BIOTHERM ENERGY

Proposed Construction of the Helena 1 75MW Solar Photovoltaic (PV) Energy Facility near Copperton, Northern Cape Province

Draft Scoping Report

DEA Reference:	**14/12/16/3/3/2/765**
Issue Date:	28 May 2015
Revision No.:	**1**
Project No.:	13031

Date:	28 May 2015
Document Title:	Proposed Construction of the Helena 1, 75MW Solar Photovoltaic (PV) Energy Facility near Copperton, Northern Cape Province
Author:	Lynsey Rimbault
Revision Number:	1
Checked by:	Andrea Gibb / Rebecca Thomas
Approved:	Rebecca Thomas
Signature:	
For:	SiVEST Environmental Division

KEY PROJECT INFORMATION

FARM DESCRIPTION	21 DIGIT SURVEYOR GENERAL CODE
Portion 3 of the farm Klipgats Pan No 117 (Project Site)	C06000000000011700003
Portion 4 of the farm Klipgats Pan No 117 (Power Lines)	C06000000000011700004

DEVELOPMENT AREAS			
PHASE	AREA (HECTARES)	CENTRE POINT COORDINATES	
		SOUTH	EAST
HELENA SOLAR 1 DEVELOPMENT AREA	427.56	S30° 1' 8.353"	E22° 17' 20.101"
SUBSTATION ASSESSMENT AREA	24.49	S30° 2' 3.789"	E22° 17' 45.873"

POWER LINE ALTERNATIVES			
ALTERNATIVE	LENGTH (KMS)	COORDINATES	
		START	END
OPTION 1	4.38	S30° 2' 2.692" E22° 17' 54.321"	S30° 1' 27.878" E22° 20' 18.716"
OPTION 2	5.11	S30° 2' 7.012" E22° 17' 52.457"	S30° 1' 31.611" E22° 20' 17.451"

Refer to Appendix 8A for the full list of coordinates.

TITLE DEEDS: These will be included within the Environmental Impact Report (EIR).

PHOTOGRAPHS OF SITE:

General Characteristics of the study area

TYPE OF TECHNOLOGY: Photovoltaic (PV)

STRUCTURE HEIGHT: Estimated to be approximately 3 - 5m although the final design details are yet to be confirmed. These details will become available during the detailed design phase of the project.

SURFACE AREA TO BE COVERED: The total area of the site is 1246 hectares, with the proposed development area taking up 429 ha and the substation assessment area comprising of approximately 24 ha. However, the 75MW energy facility layout will require approximately 250 ha. The final design details are yet to be confirmed. These details will become available during the detailed design phase of the project.

STRUCTURE ORIENTATION: Structure will either by single axis tracking or fixed tilt structures. This will be confirmed during the detailed design phase of the project. For single axis tracking the structures will be mounted on a north-south horizontal axis and will track the sun from east to west. For fixed tilt structures the modules will be north facing tilted at an angle of between 15-30 degrees.

PV DESIGN: The plant will comprise of either fixed tilt or horizontal single axis tracking structures. Either thin film or crystalline silicon modules will be used. The modules will be mounted in rows on the support structures. The modules will be connected in series strings and the strings in parallel to the inverters. The inverters will convert the DC power from the modules to low voltage AC power. The low voltage AC power will then be stepped up to medium voltage power (typically 22-33kV) for distribution within the solar PV energy facility to the project substation. The inverters and transformers can comprise of containerised units where the inverters and transformers supplied as one complete unit in a container; as individual inverters connected to an outdoor transformer; or as containerised inverters connected to an outdoor transformer. The project substation will typically comprise of utility specification/grade equipment which will include a step up transformer (80MVA) to step up the MV voltage from the facility to high voltage (typically 132kV) for injection into the grid, switchgear, control equipment, substation building, bays and busbars as required.

FOUNDATIONS: Depending on the final geotechnical conditions of the sites the foundations will either be rammed structures or screw structures where the ground conditions are favourable or concrete foundations for less favourable ground conditions. The final foundation design will be determined at the detailed design phase of the project.

TEMPORARY LAYDOWN AREA DIMENSIONS: Approximately 3 to 5 hectares is required..

GENERATION CAPACITY: The project will have a total generation capacity of 75MW.

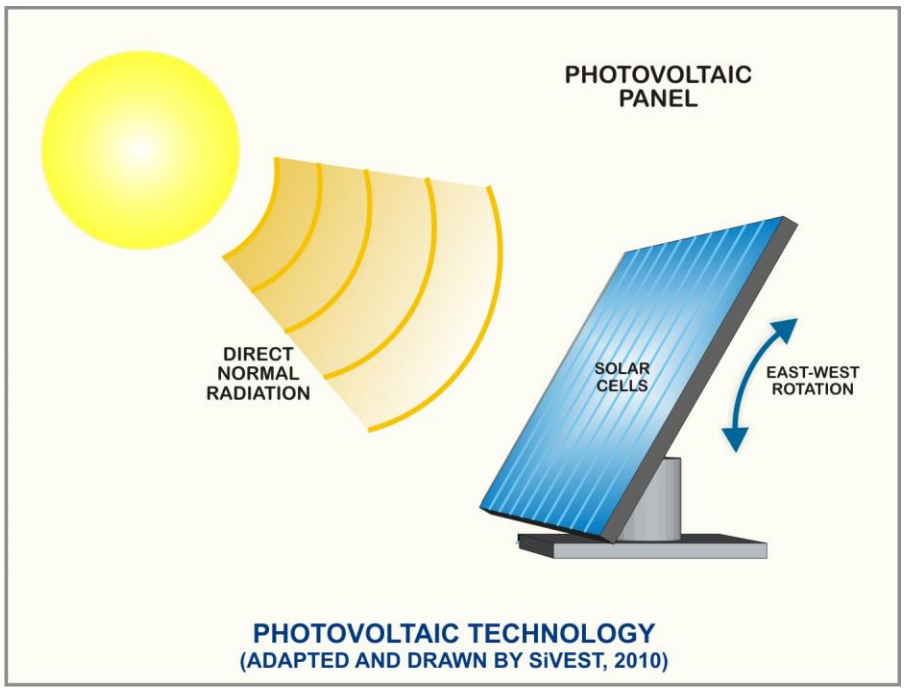

Figure i. Example of a Photovoltaic Panel with tracking capability.

A3 Maps of all smaller maps included in the report are included in Appendix 5.

BIOTHERM ENERGY

PROPOSED CONSTRUCTION OF THE HELENA 1 SOLAR PHOTOVOLTAIC (PV) ENERGY FACILITY NEAR COPPERTON, NORTHERN CAPE PROVINCE

DRAFT SCOPING REPORT

Executive Summary

BioTherm Energy (Pty) Ltd (hereafter referred to as BioTherm) intends to develop the Helena 1 solar photovoltaic (PV) energy facility and associated infrastructure near Copperton in the Northern Cape Province of South Africa. SiVEST Environmental Division has been appointed as independent consultants to undertake the Environmental Impact Assessment (EIA) for the proposed energy facility and associated infrastructure. The overall objective of the project is to generate electricity to feed into the National Grid by constructing a solar PV energy facility (and associated infrastructure).The proposed project will consist of a 75MW export capacity solar PV energy facility.

This proposed PV energy facility forms one of three PV energy facilities with a 75MW export capacity that BioTherm are proposing to develop on Portion 3 of the farm Klipgats Pan No 117 (Figure i). In order to accommodate the Department of Energy's (DoE) competitive bidding process for procuring renewable energy from Independent Power Producers in South Africa each PV energy facility will be developed under a separate Special Purpose Vehicle (SPV) and therefore each requires a separate Environmental Authorisation. Although each PV energy facility will be assessed separately, a single public participation process is being undertaken to consider all three proposed developments and the potential environmental impacts associated with all three PV developments will be assessed during the EIA phase as part of the cumulative impact assessment. Additionally, the the possibility to allow shared associated infrastructure will be considered. The reference numbers allocated for the other two proposed PV energy facilities are as follows:

- **Helena Solar 2:**
  DEA Ref. No.: 14/12/16/3/3/2/766
- **Helena Solar 3:**
  DEA Ref. No.: 14/12/16/3/3/2/767

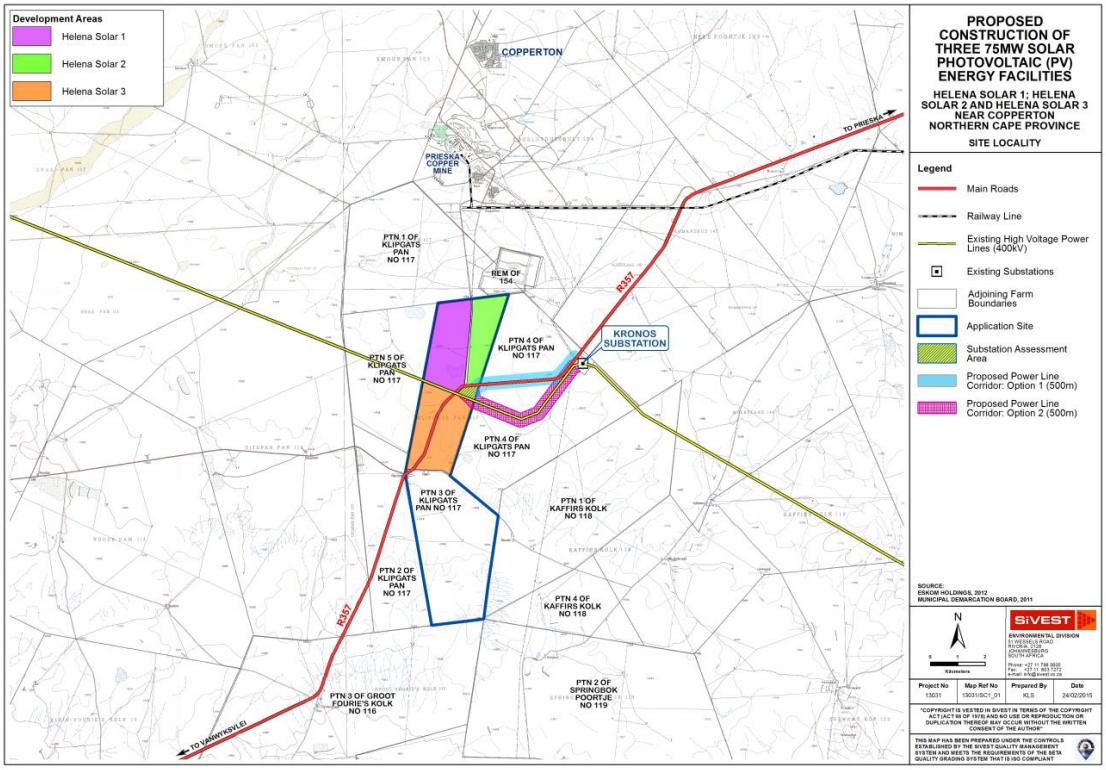

Figure i: Site locality for the proposed PV energy facility

DEVELOPMENT AREAS			
PHASE	**AREA (HECTARES)**	**CENTRE POINT COORDINATES**	
		SOUTH	**EAST**
HELENA SOLAR 1 DEVELOPMENT AREA	427.56	S30° 1' 8.353"	E22° 17' 20.101"
SUBSTATION ASSESSMENT AREA	24.49	S30° 2' 3.789"	E22° 17' 45.873"

Refer to Appendix 8A for the full project coordinates.

The proposed development requires Environmental Authorisation from the Department of Environmental Affairs (DEA). However, the provincial authority will also be consulted (i.e. the Northern Cape Department of Environment and Nature Conservation (NC DENC). The EIA for the proposed development will be conducted in terms of the EIA Regulations promulgated in terms of Chapter 5 NEMA (National Environmental Management Act), which came into effect on the 2nd of August 2010. In terms of these regulations, a full EIA is required for the proposed project. All relevant legislations and guidelines (including Equator Principles) will be consulted during the EIA process and will be complied with at all times.

The following assessments were conducted during the Scoping phase to identify the issues associated with the proposed development:

- Biodiversity Assessment
- Avifauna Assessment
- Surface Water Impact Assessment
- Soils and Agricultural Potential Assessment
- Visual Impact Assessment
- Heritage Assessment
- Socio-economic Impact Assessment

These studies will also be undertaken to inform the impact assessment to take place in the EIA phase of the project. In the scoping phase the specialists assessed the entire application site (Portion 3 of the farm Klipgats Pan No 117) and therefore all three proposed PV energy facilities were assessed in one specialist report. During the EIA phase, the specialist reports will be split into three separate reports which assess site specific impacts of each proposed PV energy facility in detail.

Two alternative power line corridor alternatives have been assessed during the scoping phase, additionally, the no-go alternative will be assessed throughout the Environmental Impact Assessment (EIA). Based on the scoping studies which were conducted, a few potentially sensitive sites have been identified within the study area. These have informed the identification of layout alternatives which are included in Chapter 9 and will be assessed during the EIA phase. The table below summarises the specialist findings of the Scoping Report for the entire project.

Biodiversity	The project is unlikely to have highly significant impacts on the ecological receiving environment and impacts that will occur can be controlled and reduced to low significance. The seriousness of many of these impacts can be determined during the field investigation of the site. Some impacts require permits to be issued, either by National or Provincial authorities and field data is required for the permit applications.
Avifauna	The proposed project is located in the region with the highest number of endemics in southern Africa. With over a quarter of all southern African endemics or near endemics potentially occurring in the study area, the study area as a whole should be regarded as moderately sensitive from an avifaunal perspective. Within the study area, potential high sensitive, no-go areas were identified, i.e. surface water (water troughs and dams) and high voltage lines, as both these micro-habitats are potential focal points of bird activity. Water troughs (boreholes) could potentially be declassified as high sensitivity should it be confirmed that they will be removed and therefore cease to function as

	potential focal points for bird activity after the construction of the solar panels. In the case of the existing Aries-Kronos 400kV line, the sensitivity and potential no-go areas will only become apparent once a field investigation has been conducted. Should no priority raptor nests be present, there will be no need for buffer zones. However, if there are nests present, an appropriate buffer zone will be required around the nest, depending on the species. In the case of a Red Data species such as a Martial Eagle, this would necessitate a buffer zone of at least 1.5km.
Surface water	The scoping level surface water assessment incorporated a database (GIS databases) and desktop (Google™ satellite imagery overlaid upon 1:50 000 topographical images) assessment of the entire study area. Database findings revealed that two (2) non-WETFEPA natural depression wetlands, and two (2) non-perennial rivers are located within the study area. In terms of the proposed development, a depression wetland was identified within both Helena Solar 1 and Power Line Option 2. A non-perennial river was identified within Power Line Option 1. Desktop findings revealed a depression wetland within Helena Solar 1 and a non-perennial river coursing Power line Options 1 and 2.
Soils and Agricultural Potential	Virtually all of the study area comprises shallow, calcareous soils with rock (land type Ah93). Coupled with these shallow soils, the very low rainfall in the area means that the only means of cultivation would be by irrigation and the Google Earth image of the area shows absolutely no signs of any agricultural infrastructure and certainly none of irrigation. The climatic restrictions mean that this part of the Northern Cape is suited at best for grazing and here the grazing capacity is low, around 20 ha/large stock unit. Therefore the expected impact is low, as soils are shallow and climate very unfavourable for cultivation.
Visual	The study area has a rural visual character with a low visual sensitivity. However, several solar energy facilities are proposed within relatively close proximity to the proposed PV plant. These facilities and their associated infrastructure, will significantly alter the visual character and baseline in the study area once constructed and make it appear to have a more industrial-type visual character. The proposed PV plant development is likely to visually influence four farmsteads identified within the visual assessment zone, therefore these are regarded to be potentially sensitive visual receptor locations. The sensitivity of the receptor locations will need to be confirmed through further assessment in the next phase of the study. The nature of the visual impacts associated with a development of this size on a receptors in the study area could be significant.
Heritage	The possibility of archaeological finds have been identified as being high. The palaeontological potential of the area has been confirmed as being low. As seen from the archival in the heritage scoping report, the possibility of historical

	finds has been identified. Thus further fieldwork is required to develop a comprehensive Heritage Management Plan.
Socio-economic	No fatal flaws or contraventions from a socio-economic policy perspective exist for the implementation of the proposed project. The national, provincial, and to some extent local governments do prioritise the development of renewable energy projects to reduce carbon emissions, create new jobs, increase economic growth and security of electricity supply. However, it is very clear that these developments need to be undertaken in a sustainable manner and should not jeopardise the growth of the other sectors, mainly agriculture that is considered to be an economic driver in the local area, where the project is to be developed. Instead, harnessing of renewable energy sources is considered to be the means to drive development and expansion of the local agricultural activities and development of other industries. The economy is in dire need for investment that would diversity its economic base and lead to the improvement of standards of living among local households through the increased income levels and access to improved services, which can be achieved by raising the local municipality's (LMs) revenue base through taxes and rates paid by new businesses. The proposed project is therefore likely to create a positive impact on the local economic development and the socio-economic environment in the municipality in general.

Based on the above mentioned studies, the Scoping Report has identified several aspects that warrant further investigation in the EIA Phase. These are as follows:

- Biodiversity Assessment
- Avifauna Impact Assessment
- Surface Water Impact Assessment
- Soils and Agricultural Potential Assessment
- Visual Impact Assessment
- Heritage Assessment
- Socio-economic Impact Assessment

BIOTHERM ENERGY

PROPOSED CONSTRUCTION OF THE HELENA 1 SOLAR PHOTOVOLTAIC (PV) SOLAR ENERGY FACILITY NEAR COPPERTON, NORTHERN CAPE PROVINCE

DRAFT SCOPING REPORT

Contents Page

List of Tables

List of Figures

List of Appendices

Glossary of Terms

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

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

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

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

"Equator Principles": A financial industry benchmark for determining, assessing and managing social & environmental risk in project financing.

Environmental Impact Assessment: 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 the application.

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

Environmental Management Programme: A legally binding working document, which stipulates environmental and socio-economic mitigation measures which must be implemented by several responsible parties throughout the duration of the proposed project.

Heritage Significance Grades:

a) Grade I: Heritage resources with qualities so exceptional that they are of special national significance;

(b) Grade II: Heritage resources which, although forming part of the national estate, can be considered to have special qualities which make them significant within the context of a province or a region; and

(c) Grade III: Other heritage resources worthy of conservation.

Heritage Resources: This means any place or object of cultural significance. See also archaeological resources above.

Historical Period: Since the arrival of the white settlers - c. AD 1840 - in this part of the country

Iron Age: Period covering the last 1800 years, when new people brought a new way of life to southern Africa. They established settled villages, cultivated domestic crops such as sorghum, millet and beans, and they herded cattle as well as sheep and goats. These people, according to archaeological evidence, spoke early variations of the Bantu Language. Because they produced their own iron tools, archaeologists call this the Iron Age.
Early Iron Age AD 200 - AD 900
Middle Iron Age AD 900 - AD 1300
Late Iron Age AD 1300 - AD 1830

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

Precipitation: Any form of water, such as rain, snow, sleet, or hail that falls to the earth's surface.

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

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

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

Stone Age: The first and longest part of human history is the Stone Age, which began with the appearance of early humans between 3-2 million years ago. Stone Age people were hunters, gatherers and scavengers who did not live in permanently settled communities. Their stone tools preserve well and are found in most places in South Africa and elsewhere.
Early Stone Age 2 000 000 - 150 000 Before Present
Middle Stone Age 150 000 - 30 000 BP
Late Stone Age 30 000 - until c. AD 200

List of Abbreviations

AP - Action Plan
BID - Background Information Document
CARA - Conservation of Agricultural Resources Act
CISPR - International Special Committee of Radio Interferences
CSP - Concentrated Solar Power
DEA - Department of Environmental Affairs
DSR - Draft Scoping Report
DoE - Department of Energy
DM - District Municipality
DWS - Department of Water and Sanitation
EAP - Environmental Assessment Practitioner
EHS - Environmental, Health, and Safety
EIA - Environmental Impact Assessment
EIR - Environmental Impact Report
EMPr - Environmental Management Programme
ECA - Environmental Conservation Act No 73 of 1989
EMI - Electromagnetic Interference
EP - Equator Principles
EPFI - Equator Principles Financial Institutions
ERA - The Electricity Regulation Act No. 4 of 2006
FGM - Focus Group Meeting
FSR - Final Scoping Report
GDP - Gross Domestic Product
GIIP - Good International Industry Practice
GIS - Geographic Information System
GW - Gigawatts
HIA - Heritage Impact Assessment
I&AP(s) - Interested and Affected Parties
IBA(s) - Important Bird Area(s)
IDP - Integrated Development Plan
IEP - Integrated Energy Plan
IFC - International Finance Corporation
IPP(s) - Independent Power Producers
IRP - Integrated Resource Plan
IUCN - International Union for the Conservation of Nature and Natural Resources
KSW - Key Stakeholder Workshop
kV - Kilo Volt
LM - Local Municipality
MSA - Middle Stone Age

MW - Megawatt
NC DENC- Northern Cape Department of Environment and Nature Conservation
NEA - The National Energy Act No. 34 of 2008
NEMA - National Environmental Management Act No. 107 of 1998
NEMBA- National Environmental Management: Biodiversity Act No. 10 of 2004
NHRA - National Heritage Resources Act No. 25 of 1999
NSBA - National Spatial Biodiversity Assessment
NWA - National Water Act No. 36 of 1998
NEMAA- National Environmental Management: Air Quality Act of 2004
NPAES -National Parks Area Expansion Strategy
OHSA - Occupational Health and Safety Act No. 85 of 1993
PoS - Plan of Study
PM - Public Meeting
PPA - Power Purchase Agreement
PPP - Public Participation Process
PV - Photovoltaic
RFI - Radio Frequency Interference
RFP - Request for Proposals
RFQ - Request for Qualifications
SA - South Africa
SABAP 2 - Southern African Bird Atlas Project 2
SAHRA - South African Heritage Resources Agency
SALT - Southern African Large Telescope
SANBI - South African National Biodiversity Institute
SDF - Spatial Development Framework
SKA - Square Kilometre Array
SPVs - Special Purpose Vehicles
TL - Terrain Loss
WETFEPA –Wetland Freshwater Priority Areas

BIOTHERM ENERGY

PROPOSED CONSTRUCTION OF THE HELENA 1 SOLAR PHOTOVOLTAIC (PV) ENERGY FACILITY NEAR COPPERTON, NORTHERN CAPE PROVINCE

DRAFT SCOPING REPORT

1 INTRODUCTION

BioTherm Energy (Pty) Ltd (hereafter referred to as BioTherm) intends to develop the Helena 1 solar photovoltaic (PV) energy facility (hereafter referred to as the "proposed development") near Copperton in the Northern Cape Province of South Africa. The proposed project will consist of a 75MW export capacity solar PV energy facility. SiVEST Environmental Division has been appointed as independent Environmental Assessment Practitioner (EAP) to undertake the Environmental Impact Assessment (EIA) for the proposed development. The overall objective of the project is to generate electricity to feed into the National Grid by constructing a solar PV energy facility (and associated infrastructure).

This proposed PV energy facility forms one of three PV energy facilities with a 75MW export capacity that BioTherm are proposing to develop on Portion 3 of the farm Klipgats Pan No 117. In order to accommodate the Department of Energy's (DoE) competitive bidding process for procuring renewable energy from Independent Power Producers in South Africa each PV energy facility will be developed under a separate Special Purpose Vehicle (SPV) and therefore each requires a separate Environmental Authorisation. Although each PV energy facility will be assessed separately, a single public participation process is being undertaken to consider all three proposed developments and the potential environmental impacts associated with all three PV developments will be assessed during the EIA phase as part of the cumulative impact assessment. Additionally, the the possibility to allow shared associated infrastructure will be considered. The reference numbers allocated for the other two proposed PV energy facilities are as follows:

- **Helena Solar 2:**
  DEA Ref. No.: 14/12/16/3/3/2/766
- **Helena Solar 3:**
  DEA Ref. No.: 14/12/16/3/3/2/767

The proposed development requires Environmental Authorisation from the Department of Environmental Affairs (DEA). However, the provincial authority will also be consulted (i.e. the Northern Cape Department of Environmental Affairs and Nature Conservation (NC DENC). The EIA for the proposed development will

be conducted in terms of the EIA Regulations promulgated in terms of Chapter 5 NEMA (National Environmental Management Act), which came into effect on the 2nd of August 2010. In terms of these regulations, a full EIA is required for the proposed project. All relevant legislations and guidelines (including Equator Principles) will be consulted during the EIA process and will be complied with at all times.

