute shortage of schools in the remote areas of the district. As a result children often have to walk long distances to reach schools (PKSDM IDP 2008/2009).

5.9. Heritage

The area proposed for the development of the Prieska Solar Energy Facility is located in an underdeveloped rural area east of the town of Prieska.

5.9.1. Palaeontology

Beneath the superficial sediment cover, Permo-Carboniferous glacial sediments of **Dwyka Group** (C-Pd, **Karoo Supergroup)** underlie almost the entire Klipgats Pan study area. Dwyka rocks may therefore be intersected by deeper excavations during development. The Dwyka Group along the north-western margin of the Main Karoo Basin, including the Prieska Subbasin in particular, has been reviewed by Visser (1982, 1985). In Dwyka times the Prieska – Copperton area lay within a basement high region between the Sout River Valley in the west and the Prieska Basin in the east. This area is referred to as the Kaiing Hills or Kaiing Veld Region by Visser and is characterized by a relatively thin Dwyka succession (normally < 50m). This mainly comprises massive clast-rich diamictites and clast–poor argillaceous diamictites ("boulder shale") overlain by a thin zone of laminated dropstone argillite with outsized clasts composed mainly of quartzite and gneiss . Note the presence of an isolated peak (monadnock) of Proterozoic basement rocks emerging through the Dwyka cover rocks to the southeast of Copperton (ibid.). Ice transport directions initially towards the south and later towards the southwest are reconstructed by Visser. The source area of many of the exotic boulder erratics (e.g. stromatolitic carbonates of Griqualand West succession, amygdaloidal lavas of the Ventersdorp Supergroup) seen in the Dwyka succession near Copperton, as well as the Prieska Basin to the east, is the elevated Ghaap Plateau to the north of Prieska (Visser 1982).

Further detailed observations on the Dwyka beds on the northern edge of the Britstown 1: 250 000 sheet are provided by Prinsloo (1989). Good surface outcrops of the Dwyka beds are rare here due to extensive cover by thin surface gravels. Massive tillites at the base of the Dwyka succession were deposited by dry-based ice sheets in deeper basement valleys. Later climatic amelioration led to melting, marine transgression and the retreat of the ice sheets 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 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 (Almond J.E. 2012).

5.9.2. Arcahaeology: Stone Age

This area is home to all three of the known phases of the Stone Age, namely: the Early- (2.5 million – 250 000 years ago), Middle- (250 000 – 22 000 years ago)

and Late Stone Age (22 000 – 200 years ago). The Late Stone Age in this area also contains sites with rock art from the San and Khoi San cultural groups. Early to Middle Stone Age sites are less common in this area, however rock-art sites and Late Stone Age sites are much better known.

The Early Stone Age (also referred to as the Acheulean or ESA) in the Prieska area, as in most other areas, is little known and largely under researched. The reason for this is the lack of stratigraphically preserved sites (such as found in caves). According to Richard Klein, less than 20 sealed ESA sites have been found in southern Africa (Klein, 2000). For this reason, most of what we know about the ESA in southern Africa is based on the study of similar, stratified sites from East Africa. The one area according to Deacon, where stratified ESA sites could be found is in the fluvial deposits of the Vaal-Orange drainage (Deacon 1975). There is therefore a possibility of such sites being found sub-surface in the study area and although small, it is a possibility that should be investigated.

While the main characteristic of the Acheulean artefact assemblages were the occurrence of large bi-facial hand axes and cleavers (although the contemporary Oldowan Industry lacked these in East Africa), the Middle Stone Age (MSA) shows a distinct lack of these (Leakey 1971, 1975). It is suggested by Clark that the reason for the disappearance of the bi-facial hand axe is that MSA peoples devised a technique for hafting stone flakes to make more efficient tools (Clark 1993). The term MSA has also been contentious since its first use as many academics campaign for its inclusion in either the ESA or LSA. The identification and research on MSA sites are therefore of paramount importance, and areas where these might occur should probably be investigated.

During the Middle Stone Age, 200 000 years ago, modern man or Homo sapiens emerged, manufacturing a wider range of tools, with technologies more advanced than those from earlier periods. This enabled skilled hunter-gatherer bands to adapt to different environments. From this time onwards, rock shelters and caves were used for occupation and reoccupation over very long periods of time. In areas where such structures were not readily available (such as the study area) it seems *A priori* that temporary shelters should have been used, however these were probably to flimsy to have survived for any significant length of time.

It is suggested by Klein that both Acheulean and MSA people were closely tied to standing water sources, possibly because they lacked impermeable water containers (Klein 2000). For this reason, possible sources of standing water (pans and creeks) were investigated for possible MSA or ESA deposits.

The Late Stone Age (LSA), considered to have started some 20 000 years ago, is associated with the predecessors of the San and Khoi Khoi. Stone Age hunter-gatherers lived well into the 19th century in some places in SA. Stone Age sites

may occur all over the area where an unknown number may have been obliterated by mining activities, urbanisation, industrialisation, agriculture and other development activities during the past decades especially associated with the town of Prieska.

It is suggested that the LSA could be widely ascribed to one of two possible origins, hunters and herders. Beaumont identifies two broad categories described as the *Swartkop Industry*, associated with hunters and the *Doornfontein Industry*, associated with herders (Beaumont 1995). This distinction seems clearer in the Bushmanland and Northern Cape than in the Western Cape. Both of these types of sites are associated with ceramic industries.

A limited number of Rock-Art sites are located in this area, mostly due to the lack of suitable shelter sites.

5.9.3. Arcaeology: Iron Age

Due to the variable definition of the term Iron Age, its occurrence in the Northern Cape is contentious. Traditionally the Iron Age is associated with agricultural people who made use of a ceramic industry (Cobbing 1988). The occurrence of metal working within these industries was not considered essential. As can be seen from the Doornfontein LSA Industry in the Northern Cape, this Stone Age industry has all the characteristics of an Iron Age society, however it is still regarded as a Stone Age Industry, due to its heavy reliance on stone age technologies. Traditional Iron Age societies are therefore only found in this area in association with the historic era and no contemporary Iron Age communities inhabited this region with the Stone Age communities.

5.9.4. The Historic Era

The name Prieska is most probably derived from the Korana words "*beris*" and "*ga*", combined meaning: "*…where the she-goat was lost*". The reason for this name is however unclear.

While Prieska only became a municipality in 1878, it was used as a fording place for the Orange River for many years before.

Prieska is also associated with the minor Cape Afrikaner revolt of 1900, which was finally suppressed by Lord Kitchener, where after the people involved, moved to the Transvaal. Current reminders of this action are the British built fort on the hill outside of Prieska as well as the British Military Memorial Gardens in town.

The area is also known for zinc, copper and asbestos mining. Most of the mines have become unprofitable and have closed down. The study area is used mainly for livestock farming at the moment.

5.9.5. Built Environment

The study area consists mainly of agricultural grazing land with few manmade structures visible on site. There are some recently built labour houses near the access road from the provincial asphalt road (Figure 5.6).

Figure 5.6: Labour housing on site

The building style as well as building materials used in the labour houses suggests that these are of recent construction. These structures will not be affected by the proposed development.

Furthermore there are some homesteads and agricultural buildings on the portion of the property that will be un-affected by the proposed development. These are however not indicated in the 1859 property act and are also not of such historic significance that the development will have a visually negative impact on them.

ASSESSMENT OF POTENTIAL IMPACTS CHAPTER 6

This chapter serves to assess the significance of the positive and negative environmental impacts (direct, indirect, and cumulative) expected to be associated with the development of the proposed Prieska Solar Energy Facility. This assessment is done for the 75 MW facility and for all the facility's components which will comprise:

» Solar panels (single or double axis).
» An on-site inverter to step up the power and a substation to facilitate the connection between the solar energy facility and the Eskom electricity grid.
» Two alternatives are being considered to evacuate the electricity from the facility.
  a) Alternative 1 a loop-in and loop out power line to connect into the existing Burchell-Mooidraai 1 132kV power line which traverses the site;
  b) Alternative 2 to connect directly into the existing Eskom Mooidraai Substation located on the site.
» Internal access roads.
» Workshop area for maintenance and storage.

The development of the Prieska Solar Energy Facility will comprise the following phases:

» *Pre-Construction and Construction* – will include pre-construction surveys; site preparation; establishment of the access road, electricity generation infrastructure, power line servitudes, construction camps, laydown areas, transportation of components/construction equipment to site; and undertaking site rehabilitation and establishment and implementation of a storm water management plan. This phase is expected to take approximately 18 - 24 months.
» *Operation* – will include operation of the facility and the generation of electricity. The operational phase is expected to extend in excess of 20 years.
» *Decommissioning* – depending on the economic viability of the plant, the length of the operational phase may be extended. Alternatively decommissioning will include site preparation; disassembling of the components of the facility; clearance of the site and rehabilitation. Note that impacts associated with decommissioning are expected to be similar to construction. Therefore, these impacts are not considered separately within this chapter.

6.1. Methodology for the assessment of Potentially Significant Impacts

A broader site of 3 164 ha (i.e. on Portion 3 of the Farm Holsloot 47) was identified by the project developer for the purpose of establishing the proposed Prieska Solar Energy Facility. However, the developmental footprint will cover an extent of ~275ha.

The assessment of potential issues has involved key input from specialist consultants, the project developer, key stakeholders, and interested and affected parties (I&APs). The Comments and Response Report included within Appendix L lists these issues and the responses given by the EAP during the EIA process up to date.

6.2. Assessment of the Potential Impacts associated with the Construction and Operation Phases

The sections which follow provide a summary of the findings of the assessment undertaken for potential impacts associated with the construction and operation of the proposed solar energy facility on the identified site. Issues were assessed in terms of the criteria detailed in Chapter 4 (Section 4.3.3). The nature of the potential impact is discussed, and the significance is calculated with and without the implementation of mitigation measures. Recommendations are made regarding mitigation/enhancement and management measures for potentially significant impacts and the possibility of residual and cumulative impacts are noted.

6.2.1 Potential Impacts on Ecology

Solar energy facilities require relatively large areas of land for placement of infrastructure. This PV facility requires ~275 hectares. The main expected negative impact will be due to loss of habitat which may have direct or indirect impacts on individual species. Potential impacts and the relative significance of the impacts are summarised below (refer to **Appendix F - Ecology Report** for more details).

The ecological sensitivity assessment identifies those parts of the study area that have high conservation value or that may be sensitive to disturbance. This sensitivity assessment is based on a desktop study, detailed field evaluation of the site and detailed analysis of aerial photography. A detailed methodology is included within the Ecology report (See Appendix F).

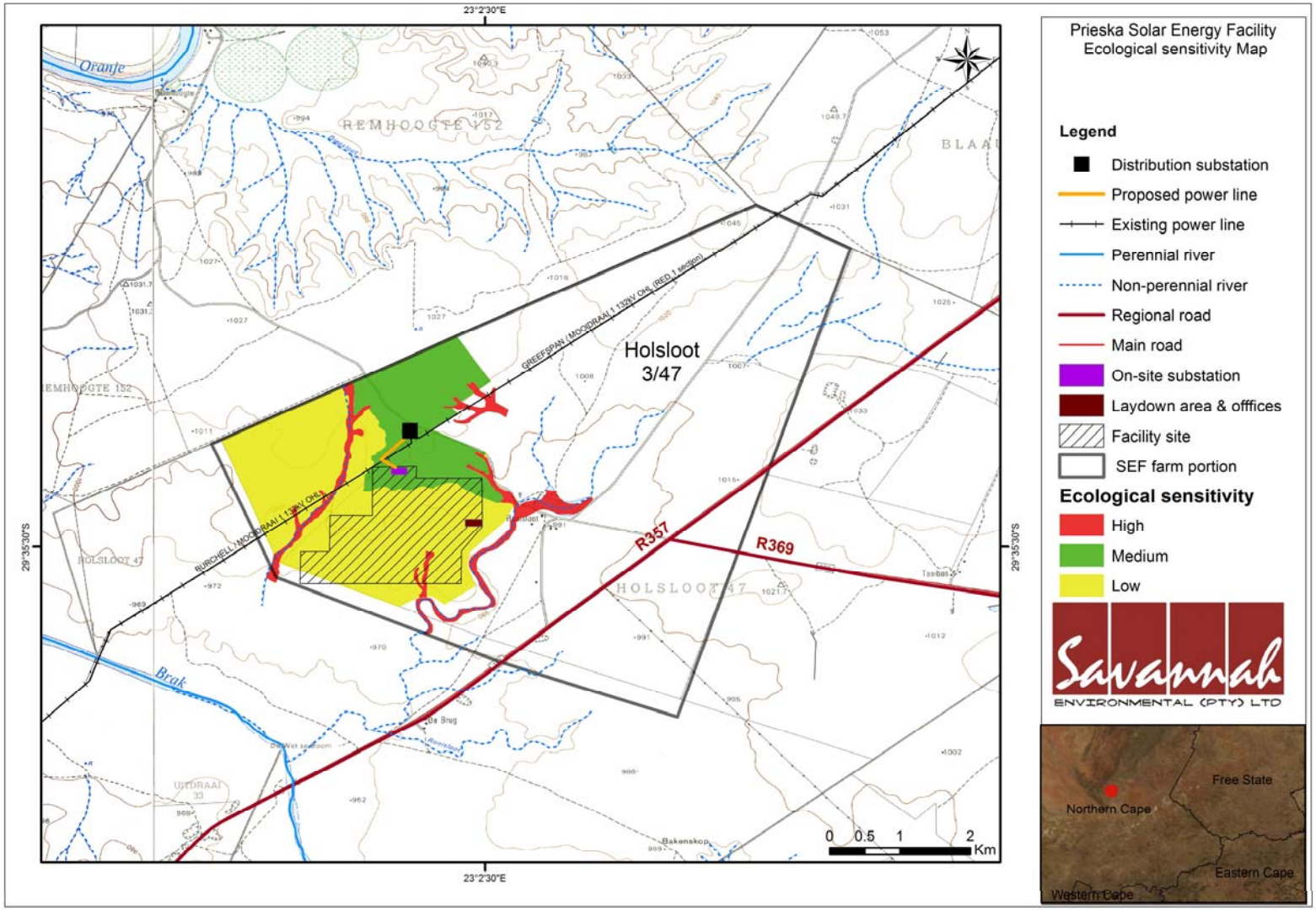

Figure 6.1: Ecological sensitivity of the study area

Impact tables summarising the significance of impacts on ecology (with and without mitigation)

Upgrading of Access Road

Nature: Removal of vegetation, compaction of soils, creation of runoff zone Loss of vegetation, increase in runoff and erosion.		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (4)	Small (0)
Probability	Definite (5)	Definite (5)
Significance	**Medium (50)**	**Low (25)**
Status (positive or negative)	Negative	Neutral
Reversibility	Not reversible	Partially reversible
Irreplaceable loss of resources?	Probable	Not likely
Can impacts be mitigated?	Reasonably	

Mitigation:

» Make use of the existing track to the substation (past the farm house), no new route to be constructed over the ephemeral river west of the farm house
» Ensure an adequate plant search and rescue program is implemented prior to commencement of activity
» Reinforce portions of existing access routes that are prone to erosion, create structures or low banks to drain the access road rapidly during rainfall events, yet preventing erosion of the track and surrounding areas
» Ensure that runoff from compacted or sealed surfaces is slowed down and dispersed sufficiently to prevent accelerated erosion from being initiated (storm water and erosion management plan required)
» Ensure adequate drainage where access roads cross drainage lines
» Prevent leakage of oil or other chemicals or any other form of pollution
» Monitor the establishment of (alien) invasive species and remove as soon as detected, whenever possible before regenerative material can be formed
» After decommissioning, if access road or portion thereof will not be of further use to the landowner, remove all foreign material and rip area to facilitate the establishment of vegetation

Cumulative impacts:

» Possible erosion of areas lower than the access road, possible contamination of lower-lying drainage lines, rivers (Gariep) and dams due to oil or other spillage,
» Possible spread and establishment of alien invasive species

Residual Impacts:

» Altered vegetation composition and structure,
» Barren areas,
» Potential for erosion

Fencing area – may also serve as access road to PV panels as well as fire-break

Nature: Removal of vegetation, compaction of soils, creation of runoff zone

Loss of vegetation, loss of micro-habitat, increase in runoff and erosion, window of opportunity for the establishment of alien invasive species, altered topsoil characteristics prone to capping, increased runoff and erosion.

	Without mitigation	**With mitigation**
Extent	Local (2)	Local (1)
Duration	Long-term (4)	Long term (4)
Magnitude	Moderate (6)	Minor (2)
Probability	Definite (5)	Definite (5)
Significance	**Medium (60)**	**Medium (35)**
Status (positive or negative)	Negative	Neutral Clearing of encroacher bush positive
Reversibility	Partially reversible	Reversible
Irreplaceable loss of resources?	Probable	
Can impacts be mitigated?	Reasonably	

Mitigation:

» Minimise area affected, especially during construction
» Re-apply topsoil removed within 6 months, spreading them as shallow as possible to retain the natural seed bank and thus enable natural revegetation
» Remove and collect all bulbous and tuberous plants from cleared areas and transplant onto the newly redistributed topsoils, together with other species used for revegetation
» Prevent leakage of oil or other chemicals
» Monitor the establishment of alien and indigenous invasive species and remove as soon as detected, whenever possible *before* regenerative material can be formed

Cumulative impacts:

» Possible erosion of cleared areas and thus also accelerated erosion from surrounding areas
» Possible loss of ecosystem functioning due to increase in invasive species
» Possible excessive fragmentation and thus reduction of core habitats that may negatively influence species population viability

Residual impacts:

» Altered vegetation composition (may be positive if invasive species are reduced significantly),
» Compacted topsoils,
» Possibility for erosion

Construction and operation of PV panels

Nature: Removal of or excessive damage to vegetation, compaction of soils, creation of runoff zone, redistribution and concentration of runoff from panel surfaces, artificial shading of vegetation

Loss of vegetation, loss of and alteration of microhabitats, altered vegetation cover, altered distribution of rainfall and resultant runoff patterns, increase in runoff and accelerated erosion.

	Without mitigation	**With mitigation**
Extent	Regional (4)	Local (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	High (8)	Moderate (6)
Probability	Definite (5)	Definite (5)
Significance	**High (80)**	**Medium (60)**
Status (positive or negative)	Negative	Negative to neutral
Reversibility	Partially reversible	Partially reversible
Irreplaceable loss of resources?	Highly Probable	Slight Probability
Can impacts be mitigated?	Reasonably	

Mitigation:

» Keep areas affected to a minimum
» Utilise area as close as possible to existing infrastructure, keep buffer zone of a minimum of 50 to 100 m around drainage lines
» Remove all invasive vegetation: *Argemone* sp, *Rhigozum trichotomum*, *Acacia mellifera*, preferably when such vegetation does not contain seed material (late winter)
» Shred all non-seed bearing material and use as mulch when topsoils are re-applied or landscaped as a means to protect the soil surface from capping and erosion and enable the establishment of grasses from the natural seed banks
» Limit development on areas with high levels of surface rockiness
» Monitor the area below the PV panels regularly after larger rainfall events to determine where erosion may be initiated and then mitigate by modifying the soil micro topography and revegetation efforts accordingly
» Aim to maintain a reasonable cover of indigenous perennial vegetation throughout the operational phase within and on the periphery of the PV array, preferably perennial grasses or dwarf shrubs
» Prevent leakage of oil or other chemicals
» Monitor the establishment of all invasive species and remove as soon as detected, whenever possible before regenerative material can be formed

Cumulative impacts:

» possible erosion of areas below and lower than the panels
» possible contamination of drainage lines, lower-lying ephemeral rivers and the Gariep River
» possible fragmentation of plant populations
» possible spread and establishment of invasive species

Residual Impacts:

» altered topsoil characteristics
» altered vegetation composition

Construction of power line to substation

The main impact associated with the power line would be disturbance of vegetation and habitat. Due to the short length of the power line this is expected to be of low significance.