As previously mentioned, this Scoping Report is compiled in accordance with the Equator Principles (EP), which is a financial industry benchmark for determining, assessing and managing social and environmental risk in project financing (Equator Principles, 2006). This proposed development is considered a Category B project, which are those with potential limited adverse social or environmental impacts that are few in number, generally site-specific, largely reversible and readily addressed through mitigation measures (Equator Principles, 2006). The project will also comply with the International Finance Corporation's (IFC) Social and Environmental Performance Standards (2006).

1.1 Objectives of the Scoping Phase

The NEMA EIA Regulations (GN. R. 543) state that the objectives of a Scoping study are to identify:

- 27 (e) (i): issues that will be relevant for consideration of the application;
- 27 (e) (ii): the potential environmental impact of the proposed activity; and
- 27 (e) (iii): alternatives to the proposed activity that are feasible and reasonable.

The primary purpose of the Scoping phase is to establish baseline information with regards to the environment within which the project is proposed to take place and to determine feasible and reasonable alternatives associated with the activities. In this context the environment is taken to include the natural, cultural, social and economic environments, with baseline information being the current conditions of the various environments. Various specialists have undertaken studies to ascertain the current conditions in the study area in their specific field, all of which is done within the framework of the project description.

Having established the baseline information, specialists are then required to identify possible impacts of the proposed development on the specific environment that their field encompasses. These potential impacts are set out in several tables below. Note that the impacts detailed in the tables are provisional and additional impacts may be identified during the EIA Phase, while other identified impacts may fall away.

As part of their assessments the specialists will also be conducting a preliminary investigation on the alternatives that are available at this stage. These alternatives can include the option of not implementing the activity, the location, type of activity, layout of the activity, technology to be used, and operational aspects of the activity. It is likely that the assessment of alternatives will be more detailed in the impact phase of the EIA as the specialist findings in the scoping phase will help to inform the identification of alternatives.

During the scoping phase, alternative layouts and power line route alternatives were identified that are reasonable and feasible. These alternatives are described in Chapter 9. In accordance with the EIA Regulations, 2010, a detailed comparative assessment of the identified layout alternatives will be undertaken during the EIA phase. The advantages and disadvantages of the no-go alternative are also described in this DSR as well as the potential advantages and disadvantages of the proposed layout alternatives.

An additional objective of the Scoping phase is to provide Interested and Affected Parties (I&APs) with information regarding the project and also the opportunity to raise issues regarding the project, submit comments and ask questions. The Public Participation Process (PPP) undertaken during the Scoping Phase is also reported on below. The PPP section provides details on the greater process as well as listing the comments and concerns raised by I&APs.

1.2 Applicable Documentation

The following documentation should be read in conjunction with this Scoping Report:

- "Equator Principles" 2006
- International Finance Corporation's (IFC) Performance Standards on Social and Environment, April 2006, namely:
    - Performance Standard 1: Social and Environmental Assessment and Management Systems
    - Performance Standard 2: Labour and Working Conditions
    - Performance Standard 3: Pollution Prevention and Abatement
    - Performance Standard 4: Community Health, Safety and Security
    - Performance Standard 5: Land Acquisition and Involuntary Resettlement
    - Performance Standard 6: Biodiversity Conservation and Sustainable Natural Resource Management
    - Performance Standard 7: Indigenous Peoples
    - Performance Standard 8: Cultural Heritage
- International Finance Corporation – World Bank Guidelines, General Environmental Health and Safety (EHS) Guidelines 2007.

The EHS Guidelines are technical reference documents with general and industry-specific examples of Good International Industry Practice (GIIP). These EHS Guidelines are applied as required by the World Bank's respective policies and standards. These General EHS Guidelines are designed to be used together with the relevant Industry Sector EHS Guidelines which provide guidance to users on EHS issues in specific industry sectors. The IFC handbook is contained in Appendix 1.

1.3 Specialist Studies

Specialist studies have been conducted in terms of the stipulations contained within Section 28 (1) of the 2010 NEMA EIA regulations.

The following specialist studies have been conducted for the area:

- Biodiversity Assessment
- Avifauna Assessment
- Surface Water Impact Assessment
- Soils and Agricultural Potential Assessment
- Visual Impact Assessment
- Heritage Assessment
- Socio-economic Assessment

These studies have been used to identify issues at a scoping level and will be supplemented with more site specific studies during the EIA phase of the project. Key issues relating to the proposed site are discussed below.

1.4 Authority Consultation

The National Department of Environmental Affairs (DEA) is the competent authority on this project. As such an application for environmental authoristaion (EA) for the proposed development was submitted to DEA on the 5th of December 2014. A proof of payment, details of the EAP and declaration of interest, a project schedule, details of landowners, and locality map formed part of the application form and were submitted accordingly on the same date. The DEA acknowledged the application on the 15th of January 2015 and the proposed project was allocated the following reference number 14/12/16/3/3/2/765 (Appendix 4). Authorisation was thus granted to undertake a Scoping study and submit a Scoping Report for the proposed development.

1.5 Expertise of Environmental Assessment Practitioner

SiVEST has considerable experience in the undertaking of EIAs. Staff and specialists who have worked on this project and contributed to the compilation of this Scoping Report are detailed in Table 1 below.

Table 1: Project Team

Name and Organisation	Role
Rebecca Thomas – SiVEST	Project Leader

Name and Organisation	Role
Andrea Gibb – SiVEST	Environmental Assessment Practitioner (EAP) and Visual
Lynsey Rimbault – SiVEST	Environmental Consultant / Public Participation Practitioner
David Hoare – David Hoare Consulting	Biodiversity
Chris van Rooyen – Chris van Rooyen Consulting	Avifauna
Shaun Taylor and Alistair Fyfe – SiVEST	Surface Water
D.G. Paterson – ARC Institute for Soil, Climate and Water	Agricultural Potential
Wouter Fourie – PGS	Heritage
Elena Broughton – Urban-Econ Development Economists	Socio-economic
Nicolene Venter – Zitholele Consulting	Senior Public Participation Practitioner
Kerry Schwartz – SiVEST	GIS and Mapping

Please refer to attached CV's for more information in Appendix 2. Declarations of independence of each specialist are contained in Appendix 3.

1.6 Draft Scoping Report Structure

This Draft Scoping Report (DSR) is structured as follows:

- Chapter 1 introduces the project and explains the objectives of the Scoping phase. The chapter also outlines the relevance of the Equator Principles as well as the IFC Performance Standards and points out the specialist studies for the project. It describes the authority consultation thus far. Furthermore, the chapter discusses the experience of the Environmental Assessment Practitioners (EAP), including specialists, who have contributed to the report.
- Chapter 2 presents the technical description of the project, including a description of alternatives being considered.
- Chapter 3 expands on the relevant legal ramifications applicable to the project and describes relevant development strategies and guidelines.
- Chapter 4 provides explanation to the need and desirability of the proposed project.
- Chapter 5 provides a description of the region in which the proposed development is intended to be located. Although the chapter provides a broad overview of the region, it is also specific to the application. It contains descriptions of the site and the specialist studies are also summarised.

- Chapter 6 identifies potential impacts associated with the proposed solar PV energy facility as well as the substation. The chapter further identifies these impacts per specialist study and discusses potential cumulative impacts.
- Chapter 7 describes the Public Participation Process (PPP) undertaken during the Scoping Phase and tables issues and concerns raised by Interested and Affected Parties (I&APs).
- Chapter 8 provides an assessment of the report in terms of the Equator Principles.
- Chapter 9 provides a conclusion to the DSR and recommendations to be addressed in further assessment.
- Chapter 10 describes the environmental impact reporting phase of the EIA (i.e. the way forward for this study and includes the Plan of Study for EIA).
- Chapter 11 lists references indicated in the DSR.

2 TECHNICAL DESCRIPTION

The proposed project will encompass the installation of a solar PV field and associated components, in order to generate electricity that is to be fed into the Eskom grid. The facility will have a maximum export capacity of 75MW. The total area of the solar PV arrays has not been determined and will be determined during the EIA phase, however the proposed development area is approximately 430 ha. Additionally, the substation assessment has an area of approximately 24 ha. It is envisaged that the 75MW energy facility layout will require approximately 250 ha. During the scoping phase the entire development area will be assessed in order to finalise layout alternatives for the solar PV energy facility. These layout alternatives will be presented in the Plan of Study for the EIA Phase (Chapter 10). The voltage of the connection lines from the solar PV energy facility substation to the grid is likely to be 132kV.

2.1 PV Project Components

BioTherm is proposing the establishment of a solar PV energy facility on the development site near Copperton (Figure 1). As mentioned, the objective of the solar project is to generate electricity to feed into the national grid. The solar PV energy facility will have a maximum export capacity of 75MW.

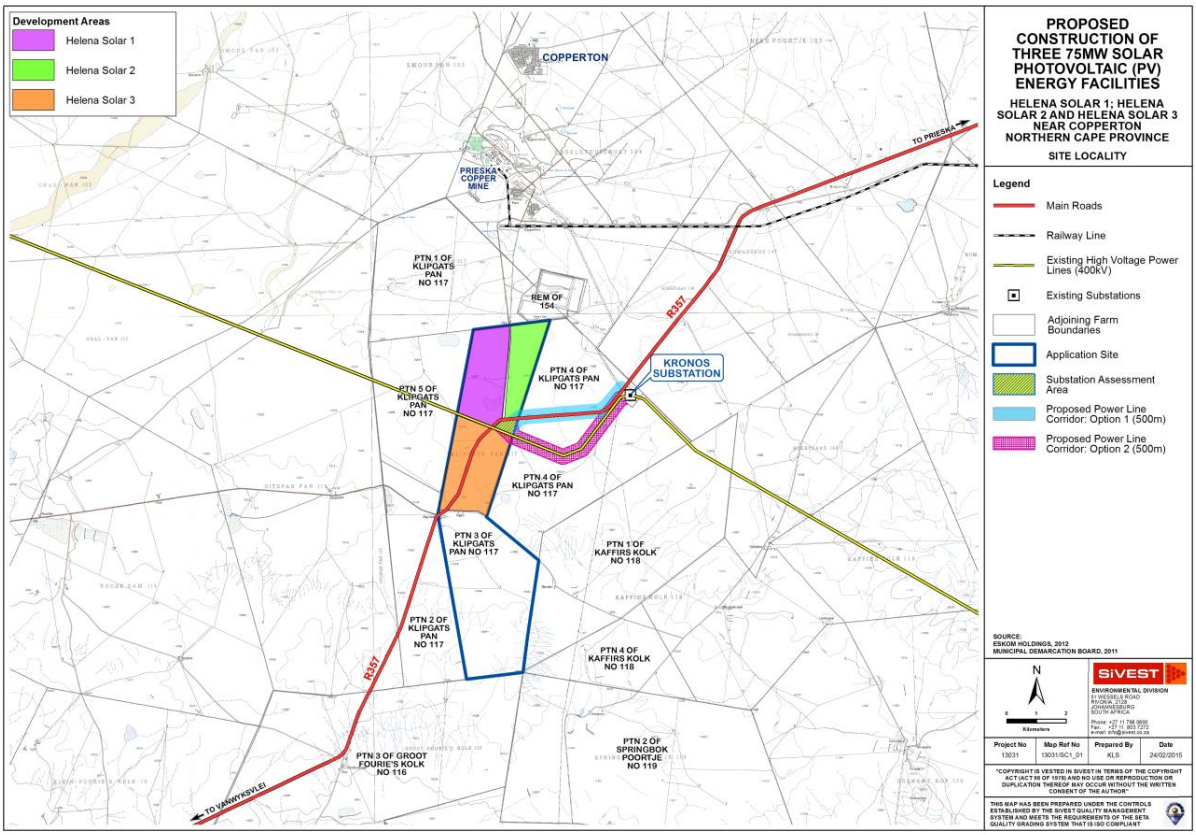

Figure 1: Proposed solar PV energy facility study area

The key technical details and infrastructure required is presented in the table below (Table 2).

Table 2: Helena Solar 1 phase summary

Phase Name	DEA Reference	Farm name and area	Technical details and infrastructure necessary for each phase
Helena Solar 1	14/12/16/3/3/2/765	Portion 3 of Klipgats Pan No 117 (PV site) and Portion 4 of Klipgats Pan No 117 (power lines) PV Site Area: 427.56 ha	▪ Approximately 300 000 **solar PV panels** with a total export capacity of 75MW; ▪ Panels will be either **fixed axis mounting or single axis tracking solutions**, and will be either crystalline silicon or thin film technology; ▪ Onsite **switching station**, with the transformers for voltage step up from medium voltage to high voltage; ▪ The panels will be connected in strings to inverters, approximately **43 inverter stations** will be required throughout the site. Inverter stations will house 2 x 1MW inverters and 1 x 2MVA transformers; ▪ DC power from the panels will be converted into AC power in the inverters and the voltage will be stepped up to 22-33kV (medium voltage) in the transformers. ▪ The **22-33kV cables** will be run underground in the facility to a common point before being fed to the **onsite substation** where the voltage will typically be stepped up to 132kV. ▪ Grid connection is to the Kronos substation. A **power line** with a voltage of 132kV is proposed and will run from the onsite substation to the Kronos substation. The distance will be about 4km. The final grid connection voltage will be below 275kV. ▪ A **laydown area** for the temporary storage of materials during the construction activities; ▪ **Access roads and internal roads**; ▪ Construction of a **car park and fencing** around the project; and ▪ **Administration, control and warehouse buildings**

As previously mentioned, this proposed PV energy facility forms one of three PV energy facilities with a 75MW export capacity that BioTherm are proposing to develop on Portion 3 of the farm Klipgats Pan No. In order to accommodate the Department of Energy's (DoE) competitive bidding process for procuring renewable energy from Independent Power Producers in South Africa each PV energy facility will be developed under a separate Special Purpose Vehicle (SPV) and therefore each requires a separate Environmental Authorisation. However, the the possibility to allow shared associated infrastructure will be considered.

2.2 Solar Field

Solar PV panels are usually arranged in rows or 'arrays' consisting of a number of PV panels. The area required for the PV panel arrays will likely need to be entirely cleared or graded. Where tall vegetation is present, this vegetation will be removed from the PV array area.

Approximately 300 000 solar PV panels will be required per project for a total export capacity of 75MW. Support structures will be either fixed axis mounting or single axis tracking solutions and the modules will be either crystalline silicon or thin film technology. The solar PV panels are variable in size, and are affected by advances in technology between project inception and project realisation. The actual size of the PV panels to be used will be determined in the final design stages of the project. The PV panels are mounted onto metal frames which are usually aluminium. Rammed or screw pile foundations are commonly used to support the panel arrays (Figure 2).

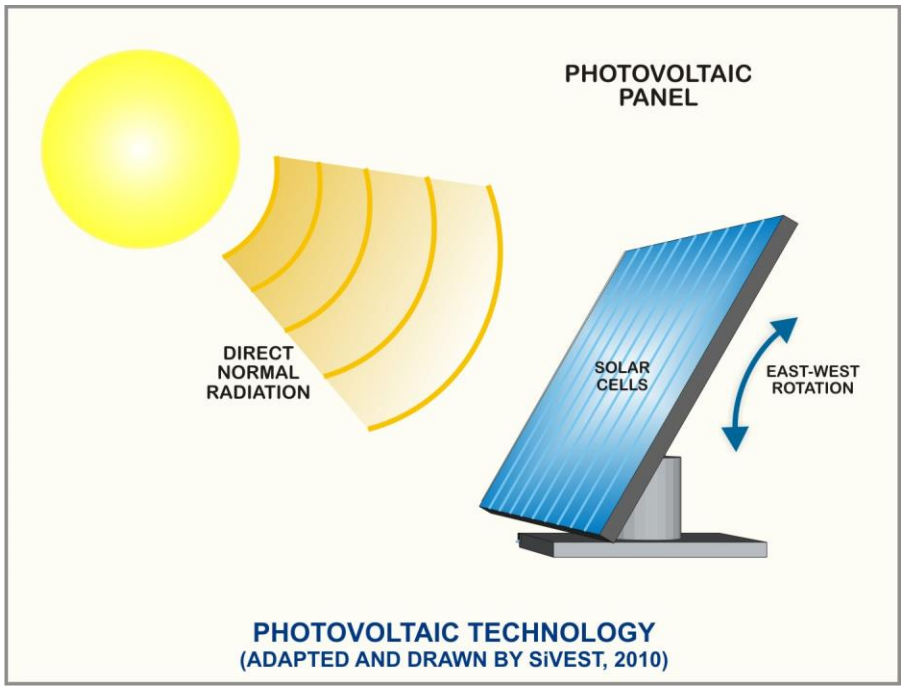

Figure 2: Example of a Photovoltaic Panel with tracking capability.

2.3 Associated Infrastructure

2.3.1 Electrical Infrastructure

The solar PV panel arrays are connected to each other in strings, which are in turn connected to inverters. For a 75MW size facility, typically 2MW inverter stations which are containerised stations housing 2x1MW inverters and 1x2MVA transformers will be used; therefore approximately 43 inverter stations will be required throughout the site for the proposed solar PV energy facility (Figure 3). DC power from the panels will be converted into AC power in the inverters and the voltage will be stepped up to 22-33kV (medium voltage) in the transformers. The 22-33kV cables will be run underground in the facility to a common point before being fed to the onsite substation and switching station where the voltage will typically be stepped up to 132kV. A Power line with a voltage of up to 132kV will run from the onsite substation to the existing Kronos substation. The distance will be about 4km.

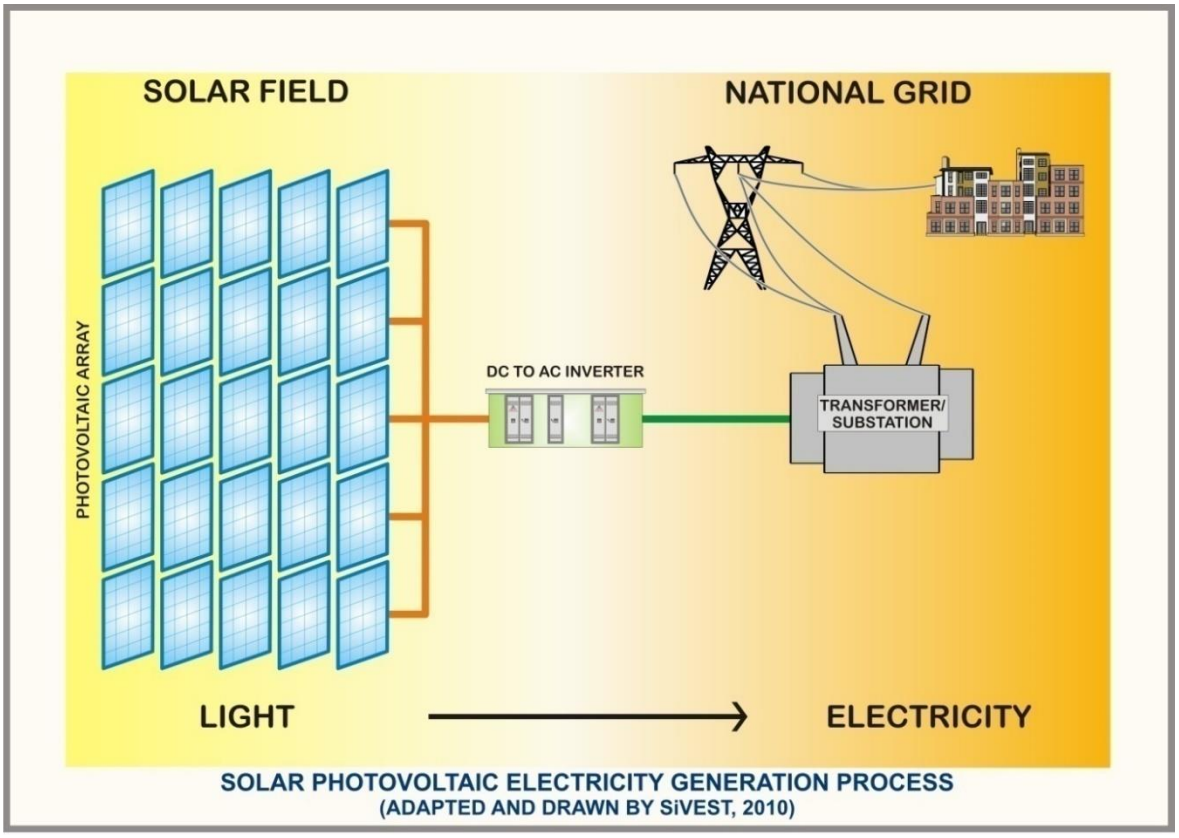

Figure 3: PV process

2.3.2 Buildings

The solar field will require onsite buildings which will be used in the daily operation of the plant and includes an administration building (office). Potential locations for the administration building will be determined at a later stage during the EIA process based on any environmental constraints identified and design factors that need to be considered. The buildings will likely be single storey buildings which will be required to accommodate the following:

- Control room
- Workshop
- High Voltage (HV) switchgear
- Mess Room
- Toilets
- Warehouse for storage
- Car park and fencing around the project

2.3.3 Construction Lay-down Area

A general construction lay-down area will be required for the construction phase of the proposed solar PV energy facility. The size of this area is yet to be determined, but 3 to 5 hectares is likely. The location of the construction lay-down area will be determined at a later stage in the EIA process based on environmental constraints and design factors.

2.3.4 Other Associated Infrastructure

Other associated infrastructure includes the following:

- Access roads and internal roads;
- A car park; and
- Fencing around the project.

2.4 Alternatives

As per Chapter 1 of the EIA regulations (2010), feasible and reasonable alternatives are required to be considered during the EIA process. Alternatives are defined at "different means of meeting the general purpose and requirements of the activity" These alternatives may include:

(a) The property on which or location where it is proposed to undertake the activity;
(b) The type of activity to be undertaken;
(c) The design or layout of the activity;
(d) The technology to be used in the activity;
(e) The operational aspects of the activity; and
(f) The option of not implementing the activity.

Each of this alternatives is discussed in relation to the proposed project in the sections below.

2.4.1 The property on which or location where it is proposed to undertake the activity;

No site alternatives for this project are being considered because the placement of solar PV installations is dependent on several factors, all of which are favourable at the proposed site location. These include solar resource, climate, topography, grid connections and access to the site. The project site near Copperton has been identified through pre-feasibility studies conducted by BioTherm based on an estimation of the solar energy resource as well as weather, dust, dirt, and surface albedo. Grid connection and land availability were also important initial considerations. The Northern Cape has the highest levels of solar potential in the country, and the project site has a relatively flat topography that is suitable for facilities of this kind. The project site also has advantageous grid connection potential, with the existing Kronos substation approximately 4km away. The site is also easily accessible as the R357 transects the farm. The site is therefore considered highly suitable for the proposed development and no other locations are being considered.

2.4.2 The type of activity to be undertaken;

No other activity alternatives are being considered. Renewable energy development in South Africa is highly desirable from a social, environmental and development point of view. Wind energy installations are not feasible on the site as there is not enough of a wind resource. Concentrated solar power (CSP) installations are also not feasible because they have a high water requirement and the project site is located in an arid area. Therefore solar PV is the only activity being considered for the proposed site.

2.4.3 The design or layout of the activity;

Design or layout alternatives are being considered in the EIA process. Various environmental specialists assessed the site during the scoping phase. Their assessments encompassed the entire proposed development site and included the identification of sensitive areas. These sensitive areas were used during the scoping phase to guide layout design for the proposed solar PV energy facility. These layouts will be extensively investigated in the EIA phase of the project (see the plan of study for the EIA phase in Chapter 10 of the DSR). The design and layout alternatives will include; power line routes, internal roads and alternative locations for the substation. The layout alternatives will be based on both environmental constraints and design factors. The layout alternatives, including maps, are presented in Chapter 9.