Nature: Limited removal of vegetation, compaction of soils Loss of vegetation, increase in runoff and erosion After decommissioning: altered topsoil characteristics and altered vegetation.		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Minor (2)	Small (0)
Probability	Definite (5)	Definite (5)
Significance	**Medium (40)**	**Low (25)**
Status (positive or negative)	Negative	Neutral to positive
Reversibility	Partially reversible	Reversible
Irreplaceable loss of resources?	Probable	Not likely
Can impacts be mitigated?	Reasonably	
Mitigation: » Conduct a search and rescue operation for succulents, tuberous and bulbous plants prior to pylon construction » Prevent spillage of construction material beyond area affected » Monitor the establishment of invasive species and remove as soon as detected, whenever possible before regenerative material can be formed		
Cumulative impacts: » Possible erosion of surrounding areas, no major cumulative impact on vegetation expected » Establishment of perennial grasses along the servitude after the removal of invasive bush will be positive		
Residual Impacts: » Very localised alteration of soil surface characteristics » Establishment of perennial grasses after the removal of invasive bush will be positive		

Construction of workshop area

Nature: Removal of vegetation, compaction of soils, introduction of pollutants Loss of vegetation, increase in runoff and erosion, pollution.		
	Without mitigation	**With mitigation**
Extent	Regional (4)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (4)	Small (1)
Probability	Definite (5)	Definite (5)

Significance	**Medium (60)**	**Low (30)**
Status (positive or negative)	Negative	Neutral
Reversibility	Partially reversible	Partially reversible
Irreplaceable loss of resources?	Probable	Not likely
Can impacts be mitigated?	Reasonably	
Mitigation: » Maintain a minimum buffer of 50 to 100 m from any drainage line » Limit disturbance to footprint area as far as practically possible » Conduct a search and rescue operation for succulent, tuberous or bulbous plants prior to construction » Place infrastructure as far as possible on sites where the slope is negligible » Prevent spillage of construction material and other pollutants beyond area affected » Rehabilitate and revegetate all areas outside footprint area that have been disturbed » Monitor the establishment of invasive species and remove as soon as detected, whenever possible before regenerative material can be formed		
Cumulative impacts: » Possible erosion of adjacent or lower-lying areas » Possible contamination of drainage lines, lower-lying ephemeral rivers and the Gariep River » Possible spread and establishment of invasive plant species » Possible erosion of surrounding areas		
Residual Impacts: » Altered topsoil characteristics » Altered vegetation composition – replacement of invasive bush with perennial grasses will be positive		

Implications for Project Implementation

» The proposed photovoltaic facility development on the site will not have significant impacts on the ecology of the site, if more sensitive areas such as denser stands of protected plants can be avoided and a sufficient buffer is maintained around all riparian areas identified. The largely low sensitivity of the larger portion of the study area is due to the overall degradation of the site by dense bush encroachment. Clearing of this dense bush and the replacement of the vegetation layer by a lower, dense grass layer (at least after decommissioning) can be seen as beneficial to the overall ecology of the area.

» Potentially significant negative impacts on the ecological environment could include soil degradation issues as a result of construction activity; possible introduction of alien invasive plants and a long-term (more than 8 months) low or absent vegetation cover after construction. In addition, a loss of niches and specialised habitats for flora and fauna could occur with the removal of large specimens of *Boscia* trees. With the diligent implementation of mitigating measures by the developer, contractors, and operational staff, the severity of these impacts can be minimised.

» The impact on fauna is expected to be negligent, as animals are mobile. They will move away during construction, and may resettle after construction. No restricted or specific habitat of vertebrates will be affected by the proposed development; especially of the proposed development remains outside the riparian areas.

6.2.2 Potential Impacts on Geology; Soils and Agricultural Potential

Potential impacts on soils and agricultural potential include:

» **Impact 1**: Soil (degradation due to wind and water erosion, as well as by contamination with oil, petrol, diesel and other contaminants used by the construction vehicles and equipment)
» **Impact 2**: Vegetation and grazing capacity (degradation due to a decrease in species composition and vegetation cover, as well as the recruitment of alien woody invaders and/or indigenous enchroaching woody plants, and a loss of grazing capacity)
» **Impact 3**: Underground water (degradation due to contamination by oil, petrol, diesel and other contaminants used by the construction vehicles and equipment)
» **Impact 4**: Livestock production systems (interference with farm and livestock management activities and a decline in the long term food production).

Potential Impacts from the Solar Facility Footprint

Impact 1 Soil

The soil erosion potential of the site is relatively low as long as a healthy grass cover is maintained and storm water runoff is not concentrated.

Nature: Soil erosion on construction sites during and after the construction phase due to decreased vegetation cover and concentrated water run-off		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Short-term (2)	Short-term (2)
Magnitude	Low (4)	Minor (2)
Probability	Definite (5)	Probable (3)
Significance	**35 (Medium)**	**15 (Low)**
Status	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	

Mitigation: » Care must be taken with the ground cover during and after construction on the site. » If it is not possible to retain a good plant cover during construction, technologies should be employed to keep the soil covered by other means, i.e. straw, mulch, erosion control mats, etc., until a healthy plant cover is established again. » Care should also be taken to control and contain storm water run-off and not to concentrate its runoff, specifically under the solar arrays. » Rehabilitate construction sites by establishing it with indigenous grasses like *Anthephora pubescens, Cenchrus ciliaris, Eragrostis curvula*, etc.
Cumulative Impacts: » Little with the necessary mitigation in place
Residual Impacts: » Little with the necessary mitigation in place

Nature: Dust production and dust pollution		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Short term (2)	Short-term (2)
Magnitude	Low (4)	Minor (2)
Probability	Probable (3)	Improbable (2)
Significance	**21 (Low)**	**10 (Low)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: » Apply dust control measures, i.e. water spraying.		
Cumulative Impacts: » Little with the necessary mitigation in place		
Residual Impacts: » Little with the necessary mitigation in place		

Impact 2 Vegetation and grazing capacity

Firstly, the construction activities will lead to areas where the soil will be denuded of vegetation. Secondly, there is a potential that the alien invader species *Prosopis glandulosa* and the indigenous enchroaching species *Rhigozum trichotomum* and *Acacia mellifera* subsp. *detinens* may establish on the construction sites due to soil disturbance.

The Plooysburg-soils has the best agricultural potential and should where possible not be used for the establishment of the solar facility footprint features.

Nature: Denudation of the soil due to construction activities and loss of carrying capacity		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Medium-term (3)	Short-term (2)
Magnitude	Low (4)	Minor (2)
Probability	Definite (5)	Definite (5)
Significance	**40 (Medium)**	**25 (Low)**
Status	Negative	Negative
Reversibility	Medium	High
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	
Mitigation: » Rehabilitate construction sites by establishing it with indigenous grasses like *Anthephora pubescens, Cenchrus ciliaris, Eragrostis curvula*, etc.		
Cumulative Impacts: » Little with the necessary mitigation in place. The maintenance of a dense grass cover may lead to an increased grazing and carrying capacity of the site.		
Residual Impacts: » Little with the necessary mitigation in place		

Nature: Invasion of alien and indigenous invader plants after soil disturbance on construction sites		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Short-term (2)
Magnitude	Low (4)	Minor (2)
Probability	Definite (5)	Improbable (2)
Significance	**45 (Medium)**	**10 (Low)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: » Control invader plants recruiting on construction sites chemically and then mechanically to prevent coppice by the woody plants. » The control of woody plants will lead to an increased grazing and carrying capacity on the site.		
Cumulative Impacts: » Little with the necessary mitigation in place		

Residual Impacts:
» Little with the necessary mitigation in place

Impact 3 Underground water

It is highly unlikely that the solar facility footprint will have any impact on the underground water resources.

Impact 4: Livestock production systems

During the construction phase there will be an impact on the normal day-to-day management of the livestock and the veld management system.

The long term impact on food production will be negligible due to the low grazing capacity and small size of the site. If grazing is allowed within the site after the construction phase and the grass cover is restored due to rehabilitation of construction sites with grasses and the removal of invading and encroaching woody plants, the impact on grazing capacity and food production is expected to be positive rather than negative.

Nature: Interference with the day-to-day management of the livestock and veld due to construction and other activities on the site		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Short-term (2)	Short-term (2)
Magnitude	Low (4)	Minor (2)
Probability	Definite (5)	Probable (3)
Significance	**35 (Medium)**	**15 (Low)**
Status	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: » When farming infrastructure, i.e. fences, water pipelines, water troughs, etc., is removed or damaged, it should be replaced as soon as possible. » Construction and other activities must be communicated and co-ordinated with the land owner to put her in a position to properly plan her management activities.		
Cumulative Impacts: » Little with the necessary mitigation in place		
Residual Impacts: » Little with the necessary mitigation in place		

Potential Impacts from Construction and positioning of internal access roads

Impact 1 Soil

There are internal access roads on the site. Internal access roads within the PV facility will have to be constructed. Soil erosion on the roads themselves as well as adjacent areas is a possibility if the storm water runoff from these roads is not controlled and managed properly.

Nature: Soil erosion due to increased and concentrated storm water runoff from road surfaces		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Short-term (2)	Short-term (2)
Magnitude	Low (4)	Minor (2)
Probability	Definite (5)	Improbable (2)
Significance	**35 (Medium)**	**10 (Low)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	Yes	No
Can impacts be mitigated?	Yes	
Mitigation: » Care should be taken to put gravel on access road surfaces to protect the soil against wind and water erosion. » Cross mounds and other storm water dispersing and drainage techniques must be employed to decrease the speed and force of the storm water properly from road surfaces.		
Cumulative Impacts: » Little with the necessary mitigation in place		
Residual Impacts: » Little with the necessary mitigation in place		

Impact 2 Vegetation and grazing capacity

New roads will contribute to the loss of vegetation and carrying capacity, although the impact is considered to be negligible taking into account the relatively low grazing capacity of the veld and the small area the roads will cover.

Nature: Loss of vegetation and carrying capacity		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Minor (2)	Minor (2)
Probability	Definite (5)	Definite (5)

Significance	**40 (Medium)**	**40 (Medium)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: » Minimize the number of roads.		
Cumulative Impacts: » Little, as long as the roads are not an additional source of erosion and storm water		
Residual Impacts: » Permanent		

Impact 3 Underground water

No impact expected.

Impact 4: Livestock production systems

During the construction phase there will be an impact on the normal day-to-day management of the livestock and the veld management system.

Nature: Interference with the day-to-day management of the livestock and veld due to construction and other activities on the site		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Short-term (2)	Short-term (2)
Magnitude	Low (4)	Minor (2)
Probability	Definite (5)	Probable (3)
Significance	**35 (Medium)**	**15 (Low)**
Status	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: » Construction and other activities must be communicated and co-ordinated with the landowner in order for her to properly plan her management activities.		
Cumulative Impacts: » Little with the necessary mitigation in place		
Residual Impacts: » Little with the necessary mitigation in place		

Potential Impacts from Construction and positioning of underground cabling between project components

Impact 1 Soil

The trenches dug for the laying of the internal cabling will disturb the soils as well as denude it of vegetation which could lead to soil erosion.

Nature: Soil erosion along the trenches dug during and after the construction phase due to decreased vegetation cover and increased water run-off		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Short-term (2)	Short-term (2)
Magnitude	Low (4)	Minor (2)
Probability	Definite (5)	Probable (3)
Significance	**35 (Medium)**	**15 (Low)**
Status	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	
Mitigation: » Care must be taken with the ground cover during and after construction on the site. » If it is not possible to retain a good plant cover during construction, technologies should be employed to keep the soil covered by other means, i.e. straw, mulch, erosion control mats, etc., until a healthy plant cover is again established. » Care should also be taken to control and contain storm water run-off. » Rehabilitate construction sites by establishing it with indigenous grasses like *Anthephora pubescens*, *Cenchrus ciliaris*, *Eragrostis curvula*, etc.		
Cumulative Impacts: » Little with the necessary mitigation in place		
Residual Impacts: » Little with the necessary mitigation in place		

Impact 2 Vegetation and grazing capacity

The trenches dug for the internal cabling will denude the soil of its vegetation which will lead to a loss of grazing capacity (although the expected impact will be minor) and disturb the soil which could lead to woody plant recruitment.

Nature: Loss of vegetation and carrying capacity		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Short-term (2)
Magnitude	Minor (2)	Minor (2)

Probability	Definite (5)	Definite (5)
Significance	**40 (Medium)**	**25 (Low)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation:		
» Rehabilitate construction sites by establishing it with indigenous grasses like *Anthephora pubescens, Cenchrus ciliaris, Eragrostis curvula*, etc.		
Cumulative Impacts:		
» Little, as long as the roads are not an additional source of erosion and storm water		
Residual Impacts:		
» Permanent		

Nature: Recruitment of alien and indigenous invader plants after soil disturbance on trench digging sites		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Short-term (2)
Magnitude	Low (4)	Minor (2)
Probability	Definite (5)	Improbable (2)
Significance	**25 (Medium)**	**10 (Low)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation:		
» Control invader plants recruiting on construction sites chemically and then mechanically to prevent coppice by the woody plants.		
Cumulative Impacts:		
» Little with the necessary mitigation in place		
Residual Impacts:		
» Little with the necessary mitigation in place		

Impact 3 Underground water

No impact expected.

Impact 4: Livestock production systems

During the construction phase there will be an impact on the normal day-to-day management of the livestock and the veld management system.

Nature: Interference with the day-to-day management of the livestock and veld due to construction and other activities on the site		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Short-term (2)	Short-term (2)
Magnitude	Low (4)	Minor (2)
Probability	Definite (5)	Probable (3)
Significance	**35 (Medium)**	**15 (Low)**
Status	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: » Construction and other activities must be communicated and co-ordinated with the landowner in order for her to properly plan her management activities.		
Cumulative Impacts: » Little with the necessary mitigation in place		
Residual Impacts: » Little with the necessary mitigation in place		

Potential Impacts from Construction and positioning of a new on-site substation

Impact 1 Soil

The buffer zone surrounding the substation and the storm water runoff from the substation roof may be agents of increased water runoff and water erosion.

Nature: Soil erosion in the area surrounding the substation		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Short-term (2)	Short-term (2)
Magnitude	Low (4)	Minor (2)
Probability	Definite (5)	Probable (3)
Significance	**35 (Medium)**	**15 (Low)**
Status	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	
Mitigation: » Care must be taken with the ground cover during and after construction on the site and the buffer zone surrounding it. » During construction, technologies should be employed to keep the soil covered with		

agent like straw, mulch, erosion control mats, etc. » After construction the buffer zone around the building should be covered with gravel. » Care should also be taken to control and distribute the storm water run-off from the roof of the building in such a manner that it does not lead to water erosion of the surrounding soil.
Cumulative Impacts: » Little with the necessary mitigation in place
Residual Impacts: » Little with the necessary mitigation in place

Impact 2 Vegetation and grazing capacity

Very little impact expected as it will only cover a very small area of land and positioned on the Coega soil form with the lowest grazing capacity on the site.

Nature: Invasion of alien and indigenous invader plants after construction		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Short-term (2)
Magnitude	Low (4)	Minor (2)
Probability	Definite (5)	Improbable (2)
Significance	**25 (High)**	**10 (Low)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: » Control invader plants recruiting on the construction site.		
Cumulative Impacts: » Little with the necessary mitigation in place		
Residual Impacts: » Little with the necessary mitigation in place		

Impact 3 Underground water

No impact expected.

Impact 4: Livestock production systems

During the construction phase there will be an impact on the normal day-to-day management of the livestock and the veld management system.

Nature: Interference with the day-to-day management of the livestock and veld due to construction and other activities on the site		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Short-term (2)	Short-term (2)

Magnitude	Low (4)	Minor (2)
Probability	Definite (5)	Probable (3)
Significance	**35 (Medium)**	**15 (Low)**
Status	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: » Construction and other activities must be communicated and co-ordinated with the landowner in order for her to properly plan her management activities.		
Cumulative Impacts: » Little with the necessary mitigation in place		
Residual Impacts: » Little with the necessary mitigation in place		

Potential Impacts from Construction and positioning of an on-site workshop area

Impact 1 Soil

The buffer zone surrounding the workshop area and the storm water runoff from the roof/s may be agents of increased water runoff and water erosion.

Nature: Soil erosion in the area surrounding the workshop area		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Short-term (2)
Magnitude	Low (4)	Minor (2)
Probability	Definite (5)	Probable (3)
Significance	**50 (Medium)**	**15 (Low)**
Status	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	
Mitigation: » Care must be taken with the ground cover during and after construction on the site and the buffer zone surrounding it. » During construction, technologies should be employed to keep the soil covered with agent like straw, mulch, erosion control mats, etc. » After construction the buffer zone around the building should be covered with gravel. Care should also be taken to control and distribute the storm water run-off from the roof of the building in such a manner that it does not lead to water erosion of the surrounding soil.		
Cumulative Impacts: » Little with the necessary mitigation in place		
Residual Impacts:		

» Little with the necessary mitigation in place

Impact 2 Vegetation and grazing capacity

Very little impact expected as it will only cover a very small area of land. According to the lay-down plan, this facility is planned to be situated on an area covered with the Plooysburg soil form with the best grazing capacity of the two soils present on the site. It is suggested that it be moved to an area with soil of the Coega form (if practical) as the vegetation on the Coega soils has the lowest grazing capacity of the two soils on the site.

Nature: Invasion of alien and indigenous invader plants after construction		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Short-term (2)
Magnitude	Low (4)	Minor (2)
Probability	Definite (5)	Improbable (2)
Significance	**45 (Medium)**	**10 (Low)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: » Control invader plants recruiting on the construction site. » Move workshop to an area with soil of the Coega form (if practical) as the vegetation on the Coega soils has the lowest grazing capacity of the two soils on the site.		
Cumulative Impacts: » Little with the necessary mitigation in place		
Residual Impacts: » Little with the necessary mitigation in place		

Impact 3 Underground water

No impact expected.

Impact 4: Livestock production systems

During the construction phase there will be an impact on the normal day-to-day management of the livestock and the veld management system.

Nature: Interference with the day-to-day management of the livestock and veld due to construction and other activities on the site		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)

Duration	Short-term (2)	Short-term (2)
Magnitude	Low (4)	Minor (2)
Probability	Definite (5)	Probable (3)
Significance	**35 (Medium)**	**15 (Low)**
Status	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: » Construction and other activities must be communicated and co-ordinated with the land owner in order for her to properly plan her management activities.		
Cumulative Impacts: » Little with the necessary mitigation in place		
Residual Impacts: » Little with the necessary mitigation in place		

Potential Impacts from use of potential contaminants on the site (i.e. oil, petrol, diesel and other contaminants used by the vehicles and equipment)

Impact 1 Soil

Nature: Contamination and degradation of the soil due to spillages of oil, petrol, diesel and other contaminants used by vehicles and equipment on the site or stored on the site		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (4)	Low (4)
Probability	Probable (3)	Improbable (2)
Significance	**30 (Medium)**	**20 (Low)**
Status	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	
Mitigation: » Vehicles and equipment must be serviced regularly and maintained in a good running condition. Use of drip trays and spill kits. » Storage of contaminants must be limited to low quantities and done under strict industry standards. » There must be strict control over the safe usage of vehicles and equipment to minimise vehicle accidents and damage to vehicles by rocks and boulders which may cause		

spillages.
Cumulative Impacts:
» None
Residual Impacts:
» Spillages of contaminants will have a long residual effect on the natural resources, specifically to the soil and vegetation, and possibly the underground water depending on the quantum of the spillage.

Impact 2 Vegetation and grazing capacity

Nature: Contamination and degradation of the soil & vegetation due to spillages of oil, petrol, diesel and other contaminants used by vehicles and equipment on the site or stored on the site		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (4)	Low (4)
Probability	Probable (3)	Improbable (2)
Significance	**30 (Medium)**	**20 (Low)**
Status	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	
Mitigation: » Vehicles and equipment must be serviced regularly and maintained in a good running condition. » Use of drip trays and spill kits. » Storage of contaminants must be limited to low quantities and done under strict industry standards. » There must be strict control over the safe usage of vehicles and equipment to minimise vehicle accidents and damage to vehicles by rocks and boulders which may cause spillages.		
Cumulative Impacts: » None		
Residual Impacts: » Spillages of contaminants will have a long residual effect on the natural resources, specifically to the soil and vegetation, and possibly the underground water depending on the quantum of the spillage.		

Impact 3 Underground water

Nature: Contamination and degradation of the soil due to spillages of oil, petrol, diesel and other contaminants used by vehicles and equipment on

the site or stored on the site		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (4)	Low (4)
Probability	Improbable (2)	Very improbable (1)
Significance	**20 (Medium)**	**10 (Low)**
Status	Negative	Negative
Reversibility	Unlikely	Unlikely
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	
Mitigation: » Vehicles and equipment must be serviced regularly and maintained in a good running condition. » Use of drip trays and spill kits. » Storage of contaminants must be limited to low quantities and done under strict industry standards. » There must be strict control over the safe usage of vehicles and equipment to minimise vehicle accidents and damage to vehicles by rocks and boulders which may cause spillages.		
Cumulative Impacts: » None		
Residual Impacts: » Spillages of contaminants will have a long residual effect on the natural resources, specifically to the soil and vegetation, and possibly the underground water depending on the quantum of the spillage.		

Impact 4: Livestock production systems

No impact expected.

Implications for Project Implementation

» The long term impact on the agricultural potential and productivity of the development footprint of the proposed Prieska Solar Energy Facility Site will be negligible as long as the development adheres to the mitigation measures as detailed in this report as well as the specifications of the EMP. In the event of the site being made available for livestock production again during the commercial energy production phase of the project, the impact on agricultural production will only be temporary. Even if the site is not utilised for agricultural production during the lifetime of the project the loss of agricultural potential and food production is still considered to be negligible due to the relatively small size of the site (~275ha) and its relatively low grazing and carrying capacities (9 LSUs, 5.4 medium framed cows or 40 dorper ewes respectively).

» The soils present on the site are susceptible to water erosion, specifically when subjected to high volumes of fast flowing runoff water. With the necessary mitigation measures in place, though, water erosion need not be a major concern. It is therefore important that there should be strict adherence to the EMP and measures regarding the management of storm water runoff and water erosion control during the construction phase of the project, as well as thereafter.
» There is a potential for the invasion and encroachment of woody plants where the soil is disturbed. This should be prevented as increased woody plant densities will depress the grass cover which will increase the hazard of water erosion on the site. The woody plants currently present on the site have the ability to coppice and increase in density after being cut off or mechanically removed. It is recommended that the present woody plants are firstly treated with the correct herbicides at the prescribed dosages before it is mechanically removed.
» There are no agricultural sensitive areas, areas of high agricultural value, wetlands, watercourses, cultivated lands or agricultural infrastructure on the site that shall be interfered with as a result of the proposed project.

6.2.3 Assessment of Potential Impacts on Heritage Sites

The area investigated for the proposed facility was rich in surface finds of MSA and LSA stone tools. Due to a lack of research into open-air sites in the Northern Cape it is advised that the finds are not dismissed as surface scatters.

Impact tables summarising the significance of impacts on heritage sites, or objects (with and without mitigation)

Nature: Possible pre-contact Stone Age site could be damaged locally by excavation activities and associated activities Placement of the solar power plant could negatively affect sites associated with the Middle to Late Stone Age.		
	Without Mitigation	**With Mitigation**
Extent	Local (2)	Local (2)
Duration	Long term (5)	Long term (5)
Magnitude	High (8)	Low (1)
Probability	Probable (3)	Improbable (1)
Significance	**Medium (45)**	**Low (8)**
Status	Negative	Positive
Reversibility	Irreversible	Irreversible
Irreplaceable loss of resources?	Yes	No
Can impacts be mitigated?	No	Yes

Mitigation
» Surface collection of Stone Age material before construction commences
Cumulative impacts:
» None
Residual impacts:
» Loss of heritage related information

Implications for Project Implementation

» The area showed significant surface occurrences of MSA to LSA stone tools. These stone tools seem to be spread throughout the study area without specific concentrations to be found. The variability and extent of the artefact types does however suggest that a manufacturing site could be located somewhere underneath the local alluvial deposits.
» It is a known characteristic of Northern Cape Stone Age Research that open-air sites of the Middle and Late Stone Age have in the past been neglected with researchers rather focusing on the few sealed shelter sites.
» Due to this very little is known of the distribution patterns of these open-air sites and even less of the surface indicators that would lead to the identification of sub-surface deposits.
» Even with the lack of manufacturing debris such as flakes and hammer stones, recent studies in these areas have tried to identify specific sites in order to facilitate their preservation through the mitigation of construction activities.
» These "sites" are based on the increase in surface density of stone artefacts and rely heavily on the subjective evaluation of the investigator.

6.2.4 Assessment of Potential Visual Impacts

The results of the preliminary viewshed analyses of the proposed Prieska Solar Energy Facility are indicated on Figure 6.3. The viewshed analyses were undertaken at offsets of 3m above average ground level (i.e. the approximate maximum height of the PV structures). This was done in order to determine the general visual exposure of the area under investigation, simulating the proposed structures associated with the Prieska Solar Energy Facility.

To the north-west the topography forms a slight escarpment containing the viewshed to the south-eastern section of the study area. The proposed facility would be visible over approximately 95% of the proposed project site.

Along the R357, north-east of the site boundary, the proposed facility would be visible for the majority of the route up to approximately 16km from the facility. The project components would be visible for just over 8km along the R357, south-

west of the project site. When driving westbound along the R369, the proposed facility would theoretically be visible from a distance of 16km for the most part of the route.

The structures of the proposed facility would also be visible from the homesteads and settlements on the Farms *Zwemkuil, Holsloot, Wildebeespan, Diepfontein, Bosjemansvlei* en *Uitdraai*.

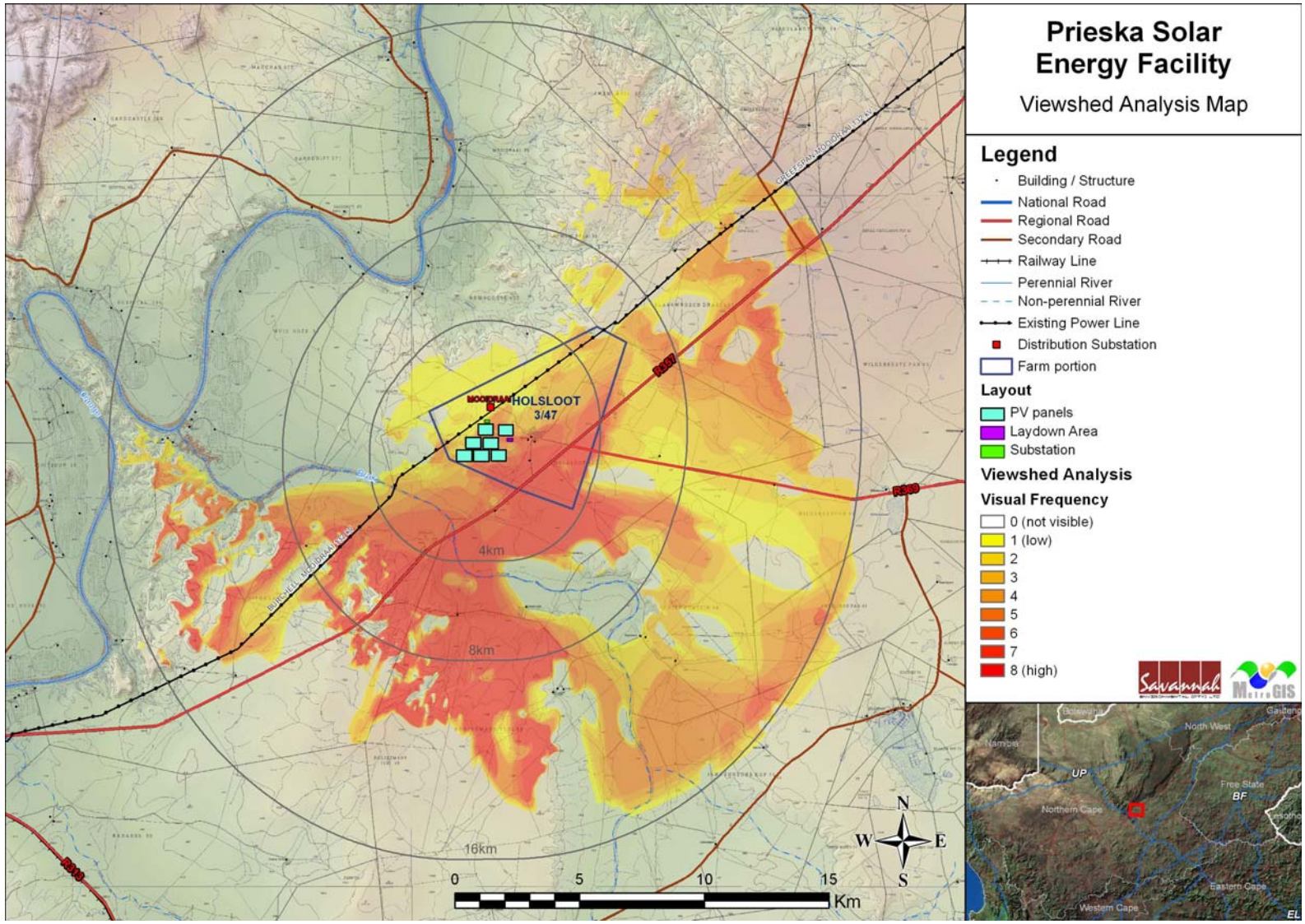

Figure 6.3: Potential visual exposure of the proposed Prieska Solar Energy Facility

Visual impact index

The combined results of the visual exposure, viewer incidence / perception and visual distance of the proposed solar energy facility are displayed on **Figure 6.3**. Here the weighted impact and the likely areas of impact have been indicated as a visual impact index. Values have been assigned for each potential visual impact per data category and merged in order to calculate the visual impact index. An area with short distance, a potential visual exposure to the proposed facility, a high viewer incidence, and a predominantly negative perception would therefore have a higher value (greater impact) on the index. This helps in focussing the attention to the areas of potential impact when evaluating the issues related to the visual impact.

In terms of the Visual Impact Index, the following is of relevance (refer to figure 6.4):

» Areas of potentially **high** visual impact are indicated within a 4km radius of the proposed facility. Within the 4km radius, sensitive visual receptors are limited to travellers along the R357 as well as the homesteads / settlements on the project site. These receptors are likely to be exposed to potentially very **high** visual impact.

» The extent of potential visual impact decreases between the 4km and 8km radius. Visually exposed areas occur mostly south-east of the existing Burchell-Mooidraai No.1 132kV power line covering almost the entire area except for a section along the Brak River and a couple of other scattered areas in the south-eastern section of this zone. These areas are likely to experience potentially **moderate** visual impact. Sensitive visual receptors include users of sections of the R537 and R369 roads. A number of homesteads and settlements occur in the east, south and south-west and are likely to experience a potentially **high** visual impact.

» Between the 8km and 16km radius, visually exposed areas occur mostly south-east of the existing Burchell-Mooidraai No.1 132kV power line mostly in the eastern and south-eastern sections of this zone. These areas are likely to experience potentially **low** visual impact. Sensitive visual receptors include the north-eastern section and very short section of the south-western section of the R357 as well as almost the entire section of the R369 contained in this zone. In addition, about 8 homesteads and settlements (two in the north-east, 3 in the south-east and 3 in the south-west) will be visually exposed. These receptors may be exposed to potentially **moderate** visual impact. Beyond a radius of 16km from the site, the magnitude of visual impact is **very low** where this occurs at all.
The built up area of Prieska will not be visually impacted upon.

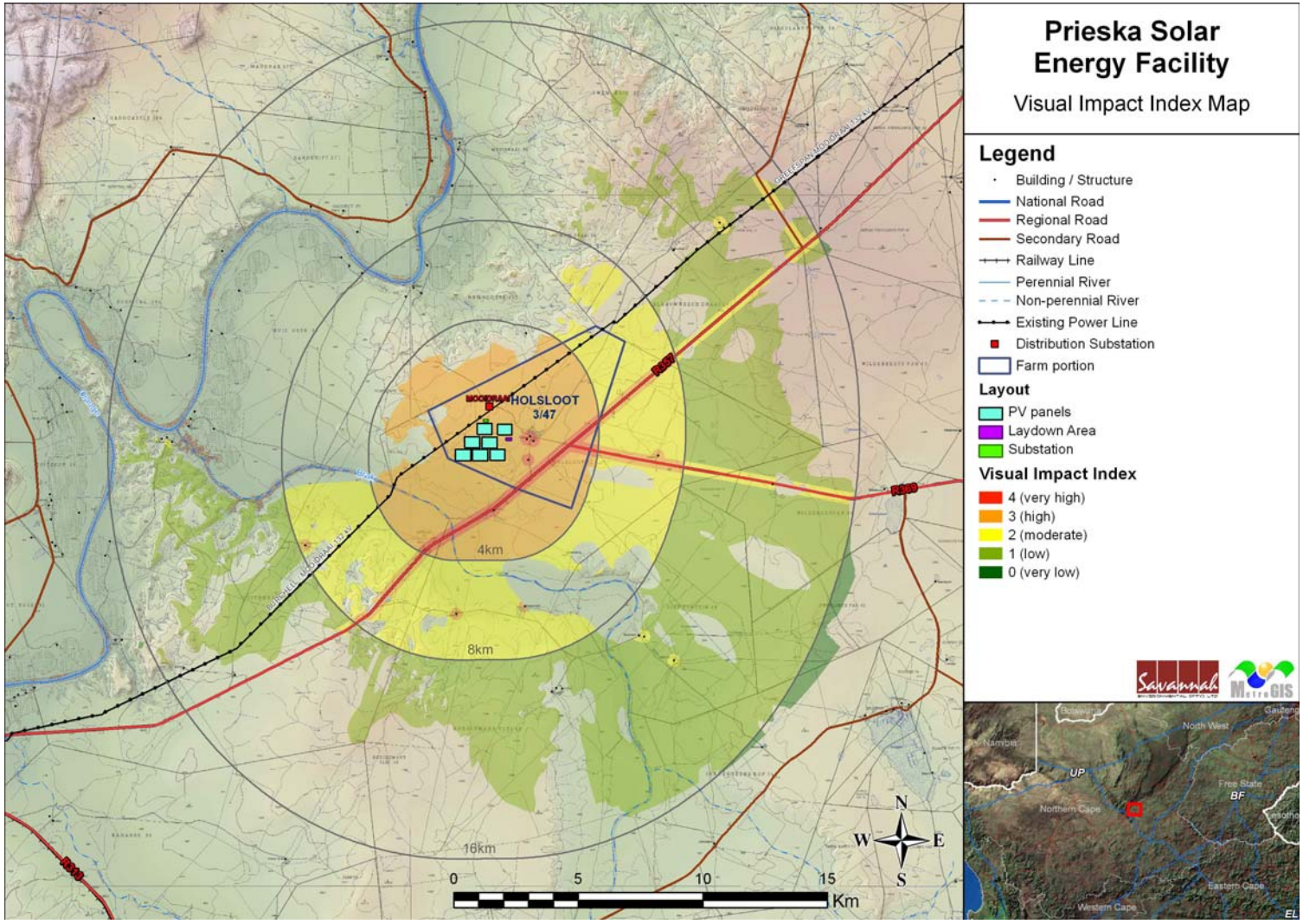

Figure 6.4: Visual Impact Index of the proposed Prieska Solar Energy Facility

Impact tables summarising the significance of visual impacts of the PV facility (with and without mitigation)

(a) Visual impact assessment: primary impacts

Nature: Potential visual impact on sensitive visual receptors in close proximity to the proposed Prieska Solar Energy Facility

Sensitive visual receptors in close proximity to the proposed Solar Energy Facility (i.e. **within a 4km radius**) include residents of homesteads (*Holsloot*), travellers along the R357 which bypasses the site to the south-east as well as travellers along the R369 northbound in the last kilometre before is ends at the junction with the R357.

Primary infrastructure refers to the PV panels with a height of 3m, while ancillary infrastructure includes the inverter and substation, internal access road, workshop and new power line connecting with the existing Burchell-Mooidraai No.1 132kV power line or Eskom Mooidraai Substation.

Both the primary and ancillary infrastructure could present a visual impact as these structures are built forms within a natural context. In addition, vegetation will need to be removed for these structures to be built.

The proposed facility will require an access road, which will also require a degree of vegetation clearing and grading. The access road, although devoid of any vertical dimension, has the potential of manifesting as a scar in the landscape.

The anticipated visual impact on users of roads, resulting from the proposed solar energy facility and ancillary infrastructure is likely to be of **high** significance, but may be mitigated to **moderate**.

	No mitigation	***Mitigation considered***
Extent	Local (4)	Local (4)
Duration	Long term (4)	Long term (4)
Magnitude	V High (10)	V High (10)
Probability	Highly probable (4)	Probable (3)
Significance	**High (72)**	**Moderate (54)**
Status	Negative	Negative
Reversibility	Recoverable (3)	Recoverable (3)
Irreplaceable loss of resources?	No	No
Can impacts be mitigated	Yes	

Mitigation:

Planning:

» Retain a buffer (approximately 30-50m wide) of intact natural vegetation along the perimeter of the development site footprint.
» Retain and maintain natural vegetation in all areas outside of the development footprint.
» Plan internal roads and ancillary infrastructure in such a way and in such a location

that clearing of vegetation is minimised. Consolidate infrastructure as much as possible, and make use of already disturbed areas rather than pristine sites wherever possible.

» Construction:
» Rehabilitation of all construction areas.
» Ensure that vegetation is not cleared unnecessarily to make way for the access road, power line and ancillary buildings.