2.4.4 The technology to be used in the activity;

There are very few technological alternatives for PV technology. For the Helena solar energy facility the mounting structures will be either fixed axis mounting or single axis tracking solutions, and the modules will be either crystalline silicon or thin film technology. The impacts on the environment of the different types of PV technology are the same during construction, operation and decommissioning. Therefore no technology alternatives will be considered during the EIA. The choice of technology used will ultimately be determined by technological and economic factors at a later stage.

2.4.5 The operational aspects of the activity; and

No operational alternatives were assessed in the EIA, as none are available for solar PV installations.

2.4.6 The option of not implementing the activity.

The option of not implementing the activity, or **the 'no-go' alternative, is considered in the EIA**. South Africa is under immense pressure to provide electricity generating capacity in order to reduce the current electricity demand in the country. With the global focus on climate change, the government is under severe pressure to explore alternative energy sources in addition to coal-fired power stations. Although solar power is not the only solution to solving the energy crisis in South Africa, not establishing the proposed solar PV energy facility would be detrimental to the mandate that the government has set to promote the implementation of renewable energy. It is a suitable sustainable solution to the energy crisis and this project could contribute to addressing the problem. This project will aid in achieving South Africa's goals in terms of sustainability, energy security, mitigating energy cost risks, local economic development and national job creation.

3 LEGAL REQUIREMENTS AND GUIDELINES

3.1 Key Legal and Administrative Requirements Relating to the Proposed Development

3.1.1 National Environmental Management Act No. 107 of 1998 – NEMA EIA Requirements

The National Environmental Management Act (Act No. 107 of 1998) was promulgated in 1998 but has since been amended on several occasions from this date. This Act replaces parts of the Environment Conservation Act (Act No 73 of 1989) with exception to certain parts pertaining to Integrated Environmental Management. The act intends to provide for:

- co-operative environmental governance by establishing principles for decision-making on matters affecting the environment;
- institutions that will promote co-operative governance and procedures for coordinating environmental functions exercised by organs of state;
- to provide for the prohibition, restriction or control of activities which are likely to have a detrimental effect on the environment;
- and to provide for matters connected therewith.

NEMA now governs the EIA process with the recent promulgation of the new EIA regulations in June 2010 (Government Gazette No. 33306 of 18th June 2010).

Activities that may significantly affect the environment must be considered, investigated and assessed prior to implementation.

In terms of the newly released EIA Regulations promulgated in terms of Chapter 5 NEMA (National Environmental Management Act), which came into effect on 2nd August 2010, a full EIA is required for the proposed project.

3.1.2 NEMA EIA Requirements

Sections 24 and 44 of NEMA make provision for the promulgation of regulations that identify activities which may not commence without an environmental authorisation, the result being that NEMA now governs the EIA process with the said promulgation of EIA Regulations in December 2014 (Government Gazette No. 38282 of 04 December 2014). However the EIA for this proposed project was initiated with the submission of the application form on the 5th of December 2014, prior to the EIA Regulations 2014 coming into effect, . Therefore in accordance with Regulation 53 (1) of the 2014 EIA Regulations, any applications submitted in terms of the previous NEMA regulations must be undertaken as if the previous NEMA regulations were not repealed. **This EIA has therefore been undertaken in accordance with the NEMA EIA 2010 Regulations which are contained in four Government Notices (GN 543, 544, 545 and 546) which were promulgated on 18 June 2010 and came into effect on 02 August 2010.**

In terms of these Regulations, a full Environmental Impact Assessment is required for the proposed development based on triggered activities. However, several activities which trigger a basic assessment were also identified and need also be specified. Ultimately, these activities will not form a separate assessment, but will fall into the greater EIA.

The following Schedules of the Government Notice No. R. 544 - 546 of the 18th June 2010 are of relevance to the project in question. All of the Listed Activities identified in terms of Sections 24(2) and 24D include:

Table 3: Listed activities in terms of the NEMA Regulations

Number and date of the relevant notice:	**Activity No (s)**	**Description of listed activity**
Government Notice R544 (18 June 2010)	Activity 10	The construction of facilities or infrastructure for the transmission and distribution of electricity- *i. outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts.* **Power lines are proposed to connect the Photovoltaic Plant to the Eskom Grid at the Kronos Substation. The proposed power lines will be located outside an urban area and will have a capacity of 132kV.**
	Activity 11	The construction of (iii) bridges…(xi) infrastructure or structures covering 50 square metres or more, where such infrastructure occurs within a water course or within 32 metres of a watercourse, measured from the edge of the water course…. **The surface water desktop study revealed that four depression wetlands and two unnamed non-perennial rivers wetlands occur on the proposed development site. The proximity of the proposed development footprint to watercourses will be determined during the EIA phase once final layouts have been**

		selected and after detailed specialist studies have been undertaken.
	Activity 18	The infilling or deposition of any material of more than 5 cubic metres into, or the dredging. Excavation, removal of moving of soil, sand, sand….pebbles or rock from a watercourse may occur during the construction of the access road or any other infrastructure associate with the proposed solar energy plant. **The surface water desktop study revealed that four depression wetlands and two unnamed non-perennial rivers wetlands occur on the proposed development site. The proximity of the proposed development footprint to watercourses will be determined during the EIA phase once final layouts have been selected and after detailed specialist studies have been undertaken. Should construction activities take place within a watercourse soil is likely to be removed**.
	Activity 22	The construction of a road, outside urban areas, i) with a reserve wider than 13.5m or ii) where no reserve exists where the road is wider than 8m. iii) for which an environmental authorisation was obtained for the route determination in terms of activity 5 in Government Notice 387 of 2006 or activity 18 in Notice 545 of 2010. **On site roads will be required for the proposed development. The width of these roads will be determined during the EIA phase of the project.**
	Activity 26	Any process or activity identified in terms of section 53(1) of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004). **A preliminary Biodiversity Scoping Study suggests the potential presence of one protected tree species, two protected plant species, and of one plant species of concern that is listed as Near Threatened. As well as the potential presence of 13 animal species of potential conservation concern. The impact of the proposed development on species of conservation concern will be determined during the next phase of the EIA once detailed specialist studies have been undertaken. Should Red Data species be affected by the proposed development during construction or operation a permit in terms of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) would be required.**
	Activity 39	The expansion of (iii) bridges; within a watercourse or within 32 metres of a watercourse, measured from the edge of a watercourse, where such expansion will result in an increased development

		footprint but excluding where such expansion will occur behind the development setback line. **Existing access roads may need to be upgraded in order to access the site. The surface water desktop study revealed that four depression wetlands and two unnamed non-perennial rivers wetlands occur on the proposed development site. Upgrading the existing access roads might require the expansion of existing bridges crossing watercourses. The requirement of the expansion of bridges will be determined during the EIA phase of the project.**
	Activity 47	The widening of a road by more than 6m, or the lengthening of a road by more than 1km: iii) where the existing reserve is wider than 13,5m; or iv) where no reserve exists, where the existing road is wider than 8m. **The requirement of a widening or lengthening a road associated with the proposed development will be determined during the EIA phase of the project.**
Government Notice R545 (18 June 2010)	Activity 1	The construction of facilities or infrastructure, including associated structures or infrastructure, for the generation of electricity where the electricity output is 20 megawatts or more. **It is proposed that a solar PV energy facility with a maximum export capacity of 75MW will be constructed.**
	Activity 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) Agriculture or afforestation where the activity 16 in this schedule will apply* **The proposed development will transform more than 20 hectares of undeveloped, vacant or derelict land to industrial use (solar PV energy facility). The exact size of the development footprint will be determined during the EIA phase, however the proposed development site is approximately 428ha and the Substation Assessment Area is 24ha.**
	Activity 4:	The construction of a road wider than 4 metres with a reserve less than 13,5 metres - *Outside urban areas, in:*

Government Notice R546 (18 June 2010)		*cc) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority;* *dd) Sites or areas identified in terms of an International Convention;* *ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;* **Internal access roads between the arrays and the onsite substation will be required. According to the National Parks Area Expansion Strategy (NPAES), there is an area 15km to the east of the project study area that has been identified as priority areas for inclusion in future protected areas. This particular component of the landscape is considered to be of high biodiversity value by National Parks, but the proposed project does not affect this area at all and is further away than 10 kilometres. The proximity of the development in relation to other sensitive areas will be confirmed during the EIA phase of the project with input from the detailed biodiversity impact report and through consultation with the provincial and local authorities.**
	Activity 12:	The clearance of an area of 300 square metres or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation. *a) within any critically endangered or endangered ecosystem listed in terms of section 52 of the NEMBA or prior to the publication of such a list, within an area that has been identified as critically endangered in the National Spatial Biodiversity Assessment 2004;* *b) Within critical biodiversity areas identified in bioregional plans;* **More than 300 square metres of vegetation would need to be cleared for the proposed solar PV energy facility and associated infrastructure. The nature of the vegetation on site and the proximity of the development in relation to endangered and critical biodiversity areas will be confirmed during the EIA phase of the project with input from the detailed biodiversity impact report.**
	Activity 13	The clearance of an area of 1 hectare or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation, in: (a) Critical biodiversity areas and ecological support areas as identified in systematic biodiversity plans adopted by the competent authority. (b) National Protected Area Expansion Strategy Focus areas. **(c) In the Northern Cape:**

		Outside urban areas, the following: *cc) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority;* *dd) Sites or areas identified in terms of an International Convention;* **More than 1 hectare of vegetation would need to be cleared for the proposed solar PV energy facility and associated infrastructure. The nature of the vegetation on site and the proximity of the development in relation to sensitive areas will be confirmed during the EIA phase of the project with input from the detailed biodiversity impact report.**
	Activity 14	The clearance of an area of 5 hectares or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation **(a) In the Northern Cape** *i) All areas outside urban areas* **More than 5 hectares of vegetation would need to be cleared for the proposed solar PV energy facility and associated infrastructure. The sites fall within the Nama-Karoo Biome and includes the vegetation types of Bushmanland Basin Shrubland, Bushmanland Vloere, and Bushmanland Arid Grassland. The nature of the vegetation on site will be confirmed during the EIA phase of the project with input from the detailed biodiversity impact report.**
	Activity 16	The construction of: 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. **a) In the Northern Cape** ii) Outside urban areas, in: *dd) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority;* *ee) Sites or areas identified in terms of an International Convention;* *ff) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;*

		The surface water desktop study revealed that four depression wetlands and two unnamed non-perennial rivers wetlands occur on the proposed development site. Proximity of the final layout to watercourses and sensitive areas will be determined during the EIA, after detailed surface water field studies have been conducted.
	Activity 19	The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 kilometre. **a) In the Northern Cape** iii) Outside urban areas, in: *(cc) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority;* *dd) Sites or areas identified in terms of an International Convention;* *ee) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;* *(ii) Areas on the watercourse side of the development setback line or within 100 metres from the edge of a watercourse where no such setback line has been determined.* **Existing access roads will need to be upgraded in order to access the site. Upgrading the existing roads could involve widening and lengthening of the road. Proximity of the development to watercourses and sensitive areas will be determined during the EIA.**

3.1.3 National Heritage Resources Act No. 25 of 1999

This Act requires all developers to undertake archaeological impact studies whenever any type of development activity is undertaken. Preliminary archaeological impact studies will consequently become a common procedure for all development activities, even if such development may be exempted in terms of the National Environmental Management Act (Act No 107 of 1998).

The law ensures community participation in the protection of national heritage resources and will involve all three levels of government in the management of the country's national heritage. The South African Heritage Resources Agency (SAHRA) will establish and maintain a national policy, strategy plans and standards for heritage resources management and will monitor the system as a whole.

Heritage authorities will assist and co-operate with individuals and organisations concerned with the study, the conservation, promotion and utilisation of national heritage resources. A newly established National Heritage Resources Fund will provide financial assistance for heritage projects.

A heritage assessment has been conducted to explore how the proposed development may impact on heritage resources as protected by the Act.

3.1.4 National Water Act No. 36 of 1998

The National Water Act (NWA) No 36 of 1998 was promulgated on the 20th August 1998. This Act is important in that it provides a framework to protect water resources against over exploitation and to ensure that there is water for socio-economic and economic development, human needs and to meet the needs of the aquatic environment. The Act also recognises that water belongs to the whole nation for the benefit of all people.

It is important to note that water resources are protected under the Act. Under the act, water resources as defined include a watercourse, surface water, estuary or aquifer. A watercourse is defined as a river or spring, a natural channel in which water flows regularly or intermittently, or a wetland, lake or dam into which, or from which water flows.

One of the main aims of the Act is the protection of water resources. 'Protection' in relation to a water resource entails:

- Maintenance of the quality of the water resource to the extent that the water use may be used in a sustainable way;
- Prevention of degradation of the water resource
- The rehabilitation of the water resource

In the context of the proposed development and any potential impact on water resources, the definition of pollution and pollution prevention contained within the Act is relevant. 'Pollution', as described by the Act is the direct or indirect alteration of the physical, chemical or biological properties of a water resource, so as to make it (*inter alia*):

- less fit for any beneficial purpose for which it may reasonably be expected to be used; or
- harmful or potentially harmful to the welfare or human beings, to any aquatic or non-aquatic organisms, or to the resource quality.

This definition of pollution is quite wide ranging, and it applies to all types of water resource. Activities which cause alteration of the biological properties of a watercourse (i.e. the fauna and flora contained within that watercourse are also considered pollution).

In terms of section 19 of the Act owners / managers / people occupying land on which any activity or process undertaken which causes, or is likely to cause pollution of a water resource must take all reasonable measures to prevent any such pollution from occurring, continuing or recurring. These measures may include (inter alia):

- measures to cease, modify, or control any act or process causing the pollution;
- comply with any prescribed waste standard or management practice;
- contain or prevent the movement of pollutants;
- remedy the effects of the pollution; and

- remedy the effects of any disturbance to the bed and banks of a watercourse.

A surface water assessment has been conducted to explore how the proposed development may impact on water resources as protected by the Act.

3.1.1 Northern Cape Nature Conservation Act, 2009 (Act No. 9 of 2009)

These are developed to protect both animal and plant species within the various provinces of the country which warrant protection. These may be species which are under threat or which are already considered to be endangered. The provincial environmental authorities are responsible for the issuing of permits in terms of this legislation. The Northern Cape Nature Conservation Act, 2009 (Act No. 9 of 2009) and the Nature and Environmental Conservation Ordinance 19 of 1974 are of relevance to the Northern Cape Province.

A biodiversity assessment has been conducted to explore how the proposed development may impact on biodiversity as protected by the Act.

3.1.2 National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)

The overarching aim of the National Environmental Management: Biodiversity Act (NEMBA) No. 10 of 2004, within the framework of NEMA, is to provide for:

- The management and conservation of biological diversity within South Africa, and of the components of such biological diversity;
- The use of indigenous biological resources in a sustainable manner; and
- The fair and equitable sharing among stakeholders of benefits arising from bio-prospecting involving indigenous biological resources.

The South African National Biodiversity Institute (SANBI) was established by the NEMBA, its purpose being (*inter alia*) to report on the status of the country's biodiversity and the conservation status of all listed threatened or protected species and ecosystems.

NEMBA provides for a range of measures to protect ecosystems and for the protection of species that are threatened or in need of protection to ensure their survival in the wild, including a prohibition on carrying out a "restricted activity" involving a specimen of a listed threatened or protected species without a permit issued in terms of Chapter 7. Lists of critically endangered, endangered, vulnerable and protected species have been published and a permit system for listed species has been established.

It is also appropriate to undertake a Faunal and Botanical Impact Assessment where proposed developments, in an area that is considered ecologically sensitive, require an environmental authorisation in terms of NEMA, with such Assessment taking place during the basic assessment or EIA. These two studies will be undertaken during the project.

The NEMBA is relevant to the proposed projects as the construction of the solar PV energy facility and other components (such as power lines and the substations) may impact negatively on biodiversity. The project proponent is therefore required to take appropriate reasonable measures to limit the impacts on biodiversity, to obtain permits if required and to also invite SANBI to provide commentary on any documentation resulting from the proposed development.

3.1.3 National Forests Act, 1998 (Act No. 84 of 1998)

The National Forest Act (NFA) was enacted to:

- Provide for the protection, management and utilisation of forests;
- The protection of certain plant and animal life;
- The regulation of trade in forest produce;
- The control and management of a national hiking way system and National Botanic Gardens.

The NFA enforces the necessity for a license to be obtained prior to destroying any indigenous tree in a natural forest and, subject to certain exemptions, cutting, disturbing, damaging, destroying or removing any protected tree. The list of protected trees is currently contained in GN 908 of 21 November 2014. Licenses are issued by the Minister and are subject to periods and conditions as may be stipulated.

The NFA is relevant to the proposed project as the removal and/or disturbance and/or clearance of indigenous vegetation may be required and a license in terms of the NFA may be required for this to be done.

3.1.4 Conservation of Agricultural Resources Act No. 43 of 1983

The Conservation of Agricultural Resources Act (CARA) No. 43 of 1983 controls the utilization of natural agricultural resources in South Africa. The Act promotes the conservation of soil, water sources and vegetation as well as the combating weeds and invader plants. The Act has been amended in part by the Abolition of Racially Based Land Measures Act, No. 108 of 1991.

The primary objective of the Act is to conserve natural agricultural resources by:
- maintaining the production potential of land;
- combating and preventing erosion and weakening or destruction of the water resources;
- protecting vegetation; and
- combating weeds and invaders plants.

The CARA is relevant to the proposed projects as the construction of a solar energy facility as well as other components (such as power lines and the substations) may impact on agricultural resources and vegetation on the site. The Act prohibits the spreading of weeds and prescribes control measures that need to be complied with in order to achieve this. As such, measures will need to be taken to protect agricultural resources and prevent weeds and exotic plants from invading the site as a result of the proposed development.

An agricultural potential assessment has been conducted to explore how the proposed development may impact on the agricultural production potential of the proposed site.

3.1.5 Subdivision of Agricultural Land Act No. 70 of 1970, as amended

The Subdivision of Agricultural Land Act No. 70 of 1970 controls the subdivision of all agricultural land in South Africa; prohibiting certain actions pertaining to agricultural land. Under the Act the owner of agricultural land is required to obtain consent from the Minister of Agriculture in order to subdivide agricultural land.

The purpose of the Act is to prevent uneconomic farming units from being created and degradation of prime agricultural land. To achieve this purpose the act also regulates leasing and selling of agricultural land as well as registration of servitudes.

The Act is of relevance to the proposed development as any land within the study area that is zoned for agricultural purposes will be regulated by this Act.

Although the whole of this Act has been repealed by section 1 of the Subdivision of Agricultural Land Act Repeal Act 64 of 1998, this Repeal Act has not been implemented and no date of coming into operation has been proclaimed.

It is important to note that the implementation of this act is problematic as the Act defines 'Agricultural Land' as being any land, except land situated in the area of jurisdiction of a municipality or town council, and subsequent to the promulgation of this Act uninterrupted Municipalities have been established throughout South Africa.

3.1.6 National Road Traffic Act No. 93 of 1996, as amended

The National Road Traffic Act (NRTA) No. 93 of 1996 provides for all road traffic matters and is applied uniformly throughout South Africa. The Act enforces the necessity of registering and licensing motor vehicles. It also stipulates requirements regarding fitness of drivers and vehicles as well as making provision for the transportation of dangerous goods.

All the requirements stipulated in the NRTA will need to be complied with during the construction and operational phases of the proposed solar PV energy facility.

3.1.7 Civil Aviation Act No. 13 of 2009

The Civil Aviation Act No. 13 of 2009 controls and regulates aviation within South Africa. It provides for the establishment of a South African Civil Aviation Authority and independent Aviation Safety Investigation Board in compliance with Annexure 13 of the Chicago Convention. It gives effect to various conventions related to

aircraft offences, civil aviation safety and security, and provides for additional measures directed at more effective control of the safety and security of aircrafts, airports and matters connected thereto.

Although the Act is not directly relevant to the proposed development, it should be considered as the establishment of a photovoltaic plant may impact on aviation and air traffic safety if located directly within aircraft flight paths.

All relevant project information was submitted to ATNS (Air Traffic and Navigation Services Company Limited), who in turn evaluated the proposed development in respect of aviation. The Civil Aviation Authority have also been consulted about the project.

3.1.8 Astronomy Geographic Advantage Act No. 21 of 2007

The Astronomy Geographic Advantage Act No. 21 of 2007 provides for:

- The preservation and protection of areas that are uniquely suited for optical and radio astronomy;
- Intergovernmental cooperation and public consultation on matters concerning nationally significant astronomy advantage areas and matters connected therewith.

In terms of section 7(1) and 7(2) of this Act, the Minister declared core astronomy advantage areas on 20 August 2010 under Regulation No. 723 of Government Notice No. 33462. As such, all land within a 3 Kilometre radius of the centre of the Southern African large Telescope (SALT) dome located in the Northern Cape Province, falls under the Sutherland Core Astronomy Advantage Area. The declaration also applies to the core astronomy advantage area containing the MeerKAT radio telescope and the core of the planned Square Kilometre Array (SKA) radio telescope.

Under Section 22(1) of the Act the Minister has the authority to protect the radio frequency spectrum for astronomy observations within a core or central astronomy advantage area. As such, the Minister may still under section 23(1) of the Act, declare that no person may undertake certain activities within a core or central astronomy advantage area. These activities include the construction, expansion or operation; of any fixed radio frequency interference source, facilities for the generation, transmission or distribution of electricity, or any activity capable of causing radio frequency interference or which may detrimentally influence the astronomy and scientific endeavours.

The South African SKA was notified of the proposed project and provided with the opportunity to comment on the project. During the scoping phase of the project the SKA submitted comments noting that based on distance to the nearest SKA station, detailed design of the solar installation, and the cumulative impact of multiple renewable energy facilities of a similar nature in the same vicinity, the proposed facility poses a high risk of detrimental impact on the SKA. The SKA project office recommended that further electromagnetic interference (EMI) and radio frequency interference (RFI) detailed studies be conducted as significant mitigation measures would be required to lower the risk of detrimental impact to an acceptable level.

As per the SKA's request a baseline EMI and RFI study has been undertaken and attached as Appendix 8B. From the results in the initial report, it is clear that at lower frequencies, emissions below the international

special committee on radio interference's (CISPR) standards are required especially in the case of the closest telescope. This is mainly due to the absence of any terrain loss (TL) over this short distance. Towards telescopes in the core site, the allowable measured levels increase slightly due to the additional TL. The possibility exists that the overall lower levels would have to be achieved to limit interference to the closest telescopes as much as possible.

Further investigation will be carried out in consultation with the SKA when final layouts are selected and the results of the study will be adjusted accordingly. The requirement for mitigation measures will be determined in consultation with the SKA. The study is attached to this DSR and will also be supplied to the SKA in order for them to provide further comment (Refer to Appendix 8B). Any additional correspondence with the SKA will be included in the DEIR.

3.1.9 Additional Relevant Legislation

- Occupational Health and Safety Act No. 85 of 1993
- National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004)
- National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008)
- Development Facilitation Act No. 67 of 1995
- Northern Cape Planning and Development Act, 1998 (Act No. 7 of 1998)

3.2 Key Development Strategies and Guidelines

3.2.1 Integrated Development Plans

An Integrated Development Plan (IDP) is defined in the Local Government: Municipal Systems Act No. 32 of 2000), as an inclusive and strategic plan that:

- Links, integrates and co-ordinates plans and takes into account proposals for the development of the municipality;
- Aligns the resources and capacity of the municipality with the implementation of the plan
- Forms the policy framework on which annual budgets must be based; and
- Is compatible with national and provincial development plans and planning requirements binding on the municipality in terms of legislation.