Operations:

» Maintain the general appearance of the facility as a whole.
» Maintenance of roads to avoid erosion and suppress dust.

Decommissioning:

» Remove infrastructure and roads not required for the post-decommissioning use of the site.
» Rehabilitate all areas. Consult an ecologist regarding rehabilitation specifications.
» Monitor rehabilitated areas post-decommissioning and implement remedial actions.

Cumulative impacts:

» The construction of the solar energy facility and ancillary infrastructure will increase the cumulative visual impact of electrical type infrastructure within the region. This is relevant in light of the existing power line, and the Mooidraai Substation.

Residual impacts:

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

Nature: Potential visual impact on sensitive visual receptors within the region.

Sensitive visual receptors within the region (i.e. **beyond the 4km radius**) include users of main roads (i.e. the R357 and R369) and residents of homesteads and settlements. The latter include *Holsloot*, *Diepfontein*, *Bosjesmansvlei* and *Uitdraai* between the 4km and 8km radius, and about 8 homesteads and settlements between the 8km and 16km radius.

The visual impact of the proposed facility is likely to occur mainly as a result of primary infrastructure (i.e. the PV panels), but ancillary infrastructure may also be a factor.

The nature of the impact for both power line options is again that of an expansive built form within a natural context. In addition, vegetation will need to be removed for these structures to be built.

The anticipated visual impact resulting from the proposed solar energy facility and ancillary infrastructure is likely to be of **moderate** significance, but may be mitigated to **low**.

	No mitigation	***Mitigation considered***
Extent	Regional (3)	Regional (3)
Duration	Long term (4)	Long term (4)
Magnitude	High (8)	High (8)
Probability	Probable (3)	Improbable (2)
Significance	**Moderate (45)**	**Low (30)**

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

Mitigation:

Planning:

» Retain a buffer (approximately 30-50m wide) of intact natural vegetation along the perimeter of the development site.

» Retain and maintain natural vegetation in all areas outside of the development footprint.

» Plan internal roads and ancillary infrastructure in such a way and in such a location that clearing of vegetation is minimised. Consolidate infrastructure as much as possible, and make use of already disturbed areas rather than pristine sites wherever possible.

Construction:

» Rehabilitation of all construction areas.

» Ensure that vegetation is not cleared unnecessarily to make way for the access road, power line and ancillary buildings.

Operations:

» Maintain the general appearance of the facility as a whole.

» Maintenance of roads to avoid erosion and suppress dust.

Decommissioning:

» Remove infrastructure and roads not required for the post-decommissioning use of the site.

» Rehabilitate all areas. Consult an ecologist regarding rehabilitation specifications.

» Monitor rehabilitated areas post-decommissioning and implement remedial actions.

Cumulative impacts:

» The construction of the solar energy facility and ancillary infrastructure will increase the cumulative visual impact of electrical type infrastructure within the region. This is relevant in light of the existing power lines, and the Mooidraai Substation.

Residual impacts:

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

Lighting Impacts at night – Operational Phase

Nature: Potential visual impact of lighting at night on observers in close proximity to the proposed solar energy facility.

The area immediately surrounding the proposed facility has a relatively low incidence of receptors and light sources, so light trespass and glare from the security and after-hours operational lighting for the facility will have some significance for visual receptors in close proximity.

Another potential lighting impact is that known as sky glow. Sky glow is the condition

where the night sky is illuminated when light reflects off particles in the atmosphere such as moisture, dust or smog. The sky glow intensifies with the increase in the amount of light sources. Each new light source, especially upwardly directed lighting, contribute to the increase in sky glow.

The anticipated visual impact resulting from the proposed SOLAR ENERGY FACILITY and ancillary infrastructure is likely to be of **moderate** significance, and may be mitigated to **low**.

	No mitigation	***Mitigation considered***
Extent	Local (4)	Local (4)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (6)	Moderate (6)
Probability	Probable (3)	Improbable (2)
Significance	**Moderate (42)**	**Low (28)**
Status	Negative	Negative
Reversibility	Recoverable (3)	Recoverable (3)
Irreplaceable loss of resources?	No	No
Can impacts be mitigated	Yes	

Mitigation:

Planning & Operation:

» Shielding the sources of light by physical barriers (walls, vegetation, or the structure itself).

» Limiting mounting heights of lighting fixtures, or alternatively using foot-lights or bollard level lights.

» Making use of minimum lumen or wattage in fixtures.

» Making use of down-lighters, or shielded fixtures.

» Making use of Low Pressure Sodium lighting or other types of low impact lighting.

» Making use of motion detectors on security lighting. This will allow the site to remain in relative darkness, until lighting is required for security or maintenance purposes.

Cumulative impacts:

» Some existing light impact exists as a result of the settlements and homesteads in close proximity. The development of the proposed SOLAR ENERGY FACILITY will therefore contribute to a cumulative lighting impact within an otherwise rural region.

Residual impacts:

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

Visual impact of the Construction Impacts

Nature: Potential visual impact of construction on observers in close proximity to the proposed solar energy facility.

During the construction period, there will be a noticeable increase in heavy vehicles utilising the roads to the development site that may cause, at the very least, a visual nuisance to other road users and land owners in the area. Dust from construction work

could also result in potential visual impact.

This anticipated visual impact is likely to be of **moderate** significance, and may be mitigated to **low**.

	No mitigation	***Mitigation considered***
Extent	Local (4)	Local (4)
Duration	Very short term (1)	Very short term (1)
Magnitude	Moderate (6)	Moderate (6)
Probability	Probable (3)	Improbable (2)
Significance	**Moderate (33)**	**Low (22)**
Status	Negative	Negative
Reversibility	Recoverable (3)	Recoverable (3)
Irreplaceable loss of resources?	No	No
Can impacts be mitigated	Yes	

Mitigation:

Construction:

» Ensure that vegetation is not unnecessarily cleared or removed during the construction period.

» Reduce the construction period through careful logistical planning and productive implementation of resources.

» Plan the placement of lay-down areas and temporary construction equipment camps in order to minimise vegetation clearing (i.e. in already disturbed areas) wherever possible.

» Restrict the activities and movement of construction workers and vehicles to the immediate construction site and existing access roads.

» Ensure that rubble, litter, and disused construction materials are appropriately stored (if not removed daily) and then disposed regularly at licensed waste facilities.

» Reduce and control construction dust through the use of approved dust suppression techniques as and when required (i.e. whenever dust becomes apparent).

» Restrict construction activities to daylight hours in order to negate or reduce the visual impacts associated with lighting.

» Rehabilitate all disturbed areas, construction areas, roads, slopes etc immediately after the completion of construction works.

Cumulative impacts:

» None

Residual impacts:

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

(b) Visual impact assessment: secondary impacts

Impact tables summarising the significance of The solar energy facility and ancillary infrastructure (with and without mitigation)

Nature: Potential visual impact of the proposed facility on the visual character of

the landscape and the sense of place of the region.

Sense of place refers to a unique experience of an environment by a user, based on his or her cognitive experience of the place. Visual criteria and specifically the visual character of an area (informed by a combination of aspects such as topography, level of development, vegetation, noteworthy features, cultural / historical features, etc) play a significant role.

A visual impact on the sense of place is one that alters the visual landscape to such an extent that the user experiences the environment differently, and more specifically, in a less appealing or less positive light.

The farming activities in the area has a minimal effect on the character of the landscape, thus leaving the character of the landscape largely intact as one of undeveloped, wide open spaces. Development, where this occurs is usually of a domestic scale. The visual quality of the landscape is considered to be high and the sense of place defined by an absence of development and vast grazing lands.

The nature of the impact is again that of an expansive built form within a natural context. In addition, vegetation will need to be removed for these structures to be built.

The anticipated visual impact of the facility on the regional visual character, and by implication, on the sense of place, is expected to be of **moderate** significance, and may be mitigated to **low**.

	No mitigation	***Mitigation considered***
Extent	Regional (3)	Regional (3)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (6)	Moderate (6)
Probability	Probable (3)	Improbable (2)
Significance	**Moderate (39)**	**Low (26)**
Status	Negative	Negative
Reversibility	Recoverable (3)	Recoverable (3)
Irreplaceable loss of resources?	No	No
Can impacts be mitigated	Yes	

Mitigation:

Planning:

» Retain a buffer (approximately 30-50m wide) of intact natural vegetation along the perimeter of the development site footprint.

» Retain and maintain natural vegetation in all areas outside of the development footprint.

» Plan internal roads and ancillary infrastructure in such a way and in such a location that clearing of vegetation is minimised. Consolidate infrastructure as much as possible, and make use of already disturbed areas rather than pristine sites wherever possible.

Construction:

» Rehabilitation of all construction areas.

» Ensure that vegetation is not cleared unnecessarily to make way for the access road, power line and ancillary buildings.

Operations: » Maintain the general appearance of the facility as a whole. » Maintenance of roads to avoid erosion and suppress dust. **Decommissioning:** » Remove infrastructure and roads not required for the post-decommissioning use of the site. » Rehabilitate all areas. Consult an ecologist regarding rehabilitation specifications. » Monitor rehabilitated areas post-decommissioning and implement remedial actions
Cumulative impacts: » The construction of the solar energy facility and ancillary infrastructure will increase the cumulative visual impact of electrical type infrastructure within the region. This is relevant in light of the existing power line and the Mooidraai Substation.
Residual impacts: » The visual impact will be removed after decommissioning, provided the facility and ancillary infrastructure is removed. Failing this, the visual impact will remain.

Implications for Project Implementation

» The appearance and size of the PV panels (with an approximate height of 3m) is not possible to mitigate. The functional design of the structures cannot be changed in order to reduce visual impacts.
» Secondary impacts anticipated as a result of the proposed facility (i.e. visual character, sense of place and tourism potential) are also not possible to mitigate.
» The anticipated visual impact on sensitive visual receptors (i.e. residents of homesteads and travellers along the roads) in close proximity to the proposed facility is likely to be of high significance, but may be mitigated to moderate.
» The anticipated visual impact resulting from the proposed solar energy facility and ancillary infrastructure on sensitive visual receptors (users of main roads, i.e. the R357 and R369, and residents of homesteads and settlements) within the region (i.e. beyond the 4km radius) is likely to be of moderate significance, but may be mitigated to low.
» The anticipated visual impact resulting from the effect of lighting at night on observers in close proximity to the proposed solar energy facility is likely to be of moderate significance, and may be mitigated to low.
» The anticipated visual impact of construction on observers in close proximity to the proposed solar energy facility is likely to be of moderate significance, and may be mitigated to low.
» The anticipated visual impact of the facility on the regional visual character, and by implication, on the sense of place, is expected to be of moderate significance, and may be mitigated to low.

6.3.5 Assessment of Potential Social Impacts

Impacts associated with the construction phase (18-24 months) of a project are usually of a short duration, temporary in nature, but could have long term effects on the surrounding environment. The operational life of a PV facility is between 20 to 25 years, after which the facility would possibly be upgraded to continue its lifespan if feasible, or decommissioned. The impacts usually associated with the operational phase are therefore perceived by affected parties to be more severe.

Impact tables summarising the significance of social impacts associated with the construction phase of the project (with and without mitigation)

Nature of Impact: Creation of employment and business opportunities during construction

Based on information from other solar energy facility projects the construction phase for a 75 MW Solar Energy Facility is expected to extend over a period of 18-24 months and create approximately 291 employment opportunities, depending on the final design. Of this total ~ 60% (175) will be available to low-skilled workers (construction labourers, security staff etc.), 15% (43) to semi-skilled workers (drivers, equipment operators etc.) and 25% (73) to skilled personnel (engineers, land surveyors, project managers etc.). The work associated with the construction phase will be undertaken by contractors and will include the establishment of the Solar Energy Facility and the associated components, including, access roads, services and power line. The total wage bill for the construction phase is estimated to be in the region of R60 million. This is based on the assumption that the average monthly salary for low skilled, semi-skilled and skilled workers will be in the region of R5 000, R8 000 and R25 000 respectively for a period of 20 months. The injection of income into the area in the form of wages will represent a significant opportunity for the local economy and businesses in Prieska.

	Without enhancement	**With enhancement**
Extent	Local – Regional (2)	Local – Regional (3)
Duration	Short Term (2)	Short Term (2)
Magnitude	Low (4)	Low (4)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Medium (32)**	**Medium (36)**
Status (positive or negative)	Positive	Positive
Reversibility	N/A	
Irreplaceable loss of resources?	N/A	
Can impacts be enhanced?	Yes	

Enhancement:

Employment

» Where reasonable and practical the contractors appointed by the proponent should appoint local contractors and implement a 'locals first' policy, especially for semi and low-skilled job categories. However, due to the low skills levels in the area, the majority of skilled posts are likely to be filled by people from outside the area.

» Where feasible, efforts should be made to employ local contactors that are compliant with Black Economic Empowerment (BEE) criteria.
» Before the construction phase commences the proponent and its contractors should meet with representatives from the Siyathemba Local Municipality to establish the existence of a skills database for the area. If such as database exists it should be made available to the contractors appointed for the construction phase.
» The local authorities, community representatives, and organisations on the interested and affected party database should be informed of the final decision regarding the project and the potential job opportunities for locals and the employment procedures that the proponent intends following for the construction phase.
» Where feasible, training and skills development programmes for locals should be initiated prior to the initiation of the construction phase.
» The recruitment selection process should seek to promote gender equality and the employment of women wherever possible.

Business

» The proponent should seek to develop a database of local companies, specifically BEE companies, which qualify as potential service providers (e.g. construction companies, catering companies, waste collection companies, security companies etc.) prior to the commencement of the tender process for construction contractors. These companies should be notified of the tender process and invited to bid for project-related work;
» The Siyathemba Local Municipality, in conjunction with the local Chamber of Commerce and representatives from the local hospitality industry, should identify strategies aimed at maximising the potential benefits associated with the project.

Note that while preference to local employees and companies is recommended, it is recognised that a competitive tender process may not guarantee the employment of local labour for the construction phase.

Cumulative impacts:

» Opportunity to up-grade and improve skills levels in the area.

Residual impacts:

» Improved pool of skills and experience in the local area.

Nature of Impact: Potential impacts on family structures and social networks associated with the presence of construction workers

The presence of construction workers poses a potential risk to family structures and social networks in the area, specifically local communities in Prieska. While the presence of construction workers does not in itself constitute a social impact, the manner in which construction workers conduct themselves can affect the local community. In this regard the most significant negative impact is associated with the disruption of existing family structures and social networks. This risk is linked to the potential behaviour of male construction workers, including:

» An increase in alcohol and drug use;

» An increase in crime levels;
» An increase in teenage and unwanted pregnancies;
» An increase in prostitution; and
» An increase in sexually transmitted diseases (STDs).

	Without enhancement	**With enhancement**
Extent	Local (2)	Local (1)
Duration	Medium Term for community as a whole (3) Long term-permanent for individuals who may be affected by STDs etc. (5)	Medium Term for community as a whole (3) Long term-permanent for individuals who may be affected by STDs etc. (5)
Magnitude	Low for the community as a whole (4) High-Very High for specific individuals who may be affected by STDs etc. (10)	Low for community as a whole (4) High-Very High for specific individuals who may be affected by STDs etc. (10)
Probability	Probable (3)	Probable (3)
Significance	**Low for the community as a whole (27)** **Moderate-High for specific individuals who may be affected by STDs etc. (57)**	**Low for the community as a whole (24)** **Moderate-High for specific individuals who may be affected by STDs etc. (51)**
Status (positive or negative)	Negative	Negative
Reversibility	No in case of HIV and AIDS	
Irreplaceable loss of resources?	Yes, if people contract HIV/AIDS. Human capital plays a critical role in communities that rely on farming for their livelihoods	
Can impacts be enhanced?	Yes, to some degree. However, the risk cannot be eliminated	

Mitigation:

The potential risks associated with construction workers can be mitigated. The aspects that should be covered include:

» Where possible, the proponent should make it a requirement for contractors to implement a 'locals first' policy for construction jobs, specifically semi and low-skilled job categories. This will reduce the potential impact that this category of worker could have on local family and social networks.
» The proponent should consider the establishment of a Monitoring Forum for the construction phase. The monitoring forum should be established before the construction phase commences and should include key stakeholders, including representatives from the local community, local councillors, farmers, and the contractor. The role of the Monitoring Forum would be to monitor the construction phase and the implementation of the recommended mitigation measures. The monitoring forum should also be briefed on the potential risks to the local community associated with construction workers.
» The proponent and the contractors should, in consultation with representatives from the

monitoring forum, develop a Code of Conduct for the construction phase. The code should identify what types of behaviour and activities by construction workers are not permitted. Construction workers that breach the code of good conduct should be dismissed. All dismissals must comply with the South African labour legislation.

- The proponent and the contractor should implement an HIV/AIDS awareness programme for all construction workers at the outset of the construction phase.
- The movement of construction workers on and off the site should be closely managed and monitored by the contractors. In this regard the contractors should be responsible for making the necessary arrangements for transporting workers to and from site on a daily basis.
- The contractor should make necessary arrangements to enable workers from outside the area to return home over weekends and or on a regular basis during the 18 month construction phase. This would reduce the risk posed by non-local construction workers to local family structures and social networks.
- The contractor should make the necessary arrangements for ensuring that all non-local construction workers are transported back to their place of residence once the construction phase is completed. This would reduce the risk posed by non-local construction workers to local family structures and social networks.
- As per the agreement with the local farmers in the area, no construction workers, will be permitted to stay overnight on the site. Security personnel will be housed in the vicinity of the site.

Cumulative impacts:

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

Residual impacts:

- Community members affected by STDs etc.

Nature of Impact: Potential impacts on family structures, social networks and community services associated with the influx of job seekers

Large construction projects tend to attract people to the area in the hope that they will secure a job, even if it is a temporary job. These job seekers can in turn become "economically stranded" in the area or decide to stay on irrespective of finding a job or not. While the proposed Prieska Solar Energy Facility may, on its' own, not result in influx of significant numbers of job seekers to Prieska, the establishment of a number of solar and other renewable energy projects in the area has the potential to attract job seekers to the area. As in the case of construction workers employed on the project, the actual presence of job seekers in the area does not in itself constitute a social impact. However, the manner in which they conduct themselves can affect the local community. There is also a concern that some of these job seekers may not leave town immediately and, in some cases, may stay indefinitely.

The potential social impacts associated with the influx of job seekers include:

- Impacts on existing social networks and community structures;
- Competition for housing, specifically low cost housing;
- Competition for scarce jobs;
- Increase in incidences of crime;
- An increase in sexually transmitted diseases (STDs).

	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Permanent (5) (For job seekers that stay on the town)	Permanent (5) (For job seekers that stay on the town)
Magnitude	Minor for the community as a whole (2) High-Very High for specific individuals who may be affected by STD's etc. (10)	Minor for community as a whole (2) High-Very High for specific individuals who may be affected by STD's etc. (10)
Probability	Probable (3)	Probable (3)
Significance	**Low for the community as a whole (27)** **Medium -High for specific individuals who may be affected by STD's etc. (54)**	**Low for the community as a whole (27)** **Medium-High for specific individuals who may be affected by STD's etc. (51)**
Status (positive or negative)	Negative	Negative
Reversibility	No in case of HIV and AIDS	
Irreplaceable loss of resources?	Yes, if people contract HIV/AIDS. Human capital plays a critical role in communities that rely on farming for their livelihoods	
Can impacts be mitigated?	Yes, to some degree. However, the risk cannot be eliminated	

Mitigation:

It is almost impossible to stop people from coming to the area in search of a job, specifically given that the Pixley Ka Seme District Municipality and Siyathemba Local Municipality have identified renewable energy as a future growth sector. However, as indicated above, the proponent should ensure that the employment criteria favour local residents in the area. In addition the proponent should:

- In consultation with the Siyathemba Local Municipality, investigate the option of establishing a monitoring forum (see above) to monitor and identify potential problems that may arise due to the influx of job seekers to the area. The monitoring forum should

also include the other proponents of solar energy projects in the area;

» Implement a policy that no employment will be available at the gate. This should be linked to the establishment of employment offices in Prieska and other towns in the Siyathemba Local Municipality.

Cumulative impacts:

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

Residual impacts:

» Community members affected by STDs etc. and associated impact on local community and burden services etc.

Nature of impact: Potential impact on local farmers associated with loss of farm labour to the construction phase

Experience from other projects indicates that the loss of farm workers is an issue of concern. In most instances local farmers are unlikely to be in a position to compete with the salaries offered by the renewable energy companies during the construction phase. As a result farm labourers may be tempted to resign from their current positions on farms. The loss of skilled and experienced farm labour would have a negative impact on local farmers.

	Without mitigation	**With mitigation**
Extent	Local and Regional (2)	Local and Regional (1)
Duration	Medium Term (3) (Assumed that farm labour can be replaced)	Medium Term (3) (Assumed that farm labour can be replaced)
Magnitude	Low (4)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	**Low (27)**	**Low (24)**
Status (positive or negative)	Negative	Negative
Reversibility	Yes, if farm workers return of are replaced	
Irreplaceable loss of resources?	No	
Can impacts be enhanced?	Yes, to some degree. However, the risk cannot be eliminated	

Mitigation:

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

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

Cumulative impacts:

» Impacts on farm operations due to loss of experienced farm labour
Residual impacts: » Increase in unemployment amongst local farm workers who are not rehired once construction works comes to an end. » On positive side, may result in increased skills for local farm workers and improve their economic mobility.

Nature of impact: Potential loss of livestock, poaching and damage to farm infrastructure associated with the presence of construction workers on site

The presence of construction workers on the site increases the potential risk of stock theft and poaching. The movement of construction workers on and off the site also poses a potential threat to farm infrastructure, such as fences and gates, which may be damaged. Livestock and game losses may also result from gates being left open and/or fences being damaged. The local farm owners in the area who were interviewed indicated that stock theft was currently not a major concern. However, there are isolated cases involving the theft of sheep. However, concerns were raised regarding the presence of construction workers in the area. In this regard the local farmers noted that no construction workers should be allowed to stay on the site overnight with the exception of security personnel.

	Without mitigation	**With mitigation**
Extent	Local (2)	Local (1)
Duration	Medium Term (3)	Medium Term (3)
Magnitude	Moderate (6) (Due to reliance on agriculture and livestock for maintaining livelihoods)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	**Medium (33)**	**Low (24)**
Status (positive or negative)	Negative	Negative
Reversibility	Yes, compensation paid for stock losses etc.	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	

Mitigation:

The mitigation measures that can be considered to address the potential impact on livestock, game, and farm infrastructure include:

» The proponent should enter into an agreement with the affected landowners whereby the company will compensate for damages to farm property and disruptions to farming activities. This includes losses associated with stock theft and damage to property etc. This agreement should be finalised before the commencement of the construction phase.

» The proponent should investigate the option of establishing a monitoring forum (see above) that includes local farmers and develop a Code of Conduct for construction workers. Should such a Monitoring Forum be required it should be established prior to commencement of the construction phase. The Code of Conduct should be signed by the

proponent, the neighbouring landowners and the contractors before the contractors move onto site.

» The proponent should hold contractors liable for compensating farmers and communities in full for any stock losses and/or damage to farm infrastructure that can be linked to construction workers. This should be contained in tender documents for contractors and the Code of Conduct to be signed between the proponent, the contractors and neighbouring landowners. The agreement should also cover loses and costs associated with fires caused by construction workers or construction related activities (see below).

» The EMP must outline procedures for managing and storing waste on site, specifically plastic waste that poses a threat to livestock if ingested.

» Contractors appointed by the proponent should ensure that all workers are informed at the outset of the construction phase of the conditions contained on the Code of Conduct, specifically consequences of stock theft and trespassing on adjacent farms.

» Contractors appointed by the proponent should ensure that construction workers who are found guilty of stealing livestock, poaching and/or damaging farm infrastructure should be charged as per the conditions contained in the Code of Conduct. All dismissals must be in accordance with South African labour legislation.

» The housing of construction workers on the site should be limited to security personnel.

Cumulative impacts:

» None**,** provided losses are compensated for.

Residual impacts:

» Not applicable if losses are compensated for.

Nature of impact: Potential loss of livestock, crops and houses, damage to farm infrastructure and threat to human life associated with increased incidence of veld fires

The presence of construction workers and construction-related activities on the site poses an increased risk of veld fires that in turn pose a threat to the livestock, wildlife, and farmsteads in the area. In the process, farm infrastructure may also be damaged or destroyed and human lives threatened. While fire was not identified as a key concern, Mr Du Toit (landowner - Holsloot 47) indicated that fires did occur in the area at least once a year.

» The potential risk of veld fires is heightened by windy conditions in the area, specifically during the dry, windy winter months.

» The dominant agricultural activity in the broader area is stock farming (sheep, cattle and goats). As such, the livelihoods of the farmers in the area are dependent on grazing on their farms. Any loss of grazing due to a fire would therefore impact negatively on the affected farmers livelihoods;

» The risk of fire related damage is exacerbated by the limited access to fire-fighting vehicles.

	Without mitigation	**With mitigation**
Extent	Local (4) (Rated as 4 due to potential severity of	Local (2) (Rated as 2 due to potential severity of

	impact on local farmers)	impact on local farmers)
Duration	Short Term (2)	Short Term (2)
Magnitude	Moderate due to reliance on livestock for maintaining livelihoods (6)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	**Medium (36)**	**Low (24)**
Status	Negative	Negative
Reversibility	Yes, compensation paid for stock and losses and damage etc.	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	

Mitigation:

As indicated above, the proponent should enter into an agreement with the affected landowners whereby the company will compensate for proven damages associated with construction. This includes losses associated veld fires. In addition, the potential increased risk of veld fires can be effectively mitigated. Mitigation measures include:

- Contractor should ensure that open fires on the site for cooking or heating are not allowed except in designated areas.
- No smoking on the site, except in designated areas should be permitted.
- Contractor should ensure that construction related activities that pose a potential fire risk, such as welding, are properly managed and are confined to areas where the risk of fires has been reduced. Measures to reduce the risk of fires include clearing working areas and avoiding working in high wind conditions when the risk of fires is greater. In this regard special care should be taken during the high risk dry, windy winter months;
- Contractor should provide adequate fire fighting equipment on-site.
- Contractor should provide fire-fighting training to selected construction staff.
- As per the conditions of the Code of Conduct, in the advent of a fire being caused by construction workers and or construction activities, the appointed contractors must compensate farmers for any damage caused to their farms. The contractor should also compensate the fire fighting costs borne by farmers and local authorities.

In addition the landowners and developers should also ensure that they join the local fire protection agency.

Cumulative impacts:

- None, provided losses are compensated for.

Residual impacts:

- Potential loss of income and impact on livelihoods and economic viability of affected farms.

Nature of impact: Potential noise, dust and safety impacts associated with movement of construction related traffic to and from the site

The main access to the site will be via the R357 and R356. The findings of the SIA indicate that the volume of traffic along these roads is low. The social impacts associated with the

movement of construction related traffic along this road are therefore likely to be low.

However, the movement of large, heavy loads during the construction phase has the potential to create delays and safety impacts for other road users travelling along either of the two routes. These impacts can however be mitigated by timing the trips to avoid times of the year when traffic volumes are likely to be higher, such as start and end of school holidays, long weekends and weekends in general etc. In this regard the Pixley Ka Seme District Municipality SDF identifies Prieska as a potential tourist node and the R357 as a scenic route.

The option of railing material from Port Elizabeth to Prieska via De Aar should be investigated. This would reduce the potential impact on other road users along the N10. Based comments from other renewable energy projects near De Aar, Mr. Bangani (NAFCOC representative) and Mr Jack (ELM IDP and LED Manager) both indicated that that the option of using rail to transport equipment to the Pixley Ka Seme District Municipality should be investigated.

	Without mitigation	**With mitigation**
Extent	Local-Regional (2)	Local-Regional (1)
Duration	Medium Term (3)	Medium Term (3)
Magnitude	Low (4)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	**Low (27)**	**Low (24)**
Status	Negative	Negative
Reversibility	Yes	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	

Mitigation:

As indicated above, the proponent should enter into an agreement with the affected landowners whereby the company will compensate for damages. This includes damage to local roads by construction vehicles. In addition, the potential impacts associated with heavy vehicles and dust can be effectively mitigated. The aspects that should be covered include:

- Abnormal loads should be timed to avoid times of the year when traffic volumes are likely to be higher, such as start and end of school holidays, long weekends and weekends in general etc.
- The contractor must ensure that all damage caused to local farm roads by the construction related activities, including heavy vehicles, is repaired before the completion of the construction phase. The costs associated with the repair must be borne by the contractor.
- Dust suppression measures must be implemented for heavy vehicles such as wetting of gravel roads on a regular basis and ensuring that vehicles used to transport sand and building materials are fitted with tarpaulins or covers.
- All vehicles must be road-worthy and drivers must be qualified, made aware of the potential road safety issues, and need for strict speed limits.

In addition, it is recommended that the proponent investigate the option of using rail to transport materials and equipment from Port Elizabeth to Prieska via De Aar.

Cumulative impacts:

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

Residual impacts:

» Reduced quality of road surfaces and impact on road users

Impact tables summarising the significance of social impacts associated with the operational phase of the project (with and without mitigation)

Nature of impact: The activities associated with the construction phase, such as establishment of access roads and the construction camp, movement of heavy vehicles and preparation of foundations for the PV facility and power lines will damage farmlands and result in a loss of farmlands for future farming activities.

The activities associated with the construction phase have the potential to result in the loss of land available for grazing. However, the farm owner, Mrs Muller, indicated that the project would not affect her farming activities as there was sufficient veld on the farm to graze her livestock. In addition, only one landowner is affected, Mrs Muller, and she would have entered into a lease agreement with the proponent. The loss of productive farmland would therefore be offset by the income from the lease agreement.

The final disturbance footprint can also be reduced by careful site design and placement of components. The impact on farmland associated with the construction phase can therefore be mitigated by minimising the footprint of the construction related activities and ensuring that disturbed areas are fully rehabilitated on completion of the construction phase. Recommended mitigation measures are outlined below.

	Without mitigation	**With mitigation**
Extent	Local (3)	Local (1)
Duration	Long term-permanent if disturbed areas are not effectively rehabilitated or compensation is not paid (5)	Medium Term if damaged areas are rehabilitated (3)
Magnitude	Low (4)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	**Medium (36)**	**Low (28)**
Status (positive or negative)	Negative	Negative
Reversibility	Yes, disturbed areas can be rehabilitated	
Irreplaceable loss of resources?	Yes, loss of farmland. However, disturbed areas can be rehabilitated	
Can impacts be mitigated?	Yes, however, loss of farmland cannot be avoided	

Mitigation:

The potential impacts associated with damage to and loss of farmland can be effectively mitigated. The aspects that should be covered include:

» The footprint associated with the construction related activities (access roads,

construction platforms, workshop etc.) should be minimised;

» An Environmental Control Officer (ECO) should be appointed to monitor the construction phase;

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

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

» The implementation of the Rehabilitation Programme should be monitored by the ECO.

Cumulative impacts:

» Overall loss of farmland could affect the livelihoods of the affected farmer, and the workers on the farm and their families. However, disturbed areas can be rehabilitated.

» Overall loss of farmland will however be offset by income farmers would receive from the solar energy facility.

Residual impacts:

» Land would be available for farming once rehabilitation has been completed.

Impact tables summarising the significance of social impacts associated with the operational phase of the project (with and without mitigation)

Nature of impact: Creation of employment and business opportunities associated with the operational phase

Based on the information provided by the proponent, the proposed PV solar energy facility will create ~ 60 permanent employment opportunities during the 20 year operational phase. Of this total ~ 30 (50%) will be low skilled (security and maintenance), 10 (17%) semi-skilled and 20 (33%) skilled employees. Members from the local community are likely to be in a position to qualify for the majority of the low skilled and some of the semi-skilled employment opportunities. The majority of these employment opportunities are also likely to accrue to Historically Disadvantaged (HD) members from the local community. Given the high unemployment levels and limited job opportunities in the area this will represent a social benefit. The remainder of the semi-skilled and majority of the skilled employment opportunities are likely to be associated with people from outside the area.

	Without Enhancement	**With Enhancement**
Extent	Local and Regional (1)	Local and Regional (2)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (6)	Moderate (6)
Probability	Probable (3)	Highly Probable (4)
Significance	Medium (33)	Medium (48)
Status (positive or negative)	Positive	Positive
Reversibility	N/A	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	
Enhancement:		

» The proponent should implement a training and skills development programme for locals during the first 5 years of the operational phase. The aim of the programme should be to maximise the number of locals employed during the operational phase of the project. » The proponent, in consultation with the Siyathemba Local Municipality, should investigate the opportunities for establishing a Community Trust (see above comments).
Cumulative impacts: » Creation of permanent employment and skills and development opportunities for members from the local community and creation of additional business and economic opportunities in the area
Residual impacts: » Creation of pool of people with experience in field of SEFs who are economically mobile

Nature of impact: Establishment of a Community Trust funded by revenue generated from the sale of energy. The revenue can be used to fund local community development

In terms of the Request for Proposal document prepared by the Department of Energy all bidders for operating licenses for renewable energy projects must demonstrate how the proposed development will benefit the local community. This can be achieved by establishing a community trust which is funded by revenue generated from the sale for energy. The proponent has indicated that they are committed to establishment of a community trust.

Community trusts provide an opportunity to generate a reliable and steady revenue stream over a 20 year period. This revenue can be used to fund development initiatives in the area and support the local economic and community development. The 20 year timeframe also allows local municipalities and communities to undertake long term planning for the area. The revenue from the proposed Solar Energy Facility can be used to support a number of social and economic initiatives in the area, including:

» Education (adult and child);
» Health care;
» Training and skills development;
» Support for SMMEs.

	Without Mitigation	**With Mitigation**
Extent	Local and Regional (2)	Local and Regional (3)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (6)	Moderate (6)
Probability	Probable (3)	Definite (5)
Significance	**Medium (36)**	**High (65)**
Status (positive or negative)	Positive	Positive
Reversibility	N/A	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	

Enhancement:

» The proponent in consultation with the Siyathemba Local Municipality should establish

criteria for identifying and funding community projects and initiatives in the area. The criteria should be aimed at maximising the benefits for the community as a whole and not individuals within the community;

» The proponent in consultation with the Siyathemba Local Municipality should ensure that strict financial management controls, including annual audits, should be implemented to ensure that the funds generated for the community trust from the Solar Energy Facility are managed for benefit of the community as a whole and not individuals within the community.

Cumulative impacts:

» Promotion of social and economic development and improvement in the overall well-being of the community

Residual impacts:

» Investment in local economic development in the area that would benefit the community post operational phase

Nature of impact: Promotion of clean, renewable energy

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

The overall contribution to South Africa's total energy requirements of the proposed Solar Energy Facility is relatively moderate. However, the 75 MW produced will help to offset the total carbon emissions associated with energy generation in South Africa. Given South Africa's reliance on Eskom as a power utility, the benefits associated with an IPP based on renewable energy are regarded as an important contribution.

	Without Mitigation	**With Mitigation** (The provision of renewable energy infrastructure is in itself a mitigation measure)
Extent	Local, Regional and National (4)	Local, Regional and National (4)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Low (4)
Probability	Highly Probable (4)	Highly Probable (4)
Significance	**Medium (48)**	**Medium (48)**
Status (positive or negative)	Positive	Positive
Reversibility	Yes	
Irreplaceable loss of resources?	Yes, impact of climate change on ecosystems	
Can impacts be mitigated?	Yes	

Mitigation:

The establishment of the proposed facility represents an enhancement measure in itself. In

order to maximise the benefits of the proposed project the proponent should:

» Use the project to promote and increase the contribution of renewable energy to the national energy supply;
» Implement a training and skills development programme for locals during the first 5 years of the operational phase. The aim of the programme should be to maximise the number of South African's employed during the operational phase of the project.

Cumulative impacts:

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

Residual impacts:

» Not applicable after decommissioning

Nature of impact: Potential impacts on family structures, social networks and community services associated with the influx of job seekers

While the proposed Solar Energy Facility on its own is unlikely to result in a significant influx of job seekers during the operational phase, the proposed establishment of a number of renewable energy projects in and around Prieska is likely to attract job seekers to the area. These issues are similar to the concerns associated with the influx of jobs seekers during the construction phase and include:

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

	Without Mitigation	**With Mitigation**
Extent	Local (2)	Local (2)
Duration	Permanent (5) (For job seekers that stay on the town)	Permanent (5) (For job seekers that stay on the town)
Magnitude	Low for the community as a whole (4) High-Very High for specific individuals who may be affected by STDs etc. (10)	Minor for community as a whole (2) High-Very High for specific individuals who may be affected by STDs etc. (10)
Probability	Probable (3)	Probable (3)
Significance	**Medium for the community as a whole (33)**	**Low for the community as a whole**

	Medium -High for specific individuals who may be affected by STD's etc. (51)	**(27) Medium-High for specific individuals who may be affected by STD's etc. (51)**
Status (positive or negative)	Negative	Negative
Reversibility	No in case of HIV and AIDS	
Irreplaceable loss of resources?	Yes, if people contract HIV/AIDS. Human capital plays a critical role in communities that rely on farming for their livelihoods	
Can impacts be mitigated?	Yes, to some degree. However, the risk cannot be eliminated	

Mitigation:

It is impossible to stop people from coming to the area in search of work, specifically given that the Pixley Ka Seme District Municipality and Siyathemba Local Municipality have identified renewable energy as key growth sector. However, as indicated above, the proponent should ensure that the employment criteria favour local residents in the area. In addition the proponent should:

- In consultation with the Siyathemba Local Municipality, should investigate the option of establishing a Monitoring Forum (see above) to monitor and identify potential problems that may arise due to the influx of job seekers to the area. The Monitoring Forum should also include the proponents of other renewable energy projects in the area;
- Implement a policy that no employment will be available at the gate. This should be linked to the establishment of employment offices in Prieska and other local towns in the Siyathemba Local Municipality.

Cumulative impacts:

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

Residual impacts:

- Community members affected by STDs etc. and associated impact on local community and burden services etc.