The main purpose of the IDP is considered the enhancement of service delivery and fighting poverty through an integrated and aligned approach between different role-players and stakeholders.

Each municipality is required to produce an IDP which would address pertinent issues relevant to their municipality. However, common concerns include municipal transformation and development, and service delivery and infrastructural development.

The proposed solar PV energy facility falls within the Siyathemba Local Municipality (LM), which is located within the greater Pixley ka Seme District Municipality (DM). The Siyathemba LM IDP for 2014/2015 identified

alternative energy development as an anchor economic activity, and highlighted renewable energy development as an opportunity for the municipality. Additionally, energy has been identified as a priority growth sector. The Pixley ka Seme DM IDP for 2013/2014 references the National Development Plan's proposal to procure about 20,000MW of renewable electricity by 2030. The IDP also identifies the need for the attraction and retention of investors, which can largely be through the development of renewable energy projects.

It is therefore evident that the proposed development is aligned with the goals of the municipal IDPs in the study area.

3.2.2 Integrated Energy Plan for the Republic of South Africa, 2003

The Integrated Energy Plan (IEP), developed by the former DME (now DMR), was formulated to address the energy demand of the country balanced with energy supply, transformation, economics and environmental considerations in concourse with available resources. One of the main objectives of the plan is to promote universal access to clean and affordable energy, with emphasis on household energy supply being co-ordinated with provincial and local integrated development programmes. Another objective is to ensure that environmental considerations in energy supply, transformation and end use are made. This project is thus a goal in order to implement this plan.

3.2.3 Independent Power Producer Process

The Integrated Energy Plan (IEP), developed by the former DME (now DMR), was formulated to address the energy demand of the country balanced with energy supply, transformation, economics and environmental considerations in concourse with available resources. One of the main objectives of the plan is to promote universal access to clean and affordable energy, with emphasis on household energy supply being coordinated with provincial and local integrated development programmes. Another objective is to ensure that environmental considerations in energy supply, transformation and end use are made. This project is thus a goal in order to implement this plan.

(The following information was extracted from the Eskom website: Guide to Independent Power Producer (IPP) processes in South Africa and Eskom**,** June 2010
http://www.eskom.co.za/live/content.php?Item_ID=14324)

The objective of this section is to provide an overview of the processes in the country and within Eskom relating to Independent Power Producers (IPPs). It is important that certain enabling policies, rules and regulations are in place to provide certainty and transparency in the introduction of IPPs.

- Country Process

South Africa has two acts that direct the planning and development of the country's electricity sector:

i. The National Energy Act of 2008 (No. 34 of 2008)
ii. The Electricity Regulation Act (ERA) of 2006 (No. 4 of 2006).

In August 2009, the Department of Energy (DoE) gazetted the Electricity Regulations on New Generation Capacity under the ERA. The New Generation Regulations establish rules and guidelines that are applicable to the undertaking of an IPP Bid Programme and the procurement of an IPP for new generation capacity. They also facilitate the fair treatment and non-discrimination between IPPs and the buyer of the energy.

- Formal Programmes

In terms of the New Generation Regulations, the Integrated Resource Plan (IRP) developed by the DoE sets out the new generation capacity requirement per technology, taking energy efficiency and the demand-side management projects into account. This required, new generation capacity must be met through the technologies and projects listed in the IRP and all IPP procurement programmes will be executed in accordance with the specified capacities and technologies listed in the IRP. The table below highlights the energy plan that has been proposed until 2030.

Table 4: Government Energy Plans up until 2030 in terms of the IRP

New Build Options								
	Coal	**Nuclear**	**Import Hydro**	**Gas - CCGT**	**Peak - OCGT**	**Wind**	**CSP**	**Solar PV**
2010	0	0	0	0	0	0	0	0
2011	0	0	0	0	0	0	0	0
2012	0	0	0	0	0	0	0	300
2013	0	0	0	0	0	0	0	300
2014	500	0	0	0	0	400	0	300
2015	500	0	0	0	0	400	0	300
2016	0	0	0	0	0	400	100	300
2017	0	0	0	0	0	400	100	300
2018	0	0	0	0	0	400	100	300
2019	250	0	0	237	0	400	100	300
2020	250	0	0	237	0	400	100	300
2021	250	0	0	237	0	400	100	300
2022	250	0	1143	0	805	400	100	300
2023	250	1600	1183	0	805	400	100	300
2024	250	1600	283	0	0	800	100	300
2025	250	1600	0	0	805	1600	100	1000
2026	1000	1600	0	0	0	400	0	500
2027	250	0	0	0	0	1600	0	500
2028	1000	1600	0	474	690	0	0	500
2029	250	1600	0	237	805	0	0	1000
2030	1000	0	0	948	0	0	0	1000
	6250	**9600**	**2609**	**2370**	**3910**	**8400**	**1000**	**8400**

A decision that additional capacity be provided by an IPP must be made with the concurrence of the Minister of Finance. Once such a decision is made, a procurement process needs to be embarked upon to procure that capacity in a fair, equitable and transparent process.

The New Generation Regulations set out the procurement process. The stages within a bid programme are prescribed as follows:

i. Request for Qualifications (RFQ)
ii. Request for Proposals (RFP)
iii. Negotiation with the preferred bidder(s).

A successful bidder will be awarded a Power Purchase Agreement (PPA) subject to approval by the Regulator.

3.2.1 The Northern Cape Provincial Growth and Development Strategy (NC PGDS)

The importance of developing the renewable energy sector in the Northern Cape was first acknowledged in the Northern Cape Provincial Growth and Development Strategy (NC PGDS). The NCPGDS makes reference to the need to ensure availability of affordable energy. It notes, "in order to promote economic growth in the Northern Cape the availability of electricity to key industrial users at critical localities at rates that enhance the competitiveness of their industries must be ensured." At the same time, the development of new sources of energy through the promotion of the adoption of energy applications that display a synergy with the province's natural resource endowments must be encouraged. In this regard the NC PGDS notes that, "development of energy sources such as solar energy, the natural gas fields, bio-fuels, etc., could be some of the means by which economic opportunity and activity is generated in the Northern Cape". The NC PGDS also notes that "sustainable utilisation of the natural resource base on which agriculture depends is critical in the Northern Cape with its fragile eco-systems and vulnerability to climatic variation". In this regard, care needs to be taken to ensure that renewable energy facilities do not impact negatively on the region's natural environment.

3.2.1 The Northern Cape Provincial Spatial Development Framework (SDF)

In the Northern Cape Provincial Spatial Development Framework (SDF) of 2011, the Northern Cape provincial government acknowledges that the major energy challenge faced by the province is finding a balance between ensuring electricity security and addressing issues around climate change. The Northern Cape Provincial SDF (2011) states that the energy sector could benefit the economy significantly through created economic spin-offs or multiplier effects. This will, however, require innovative planning to provide the necessary infrastructure and associated amenities to accommodate the industry in an efficient manner (Dennis Moss Partnership, 2012). It is widely acknowledged that the Northern Cape province's comparative advantage lies, among others, in solar resource (Dennis Moss Partnership, 2012), which is why the majority of the solar PV energy facilities approved for development in the country are located within its boundaries.

4 PROJECT NEED AND DESIRABILITY

4.1 National Renewable Energy Requirement

In 2010 South Africa (SA) had 44,157MW of power generation capacity installed. Current forecasts indicate that by 2025, the expected growth in demand will require the current installed power generation capacity to be almost doubled to approximately 74,000MW (SAWEA: 2010).

This growing demand, fuelled by increasing economic growth and social development within Southern Africa, is placing increasing pressure on South Africa's existing power generation capacity. Coupled with this, is the growing awareness of environmental impact, climate change and the need for sustainable development. Despite the worldwide concern regarding GHG emissions and climate change, South Africa continues to rely heavily on coal as its primary source of energy, while most of the countries renewable energy resources remain largely untapped (DME, 2003). There is therefore an increasing need to establish a new source of generating power in SA within the next decade.

The use of renewable energy technologies, as one of a mix of technologies needed to meet future energy consumption requirements is being investigated as part of Eskom's long-term strategic planning and research process. It must be remembered that solar energy is plentiful, renewable, widely distributed, clean and reduces greenhouse gas emissions when it displaces fossil-fuel derived from electricity. In this light, renewable solar energy can be seen as desirable.

4.2 National Renewable Energy Commitment

In support of the need to find solutions for the current electricity shortages, the increasing demand for energy, as well as the need to find more sustainable and environmentally friendly energy resources, South Africa has embarked on an infrastructure growth programme supported by various government initiatives. These include; the National Development Plan (NDP), the Presidential Infrastructure Coordinating Commission (PICC), the Department of Energy's Integrated Resource Plan, the National Strategy for Sustainable Development, the National Climate Change Response White Paper, the Presidency of the Republic of South Africa's Medium-Term Framework, and the National Treasury's Carbon Tax Policy Paper.

The Government's commitment to growing the renewable energy industry in South Africa is also supported by the *White Paper on Renewable Energy* (2003) which sets out the Government's principals, goals and objectives for promoting and implementing renewable energy in South Africa. In order to achieve the long term goal of achieving a sustainable renewable energy industry, the Department of Energy has set a target of contributing 17,8*GW* of renewable energy to the final energy consumption by 2030. This target is to be produced mainly through, wind and solar; but also through biomass and small scale hydro (DME, 2003; IRP, 2010).

4.3 Solar PV Power Potential in South Africa and Internationally

Internationally, PV is the fastest-growing power generation technology, South Africa has some of the highest levels of solar radiation in the world and as much as 8GW PV could potentially be installed by 2020 (DEA Guideline for Renewable Energy, 2013). Between 2000 and 2009 the installed capacity globally grew on average by 60% per year. Worldwide more than 35GW of PVs are installed and operating, and in South Africa as much as 8GW PV could potentially be installed by 2020.

4.4 Site Specific Suitability

According to the solar map (Figure 4) the Northern Cape Province of South Africa has a solar energy concentration of between 8001 and 9500 MJ/m^2. The Northern Cape is the province in South Africa with the highest solar potential. The project site falls within the range of 8501 – 9000 MJ/m^2 and is thus suitable for the establishment of solar PV energy facility. Based on an estimation of the solar energy resource as well as weather, dust, dirt, and surface albedo, pre-feasibility studies conducted by BioTherm have identified the site as optimal for the proposed Helena solar PV project.

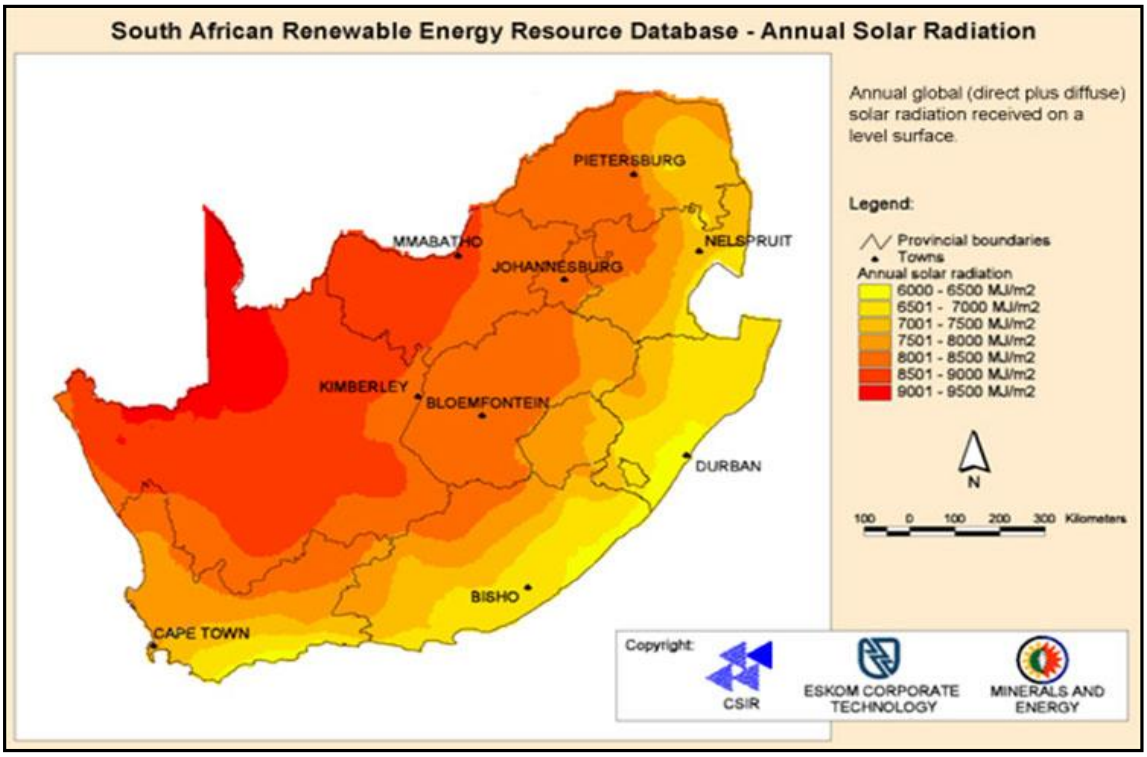

Figure 4: National Solar Resource Map (Source: Solar Vision, 2010)

The proposed solar PV energy facility is situated on the farm Portion 3 of Klipgats Pan No 117 and the proposed power line alternatives transect Portion 4 of Klipgats Pan No 117. Portion 3 of Klipgats Pan No 117 is a small private sheep farm with four people living on the farm and one labourer working there. Therefore any employment losses on the farm would be compensated by employment opportunities created by the solar facility. The land owner is of the opinion that the project will have a positive impact. Portion 4 of Klipgats Pan No 117, which will be transected by the power line, currently has no activities taking place on the farm and no one lives on the land. The proposed development will therefore have very little impact on current land use on affected farms. The site is therefore considered to be suitable from a land use perspective.

The project site near Copperton has been identified through pre-feasibility studies based on the solar resource, grid connection and land availability were also important initial considerations. The project site has a relatively flat topography that is suitable for facilities of this kind. The project site also has advantageous grid connection potential, with the existing Kronos substation approximately 4km away. The site is also easily accessible as the R357 transects the farm.

4.5 Local Need

The project falls within the Siyathemba LM, which is located within the greater Pixley ka Seme DM. The Siyathemba LM IDP for 2014/2015 identified alternative energy development as an anchor economic activity, and highlighted renewable energy development as an opportunity for the municipality. Additionally, energy has been identified as a priority growth sector. The project is therefore desirable from a municipal viewpoint.

The Northern Cape Provincial Growth and Development Strategy highlights the need to ensure the availability of affordable energy, it also notes that, "development of energy sources such as solar energy, the natural gas fields, bio-fuels, etc., could be some of the means by which economic opportunity and activity is generated in the Northern Cape". The Northern Cape Provincial SDF (2011) states that the energy sector could benefit the economy significantly through created economic spin-offs or multiplier effects and it is widely acknowledged that the Northern Cape province's comparative advantage lies, among others, in solar resource. The proposed project would therefore be advantageous for the province.

According to Census 2011 data, the employed labour in the Siyathemba LM was estimated at 5 356, while the unemployed population was estimated at 1 757, reflecting an unemployment rate of 24.7%. This was lower than the country's unemployment rate of 29.7% and lower than the provincial unemployment rate that was recorded at 27.4%. In the smaller towns, the unemployment situation was worse, with unemployment rates ranging between 33.6% and 41% in Marydale and Nierkerkshoop respectively (Stats SA, 2014). The Copperton community is very small and isolated from employment opportunities and amenities. The proposed project could therefore contribute to employment in the region, which would be particularly significant for the town of Copperton. The project will likely encounter widespread support from government, civil society and businesses, all of whom see potential opportunities for revenues, employment and business opportunities locally.

The proposed solar PV energy facility will benefit the country by tapping into an energy resource that is sustainable, by reducing the overall carbon footprint of the nation's generating fleet, by implementing a cost effective source of energy, by promoting a renewable energy culture, and by creating local jobs and training opportunities.

5 DESCRIPTION OF THE RECEIVING ENVIRONMENT

The Northern Cape Province is considered to be a suitable region for the establishment of solar PV energy facility. Accordingly, a land portion located near Copperton has been identified as a potential site. A general description of the study area is outlined in the section below. The receiving environment in relation to each specialists study is also provided.

5.1 Regional Locality

The proposed development site is situated near Copperton in the Siyathemba LM of the greater Pixley ka Seme DM, within the Northern Cape Province (Figure 5). The site is located approximately 10km south of Copperton, and 60km south-west of Prieska, and 280km south-west of Kimberley. Copperton is an abandoned town which previously serviced a mine that has subsequently closed. The proposed solar PV energy facility will be accessed by the R357 which transects the site. The centre point co-ordinates for the development site and the substation assessment area as well as the start and end point coordinates for the power line alternatives, are included in Table 5.

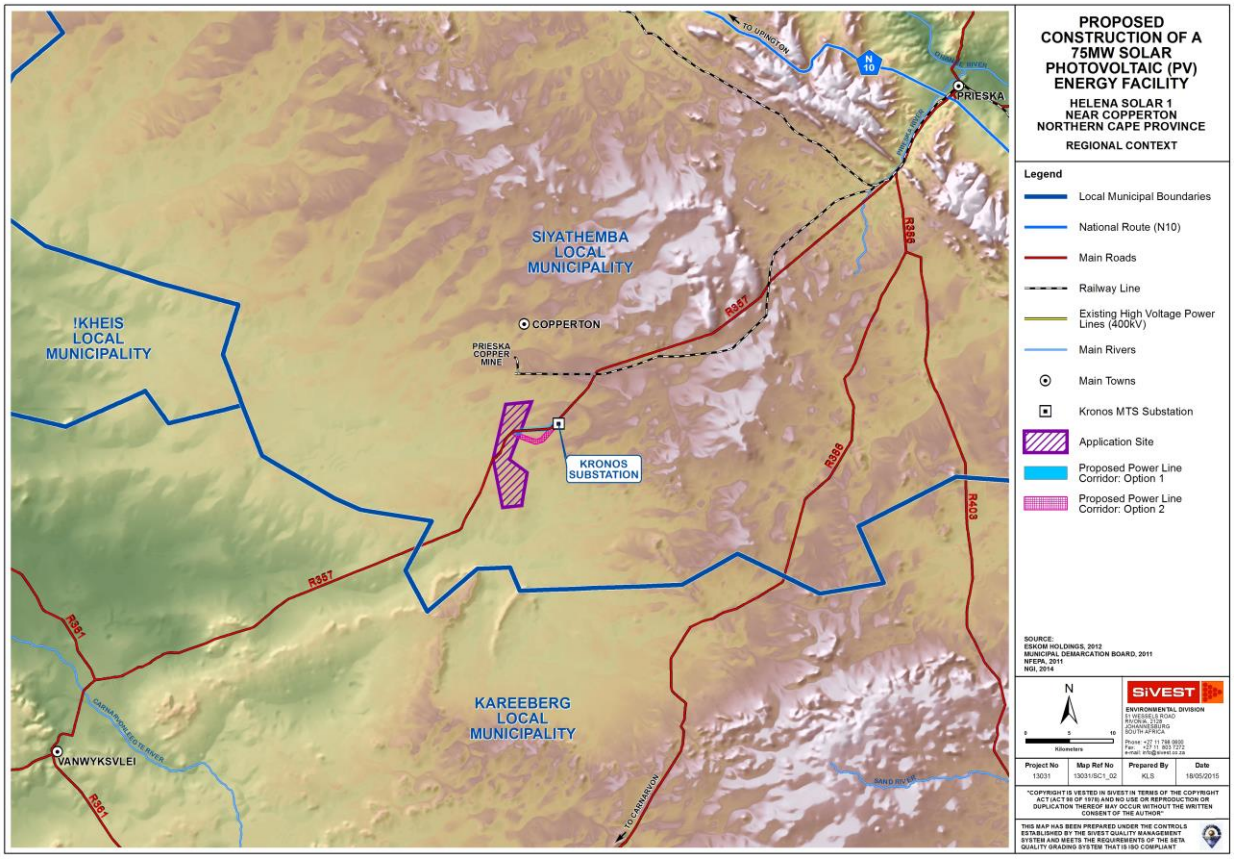

Figure 5: Regional Study Area.

Table 5: Proposed Site Location

PHASE NAME	CENTRE POINT CO-ORDINATES	
	SOUTH	EAST
HELENA SOLAR 1 DEVELOPMENT AREA	S30° 1' 8.353"	E22° 17' 20.101"
SUBSTATION ASSESSMENT AREA	S30° 2' 3.789"	E22° 17' 45.873"

Table 6: Proposed Power Line Alternatives

POWER LINE ALTERNATIVES			
ALTERNATIVE	**LENGTH (KMS)**	**COORDINATES**	
		START	**END**
OPTION 1	4.38	S30° 2' 2.692"	S30° 1' 27.878"
		E22° 17' 54.321"	E22° 20' 18.716"
OPTION 2	5.11	S30° 2' 7.012"	S30° 1' 31.611"
		E22° 17' 52.457"	E22° 20' 17.451"

Please note that all maps within the report are included in Appendix 5 and are in A3 format.

5.2 Study Site Description

The site that is proposed for the Helena solar PV energy facility near Copperton is located on the following farms:

- Portion 3 of Klipgats Pan No 117 (solar PV energy facility); and
- Portion 4 of Klipgats Pan No 117 (power lines)

The proposed PV energy facility will be situated Portion 3 of the farm Klipgats Pan No 117 and the proposed power lines transect Portion 4 of the farm Klipgats Pan No 117. Portion 3 of Klipgats Pan No 117 is a small private sheep farm with four people living on the farm and one labourer working there. Therefore any employment losses on the farm would be compensated by employment opportunities created by the solar facility. The land owner is of the opinion that the project will have a positive impact. Portion 4 of Klipgats Pan No 117, which will be transected by the power line, currently has no activities taking place on the farm and no one lives on the land.

The total area of the assessed site is approximately 1246 ha, with the proposed development area accounting for approximately 430 ha. The substation assessment area is approximately 24 ha (Figure 6). However, the total area of the PV field and associated infrastructure within the development area is yet to be determined. These will be determined using the findings of the scoping and EIA phases to avoid potentially sensitive areas. Preliminary layouts are presented in the EIA plan of study in Chapter 10 of this report, and will be assessed in detail during the EIA phase.

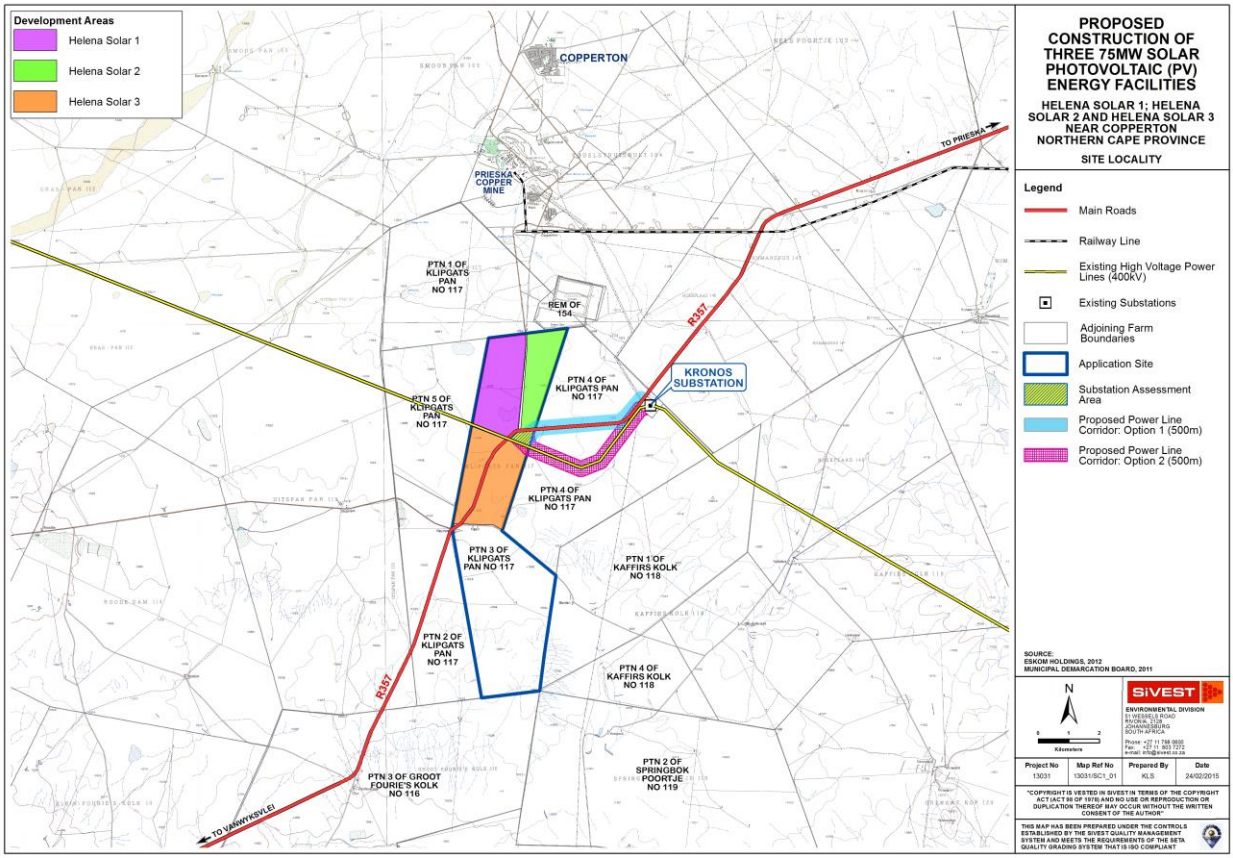

Figure 6: Site locality.

5.3 Topography

The topography of the study site and surrounds is shown below (Figure 7). The topography within and in the immediate vicinity of the proposed application site is characterised by a flat to gently undulating landscape (typical of much of the Karoo), that gently slopes down in a south-westerly direction. The topography in the wider area is characterised by a mix of very flat plains, as well as areas of slightly more undulating relief, including some low ridges and a number of isolated low koppies. In the wider area a low mountain range marks a change in topography; the Doringberge form a line of hills to the north-east of the site. The degree of slope of the site and surrounding area are shown in Figure 8.

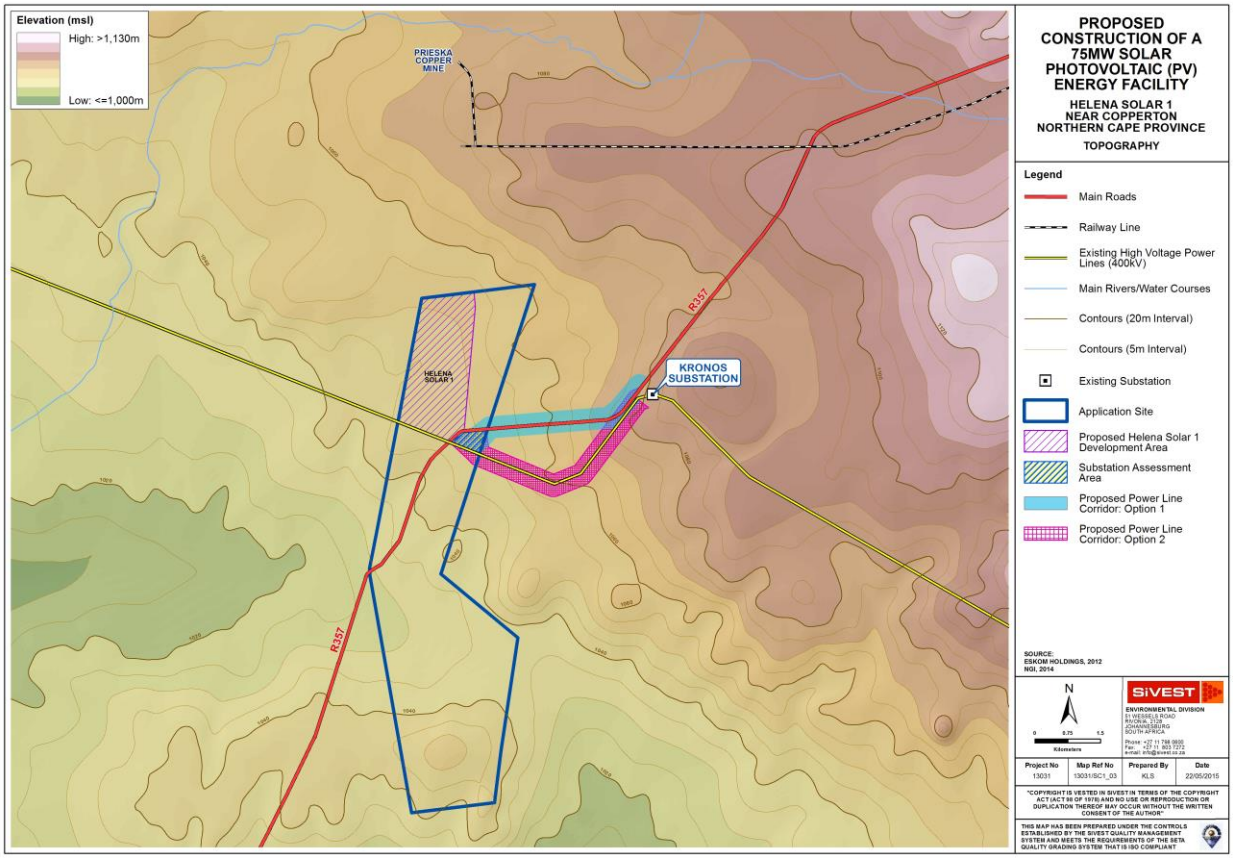

Figure 7: Topography of the study area.

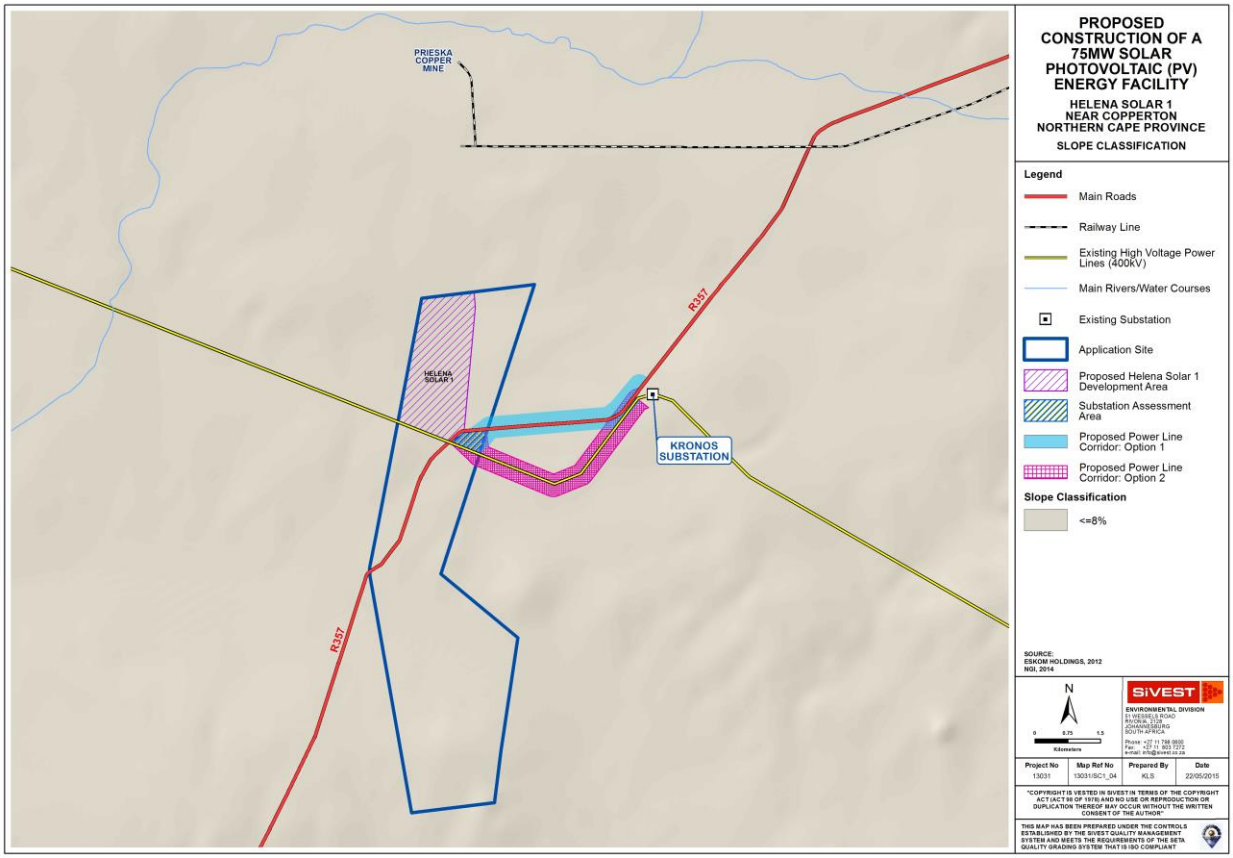

Figure 8: Degree of slope in region of the study area.

5.4 Geology

The geology of the area comprises tillite of the Dwyka Formation, with some Keimoes granite to the south (Geological Survey, 1977).

The distribution of the geological units in the area is shown in Figure 9.

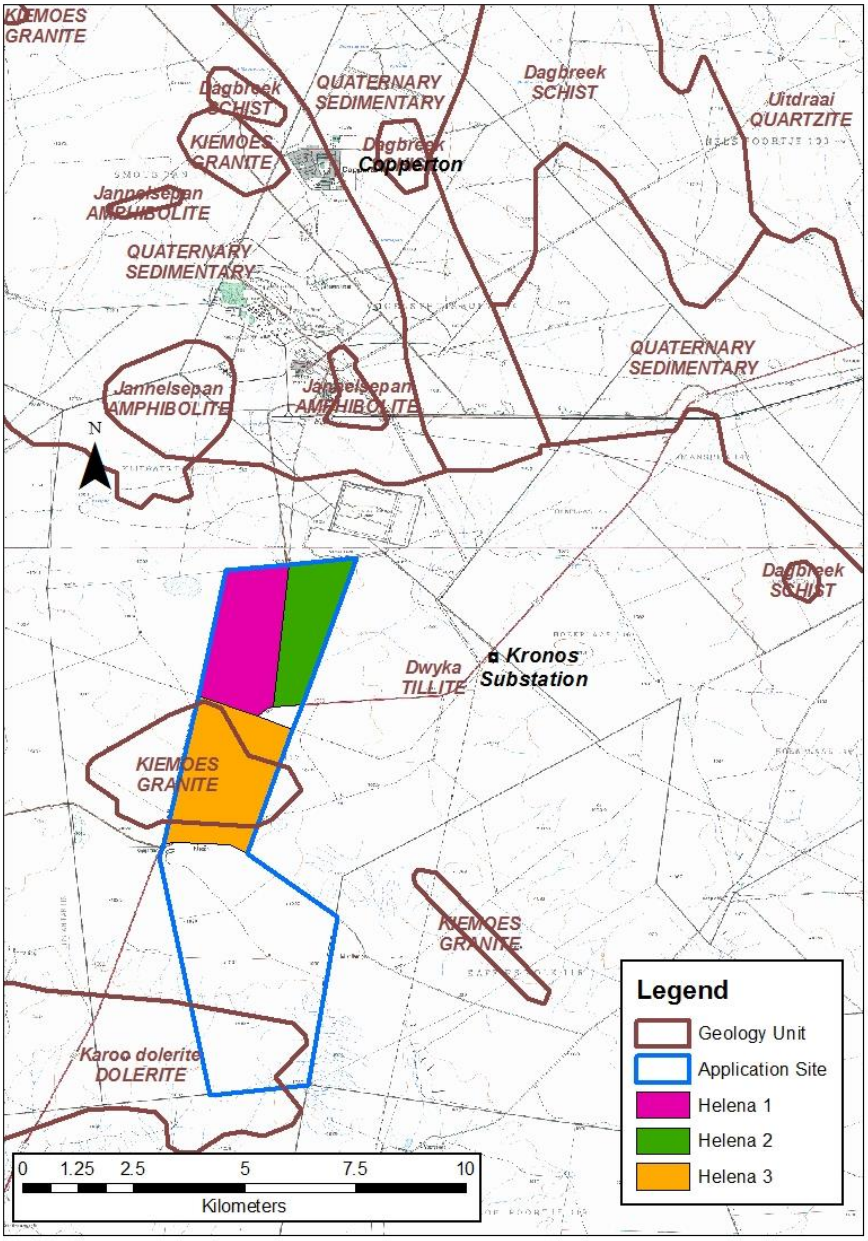

Figure 9: Geological units in the region of the study area

5.5 Land Use

The prevailing land use in the wider study area is classified as natural or undeveloped (Figure 10). The highly arid nature of the area's climate, has resulted in livestock rearing (of sheep) dominating within the area. As such, the natural vegetation has been retained across the vast majority of the study area as sheep graze on natural vegetation.

The nature of the climate and corresponding land use has also resulted in low stocking densities and relatively large farm properties across the area. Therefore the area is very sparsely populated, and little human-related infrastructure exists.

Built form in areas where livestock rearing occurs is limited to isolated farmsteads, gravel access roads, ancillary farm buildings, telephone lines, fences and the remnants of old workers' dwellings. The Aries-Kronos 1 high voltage 400kV power line also bisects the site and the tall steel structures that make up Kronos Substation are visible from the R357 as one approaches the site from the north-east. A photovoltaic (PV) energy facility has already been constructed and is operational in the area and two other projects have been awarded preferred bidder status by the DoE and once constructed they will further transform the natural vegetation in the surrounding area.

The closest built-up areas include the small mining town of Copperton, which is located approximately 6km north of the site, and the old Prieska Copper Mine which was closed in 1996. Within this part of the study area, a greater human influence is visible in the form of mining infrastructure and electricity transmission infrastructure. Directly north of the application site, the infrastructure associated with the now-defunct mine still exists, with the headgear, as well as an old slimes dam being prominent landmarks. Further north, degraded land and some urban-built up form are located directly adjacent to the old Prieska Copper Mine.

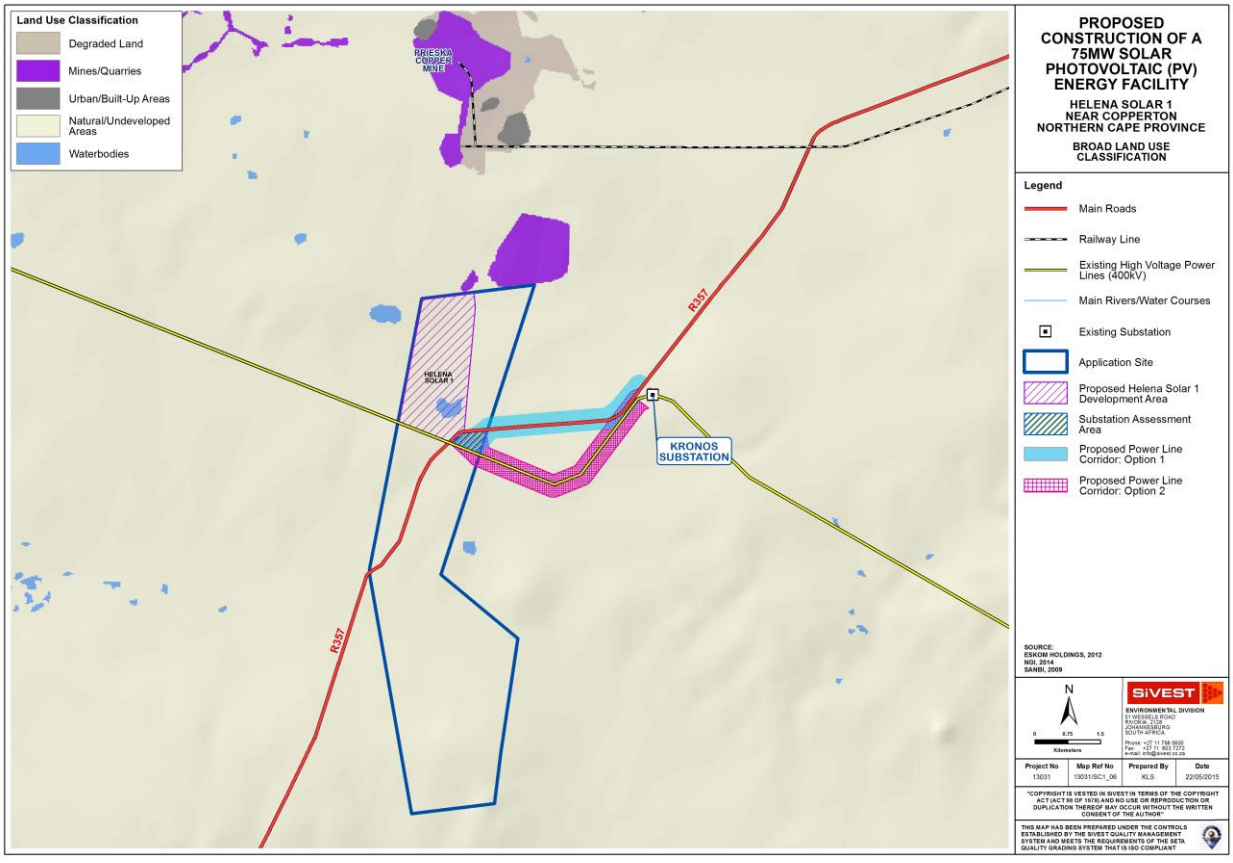

Figure 10: Land use in the region of the study area.

5.6 Climate

The climate of the study area (Monnik & Malherbe, 2005) can be regarded as warm to hot with occasional rain in summer and dry winters. The long-term average annual rainfall in this region of the Northern Cape is only 198 mm, of which 138 mm, or 69%, falls from November to April. Rainfall is erratic, both locally and seasonally and therefore cannot be relied on for agricultural practices. The average evaporation is over 2 100 mm per year, peaking at over 8.5 mm per day in December.

Temperatures vary from an average monthly maximum and minimum of 31.6ºC and 11.8ºC for January to 15.9ºC and 1.0ºC for July respectively. The extreme high temperature that has been recorded is over 42ºC and the extreme low –10.0ºC. Frost occurs most years on 30-40 days on average between early May and mid-September.

5.7 Biodiversity

The Biodiversity Assessment was conducted by David Hoare and is included as Appendix 6A. The environmental baseline from a biodiversity perspective is presented below.

5.7.1 Landuse and landcover of the study area

A landcover map of the study area (Fairbanks *et al*. 2000) indicates that the study consists of natural vegetation, classified as “shrubland and low fynbos”. The 1:50 000 topocadastral map of the site and a Google image of the site shows essentially the same pattern. There is a slimes dam on the northern boundary of the study area, two main roads traversing the study area and the Eskom Kronos Substation. These patterns were confirmed during the field survey of the site. Vegetation typical of the site is shown in Figure 11.

5.7.2 Broad vegetation types of the region

The sites fall within the Nama-Karoo Biome (Rutherford & Westfall 1986, Mucina & Rutherford 2006). The most recent and detailed description of the vegetation of this region is part of a national map (Mucina, Rutherford & Powrie, 2005; Mucina *et al*. 2006). This map shows three vegetation types occurring within the area of interest, of which only two are affected directly by the proposed project alternatives. These vegetation types are described in more detail below.

Figure 11: Typical vegetation structure within the study area.

- Bushmanland Basin Shrubland

This vegetation type occurs in the Northern Cape Province in the Large Bushmanland Basin centred on Brandvlei and Vanwyksvlei, from Granaatboskolk in the west to Copperton in the east and Kenhardt in the north to Williston in the south (Mucina et al. 2006). It is found on slightly irregular plains. The vegetation is a dwarf shrubland dominated by a mixture of low sturdy, spiny and sometimes succulent shrubs (*Rhigozum*, *Salsola*, *Pentzia* and *Eriocephalus*), white grasses and, in years of high rainfall, abundant annuals, such as *Gazania* and *Leysera*. In comparison to the bordering Bushmanland Arid Grassland, the vegetation of this unit shows increased presence of shrubs and plant indicators of high salt status of soils.

- Bushmanland Vloere

This is the vegetation of the salt pans and broad riverbeds of the central Bushmanland basin (Mucina et al. 2006). It occurs in areas of flat and very even surfaces of pans and broad bottoms of intermittent dry rivers. Typically, the central parts are devoid of vegetation. Around this is loosely patterned scrub dominated by *Rhigozum trichotomum* and various species of *Salsola* and *Lycium*, with a mixture of karroid dwarf shrubs. In places loose thickets of *Parkinsonia africana*, *Lebeckia linearifolia* and *Acacia karroo* may be found.

- Bushmanland Arid Grassland

This vegetation type occurs on extensive, relatively flat plains and is sparsely vegetated by tussock grasses, including *Stipagrostis ciliata*, *Aristida adscensionis*, *Aristida congesta*, *Enneapogon desvauxii*, *Eragrostis*

nindensis, *Schmidtia kalahariensis* and *Stipagrostis obtusa*. In some years after good rains there are abundant displays of annual herbs (Mucina et al. 2006). There are no known endemics in this vegetation type (Mucina *et al*. 2006), but does contain endemics belonging to the Griqualand West or Gariep Centres of Endemism (van Wyk & Smith 2001), namely *Aizoon asbestinum*, *Maerua gilgii*, *Ruschia muricata* and *Aloe gariepensis*. The vegetation type also contains the protected tree species, *Acacia erioloba* (camel thorn), *Acacia haematoxylon* (grey camel thorn) and *Boscia albitrunca* (shepherd's bush).

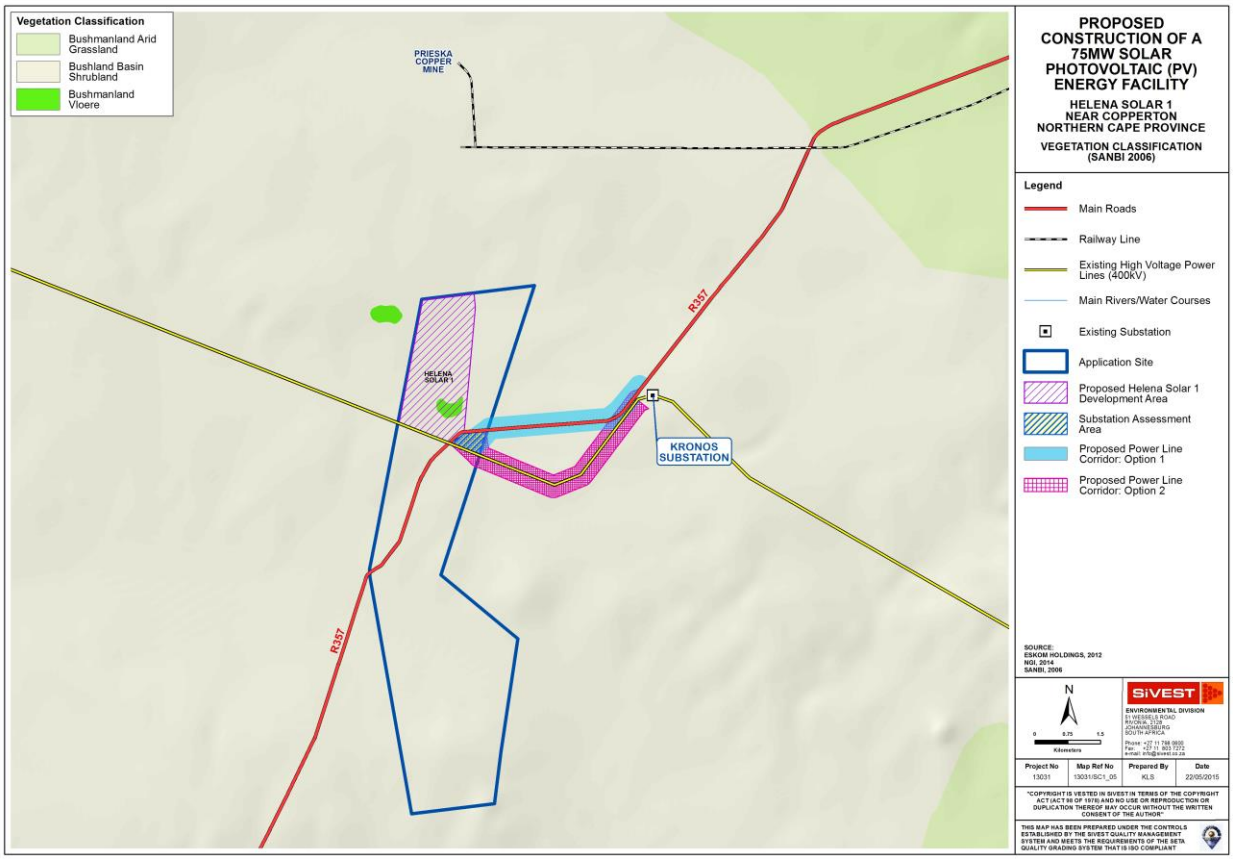

Figure 12: Vegetation types of the project study area

5.7.3 Conservation status of broad vegetation types

On the basis of a recently established approach used at national level by SANBI (Driver *et al*. 2005), vegetation types can be categorised according to their conservation status which is, in turn, assessed according to the degree of transformation relative to the expected extent of each vegetation type. The status of a habitat or vegetation type is based on how much of its original area still remains intact relative to various thresholds. The original extent of a vegetation type is as presented in the most recent national vegetation map (Mucina, Rutherford & Powrie 2005) and is the extent of the vegetation type in the absence of any historical human impact. On a national scale the thresholds are as depicted in Table 7, as determined by best available scientific approaches (Driver *et al*. 2005).