Nature of impact: Potential impact on local farmers associated with loss of farm labour to the operational phase

Experience from other projects indicates that the loss of farm workers is an issue of concern. In most instances local farmers are unlikely to be in a position to compete with the salaries offered by the renewable energy companies. As a result farm labourers may be tempted to resign from their current positions on farms. The loss of skilled and experienced farm labour would have a negative impact on local farmers. The potential impacts for the affected farmers associated with the loss of permanent farm labour are exacerbated by the security of

tenure that permanent farm labourers enjoy in terms of the Extension of Security and Tenure Act (ESTA). Those farm labourers which are eligible under ESTA and who take up jobs during the construction phase are entitled stay on in their houses on the farms in question. The net effect is that the farmer may have to incur the costs associated with the construction of new dwellings for new labour appointed to replace the labour lost to the renewable energy sector.

	Without Mitigation	**With Mitigation**
Extent	Local and Regional (3)	Local and Regional (2)
Duration	Short term (2) (Assumed that farm labour can be replaced)	Short term (2) (Assumed that farm labour can be replaced)
Magnitude	Low (4)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	**Low (27)**	**Low (24)**
Status (positive or negative)	Negative	Negative
Reversibility	Yes, if farm workers return or are replaced	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes, to some degree. However, the risk cannot be eliminated	

Mitigation:

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

Cumulative impacts:

» Impacts on farm operations due to loss of experienced farm labour

Residual impacts:

» Not applicable.

Nature of impact: Visual impact associated with the proposed solar facility and the potential impact on the areas rural sense of place.

The components associated with the proposed Solar Energy Facility will have a visual impact and, in so doing, impact on the landscape and rural sense of the place of the area. However, unlike wind energy facilities, the impact associated with solar energy facilities is lower due to the significantly lower height of the solar panels and infrastructure.

Based on the findings of the SIA the proposed Solar Energy Facility can be screened from the R357 by establishing a set back line and maintaining the natural vegetation between the site and the road. The site will also be screened from the homesteads to the north and north-west of the site by the natural topography. The significance of the impact on the area's

sense of place is therefore likely to be low.

The findings of the SIA also found that none of the local landowners in the vicinity of the site who were interviewed indicated that they were they opposed to the proposed development and or concerned about the potential impact on the areas sense of place. A Solar Energy Facility has also been proposed on the farm owned by Mr De Villiers (Remshoogte 152).

	Without Mitigation	**With Mitigation**
Extent	Local (2)	Local (1)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (6)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	**Medium (36)**	**Low (27)**
Status (positive or negative)	Negative	Negative
Reversibility	Yes, solar facility can be removed.	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	

Mitigation:

» The recommendations contained in the VIA should be implemented.

Cumulative impacts:

» Potential impact on current rural sense of place

Residual impacts:

» None as the impact would be removed when the facility is decommissioned.

Nature of impact: Potential impact of the PV facility on local tourism

The Northern Cape PGDS notes that the sustainable utilisation of the natural resource base on which agriculture depends is critical in the Northern Cape with its fragile ecosystems and vulnerability to climatic variation. The document also indicates that due to the provinces exceptional natural and cultural attributes, it has the potential to become the preferred adventure and ecotourism destination in South Africa. Therefore caution must be taken to ensure that the development of renewable energy projects, such as the proposed Solar Energy Facility, do not impact negatively on the tourism potential of the Province.

	Without Mitigation	**With Enhancement/ Mitigation**
Extent	Local (2)	Local (3)
Duration	Long term (4)	Long term (4)
Magnitude	Low (2)	Low (2)
Probability	Probable (3)	Probable (3)
Significance	**Low (24) (Applies to both – and +)**	**Low (27) (Applies to both – and +)**
Status (positive or negative)	Negative (Potential to distract from the tourist experience of the area) Positive (Potential to attract people	Negative (Potential to distract from the tourist experience of the area) Positive

	to the area)	(Potential to attract people to the area)
Reversibility	Yes	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	

Mitigation:

The recommendations contained in the VIA should be implemented.

In terms of efforts to enhance the proposed benefits to tourism:

» The proponent should liaise with representatives from the Siyathemba Local Municipality and local tourism representatives to raise awareness of the proposed facility.

» The proponent should investigate the option of establishing a renewable energy interpretation centre at entrance to the site. The centre should include a viewing area where passing visitors can stop and view the site.

Cumulative impacts:

» Potential impact on current rural sense of place.

Residual impacts:

» Not applicable as impact is removed.

Impact tables summarising the significance of social impacts associated with the power line of the project (with and without mitigation)

Nature of impact: Potential visual impact and impact on sense of place associated with power lines

The power line will involve a loop-in and loop out to connect into the existing Burchell / Mooidraai 132kV power line which traverse the site;

The findings of the SIA indicate that the social impacts associated with the power line will be low. This is due to the limited number of homesteads that will be visually affected, namely only the homestead on Blaaubosch Draai.

	Without Mitigation	**With Enhancement/ Mitigation**
Extent	Local (2)	Local (1)
Duration	Long term (4)	Long term (4)
Magnitude	Minor (2)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	**Low (24)**	**Low (21)**
Status (positive or negative)	Negative	Negative
Reversibility	Yes	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	

Mitigation:

» The recommendations contained in the VIA should be implemented. The measures listed above to address the potential impacts associated with the construction phase also apply

to the construction of the power line.
Cumulative impacts:
» Potential impact on current rural sense of place
Residual impacts:
» Not applicable as impact is removed

Implications for Project Implementation

- The findings of the SIA undertaken for the proposed Prieska Solar Energy Facility indicate that the development will create employment and business opportunities for locals during both the construction and operational phase of the project.
- The establishment of a Community Trust will also create an opportunity to support local economic development in the area.
- The development of renewable energy has also been identified as key growth sector by the Siyathemba Local Municipality and also represents an investment in clean, renewable energy infrastructure, which, given the challenges created by climate change, represents a positive social benefit for society as a whole.
- It is therefore recommended that the Solar Energy Facility as proposed be supported, subject to the implementation of the recommended enhancement and mitigation measures contained in the report.

6.3. Assessment of the Do Nothing Alternative

The 'do-nothing' alternative is the option of not constructing the proposed Prieska Solar Energy Facility. Should this alternative be selected, there would be no impacts on the site due to the construction and operation activities of a solar energy facility. However, there will be impacts at a local and a broader scale. .

From a local perspective, the identified site, is used extensively for livestock and – game farming. However, at a broader scale, the benefits of additional capacity to the electricity grid and those associated with the introduction of renewable energy would not be realised. Although the facility is only proposed to contribute 75 MW to the grid capacity, this would assist in meeting the growing electricity demand throughout the country and would also assist in meeting the government's goal for renewable energy.

At a broader scale, the benefits of this renewable energy facility would not be realised. The generation of electricity from renewable energy resources offers a range of potential socio-economic and environmental benefits for South Africa. These benefits include:

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

» **Resource saving:** Conventional coal fired plants are major consumers of water during their requisite cooling processes. It is estimated that the achievement of the targets in the Renewable Energy White Paper will result in water savings of approximately 16.5 million kilolitres, when compared with wet cooled conventional power stations. This translates into revenue savings of R26.6 million. As an already water-stressed nation, it is critical that South Africa engages in a variety of water conservation measures, particularly due to the detrimental effects of climate change on water availability.

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

» ***Pollution reduction:*** The releases of by-products through the burning of fossil fuels for electricity generation have a particularly hazardous impact on human health and contribute to ecosystem degradation. The use of solar radiation for power generation is considered a non-consumptive use of a natural resource which produces zero greenhouse gas emissions.

» ***Climate friendly development:*** The uptake of renewable energy offers the opportunity to address energy needs in an environmentally responsible manner and thereby allows South Africa to contribute towards mitigating climate change through the reduction of greenhouse gas (GHG) emissions. South Africa is estimated to be responsible for approximately 1% of global GHG emissions and is currently ranked 9th worldwide in terms of per capita carbon dioxide emissions.

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

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

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

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

Nature of impact: The no-development option would result in the lost opportunity for South Africa to supplement is current energy needs with clean, renewable energy. The No-Development option would also result in the loss of the benefits to the local community and economy associated with the creation of employment opportunities and the establishment of a Community Trust.

South Africa currently relies on coal-powered energy to meet more than 90% of its energy needs. As a result South Africa is one of the highest per capita producers of carbon emissions in the world and Eskom, as an energy utility, has been identified as the world's second largest producer carbon emissions.

The No-Development option would represent a lost opportunity for South Africa to supplement its current energy needs with clean, renewable energy. Given South Africa's position as one of the highest per capita producer of carbon emissions in the world, this would represent a negative social cost. However, the overall contribution of the proposed Prieska Solar Energy Facility to South Africa's total energy requirements will be small (75MW). In addition, the current application is not unique. The potential contribution of the proposed Prieska Solar Energy Facility should therefore be regarded as valuable, but should not be over-estimated.

The No-Development option would also result in the loss of the benefits to the local community and economy associated with the creation of employment opportunities and the establishment of a Community Trust. This would represent a negative social impact. Also, as indicated above, the No-Development option would exacerbate the current energy supply challenges facing the area.

	Without mitigation	**With mitigation**
Extent	Local-International (4)	Local-International (4)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (6)	Moderate (6)
Probability	Highly Probable (4)	Highly Probable (4)
Significance	**Medium (54)**	**Medium (54)**
Status (positive or negative)	Negative	**Positive**
Reversibility	Yes	

Irreplaceable loss of resources?	Yes, impact of climate change on ecosystems
Can impacts be mitigated?	Yes
Mitigation: » The proposed facility should be developed and the mitigation and enhancement measures identified in the SIA and other specialist studies should be implemented. However, the impact of large solar facilities on the sense of place and landscape are issues need to be addressed in the location, design and layout of the proposed plant.	
Cumulative impacts: » Cumulative visual impact on the regional area should other PV facilities also be constructed.	
Residual impacts: » Distinct change in character and quality of the area	

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

6.5. Summary of All Impacts

As can be seen from the above tables, there are no impacts of high significance expected to be associated with the construction and operation of the proposed facility, provided that the recommended mitigation measures are implemented. All identified impacts can therefore be mitigated to acceptable levels.

6.6. Assessment of Potential Cumulative Impacts

A cumulative impact, in relation to an activity, refers to the impact of an activity that in itself may not be significant, but may become significant when added to the existing and potential impacts eventuating from similar or diverse undertaking in the area4.

Based on information available at the time of undertaking the EIA, the impact of solar facilities on the landscape is therefore likely to be a key issue in South Africa, specifically given South African's strong attachment to the land and the growing number of solar plant applications.

In the case of the proposed Prieska Solar Energy Facility, there are 6 proposed renewable energy projects that are currently proposed between Prieska and

[4] Definition as provided by DEA in the EIA Regulations.

Copperton (refer to Table 6.1). Only one project has reached preferred bidder status, namely the Mulilo Power (Pty) Ltd, Proposed Photovoltaic Power Generation Facility near Prieska (DEA Reference No. 12/12/20/1722).

Table 6.1: Proposed projects in the area

Project	Project Developer	Location	Status of the Project	DEA Reference No.
1. Proposed Photovoltaic Power Generation Facility near Prieska	Mulilo Power (Pty) Ltd	Farm 104/1 near the Town of Prieska	EA issued Preferred Bidder	12/12/20/1722
2. Proposed establishment of a wind farm facility in Prieska, Siyathemba Local Municipality, Northern cape	South African Mainstream Renewable Power Development	Remainder of the Farm plat Sjambok No. 102; Portion 1 & 3 of the farm Kaffirs Kolk No. 118, near Prieska	EIA complete	12/12/20/2320/1
3. Proposed establishment of a PV Solar facility in Prieska, Siyathemba Local Municipality, Northern cape	South African Mainstream Renewable Power Development	Remainder of the Farm plat Sjambok No. 102; Portion 1 & 3 of the farm Kaffirs Kolk No. 118, near Prieska	EIA in process	12/12/20/2320/2
4. Proposed Photovoltaic Energy Plant On Farm Klipgats Pan Near Copperton, Northern Cape	Mulilo Power (Pty) Ltd	Farm Klipgats Pan Near Copperton	EIA in process	12/12/20/2501
5. Proposed Wind Energy Facility Near Copperton, Northern Cape	Plan 8	Portions 4 and 7 of Farm Nelspoortje ("Struisbult") ~50 km southwest of Prieska	Unknown	12/12/20/2099
6. Proposed Garob Wind	Juwi	Portion 5 of Farm Nelspoortje 103	EIA in process	14/12/16/3/3/2/279

Project	Project Developer	Location	Status of the Project	DEA Reference No.
Energy Facility Project, Northern Cape Province		east of Copperton		

6.6.1 Visual Impacts

The cumulative impacts associated with solar energy facilities, such as the proposed Prieska Solar Energy Facility, are largely linked to the visual impact on the areas sense of place and landscape character.

In the case of the proposed Prieska Solar Energy Facility, there are other Solar Energy Facilities proposed in the vicinity of the site, i.e. on the adjacent farm (Remhoogte) (Refer to Figure 6.5). The potential does therefore exist for combined visibility (whether two or more wind farms (solar facilities) will be visible from one location) and sequential visibility (e.g. the effect of seeing two or more wind farms (solar facilities) along a single journey, e.g. road or walking trail) cumulative impacts. However, based on the findings of the site visit the significance of the impact is likely to be low. This is due to potential to screen the Prieska Solar Energy Facility site from the R357. There are also likely to be opportunities to screen the other solar energy facilities from roads in the area.

Despite this it is recommended that the environmental authorities consider the overall cumulative impact on the rural character and the areas sense of place before a final decision is taken with regard to the optimal number of renewable energy facilities in the area. In addition, the final location of individual components of the Solar Energy Facility should be informed by findings of the relevant VIAs, specifically with respect to the visual impact on farmsteads and important roads in the area.

The table below assesses the potential visual impact for the establishment of a number of solar energy facilities in the Northern Cape Province.

Nature: Visual impacts associated with the establishment of more than one solar facility and the potential impact on the areas rural sense of place and character of the landscape.		
	Without Mitigation	**With Mitigation**
Extent	Local and regional (2)	Local and regional (2)
Duration	Long term (4)	Long term (4)
Magnitude	Minor (2)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	**Low (24)**	**Low (24)**

Status	Negative	Negative
Reversibility	Yes. Solar energy plant components and other infrastructure can be removed at decommissioning.	
Irreplaceable loss of resources?	No	
Can impact be mitigated?	Yes	
Mitigation: Implement mitigation measures as proposed for each facility to minimise impacts.		
Residual impacts: None as the impact would be removed after decommissioning.		

6.6.2 Ecology Impacts

Negative cumulative ecological impacts include habitat loss and disturbance, and soil erosion. Individual projects will require proper management of environmental impacts during construction and operation. Cumulative ecological impacts relate to:

» possible erosion of areas lower than the panels
» possible contamination and siltation of the drainage lines and lower-lying wetlands
» possible fragmentation of plant populations
» possible alteration of occupancy by terrestrial fauna
» possible reduction of available habitat to terrestrial fauna
» possible spread and establishment of alien invasive species

Nature: Loss of vegetation, loss of and alteration of microhabitats, altered vegetation cover, altered distribution of rainfall and resultant runoff patterns, increase in runoff and accelerated erosion, loss of faunal habitat and resource availability to terrestrial fauna.		
	Without mitigation	**With mitigation**
Extent	Local (5)	Local (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	Very High (10)	Moderate (6)
Probability	Definite (5)	Definite (5)
Significance	**High (95)**	**Medium (60)**
Status (positive or negative)	Negative	Negative
Reversibility	Difficult to reverse	Partially reversible
Irreplaceable loss of resources?	Highly Probable	Probable
Can impacts be mitigated?	Reasonably	
Mitigation: » Implement mitigation measures as proposed for each facility to minimise impacts.		
Residual Impacts: » altered topsoil characteristics		

» altered vegetation composition » altered habitat and resource availability to terrestrial fauna

6.6.3. Impacts on Agricultural Potential

Cumulative impacts on agricultural potential would be associated with impacts on cultivated lands and/or areas of high potential. The cumulative impact of a loss in the agricultural potential associated with the establishment of the Prieska Solar Facility is considered low as there are no agricultural sensitive areas, areas of high agricultural value, wetlands, watercourses, cultivated lands or agricultural infrastructure on the site that shall be interfered with as a result of the proposed project.

In the event of the site being made available for livestock production again during the commercial energy production phase of the project, the impact on agricultural production will only be temporary. Even if the site is not utilised for agricultural production during the lifetime of the project the loss of agricultural potential and food production is still considered to be negligible due to the relatively small size of the site (~275ha) and its relatively low grazing and carrying capacities, and therefore does not contribute to the cumulative impacts associated with agricultural potential.

The establishment of a number of large renewable energy facilities in the area does have the potential to have a negative impact on agricultural potential. The environmental authorities should consider the overall cumulative impact on the agricultural potential before a final decision is taken with regard to the optimal number of such plants in an area.

Nature: Loss of land with agricultural potential and land capability.		
	Without mitigation	***With mitigation***
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (4)	Low (4)
Probability	High Probable (4)	High Probable (4)
Significance	**Moderate (40)**	**Low (16)**
Status	Negative	Negative
Reversibility	Medium	Medium
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Direct impacts cannot be mitigated but direct impacts can be minimised and avoided through adequate planning of layout.	
Mitigation: » Implement mitigation measures recommended for each phase of development in order to		

minimise impacts.
Residual impacts:
» Minor loss of grazing land while facility is in use.

6.6.4. Impacts on Sense of Place

Although there appear to be no guidelines for solar facilities, the Australian Wind Farm Development Guidelines (Draft, July 2010) indicate that the cumulative impact of multiple wind farm facilities is likely to become an increasingly important issue for wind farm developments in Australia. This finding is also likely to apply to solar energy plants and is also likely to be the case in South Africa. The key concerns in terms of cumulative impacts are, as in the case of wind farms, also likely to be linked to visual impacts and the impact on rural, undeveloped landscapes.

The Scottish Natural Heritage (2005) describes a range of potential cumulative landscape impacts associated with wind farms on landscapes. These issues raised in these guidelines as to what defines a cumulative impact are also regarded as pertinent to solar facilities, specifically given that the key issue of concern is likely to relate to the impact on rural, undeveloped landscapes. The relevant issues raised in the by Scottish Natural Heritage include:

» Combined visibility (whether two or more wind farms (solar facilities) will be visible from one location).
» Sequential visibility (e.g. the effect of seeing two or more wind farms (solar facilities) along a single journey, e.g. road or walking trail).
» The visual compatibility of different wind farms (solar facilities) in the same vicinity.
» Perceived or actual change in land use across a character type or region.
» Loss of a characteristic element (e.g. viewing type or feature) across a character type caused by developments across that character type.

The guidelines also note that cumulative impacts need to be considered in relation to dynamic as well as static viewpoints. The experience of driving along a tourist road, for example, needs to be considered as a dynamic sequence of views and visual impacts, not just as the cumulative impact of several developments on one location. The viewer may only see one wind farm (solar facility) at a time, but if each successive stretch of the road is dominated by views of a wind farm (solar facility), then that can be argued to be a cumulative visual impact (National Wind Farm Development Guidelines, DRAFT - July 2010). It is reasonable to assume that these issues will also apply to solar thermal plants.