The level at which an ecosystem becomes Critically Endangered differs from one ecosystem to another and varies from 16% to 36% (Driver et al. 2005).

All of the vegetation types occurring in the study area (Table 8) are classified as Least Threatened (Driver *et al*. 2005; Mucina *et al*., 2006). None of the vegetation types are flagged therefore as being of conservation concern.

Table 7: Determining ecosystem status (from Driver et al. 2005)

*BT = biodiversity target (the minimum conservation requirement).

Habitat remaining (%)			
	80–100	least threatened	LT
	60–80	vulnerable	VU
	*BT–60	endangered	EN
	0–*BT	critically endangered	CR

Table 8: Conservation status of different vegetation types occurring in the study area, according to Driver *et al*. 2005 and Mucina *et al*. 2005.

Vegetation Type	Target (%)	Conserved (%)	Transformed (%)	Conservation status	
				Driver *et al*. 2005; Mucina *et al*., 2006	Draft Ecosystem List (NEMBA)
Bushmanland Basin Shrubland	21	0	1	Least Threatened	Not listed
Bushmanland Vloere				Least Threatened	Not listed
Bushmanland Arid Grassland	21	1	1	Least Threatened	Not listed

5.7.4 Biodiversity Conservation Plans

There are no fine-scale biodiversity conservation plans for the study area (bgis.sanbi.org). According to SANBI, "*Presently BGIS has no Systematic Biodiversity Conservation Plan for the Northern Cape other than the Namakwa District Biodiversity Sector Plan therefore the Biodiversity Summaries Map is used in its place for land use decision support in the province.*" The Biodiversity Summary Map for the Pixley ka Seme DM shows all natural vegetation within the municipal area, except along the Orange River, to be Least Threatened and no areas mapped as of particular biodiversity concern.

5.7.5 Proposed Protected Areas

According to the National Parks Area Expansion Strategy (NPAES), there is an area 15km to the east of the project study area that has been identified as priority areas for inclusion in future protected areas. This particular component of the landscape is considered to be of high biodiversity value by National Parks, but the proposed project does not affect this area at all.

5.7.6 Red List plant species of the study area

Lists of plant species of conservation concern previously recorded in the quarter degree grids in which the study area is situated were obtained from the South African National Biodiversity Institute. These are listed in the Biodiversity Specialist report. Additional species that could occur in similar habitats, as determined from database searches and literature sources, but have not been recorded in these grids are also listed.

There is one species that may occur in the study area, the succulent, *Hoodia officinalis* subsp. *officinalis*. This species is listed as Near Threatened (see Table 9 for explanation of categories). The species is found in Desert, Nama Karoo and Succulent Karoo and is found inside bushes in flat or gently sloping areas. The species has been recorded in two neighbouring grids and the possibility of it occurring in the study area is therefore considered to be high.

Table 9: Explanation of IUCN Ver. 3.1 categories (IUCN, 2001), and Orange List categories (Victor & Keith, 2004).

IUCN / Orange List category	**Definition**	**Class**
EX	Extinct	Extinct
CR	Critically Endangered	Red List
EN	Endangered	Red List
VU	Vulnerable	Red List
NT	Near Threatened	Orange List
Declining	Declining taxa	Orange List
Rare	Rare	Orange List
Critically Rare	Rare: only one subpopulation	Orange List
Rare-Sparse	Rare: widely distributed but rare	Orange List
DDD	Data Deficient: well-known but not enough information for assessment	Orange List
DDT	Data Deficient: taxonomic problems	Data Deficient
DDX	Data Deficient: unknown species	Data Deficient

5.7.7 Red List animal species of the study area

All Red List vertebrates (mammals, birds, reptiles, amphibians) that could occur in the study area are listed in the Biodiversity Specialist report. A separate list is provided for the sites near De Aar and the site near Copperton.

There are four mammal species of low conservation concern that could occur in available habitats in the study area. These are Geoffroy's Horseshoe Bat, Darling's Horseshoe Bat, Leseuer's Wing-gland Bat, the Honey Badger and Littledale's Whistling Rat. All of these species are classified nationally as near threatened (NT), but globally as Least Concern. They are, therefore, of relatively low conservation concern in comparison to more threatened species found in other parts of the country. The Honey Badger protected under the National Environmental Management: Biodiversity Act and any impacts on a specimen of this species or that may

negatively affect the survival of the species would require a permit. Only the Honey Badger and Littledale's Whistling Rat were considered likely to be found on site.

The Giant Bullfrog is the only amphibian species with a distribution that includes the study area and which could occur on any of the sites. This species is classified as Least Concern globally and Near threatened in South Africa. It is, however, protected under the National Environmental Management: Biodiversity Act and any impacts on a specimen of this species or that may negatively affect the survival of the species would require a permit.

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

5.7.8 Protected Plants (National Environmental Management: Biodiversity Act)

Plant species protected under the National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004) are listed in the Biodiversity Specialist report. Two plant species that appear on this list that could potentially occur in the general region, although they have not previously been recorded in the grids of the study area, are *Hoodia gordonii* and *Harpagophytum procumbens*.

Hoodia gordonii is found in Namibia, Botswana, Angola and the dry margins of the summer rainfall region of South Africa, including parts of the Western Cape, Northern Cape and Free State Provinces. It occurs in a wide variety of arid habitats from coastal to mountainous, also on gentle to steep shale ridges, found from dry, rocky places to sandy spots in riverbeds. It has not been previously recorded in this grid, but has been recorded in the grid to the north-east. It is considered likely that this species could occur on site due to habitat conditions found there relative to the species requirements.

Harpagophytum procumbens occurs in Angola, Botswana, Mozambique, Namibia, South Africa, Zambia, and Zimbabwe. Within South Africa this species occurs in the Northern Cape, North West, Free State, and Limpopo Provinces and the largest populations are found in the communally owned areas of the North West Province and the north eastern parts of the Northern Cape. The species requires well drained sandy habitats in open savanna and woodlands. It has not been previously recorded in this grid, but has been recorded in the grids in the area. It is considered possible, but unlikely that this species could occur on site due to habitat conditions found there relative to the species requirements.

5.7.9 Protected plants (Northern Cape Nature Conservation Act, No. 9 of 2009)

The Act provides lists of protected species for the Province, which is very lengthy and includes a number of common species. According to Northern Cape Nature Conservation officials, a permit is required for the removal of any species on this list. Based on previous experience on projects in the Northern Cape Province, it must be assumed that a permit application will need to be undertaken and that it will include a variety of species found on site.

5.7.10 Protected Trees

Tree species protected under the National Forest Act are listed in the Biodiversity Specialist report. The only one that has a geographical distribution that includes the study sites is *Boscia albitrunca* (Shepherd's Tree / Witgatboom / !Xhi). *Boscia albitrunca* (Shepherd's Tree / Witgatboom / !Xhi) occurs in semi-desert areas and bushveld, often on termitaria, but is common on sandy to loamy soils and calcrete soils. This species could potentially occur on site in areas affected by the proposed project.

5.7.11 Protected Animals

There are a number of animal species protected according to the National Environmental Management: Biodiversity Act (Act No. 10 of 2004).According to this Act, "*a person may not carry out a restricted activity involving a specimen of a listed threatened or protected species without a permit issued in terms of Chapter 7*". Such activities include any that are "*of a nature that may negatively impact on the survival of a listed threatened or protected species*". This implies that any negative impacts on habitats in which populations of protected species occur or are dependent upon would be restricted according to this Act.

Those species protected according to the National Environmental Management: Biodiversity Act (Act No. 10 of 2004) that have a geographical distribution that includes the site are listed in the Biodiversity Specialist report, marked with the letter "N". This includes the following species: White Rhinoceros, Black Wildebeest, Oribi, Cheetah, Cape Clawless Otter, Black-footed Cat, Brown Hyaena, Serval, Spotted-necked Otter, Honey Badger, Leopard, Cape Fox, Southern African Hedgehog, Southern African Python, Giant Bullfrog, Blue Crane, Grey-crowned Crane, Martial Eagle, Cape Vulture, Lappet-faced Vulture.

Due to habitat and forage requirements and the fact that some species are restricted to game farms and/or conservation areas, only the Black-footed Cat, Honey Badger, Leopard, Cape Fox, Giant Bullfrog and some of the birds (Kori Bustard, Ludwig's Bustard, Blue Crane, Martial Eagle, Lesser Kestrel and Black Stork) have a likelihood of occurring on site. All of these species are mobile animals that are likely to move away in the event of any activities on site disturbing them. They are therefore unlikely to be affected by the proposed development of the solar energy facility and associated infrastructure.

5.7.12 Habitats on site

Aerial imagery indicates that most of the site consists of natural vegetation (karroid dwarf shrubland called Bushmanland Basin Shrubland). There are drainage lines running through the site and some small pans. Transformed areas are associated with roads, the slimes dam in the north and the Eskom substation. The distribution of main habitats on site is shown in Figure 13.

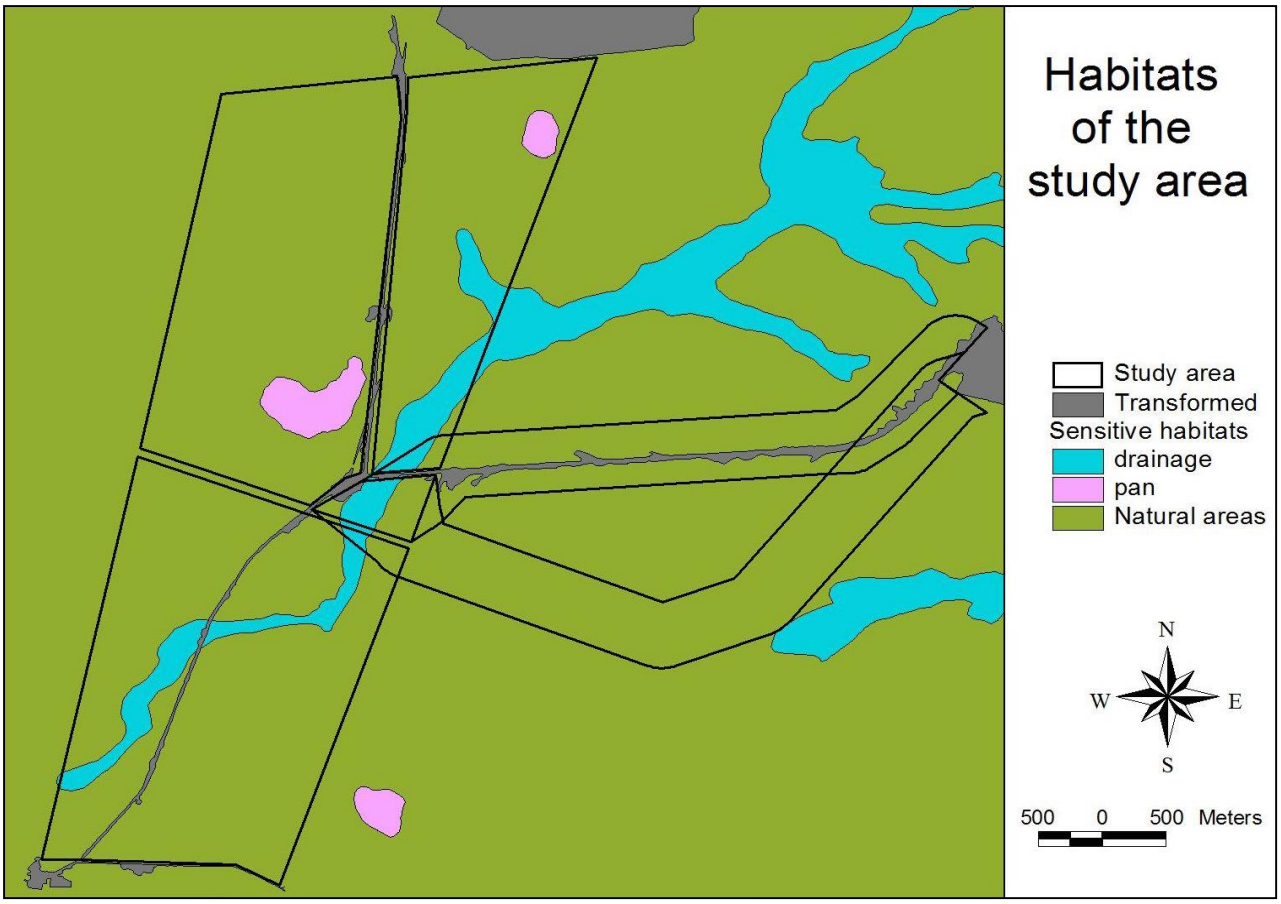

Figure 13: Main habitats of the study area

5.8 Avifauna

The Avifauna Assessment was conducted by Chris van Rooyen and is included as Appendix 6B. The environmental baseline from an avifaunal perspective is presented below.

5.8.1 Biomes and Vegetation Types

The habitat in the broader development area is highly homogenous and consists of extensive sandy and gravel plains with low shrub. The dominant vegetation type is Bushmanland Basin Shrubland. Bushmanland Basin Shrubland consists of dwarf shrubland dominated by a mixture of low, sturdy and spiny (and sometimes also succulent) shrubs (*Rhigozum, Salsola, Pentzia, Eriocephalus*), 'white' grasses (*Stipagrostis*) and in years of high rainfall also abundant annual flowering plants such as species of *Gazania* and *Leysera*. (Mucina & Rutherford 2006). The closest Important Bird Area (IBA) is located more than 300km away (Barnes 1998, Birdlife 2014).

The Atlas of South African Birds 1 (SABAP1) recognises six primary vegetation divisions within South Africa, namely (1) Fynbos (2) Succulent Karoo (3) Nama Karoo (4) Grassland (5) Savanna and (6) Forest (Harrison et al 1997). The criteria used by the authors to amalgamate botanically defined vegetation units, or to keep them separate were (1) the existence of clear differences in vegetation structure, likely to be relevant to birds, and (2) the results of published community studies on bird/vegetation associations. It is important to note that

no new vegetation unit boundaries were created, with use being made only of previously published data. Using this classification system, the natural vegetation in the study area is classified as Nama Karoo. Nama Karoo as dominated by low shrubs and grasses; peak rainfall occurs in summer from December to May. Average daily temperatures range between 35 C° in January and 18C° in July (http://www.worldweatheronline.com/Copperton-weather-averages/Northern-Cape/ZA.aspx). Trees, e.g. Acacia karroo are mainly restricted to ephemeral watercourses, but in the proposed development area, due to the extreme aridity (average annual precipitation 147mm in the 12 years from 2000 – 2012 - http://www.worldweatheronline.com) the ephemeral watercourses are devoid of trees. In comparison with the Succulent Karoo, the Nama Karoo has higher proportions of grass and tree cover.

5.8.2 Habitat classes and avifauna in the study area

Whilst much of the distribution and abundance of the bird species in the study area can be explained by the description of the biomes and vegetation types above, it is as important to examine the modifications which have changed the natural landscape, and which may have an effect on the distribution of avifauna. These are sometimes evident at a much smaller spatial scale than the biome or vegetation types, and are determined by a host of factors such as topography, land use and man-made infrastructure.

The following bird habitat classes have been identified in the study area, subject to field investigations:

- *Nama Karoo*

This habitat class is described above. The Karoo vegetation types support a particularly high diversity of bird species endemic to Southern Africa, particularly in the family *Alaudidae* (Larks) (Harrison et al. 1997). Its avifauna typically comprises ground-dwelling species of open habitats. Many typical karroid species are nomads, able to use resources that are patchy in time and space, especially enhanced conditions associated with rainfall (Barnes 1998). Red Data species specifically associated with Nama Karoo which could potentially occur regularly in the study area are the nomadic Ludwig's Bustard, which may occur in flocks following rainfall events, Karoo Korhaan, Double-banded Courser, Martial Eagle, Sclater's Lark and Lanner Falcon. Kori Bustard, Secretarybird and Verreaux's Eagle could occur irregularly. European Roller was recorded by SABAP2, but it is likely to occur only as a vagrant. Endemic species that could occur in Nama Karoo on the site are Ant-eating Chat, Black-eared Sparrowlark, Black-headed Canary, Fairy Flycatcher, Jackal Buzzard, Karoo *Eremomela*, Karoo Long-billed Lark, Karoo *Prinia*, Karoo Scrub-Robin, Large-billed Lark, Layard's Tit-babbler, Northern Black Korhaan, Orange River White-eye, Rufous-eared Warbler, Sickle-winged Chat, Sociable Weaver, South African Shelduck, and many near endemics i.e. Cape Bunting, Lark-like Bunting, White-throated Canary, Yellow Canary, Red-headed Finch, Scaly-feathered Finch, Chat Flycatcher, Spike-heeled Lark, Black-chested *Prinia*, Namaqua Sandgrouse, Cape Sparrow, Grey-backed Sparrowlark, Karoo Chat, Tratrac Chat, Southern Pale Chanting Goshawk, Dusky Sunbird and Bokmakierie and several more (see Table 10 below for a complete list of priority species which could potentially occur at the site).

- *Waterbodies*

Surface water is of specific importance to avifauna in this arid study area. The study area contains at least three boreholes and a dam. A pan is situated just outside the study area. All of these features would need to

be confirmed through site investigations. Boreholes with open water troughs are important sources of surface water and are used extensively by various species, including large raptors, to drink and bath. Apart from raptors, smaller species, including endemics and near-endemics such as Sclater's Lark, Sociable Weaver, Cape Sparrow, Red-headed Finch, Scaly-feathered Finch, Yellow Canary, White-throated Canary, and Namaqua Sandgrouse congregate in large numbers around water troughs which in turn attracts raptors such as Lanner Falcon and Southern Pale Chanting Goshawk. If the dam regularly holds water, it could attract all of the above as well as a variety of waterbirds including endemics such as South African Shelduck. Greater Flamingo *Phoenicopterus ruber* could potentially be attracted to open water in this arid region, but it has not been recorded by SABAP2, which indicates that the species does not occur regularly. The small pan just west of the study area is another potential source of intermittent surface water which could attract the same suite of species mentioned earlier. Pans are endorheic wetlands having closed drainage systems; water usually flows in from small catchments but with no outflow from the pan basins themselves. They are characteristic of poorly drained, relatively flat and dry regions. Water loss is mainly through evaporation, sometimes resulting in saline conditions, especially in the most arid regions. Water depth is shallow (<3m), and flooding characteristically ephemeral (Harrison et al. 1997). In this instance the pan is very small and unlikely to hold water regularly.

- *High voltage lines*

High voltage lines are an important potential roosting and breeding substrate for large raptors in the study area. Existing high-voltage lines are used extensively by large raptors for breeding purposes (Jenkins et al. 2006). High voltage lines therefore hold a special importance for large raptors, but also for Sociable Weavers which often construct their giant nests within the lattice work or cross-arms of high voltage structures. One high-voltage line, the Aries – Kronos 400kV line was identified from satellite imagery, running in an east – west direction through the study area, which will require further investigation. The closest known eagle nest is a Martial Eagle nest which is situated on the Hydra – Kronos 400kV line approximately 12km east of the study area (Jenkins et al. 2006).

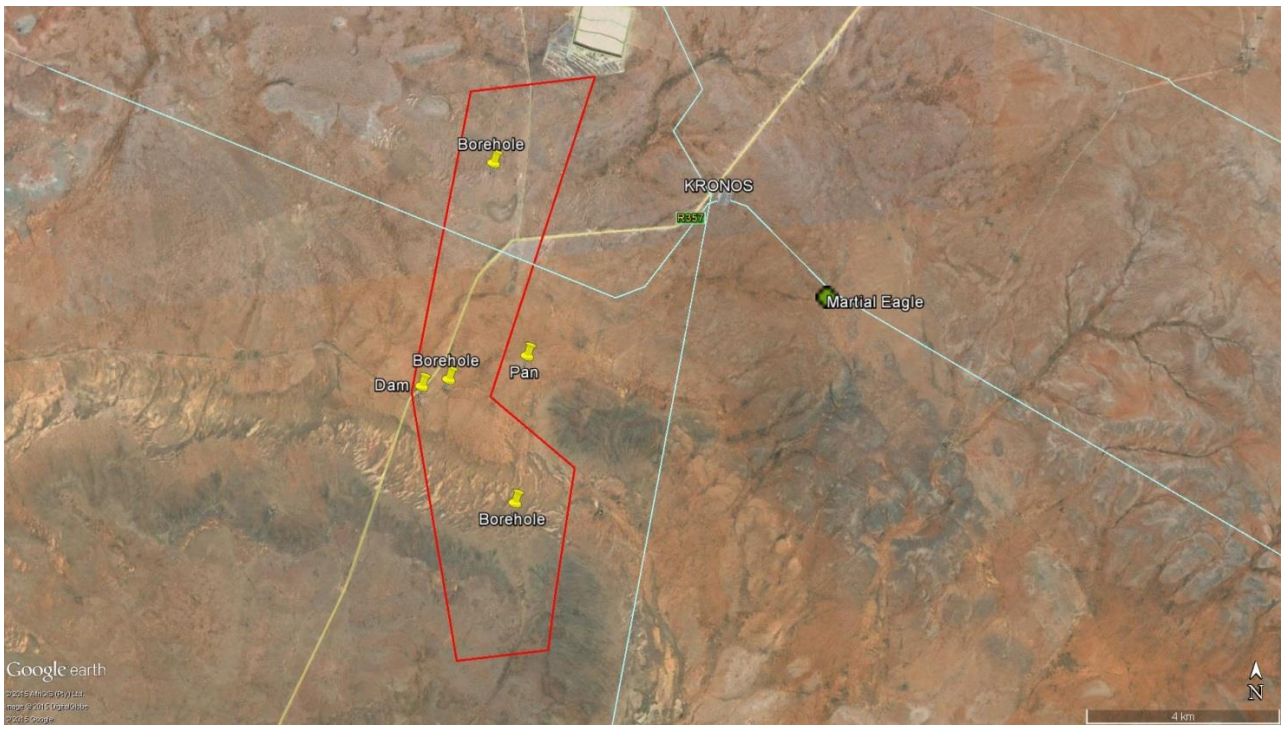

Figure 14: The location of waterbodies, high voltage lines (blue lines) and large raptor nests (green dots) in the study area.

- *Avifauna*

An estimated 121 species could potentially occur in the study area. Of these, 10 are South African Red Data species, 18 are southern African endemics and 29 are near-endemics. This means that 8.2% of the species that could potentially occur in the study area are Red Data species, and 38.8% are southern African endemics or near-endemics. Southern Africa contains 13 avifaunal endemic regions, namely Western Arid, Woodland, Evergreen Forest, Grassland, Montane, Rocky slopes and cliffs, Fynbos, Marine and Inland Waters (MacLean 1999). Of these regions, Western Arid, where the study area is located, contains the highest number of endemics. Overall, the study area potentially contains a total of 47 endemics and near-endemics, which is 28% of the 167 southern African endemics and near-endemics (Hockey et al. 2005).

See the Avifauna specialist report for a list of species potentially occurring in the study area. Potential impacts on priority species (in red) are listed in Table 10.

Table 10: Priority species potentially occurring in the study area

EN = Endangered
VU = Vulnerable
NT = Near-threatened
LC = Least concern
End = Southern African Endemic
N-End = Southern African near endemic

Name	Scientific name	National Red Data Status	Global status	Collisions with associated power line	Collisions with PV panels	Displacement through disturbance	Displacement through habitat transformation*
Ant-eating Chat	*Myrmecocichla formicivora*	End	LC		x	x	x
Ashy Tit	*Parus cinerascens*	N-end	LC		x	x	x
Black-chested Prinia	*Prinia flavicans*	N-end	LC		x	x	x
Black-eared Sparrowlark	*Eremopterix australis*	End	LC		x	x	x
Black-headed Canary	*Serinus alario*	End	LC		x	x	x
Bokmakierie	*Telophorus zeylonus*	N-end	LC		x	x	x
Cape Bunting	*Emberiza capensis*	N-end	LC		x	x	x
Cape Penduline – Tit	*Anthoscopus minutus*	N-end	LC		x	x	x
Cape Sparrow	*Passer melanurus*	N-end	LC		x	x	x
Chat Flycatcher	*Bradornis infuscatus*	N-end	LC		x	x	x
Chertnut-vented Tit-babbler	*Parisoma subcaeruleum*	N-end	LC		x	x	x
Double-banded Courser	*Rhinoptilus africanus*	NT	LC		x	x	x
Dusky Sunbird	*Cinnyris fuscus*	N-end	LC		x	x	x
Eastern Clapper-Lark	*Mirafra fasciolata*	N-end	LC		x	x	x

European Roller	*Coracias garrulus*	NT	NT		x	x	x
Fairy Flyctacher	*Stenostira scita*	End	LC		x	x	x
Grey-backed Cisticola	*Cisticola subruficapilla*	N-end	LC		x	x	x
Grey-backed Sparrowlark	*Eremopterix verticalis*	N-end	LC		x	x	x
Jackal Buzzard	*Buteo rufofuscus*	End	LC	x		x	x
Kalahari-Scrub-Robin	*Cercotrichas paena*	N-end	LC		x	x	x
Karoo Chat	*Cercomela schlegelii*	N-end	LC		x	x	x
Karoo Eremomela	*Eremomela gregalis*	End	LC		x	x	x
Karoo Korhaan	*Eupodotis vigorsii*	NT, End	LC	x	x	x	x
Karoo Long-billed Lark	*Certhilauda subcoronata*	End	LC		x	x	x
Karoo Prinia	*Prinia maculosa*	End	LC		x	x	x
Karoo Scrub-Robin	*Cercotrichas coryphoeus*	End	LC		x	x	x
Kori Bustard	*Ardeotis kori*	NT	NT	x		x	x
Lanner Falcon	*Falco biarmicus*	VU	LC			x	x
Large-billed Lark	*Galerida magnirostris*	End	LC		x	x	x
Lark-like Bunting	*Emberiza impetuani*	N-end	LC		x	x	x
Layard's Tit-babbler	*Parisoma layardi*	End	LC		x	x	x
Ludwig's Bustard	*Neotos ludwigii*	EN, N-end	EN	x		x	x
Martial Eagle	*Polemaetus bellicosus*	EN	VU	x		x	x
Mountain Wheat-ear	*Oenanthe monticola*	N-end	LC		x	x	x
Namaqua Sandgrouse	*Pterocles namaqua*	N-end	LC	x	x	x	x
Northern Black Korhaan	*Afrotis afraoides*	End	LC	x	x	x	x
Orange River White-eye	*Zosterops pallidus*	End	LC		x	x	x
Pale-winged Starling	*Onychognathus nabouroup*	N-end	LC		x	x	x

Pririt Batis	*Batis pririt*	N-end	LC		x	x	x
Red-headed Finch	*Amadina erythrocephala*	N-end	LC		x	x	x
Rufous-eared Warbler	*Malcorus pectoralis*	End	LC		x	x	x
Sabota Lark	*Calendulauda sabota*	N-end	LC		x	x	x
Scaly-feathered Finch	*Sporopipes squamifrons*	N-end	LC		x	x	x
Sclater's Lark	*Spizocorys sclateri*	NT, End	NT		x	x	x
Secretarybird	*Sagittarius serpentarius*	VU	VU	x		x	x
Sickle-winged Chat	*Cercomela sinuata*	End	LC		x	x	x
Sociable Weaver	*Philetairus socius*	End	LC		x	x	x
South African Shelduck	*Tadorna cana*	End	LC	x	x	x	x
Southern Pale Chanting Goshawk	*Melierax canorus*	N-end	LC	x	x	x	x
Spike-heeled Lark	*Chersomanes albofasciata*	N-end	LC		x	x	x
Stark's Lark	*Spizocorys starki*	N-end	LC		x	x	x
Tratrac Chat	*Cercomela tractrac*	N-end	LC		x	x	x
Verreaux's Eagle	*Aquila verreauxii*	VU	LC	x		x	x
White-throated Canary	*Crithagra albogularis*	N-end	LC		x	x	x
Yellow Canary	*Crithagra flaviventris*	N-end	LC		x	x	x

With smaller species this impact might result in partial but not total exclusion from the site, depending on the level of vegetation transformation

5.9 Surface Water

The Surface Water Assessment was conducted by Shaun Taylor and Alistair Fyfe of SiVEST. The full report is included in Appendix 6C. The environmental baseline from a surface water perspective is presented below.

5.9.1 Drainage Context

According to Dollar *et al*. (2007**)**, regions can be grouped that have similar land areas containing a limited range of recurring landforms that reflect comparable erosion, climatic and tectonic influences, and impose broad constraints on lower levels of organisation, e.g., drainage basins, macro-reaches and channel types. Hence, on this basis, geomorphic provinces (Partridge *et al*. 2010) have been delineated that reflect a relatively common set of climatic, vegetation, geological and topographical characteristics that are akin to one another. Utilising this information, the regional drainage characteristics of the broader study area can be elucidated. Under this context, the study site is located within the Western Transvaal Basin geomorphic province of South Africa.

- Northern Cape Pan Veld Geomorphic Province

The main feature of this province, which straddles the uplifted Griqualand-Transvaal axis, is the frequency of pans (some vast in size e.g., Verneukpan and Grootvloer) that are remnants of earlier (Cretaceous) drainage systems (De Wit, 1993). The province is underlain by Karoo rocks (Ecca and Dwyka Groups) in the south and east and by Namaqua gneiss in the west and north. Each pan has its own endorheic drainage net and several are used for the evaporative production of salt. These pans can be regarded as discontinuous groundwater windows, in which the substantial excess of evaporation over precipitation under the prevailing hot, dry climate, leads to rapid concentration of dissolved solids within each discrete basin. These drainage systems were disrupted both by progressive aridification and by uplift along the Griqualand-Transvaal axis, causing the dismembering of several rivers (e.g., the Koa and Vis/Hartbees rivers) (Partridge & Maud, 2000).

Four main drainage systems traverse this province; from east to west of which these are the Boesak, Vis/Hartbees and Brak rivers. Those in the east (Boesak and Vis/Hartbees) display remarkable uniformity, with flat slopes, and wide valley cross-sectional profiles. The rivers in the extreme northwest (e.g., the Brak) are, however, characterised by narrower valley cross-sectional profiles, steeper slopes and convex longitudinal profiles. The Brak River in fact follows the Koa valley, the course of which was disrupted by uplift along the Griqualand-Transvaal axis which crosses it at right angles (Partridge *et al*. 2010).

5.9.2 Database Identified Surface Water Resource Occurrence in the Study Area

The following findings from the study are limited to the databases that were directly relevant and where information was available.

In terms of the Northern Cape Catchment (2014) database, the study area is found within the Orange Primary Catchment. More specifically, the study area is found within the D54D quaternary catchment.

Of the surface water resources identifiable in the databases (Northern Cape ENPAT, 2001 and NFEPA, 2010), the study area contains:

- One (1) non-WETFEPA identified natural depression wetland; and
- Two (2) unnamed, non-perennial rivers.

Within close proximity to the study area, the following surface water resources identifiable in the databases (Northern Cape ENPAT and NFEPA) were noted:

- Three (3) non-WETFEPA natural depression wetlands roughly 270m southeast, 380m west and 120m east of the proposed study area respectively; and
- One (1) non-WETFEPA artificial depression wetland roughly 205m to the south of the proposed study area.

Over and above the already mentioned, no other wetlands or surface water features were identifiable from other remaining databases consulted that are in close proximity to the proposed development, and are expected to be affected by the proposed development (Figure 15).

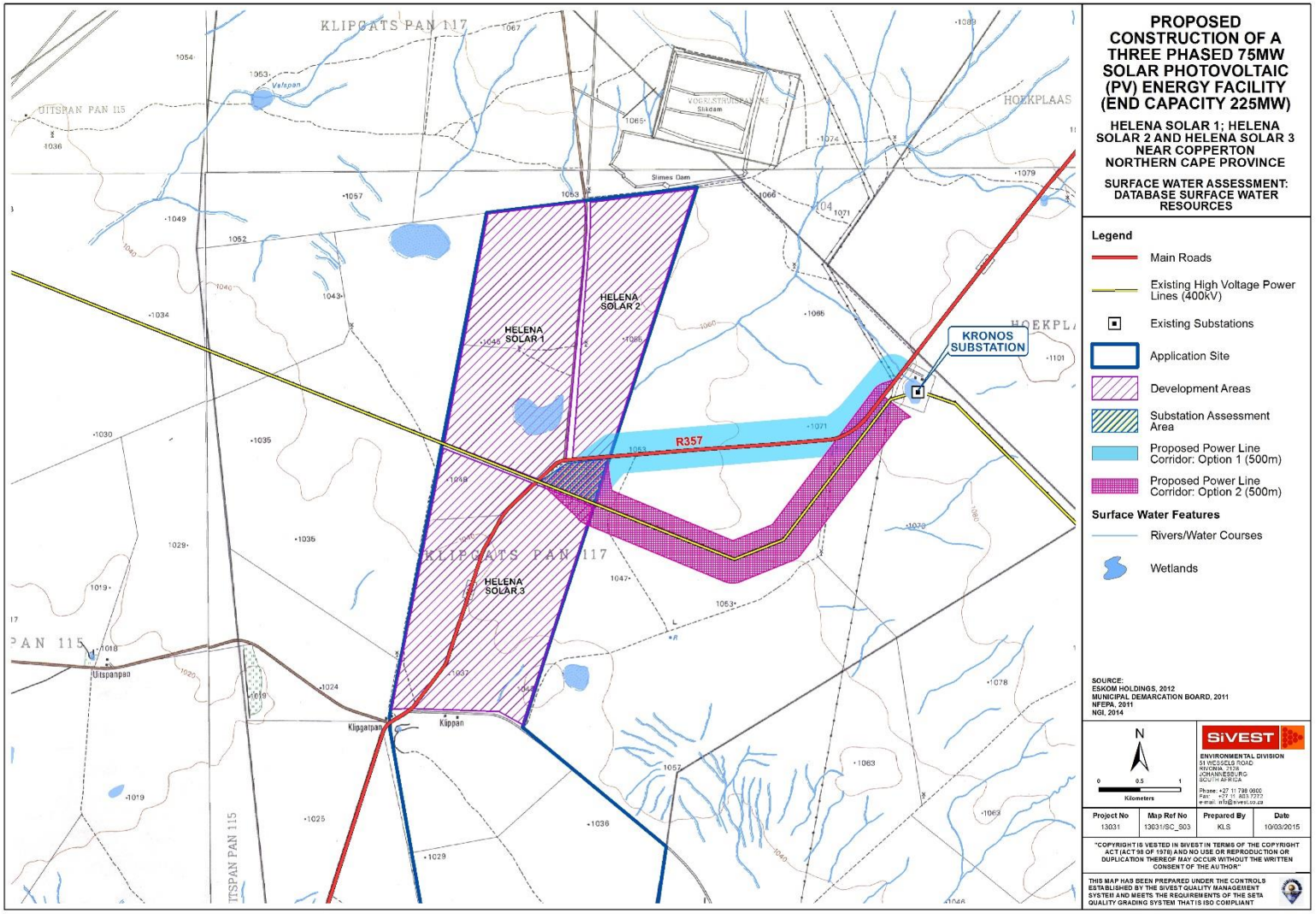

Figure 15: Database surface water resources for the BioTherm solar PV energy facility application site

5.9.3 Desktop Surface Water Resource Occurrence in the Study Area

Utilising the database findings above, Google™ satellite imagery overlaid with 1:50 000 topographical images were consulted to refine/confirm surface water resources that were identified. A number of potential surface water resources were apparent and could be delineated. In summary, it was found that there were a total of **(**Figure 16):

- Four (4) depression wetlands; and
- Two (2) unnamed, non-perennial rivers.

The database and desktop findings verify the presence of a particular depression wetland and two (2) unnamed non-perennial rivers located within the study area. By combing both the database and desktop findings, in total, potentially four (4) depression wetlands and two (2) non-perennial rivers may occur within the proposed study area. An in-field site visit involving a ground-truthing exercise will need to be undertaken to firstly verify the presence of these features and secondly any discrepancies found between the database and desktop findings in the classifications of the features.

Table 11 highlights the number and type of surface water resource found within each of the proposed development sites as well as assessment corridors.

Table 11. Surface Water Resources per Phase

Proposed Development Location	Preference Reasons
Helena Solar 1	Two (2) depression wetlands present.
Substation Area	One (1) depression wetland present.
Power Line Option 1 Alternative	One (1) non-perennial river present.
Power Line Option 2 Alternative	One (1) depression wetland present.

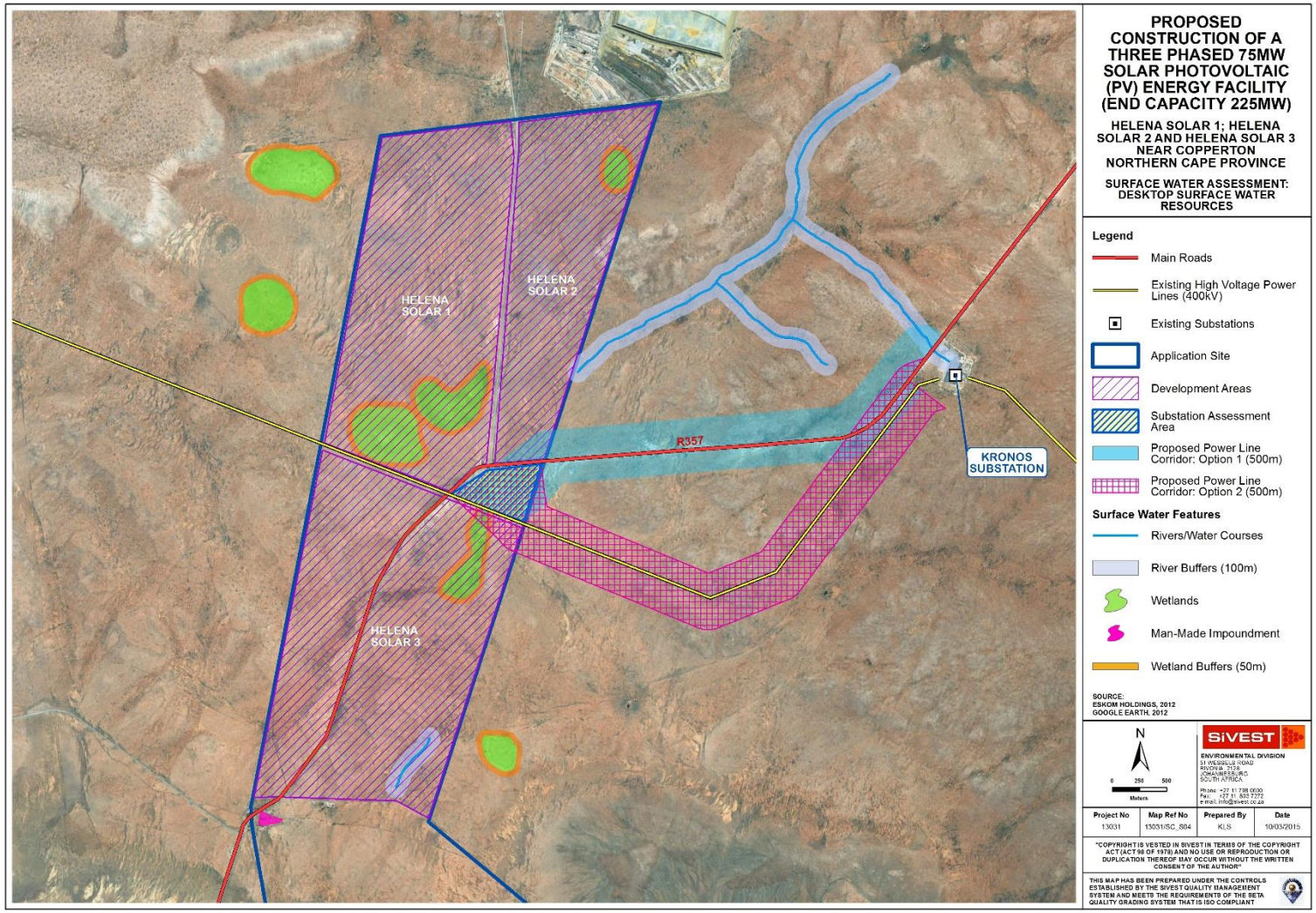

Figure 16: Desktop surface water resources for the BioTherm solar PV energy facilities application site

5.10 Soils and Agricultural Potential

The Soils and Agricultural Potential Assessment was conducted by D.G. Paterson. The full report is included in Appendix 6D. The environmental baseline from a soils and agricultural perspective is presented below.

5.10.1 Soils

Existing soil information was obtained from the map sheets 2922 Prieska and 3022 Britstown (Bruce & Geers, 2005) from the national Land Type Survey, published at 1:250 000 scale. A ***land type*** is defined as an area with a uniform terrain type, macroclimate and broad soil pattern. The soils are classified according to MacVicar *et al* (1977).

The area under investigation is covered by two land types, as shown on the map in the Soils and Agriculture Specialist Report namely: **Ah54, Ah93** (Red and yellow, freely-drained soils, high base status).

It should be clearly noted that, since the information contained in the land type survey is of a reconnaissance nature, only the general dominance of the soils in the landscape can be given, and not the actual areas of occurrence within a specific land type. Also, other soils that were not identified due to the scale of the survey may also occur. **The site was not visited during the course of this study, and so the detailed composition of the specific land types has not been ground-truthed.**

A summary of the dominant soil characteristics of each land type is given in Table 12 below.

The distribution of soils with high, medium and low agricultural potential within each land type is also given, with the dominant class shown in **bold type**.

5.10.2 Soil Pattern

The soils are all shallow to very shallow (<500 mm), usually sandy and calcareous, overlying either rock or cemented hardpan calcrete. Some rock outcrops occur in places in the landscape.

The occurrence and distribution of the land types is shown in the Soils and Agriculture specialist report.

A summary of the dominant soil characteristics is given in Table 12 below.

Table 12: Land types occurring (with soils in order of dominance)

Land Type	Depth (mm)	Dominant soils	Percent of land type	Characteristics	Agric. Potential* (%)
Ah54	300-1200 300-1200 75-250	Clovelly 43/44/44/45/46 Hutton 36/43/44/46 Glenrosa 23/24/26/27	69% 10% 9%	Yellow-brown, sandy/loamy soils on rock or hardpan calcrete Red, sandy/loamy soils on rock or hardpan calcrete Brown, sandy topsoils, on rock or hardpan calcrete	High:0.0 **Mod: 87.2** Low: 12.8
Ah93	20-100 100-250 100-500	Mispah 22/Glenrosa 23 Clovelly 43 Hutton 33/43	25% 24% 21%	Brown, sandy topsoils, on hardpan calcrete Yellow-brown, sandy soils on rock or hardpan calcrete Red, sandy soils on rock or hardpan calcrete	High:0.0 Mod: 0.0 **Low: 100.0**

*Note: Agricultural Potential refers to **soil characteristics only**, without potentially restricting climatic factors

5.10.3 Agricultural Potential

Virtually all of the study area comprises shallow, calcareous soils with rock (land type Ah93), as can be seen from the information contained in Table 12 and the Soils and Agriculture specialist report.

Coupled with these shallow soils, the very low rainfall in the area means that the only means of cultivation would be by irrigation and the Google Earth image of the area (Figure 17) shows absolutely no signs of any agricultural infrastructure and certainly none of irrigation.

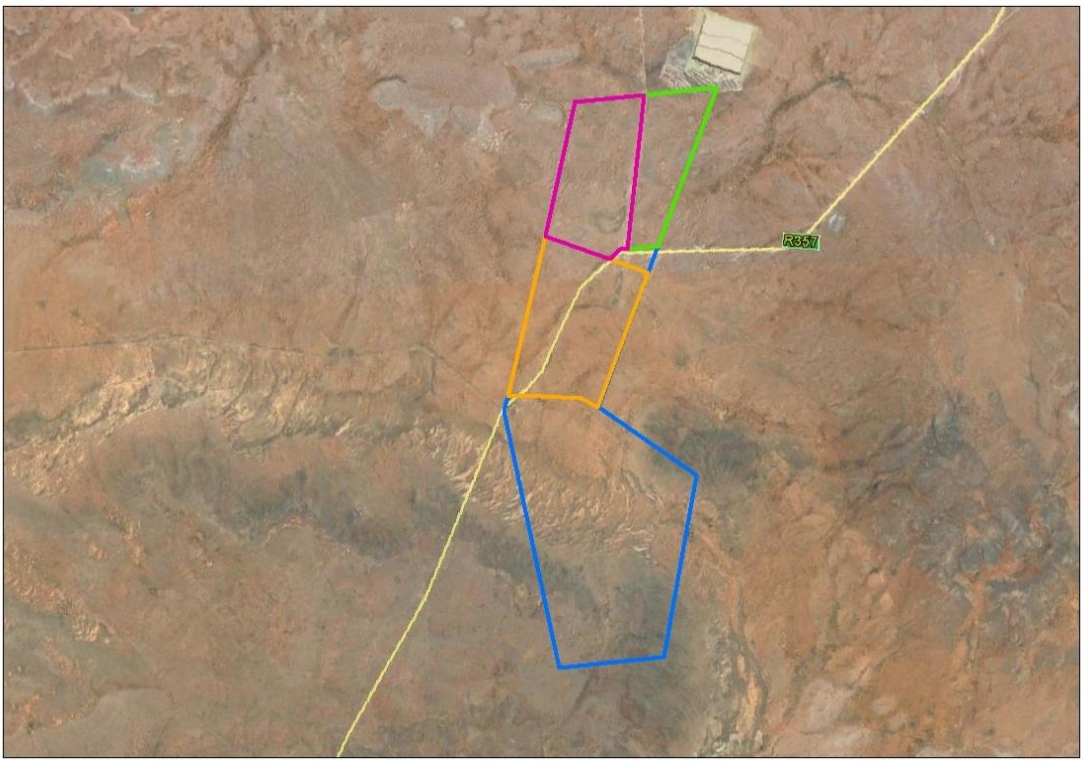

Figure 17: Google Earth image of study area

The climatic restrictions mean that this part of the Northern Cape is suited at best for grazing and here the grazing capacity is low, around 20 ha/large stock unit (ARC-ISCW, 2004).