Research on wind farms undertaken by Warren and Birnie (2009) also highlights the visual and cumulative impacts on landscape character. The paper notes that given that aesthetic perceptions are a key determinant of people's attitudes, and that these perceptions are subjective, deeply felt and diametrically contrasting, it is not hard to understand why the arguments become so heated. Because landscapes are often an important part of people's sense of place, identity and heritage, perceived threats to familiar vistas have been fiercely resisted for centuries. The paper also identifies two factors that important in shaping people's perceptions of wind farms' landscape impacts. The first of these is the cumulative impact of increasing numbers of wind farms (Campbell, 2008). The research found that if people regard a region as having 'enough' wind farms already, then they may oppose new proposals. The second factor is the cultural context. This relates to people's perception and relationship with the landscape. In the South African context, the majority of South Africans have a strong connection with and affinity for the large, undisturbed open spaces that are characteristic of the South African landscape. The concerns raised with regard to wind farms and the impact on landscapes are also likely to apply to solar facilities.

The impact of solar facilities on the landscape is therefore likely to be a key issue in South Africa, specifically given South African's strong attachment to the land and the growing number of solar plant applications. However, the relevant environmental authorities should be aware of the potential cumulative impacts associated with the establishment of renewable energy facilities in the area when evaluating applications.

In the case of the proposed Prieska SEF, two other SEFs are proposed in the vicinity of the site, namely on the adjacent farm (Remhoogte) and the CEF SEF to the west of Prieska. The potential does therefore exist for combined visibility (whether two or more wind farms or solar facilities will be visible from one location) and sequential visibility (e.g. the effect of seeing two or more wind farms or solar facilities along a single journey, e.g. road or walking trail) cumulative impacts. However, based on the findings of the site visit the significance of the impact is likely to be low. This is due to potential to screen the Prieska SEF site from the R357. There are also likely to be opportunities to screen the other two SEFs from roads in the area.

Nature: Visual impacts associated with the establishment of more than one solar plant and the potential impact on the areas rural sense of place and character of the landscape.		
	Without Mitigation	**With Mitigation**
Extent	Local and regional (2)	Local and regional (2)
Duration	Long term (4)	Long term (4)
Magnitude	Minor (2)	Minor (2)
Probability	Probable (3)	Probable (3)

Significance	Low (24)	Low (24)
Status	Negative	Negative
Reversibility	Yes. Solar energy plant components and other infrastructure can be removed.	
Irreplaceable loss of resources?	No	
Can impact be mitigated?	Yes	
Mitigation: The establishment of a number of large renewable energy facilities in the area does have the potential to have a negative cumulative impact on the areas sense of place and the landscape. The environmental authorities should consider the overall cumulative impact on the rural character and the areas sense of place before a final decision is taken with regard to the optimal number of such plants in an area. In addition, the recommendations contained in the VIA should be implemented.		
Cumulative impacts: Impact on other activities whose existence is linked to linked to rural sense of place and character of the area, such as tourism, bird watching, and hunting.		
Residual impacts: Not applicable as impact is removed		

6.6.5. Impacts on Local Economy

In addition to the potential negative impacts, the establishment of the other renewable energy projects in the area also has the potential to result in significant positive cumulative socio-economic impacts for the Siyathemba Local Municipality. The positive cumulative impacts include creation of employment opportunities (direct and indirect) for matriculants, and as such provide them with an incentive to stay on in Prieska, skills development and training opportunities (construction and operational phase), creation of downstream business opportunities and stimulation of the local property market. It is important to note that one project on its own is not going to achieve all that much positive benefits for Prieska, but combined (cumulative) there are increased potential benefits. The significance of this impact is rated as High positive with enhancement.

Nature: The establishment of a number of renewable energy facilities in and around the area will create employment, skills development and training opportunities, creation of downstream business opportunities and stimulation of the local property market.		
	Without Enhancement	**With Enhancement**
Extent	Local and regional (3)	Local and regional (4)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Moderate (6)
Probability	Highly Probable (4)	Definite (5)

Significance	Medium (44)	High (70)
Status	Positive	Positive
Reversibility	Yes. Solar energy plant components and other infrastructure can be removed.	
Irreplaceable loss of resources?	No	
Can impact be enhanced?	Yes	
Mitigation: The establishment of a number of large renewable energy facilities in the area does have the potential to have a negative cumulative impact on the areas sense of place and the landscape. However, as indicated above, the Siyathemba Local Municipality does support the establishment of renewable energy facilities in the area. The environmental authorities therefore need to take into account the potential positive and negative cumulative impacts before a final decision is taken with regard to the number and location of renewable energy facilities in an area.		
Cumulative impacts: Positive impact on the local and regional economy through the creation of downstream opportunities and wage spend in the local economy		
Residual impacts: Investment in local economic development will have long term benefits for the SLM and local towns in the area and improved pool of skills and experience in the local area.		

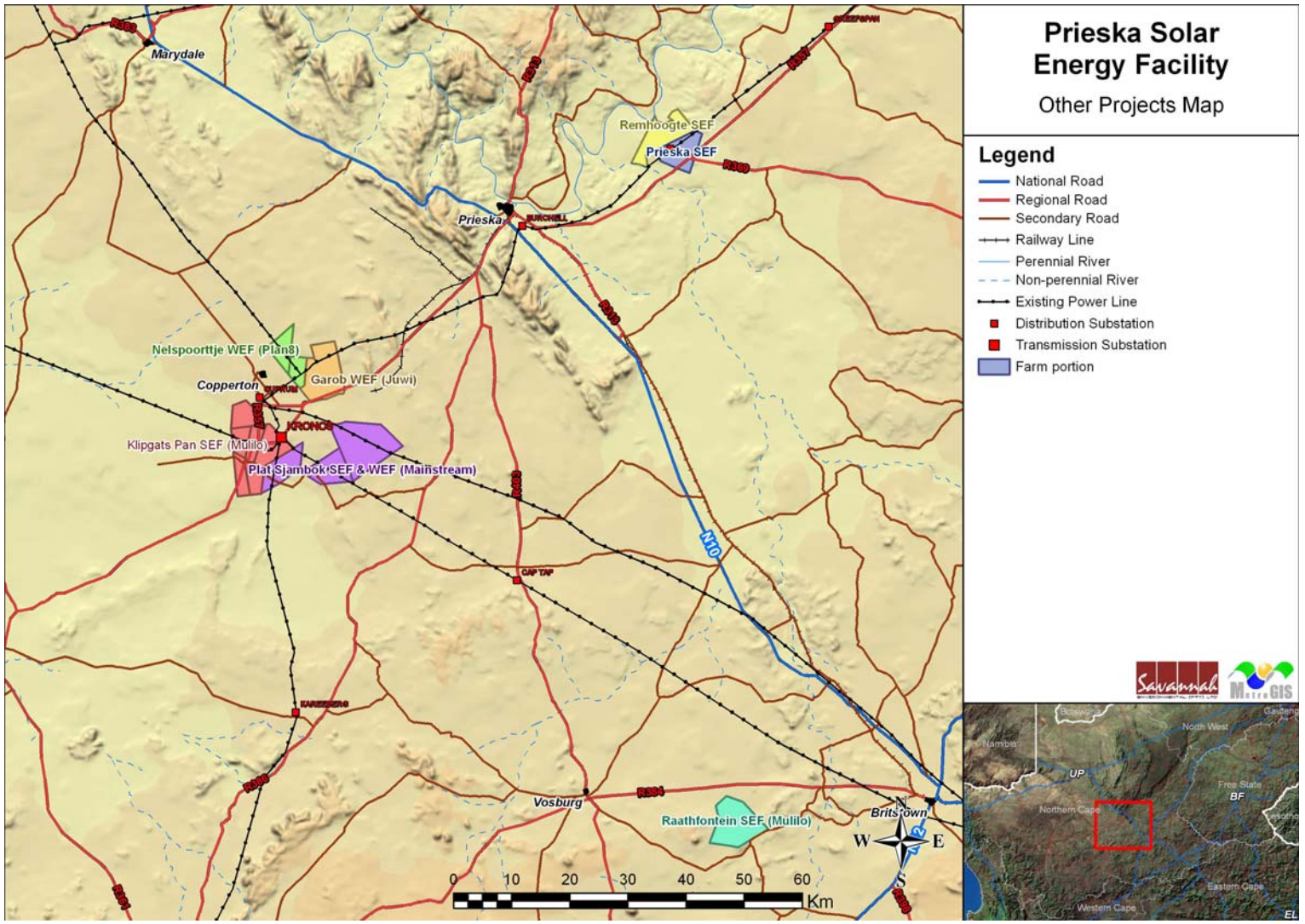

Figure 6.5: Locality map showing the adjacent Solar Energy Facilities proposed within the surrounding areas to the Prieska Solar Energy Facility.

CONCLUSIONS AND RECOMMENDATIONS CHAPTER 7

The Prieska Solar Energy Facility is proposed to be developed as a commercial solar energy facility located on the Portion 3 of the Farm Holsloot 47 which is located within the Siyathemba Local Municipality in the Northern Cape (refer to Figure 7.1) The purpose of the proposed facility is to add new capacity for generation of power from renewable energy to the national electricity supply (which is short of generation capacity to meet current and expected demand), and to aid in achieving the goal of a 30% share of all new power generation being derived from independent power producers (IPPs), as targeted by the Department of Energy (DoE).

Globally there is increasing pressure on countries to increase their share of renewable energy generation due to concerns such as climate change and exploitation of non-renewable resources. In order to meet the long-term goal of a sustainable renewable energy industry, a goal of 17,8GW of renewables by 2030 has been set by the Department of Energy (DoE) within the Integrated Resource Plan (IRP) 2010. This energy will be produced mainly from wind, solar, biomass, and small-scale hydro (with wind and solar comprising the bulk of the power generation capacity). This amounts to ~42% of all new power generation being derived from renewable energy forms by 2030. This is however dependent on the assumed learning rates and associated cost reductions for renewable options.

As such Jouren Solar (Pty) Ltd, as an IPP, is investigating the establishment of a 75 MW photovoltaic solar energy facility and associated infrastructure for the purpose of commercial electricity generation. The proposed facility will require approximately 275 ha and will be comprised of the following primary elements (refer to Chapter 2 for more details):

» Solar panels (single or double axis).
» An on-site inverter to step up the power and a substation to facilitate the connection between the solar energy facility and the Eskom electricity grid.
» Two alternatives are being considered to evacuate the electricity from the facility.
    a) Alternative 1 a loop-in and loop out power line to connect into the existing Burchell-Mooidraai 1 132kV power line which traverses the site;
    b) Alternative 2 to connect directly into the existing Eskom Mooidraai Substation located on the site.
» Internal access roads.
» Workshop area for maintenance and storage.

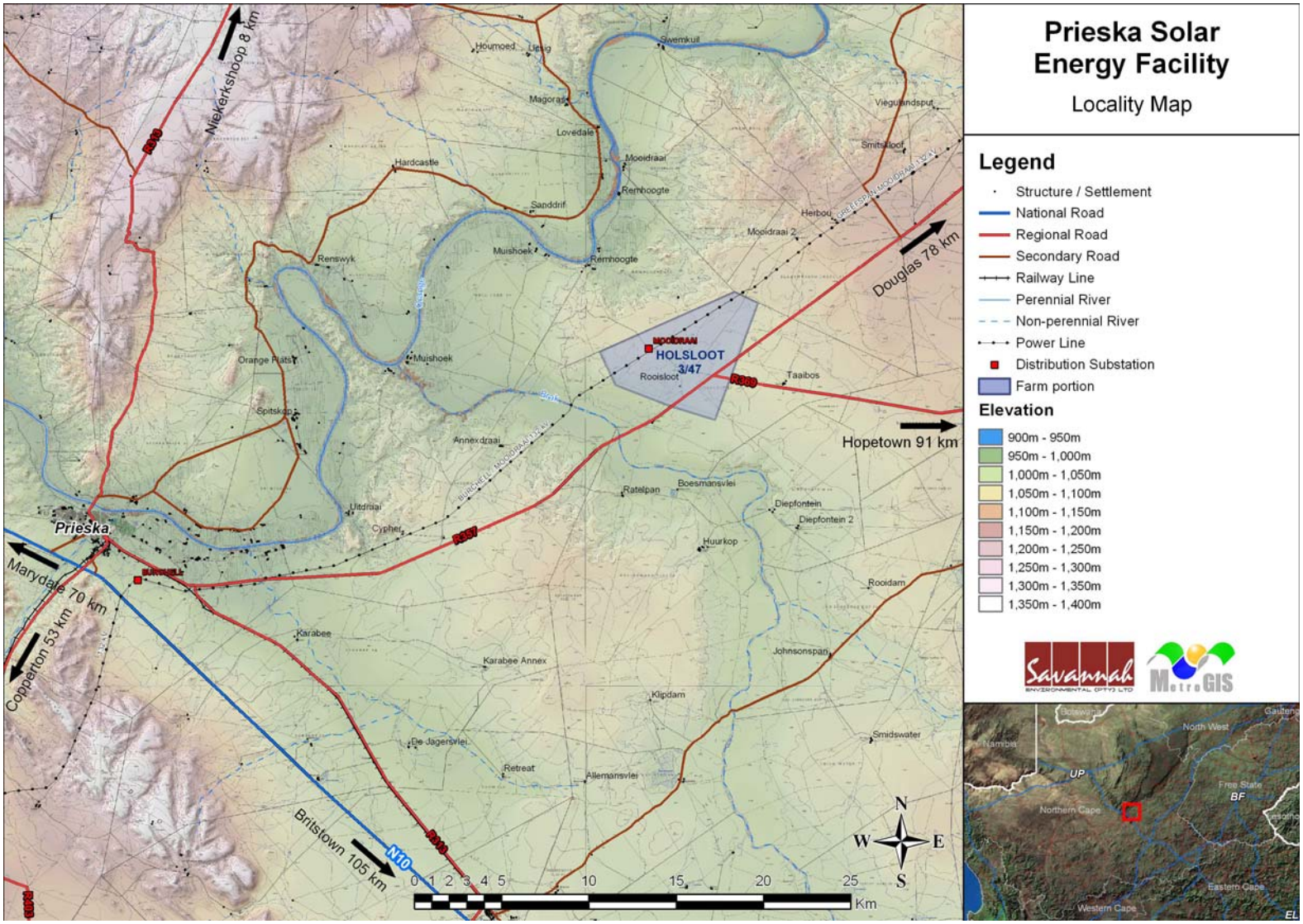

Figure 7.1: Locality map illustrating the location of the assessed development site for the proposed Prieska Solar Energy Facility

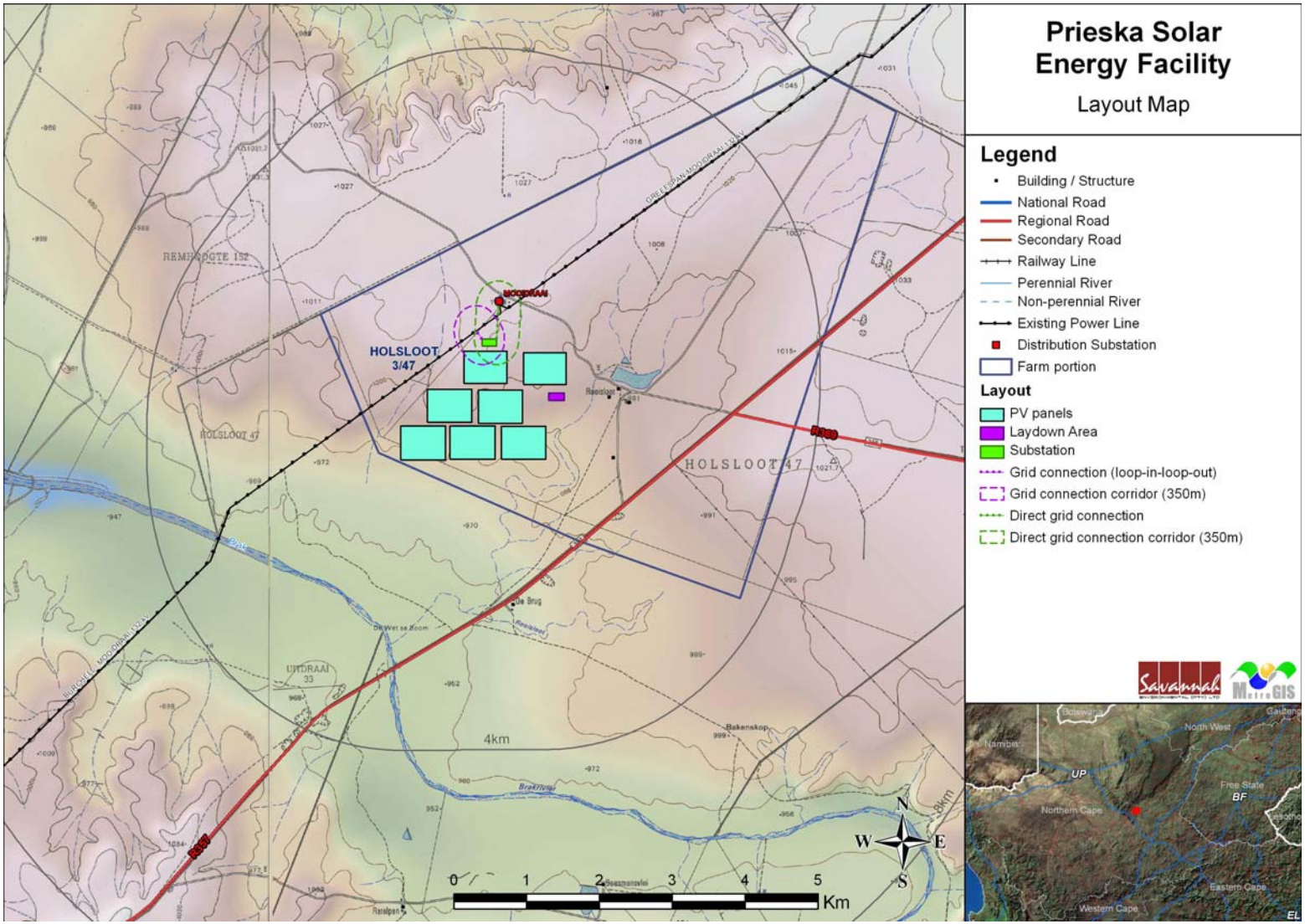

Figure 7.2: Preliminary layout of the proposed facility

An EIA process, as defined in the NEMA EIA Regulations, is a systematic process of identifying, assessing, and reporting environmental impacts associated with an activity. The EIA process forms part of the feasibility phase of a project and informs the final design of a development. In terms of the EIA Regulations published in terms of Section 24(5) of the National Environmental Management Act (NEMA, Act No. 107 of 1998), Jouren Solar (Pty) Ltd requires authorisation from the National Department of Environmental Affairs (DEA) (in consultation with the Northern Cape – Department of Environmental and Nature Conservation (DENC)) for the establishment of the proposed facility. In terms of sections 24 and 24D of NEMA, as read with the EIA Regulations of GNR543 - GNR546, a Scoping and an EIA Phase have been undertaken for the proposed project. As part of this EIA process comprehensive, independent environmental studies have been undertaken in accordance with the EIA Regulations. The following key phases have been involved thus far in the EIA Process.

» *Notification Phase* - organs of state, stakeholders, and interested and affected parties (I&APs) were notified of the proposed project using adverts, site notices, background information documents, and stakeholder letters. Details of registered parties have been included within an I&AP database for the project.
» *Scoping Phase* – potential issues associated with the proposed project and environmental sensitivities (i.e. over the broader project development site), as well as the extent of studies required within the EIA Phase were identified.
» *EIA Phase* – potentially significant biophysical and social impacts[5] and identified feasible alternatives put forward as parts of the project have been comprehensively assessed through specialist investigations. Appropriate mitigation measures have been recommended as part of a draft Environmental Management Programme (EMP) (refer to Appendix L).

The conclusions and recommendations of this EIA are the result of the assessment of identified impacts by specialists, and the parallel process of public participation. The public consultation process has been extensive and every effort has been made to include representatives of all stakeholders in the study area. A summary of the recommendations and conclusions are provided in this Chapter.

7.1. Evaluation of Prieska Solar Energy Facility

The preceding chapters of this report together with the specialist studies contained within Appendices F -K provide a detailed assessment of the potential impacts that may result from the proposed project. This chapter concludes the EIA Report for the Prieska Solar Energy Facility by providing a summary of the conclusions of the assessment of the proposed site for the development of the PV solar energy facility.

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

In so doing, it draws on the information gathered as part of the EIA process and the knowledge gained by the environmental specialist consultants and presents an informed opinion of the environmental impacts associated with the proposed project.

From the assessment of potential impacts undertaken within this EIA, it is concluded that there are no environmental fatal flaws which were identified to be associated with the site, and the only 'no-go' areas identified was that of the *Hertia pallens – Stipagrostis namaquensis* riparian areas typical of the more distinct drainage lines along the depressions between the surrounding undulating plains (unit 4 as described in the Ecology report - refer to appendix F). In summary, the most significant environmental impacts associated with the Prieska Solar Energy Facility, as identified through the EIA, include:

» Local site-specific biophysical (flora, fauna and soils) impacts as a result of physical disturbance/modification to the site with the establishment of the facility.
» Visual impacts.
» Impacts on the social environment.

7.1.1. Local Site-specific Impacts

The construction of the Prieska Solar Energy Facility will lead to permanent disturbance of an area of ~275ha in extent. Permanently affected areas include the area for the PV panels and associated infrastructure, as well as the internal access roads and power line route. From the specialist investigations undertaken for the proposed solar energy facility development site, it was determined that the majority of the site is in a natural state, but degraded. Areas of sensitivity within the proposed development site were identified through the EIA process. These relate largely to the local ecology (sensitive and protected vegetation, habitat for fauna (refer to the sensitivity map – Figure 7.3)).

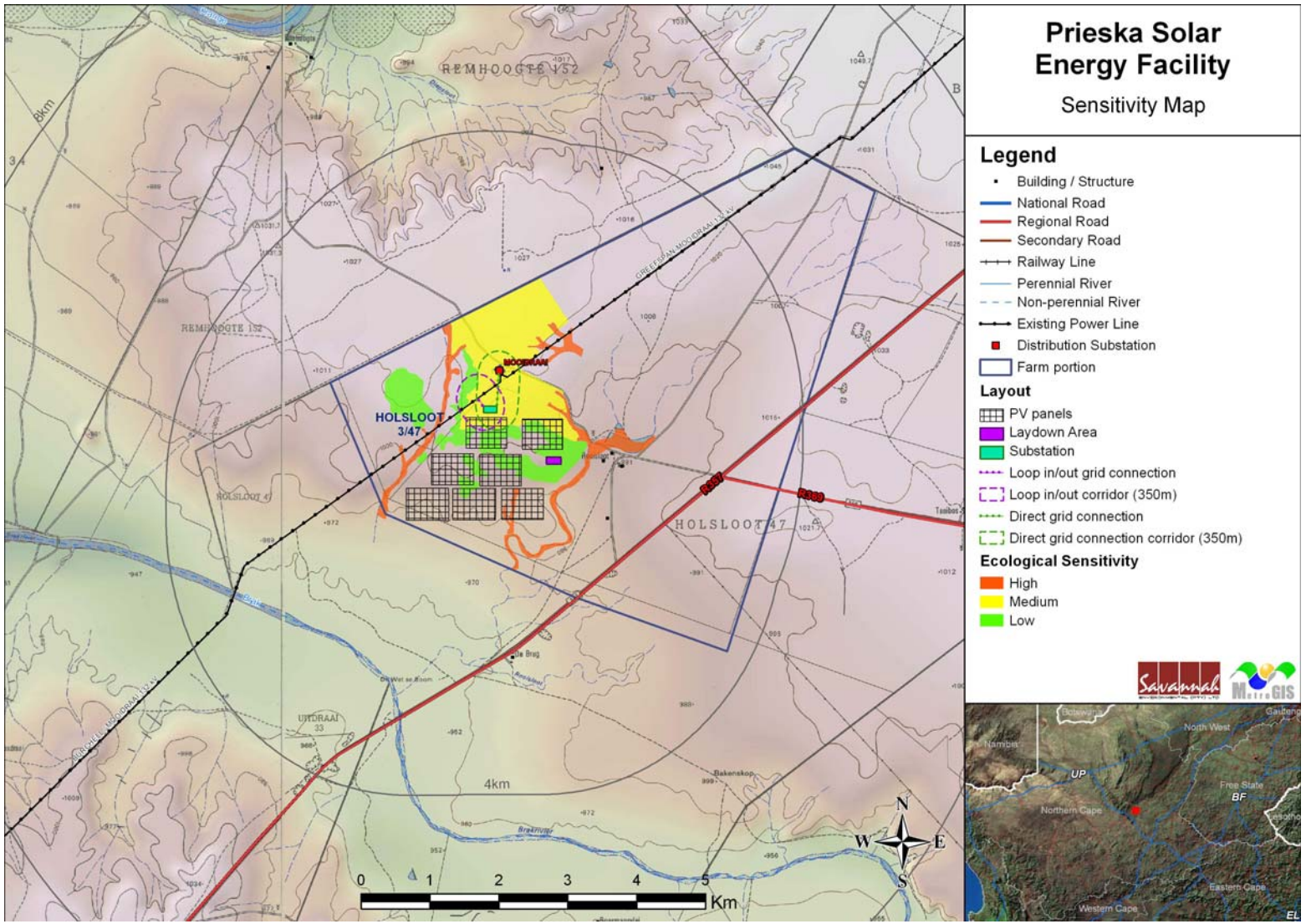

Figure 7.3: Sensitivity map for the Prieska Solar Energy Facility

Areas of high sensitivity relate to the drainage lines on the site. These areas should be avoided as far as possible. The remainder of the site is considered to be of moderate to low sensitivity. Where this is unavoidable, the relevant permits (including a water use license for impacting on the pan and biodiversity permits for impacts on threatened and/or protected plant and animal species) must be obtained prior to undertaking construction. It can be seen from Figure 7.3 that the majority of the proposed development footprint falls within areas of low to no sensitivity. Where it is not possible to avoid areas of medium sensitivity, appropriate mitigation should be implemented to reduce impacts to acceptable levels.

Agricultural potential on the site is low and limited to grazing. The long term impact on food production will be negligible due to the low grazing capacity and small size of the site. If grazing is allowed within the site after the construction phase and the grass cover is restored due to rehabilitation of construction sites with grasses and the removal of invading and encroaching woody plants, the impact on grazing capacity and food production is expected to be positive rather than negative.

7.1.2. Visual Impacts

It has been concluded that the visual impacts associated with the proposed facility will be largely contained within the broader region itself. None of the potential visual impacts identified are considered to be fatal flaws for the proposed solar energy facility. The primary considerations in this regard include the very contained extent of potential visual impact on users of the arterial roads (i.e. the R357 and R369) and the secondary roads in close proximity (i.e. within 3km) of the proposed solar energy facility. Visual impacts can be further mitigated through the retention of a buffer of 30 – 50m of natural vegetation along the boundary of the development site.

Other wind and solar energy facilities are proposed between Prieska and Copperton (Refer to Figure 7.4). At least one of these facilities has been awarded preferred bidder status by the DoE and will therefore be developed in the near future (i.e. the Mulilo Power Photovoltaic Power Generation Facility near Prieska- 12/12/20/1722). Based on the findings of the specialist studies undertaken, the potential cumulative visual impacts are likely to be low. There are also likely to be opportunities to screen the other solar energy facilities from roads in the area.

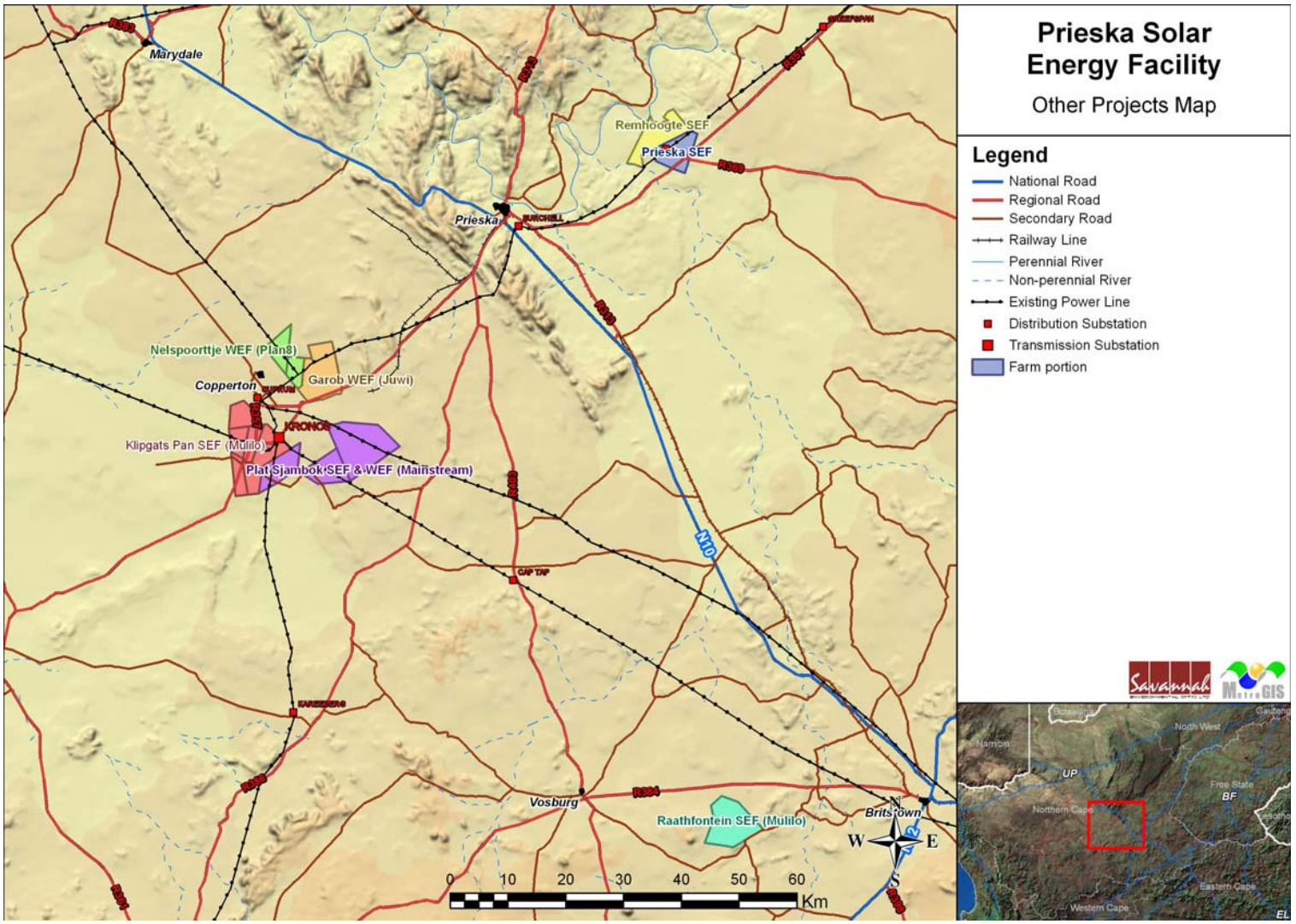

Figure 7.4: Locality map showing the adjacent Solar Energy Facilities proposed within the surrounding areas to the Prieska Solar Energy Facility

7.1.3. Impacts on the Social Environment

Impacts on the social environment are expected during both the construction phase and the operational phase of the solar energy facility. Impacts are expected at both a local and regional scale. Both positive and negative impacts are anticipated. Impacts on the social environment as a result of the construction of the solar energy facility can be mitigated to impacts of low significance or can be enhanced to be of positive significance to the region. Construction crew camps may be established on the site, and if required construction workers may also be housed in the nearest towns or other available/existing accommodation. Construction activities on the site will be largely restricted to daylight hours, and the construction phase is anticipated to extend for a period of 18-24-months.

Negative impacts during construction relate mainly to impacts due to the presence of construction workers and visual impact imposed by the facility on the local environment. The findings of the SIA undertaken for the proposed project indicate that the development will create employment and business opportunities for locals during both the construction and operational phase of the project. This will be a positive impact due to the high unemployment levels in the area. The positive impact due to employment creation will be lower during operation as there will be a limited number of staff required compared to the construction phase. The concerns raised by neighbouring landowners, have been included in this EIA report and with implementation of an EMP, these social risks from the PV plant can be managed to an acceptable level.

The area showed significant surface occurrences of archaeological finds (i.e. MSA to LSA stone tools). These finds seem to be spread throughout the study area without specific concentrations to be found. The variability and extent of the artefact types does however suggest that a manufacturing site could be located somewhere underneath the local alluvial deposits. These finds are not considered to be significant and therefore impacts on archaeological sites are considered to be low. No impacts on heritage or paleontological sites are expected.

7.1.4. Impacts from the proposed power line

Two power line options have been considered during this EIA process, namely a loop-in and loop out power line to connect into the existing Burchell-Mooidraai No.1 132kV power line which traverses the site; or alternatively to connect the proposed PV facility directly into the existing Eskom Mooidraai Substation located on the site. Both power line options are considered acceptable from an environmental point of view as both power line corridors assessed fall within an area of medium sensitivity and are expected to have similar if not the same potential impacts (Refer to Figure

7.3). The preferred option should therefore be selected on the basis of Eskom's requirements.

7.2. Overall Conclusion (Impact Statement)

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

The technical viability of establishing a solar energy facility with a generating capacity of 75 MW on a site located on the Farm Holsloot 47 which is located within the Siyathemba Local Municipality has been established by Jouren Energy (Pty) Ltd. The positive implications of establishing a solar energy facility within the Northern Cape include the following:

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

At a local scale, the benefits associated with development on the proposed site (as established through this EIA process) include:

» The low to moderate impacts on ecology due to the planning of the majority of the proposed facility within the areas of low to no sensitivity (refer to Figure 7.3).
» No impact on agricultural potential and food production due to the low agricultural potential of the soils underlying the site and the low grazing capacity.
» Low impacts on archaeological, heritage and paleontological sites.
» Limited visual impacts to within 3km of the site as a result of the nature of the facility and the location of the site within the local topography.
» Minimisation of the extent of associated infrastructure (i.e. access roads and power lines) due to the close proximity of the site to main access roads and power line and substation infrastructure.

The findings of the specialist studies undertaken within this EIA to assess both the benefits and potential negative impacts anticipated as a result of the proposed project conclude that there are **no environmental fatal flaws** that should prevent the proposed project from proceeding, provided that the recommended mitigation and management measures are implemented. The significance levels of the majority of identified negative impacts can be reduced by implementing the recommended mitigation measures. The project is therefore considered to meet the requirements of sustainable development. Environmental specifications for the management of potential impacts are detailed within the draft Environmental Management Programme (EMP) included within Appendix L.

With reference to the information available at this planning approval stage in the project cycle, the **confidence** in the environmental assessment undertaken is regarded as **acceptable**.

7.3. Overall Recommendation

Based on the nature and extent of the proposed project, the local level of disturbance predicted as a result of the construction and operation of the facility and associated infrastructure, the findings of the EIA, and the understanding of the significance level of potential environmental impacts, it is the opinion of the EIA project team that the developmental impacts of the Prieska Solar Energy Facility project can be mitigated to an acceptable level. In terms of this conclusion, the EIA project team support the decision for environmental authorisation.

The following conditions would be required to be included within an authorisation issued for the project:

- All relevant practical and reasonable mitigation measures detailed within this report and the specialist reports contained within Appendices F to K should be implemented to limit the negative impacts and enhance the positives.
- As far as possible, any component of the facility which could potentially affect sensitive areas (i.e. drainage lines) should be shifted in order to avoid these areas of high sensitivity (i.e. best practice is impact avoidance). Where this is not possible, alternative mitigation measures as detailed in this report must be implemented and relevant permits must be obtained.
- Avoid No Go Areas as far as possible by careful placement of panels.
- The riparian areas of vegetation unit 4, as well as lower-lying drainage lines and rivers that were not specifically assessed must be regarded as No Go Areas, and a buffer of the legal 32 m, preferably between 50 and 100 m, maintained between any development and these areas.
- Following the final design of the facility, a revised layout must be submitted to DEA for review and approval prior to commencing with construction.
- Both power line options are considered acceptable from an environmental point of view. The preferred option should be selected on the basis of Eskom's requirements.
- Use existing infrastructure where possible to minimise potential ecological impacts from disturbance of vegetation.
- An independent Environmental Control Officer (ECO) should be appointed to monitor compliance with the specifications of the EMP for the duration of the construction period.
- The draft Environmental Management Programme (EMP) as contained within Appendix L of this report should form part of the contract with the Contractors appointed to construct and maintain the proposed facility, and will be used to ensure compliance with environmental specifications and management measures. The implementation of this EMP for all life cycle phases of the proposed project is considered key in achieving the appropriate environmental management standards as detailed for this project. This EMP should be viewed as a dynamic document that should be updated throughout the life cycle of the facility, as appropriate.
- Alien invasive plants should be controlled on site throughout the construction and operation of the facility.
- Disturbed areas should be rehabilitated as quickly as possible once construction is completed in an area, and an on-going monitoring programme should be established to detect, quantify, and manage any alien species.
- All relevant practical and reasonable mitigation measures detailed within this report and the specialist reports contained within Appendices F to K must be implemented.
- During construction, unnecessary disturbance to habitats should be strictly controlled and the footprint of the impact should be kept to a minimum.

- Disturbed areas should be rehabilitated as quickly as possible once construction is completed in an area, and an on-going monitoring programme should be established to detect, quantify, and manage any alien species.
- A comprehensive storm water management plan should be compiled and implemented for the developmental footprint prior to construction.
- A detailed geotechnical investigation should be undertaken before the engineering design phase to provide more detail. Specialist geotechnical input is recommended during the construction of foundations.
- A walk-though survey of final infrastructure positions for the solar energy facility and associated infrastructure (including the power line) should be undertaken by a specialist ecologist and heritage specialist prior to the commencement of construction. The EMP for construction must be updated to include site-specific information and specifications resulting from the final walk-though surveys. This EMP must be submitted to DEA for approval prior to the commencement of construction.
- Proper planning should be undertaken regarding the placement of lighting structures.
- Applications for all other relevant and required permits required to be obtained by Jouren Energy (Pty) Ltd must be submitted to the relevant regulating authorities.

REFERENCES CHAPTER 8

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