- Land Use

The land use in the area is dominantly “shrubland and low fynbos” with some small areas of “bare rock and soil (natural)” as classified by the National Land Cover (Thompson, 1999). As previously mentioned, there are no areas of cultivation that were identified, only a few small, isolated areas of “Improved grassland”.

5.11 Visual

The Visual Assessment was conducted by Andrea Gibb at SiVEST. The full report is included in Appendix 6E. The environmental baseline from a visual perspective is presented below.

The physical and land use related characteristics are outlined below as they are important factors contributing to the visibility of a development and visual character of the study area. Defining the visual character is an important part of assessing visual impacts as it establishes the visual baseline or existing visual environment in which the development would be constructed. The visual impact

of a development is measured according to this visual baseline by establishing the degree to which the development would contrast or conform with the visual character of the surrounding area. The inherent sensitivity of the area to visual impacts or visual sensitivity is thereafter determined, based on the visual character, economic importance of the scenic quality of the area, inherent cultural value of the area and presence of visual receptors.

5.11.1 Topography

The flat terrain that occurs within the immediate vicinity of application site results in generally wide-ranging vistas throughout the study area. The only exception to this generally flat topography is the range of mountains located to the north-west of the site, the Doringberge are located beyond the visual assessment zone, as such there would be very little topographical shielding to lessen the impact of the PV plant from locally-occurring receptor locations. The Mountains approximately 42km from the site and they enclose the visual envelope. As these hills lie between Prieska and the site, they are a contributing factor in potentially shielding Prieska from the proposed development, although Prieska is situated at a distance from where the impact of the development is likely to be negligible.

5.11.2 Vegetation

The natural short vegetation cover will offer no visual screening. Tall exotic trees may effectively screen the proposed development from farmhouses, where these trees occur in close proximity to the farmhouse and are located directly in the way of views toward the development.

5.11.3 Land Use

The general lack of human habitation and associated human infrastructure, has an obvious impact on the sense of place and thus giving the area a largely natural, rural feel. Only in areas further north will the landscape character appear more industrial.

The influence of the level of human transformation on the visual character of the area is described in more detail below.

5.11.4 Visual Character and Cultural Value

Visual character can be defined based on the level of change or transformation from a completely natural setting, which would represent a natural baseline in which there is little evidence of human transformation of the landscape. Varying degrees of human transformation of a landscape would engender differing visual characteristics to that landscape, with a highly modified urban or industrial landscape being at the opposite end of the scale to a largely natural undisturbed landscape. Visual

character is also influenced by the presence of built infrastructure such as buildings, roads and other objects such as electrical infrastructure.

Most of the study area is considered to have a rural or pastoral character as a result of the limited human habitation and associated human infrastructural footprint present within the area. The nature of the predominant land use (sheep farming) has retained the natural vegetation and natural appearance of the landscape. Built infrastructure within the study area is limited to isolated farmhouses, gravel access roads, boundary fences and a high voltage power line which traverse the application site. The infrastructure associated with the Copper Mine is unlikely to change the visual character of the study area as the relic mine has been non-functional for a number of years, and the transformation of the area around the mine is extremely localised.

The relatively low density of human transformation throughout the surrounding area is an important component contributing to the largely natural visual character of the study area. This is important in the context of potential visual impacts associated with the proposed development of a PV energy facility as introducing this type of development could be considered to be a degrading factor in this context.

It should however be noted that several other solar energy facilities are proposed within relatively close proximity to the proposed development. These facilities and their associated infrastructure, typically consist of very large structures which are highly visible. As such, these facilities will significantly alter the visual character and baseline in the study area once constructed and make it appear to have a more industrial-type visual character.

The greater area surrounding the proposed development site is also an important component when assessing visual character. The area can be considered to be typical of a Karoo or “platteland” landscape that would characteristically be encountered across the high-lying dry western and central interior of South Africa. Much of South Africa’s dry Karoo interior consists of wide open, uninhabited spaces sparsely punctuated by widely scattered farmsteads and small towns. Traditionally the Karoo has been seen by many as a dull, lifeless part of the country that was to be crossed as quickly as possible on route between the major inland centres and the Cape coast, or between the Cape and Namibia. However, in the last couple of decades this has been changing, with the launching of tourism routes within the Karoo, and the promotion of tourism in this little visited, but large part of South Africa. In a context of increasing urbanisation in South Africa’s major centres, the Karoo is being marketed as an undisturbed getaway, especially as a stop on a longer journey from the northern parts of South Africa to the Western and Eastern Cape coasts. Examples of this may be found in the relatively recently published “Getaway Guide to Karoo, Namaqualand and Kalahari” (Moseley and Naude-Moseley, 2008). The exposure of the Karoo in the national press during 2011, as part of the debate around the potential for fracking (hydraulic fracturing) mining activities, has brought the natural resources, land use and lifestyle of the Karoo into sharp focus. Many potential objectors stress the need to preserve the environment of the Karoo, as well as preserve the ‘Karoo Way of Life’, i.e. the stock farming practices which are highly dependent on

the use of abstracted ground water (e.g. refer to the Treasure Karoo Action Group website http://treasurethekaroo.co.za/).

The typical Karoo landscape can also be considered a valuable 'cultural landscape' in the South African context. Although the cultural landscape concept is relatively new, it is becoming an increasingly important concept in terms of the preservation and management of rural and urban settings across the world (Breedlove, 2002).

According to the Committee's Operational Guidelines; Cultural Landscapes can fall into three categories (UNESCO: 2005).

i) "a landscape designed and created intentionally by man";
ii) an "organically evolved landscape" which may be a "relict (or fossil) landscape" or a "continuing landscape";
iii) an "associative cultural landscape" which may be valued because of the "religious, artistic or cultural associations of the natural element"

The typical Karoo landscape consisting of wide open plains, and isolated relief, interspersed with isolated farmsteads, windmills and stock holding pens, is an important part of the cultural matrix of the South African environment. The Karoo farmstead is also a representation of how the harsh arid nature of the environment in this part of the country has shaped the predominant land use and economic activity practiced in the area, as well as the patterns of human habitation and interaction. The presence of small Karoo towns, such as Prieska and Copperton, engulfed by an otherwise rural environment, form an integral part of the wider Karoo landscape. As such, the Karoo landscape as it exists today has value as a cultural landscape in the South African context. In the context of the types of cultural landscape listed above, the Karoo cultural landscape would fall into the second category, that of an organically evolved, "continuing" landscape.

The study area, as visible to the viewer, represents a typical Karoo cultural landscape. This is important in the context of potential visual impacts associated with the proposed development of a PV facility as introducing this type of development could be considered to be a degrading factor in the context of the natural Karoo character of the study area, as discussed further below.

5.11.5 Visual Sensitivity

Visual Sensitivity can be defined as the inherent sensitivity of an area to potential visual impacts associated with a proposed development. It is based on the physical characteristics of the area (i.e. topography, landform and land cover), spatial distribution of potential receptors, and the likely value judgements of these receptors towards a new development (Oberholzer: 2005). A viewer's perception is usually based on the perceived aesthetic appeal of an area and on the presence of economic activities (such as recreational tourism) which may be based on this aesthetic appeal.

In order to assess the visual sensitivity of the area SiVEST has developed a matrix based on the characteristics of the receiving environment which, according to the Guidelines for Involving Visual and Aesthetic Specialists in the EIA Processes, indicate that visibility and aesthetics are likely to be 'key issues' (Oberholzer: 2005).

Based on the criteria in the matrix (Table 13, the visual sensitivity of the area is broken up into a number of categories, as described below:

i) **High** - The introduction of a new development such as the erection of a power line would be likely to be perceived negatively by receptors in this area; it would be considered to be a visual intrusion and may elicit opposition from these receptors

ii) **Moderate** - Presence of receptors, but due to the nature of the existing visual character of the area and likely value judgements of receptors, there would be limited negative perception towards the new development as a source of visual impact.

iii) **Low** - The introduction of a new development would not be perceived to be negative, there would be little opposition or negative perception towards it.

The table below outlines the factors used to rate the visual sensitivity of the study area. The ratings are specific to the visual context of the receiving environment within the study area.

Table 13: Environmental factors used to define visual sensitivity of the study area

FACTORS	**RATING**									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Pristine / natural character of the environment										
Presence of sensitive visual receptors										
Aesthetic sense of place / scenic visual character										
Value to individuals / society										
Irreplaceability / uniqueness / scarcity value										
Cultural or symbolic meaning										
Scenic resources present in the study area										
Protected / conservation areas in the study area										
Sites of special interest present in the study area										
Economic dependency on scenic quality										
Local jobs created by scenic quality of the area										
International status of the environment										
Provincial / regional status of the environment										
Local status of the environment										
**Scenic quality under threat / at risk of change										

**Any rating above '5' will trigger the need to undertake an assessment of cumulative visual impacts.

Low					Moderate								High
10	20	30	40	50	60	70	80	90	100	110	120	130	140	150

Based on the above factors, the study area is rated as having a low visual sensitivity. This is mainly owing to the relatively uninhabited characteristics of the area and the relic mining infrastructure which would likely reduce the scenic quality of the area. An important factor contributing to the visual sensitivity of an area is the presence, or absence of visual receptors that may value the aesthetic quality of the landscape and depend on it to produce revenue and create jobs. As described below, very few potentially sensitive receptors are present in the study area. Although no formal protected areas or leisure / nature-based tourism activities exist within the study area, the area would still be valued as a typical Karoo cultural landscape.

*Several solar energy facilities are proposed within relatively close proximity to the proposed project. As such, an assessment of the cumulative impact that will be experienced from each potentially sensitive receptor will be undertaken in the next phase of this study, once the sensitive receptor locations have been confirmed.

5.12 Heritage

The Heritage Assessment was conducted by Wouter Fourie of Professional Grave Solutions. The full report is included in Appendix 6F. The environmental baseline from a heritage perspective is presented below.

The examination of heritage databases, historical data and cartographic resources represents a critical additional tool for locating and identifying heritage resources and in determining the historical and cultural context of the study area. Therefore an Internet literature search was conducted and relevant archaeological and historical texts were also consulted. Relevant topographic maps and satellite imagery were studied.

5.12.1 Previous Studies

Researching the SAHRIS online database (http://www.sahra.org.za/sahris), it was determined that a number of other archaeological or historical studies have been performed within the wider vicinity of the study area. Previous studies listed for the area in the APM Report Mapping Project included a number of surveys within the area listed in chronological order below:

VAN RYNEVELD, K. 2006. Phase 1 Archaeological Impact Assessment - Vogelstruisbult 104, Prieska District, Northern Cape, South Africa. National Museum Bloemfontein

KAPLAN, J.M. 2010. Archaeological Scoping Study and Impact assessment of a proposed photovoltaic power generation facility in Copperton Northern Cape. Agency for Cultural Resource Management

KAPLAN, J.M. & WILTSHIRE, N. 2011. Archaeological Impact Assessment of a proposed wind energy facility, power line and landing strip in Copperton, Siyathemba municipality, Northern Cape. Agency for Cultural Resource Management

ATWELL, M. 2011. Heritage Assessment Proposed Wind Energy Facility and Related Infrastructure, Struisbult: (Farm 103, Portions 4 and 7), Copperton, Prieska, Atwell & Associates

ORTON, JAYSON. 2012a. Heritage Impact assessment for a proposed photovoltaic energy plant on the farm Klipgats Pan near Copperton, Northern Cape. Archaeology Contracts Office Department of Archaeology. University of Cape Town

ORTON, JAYSON. 2012b. Heritage Impact Assessment for a proposed photovoltaic energy plant on the farm Hoekplaas near Copperton, Northern Cape. Archaeology Contracts Office Department of Archaeology. University of Cape Town

Van der Walt, Jaco. 2012. Archaeological Impact Assessment Report for the proposed Garob Wind Energy Facility Project, located close to Copperton in the Northern Cape. Heritage Contracts and Archaeological Consulting CC (HCAC)

FOURIE, W. 2012. Heritage Impact Assessment for the proposed Eskom Cuprum to Kronos Double Circuit 132kv Power line and Associated Infrastructure, Prieska, Northern Cape.

ORTON, J & WEBLEY, L. 2013. Heritage Impact Assessment for Multiple Proposed Solar Energy Facilities on the Remainder of Farm Klipgats Pan 117, Copperton, Northern Cape

5.12.2 Findings from the studies

- Palaeontology

The following map (Figure 18) is an extract from the palaeontological desktop study completed by Almond (2012) for the proposed solar project on the farm Klipgatspan, bordering to the study area. The map indicates the main geological units as:

The main geological units mapped within the PV4 study region are:

1. Precambrian (Mid Proterozoic / Mokolian) basement rocks (igneous / metamorphic):
   Reddish-brown (Mg) = granitic and associated intrusive rocks
2. Late Carboniferous / Early Permian Karoo Supergroup sediments:
   Grey (C-Pd) = Mbizane Formation (Dwyka Group)

3. Early Jurassic dolerite intrusions
   Pink (Jd) = Karoo Dolerite Suite
4. Cretaceous kimberlite intrusions
   Black line (Kk) = kimberlite dykes (not all mapped)
5. Late Caenozoic (Quaternary to Recent) superficial deposits:
   Pale yellow with flying bird symbol = Quaternary to Recent alluvium, pan sediments (N.B. calcrete hardpan extensively present in the subsurface and superficial soils gravels are not mapped at this scale)

Almond (2012), indicated that the, "*poorly-exposed upper Dwyka Group bedrocks in the Klipgats Pan study area do not contain rich trace fossil assemblages, petrified wood or other fossil material, and are therefore of low palaeontological sensitivity. The only fossils recorded from the Dwyka succession here are ice-transported erratic boulders of Precambrian limestone or dolomite that contain small stromatolites (microbial mounds or columns). The study area is largely mantled by Pleistocene to Recent superficial sediments (soils, alluvium, calcretes, gravels etc) that are likewise generally of low palaeontological sensitivity*."

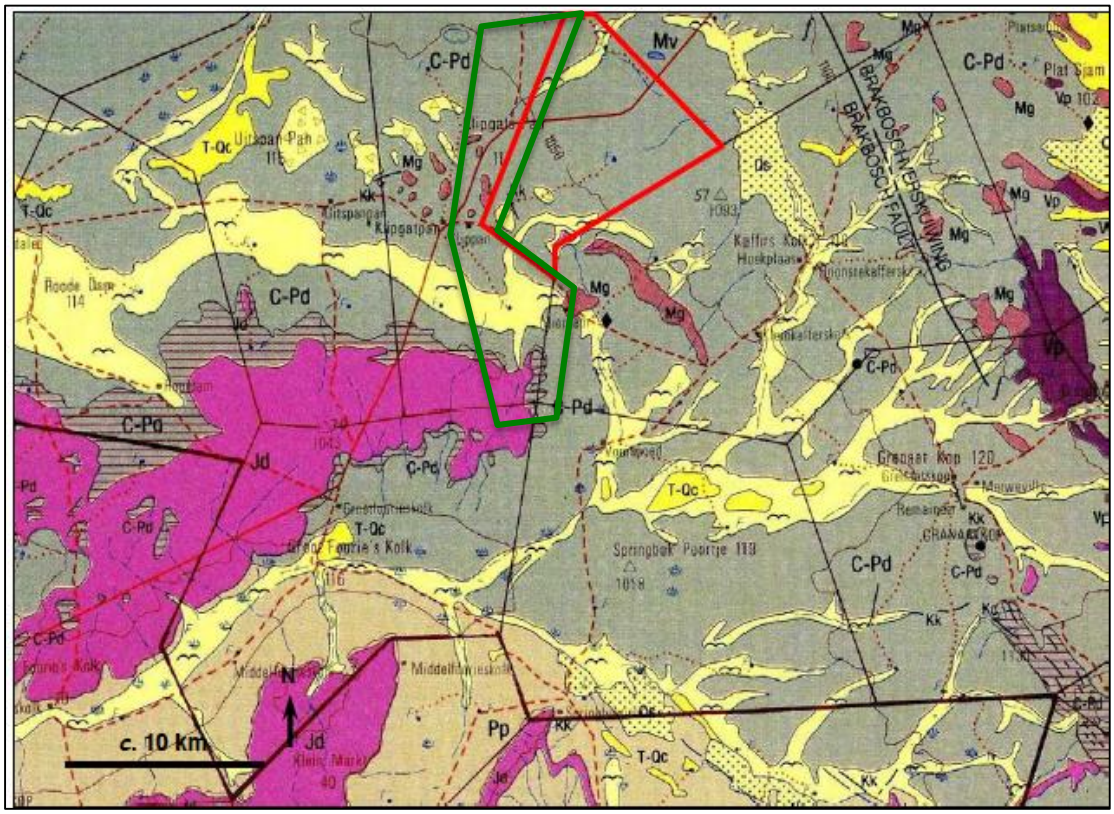

Figure 18: 250 000 geology sheet 3022 Britstown (Council for Geoscience, Pretoria). The Outline of the current study in green

- Archaeology

Most archaeological material in the Northern Cape is found near water sources such as rivers, pans and springs, as well as on hills and in rock shelters. Sites usually comprise of open sites where the majority of evidence of human occupation is scatters of stone tools (Parsons 2003). Evaluation of the alignment has identified possible sensitive areas.

The areas marked in blue and red (Figure 21) shows drainage lines and pans in the proposed development areas.

Since Sept 2011 a large number of Heritage and Archaeological Impact Assessments were completed in the vicinity of the proposed development area (Figure 21). Most notably the work of Orton (2011, 2012 and 2013), Kaplan (2010) and Kaplan and Wiltshire (2011) and Van der Walt (2012), has confirmed the statement by Parsons (2003), as noted earlier.

Figure 19: Early Stone Age stone tools found close to Kronos substation, just east of the study area

Orton (2012) notes that literature has shown that the Bushmanland area is littered by low density lithic scatters, with well weathered Early (ESA) and Middle Stone Age (MSA) artefacts dominating the assemblages. Orton's (2012 and 2013) and Fourie's (2012) work on the Klipgats Pan and Hoekplaas, that was done in the closest proximity to the study area has produced numerous find

spots as well as clusters of site located on elevated terraces overlooking pan-like areas (identified as the drainage area as indicated in Figure 21), noted by Orton as being of LSA origin.

Figure 20: Close-up view of quartzite flakes and debitage at Kr_Cu/2012/003 (Debitage and lithics indicate by dots) a site situated some 500 meters to the east of the study area (Fourie, 2013)

Kaplan and Wiltshire's (2011) work to the north of the study area has confirmed the presence of Stone Age Sites with a high local significance rating with the sites at Modderpan and Saaipan covering ESA, MSA and LSA finds. A number of knapping occurrences and find spots were also made during the fieldwork.

5.12.3 Historical structures and history

Some structures (green areas in Figure 21) identified during map analysis and needs to be investigated during the Impact Assessment phase.

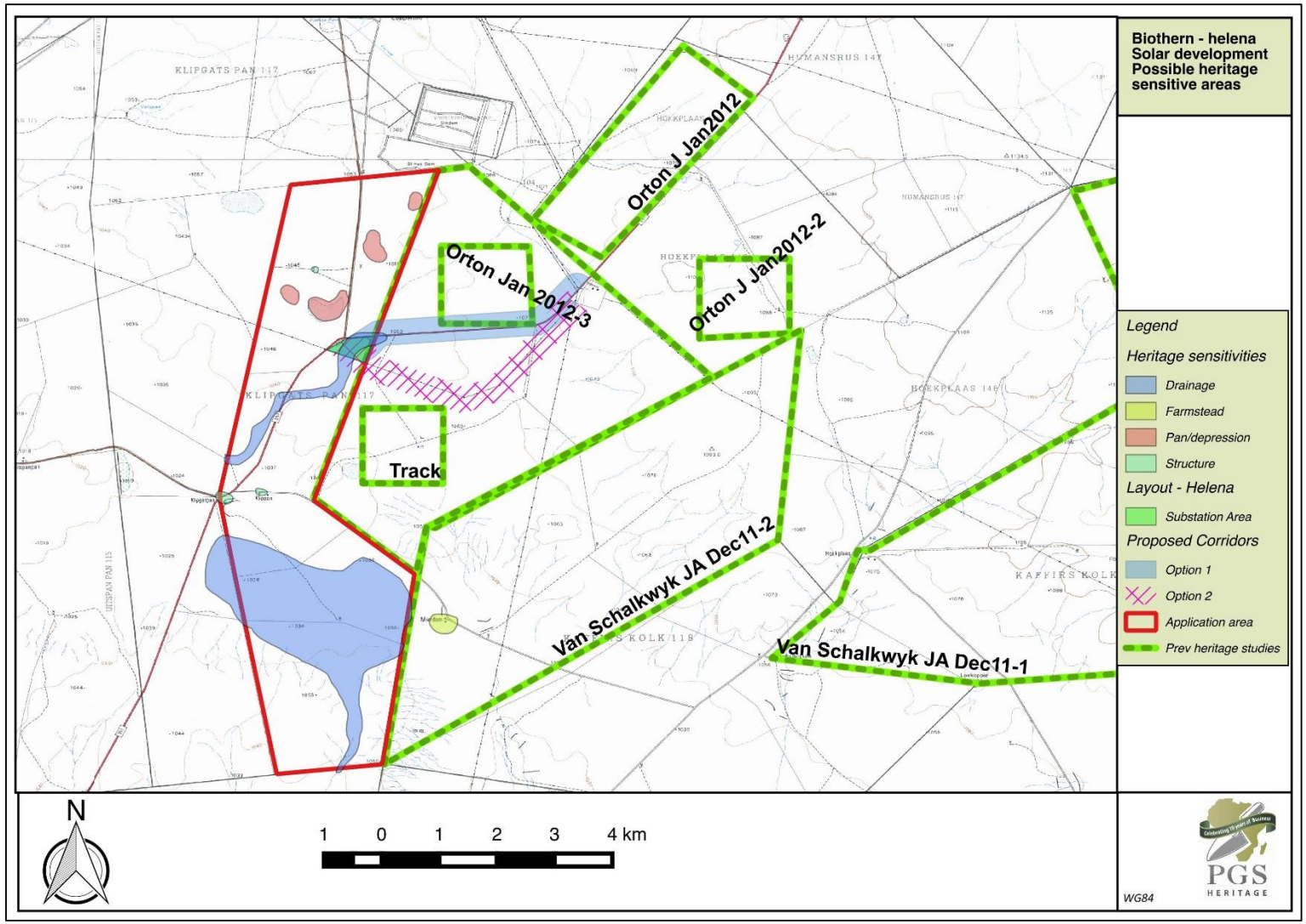

Figure 21: Possible heritage sensitive areas

5.12.4 Possible finds

Evaluation of aerial photography has indicated the following area that may be sensitive from an archaeological perspective (Figure 21). The analysis of the studies conducted in the area assisted in the development of the following landform type to heritage find matrix in Table 14.

Table 14: Landform to heritage matrix

LAND FROM TYPE	**HERITAGE TYPE**
Crest and foot hill	LSA and MSA scatters
Crest of small hills	Small LSA sites – scatters of stone artefacts, ostrich eggshell, pottery and beads
Pans	Dense LSA sites
Dunes	Dense LSA sites
Outcrops	Occupation sites dating to LSA
Farmsteads	Historical archaeological material

To be able to compile a heritage management plan to be incorporated into the Environmental Management Plan the following further work will be required for the EIA.

- Archaeological walk through of the areas where the project will be impacting;
- Palaeontological desktop assessment of the areas and selective site visits where required by the palaeontologist;

5.13 Socio-economic Environment

The Socio-economic Assessment was conducted by Elena Broughton of Urban-Econ Development Economists. The full report is included in Appendix 6G. The environmental baseline from a socio-economic perspective is presented below.

This chapter examines key socio-economic characteristics of the study area. This is essential as it provides both qualitative and quantitative data related to the communities and economies under observation, creating a baseline, against which the impacts can be assessed.

5.13.1 3.1 Study area's composition

- *Spatial context and regional linkages*

The proposed Helena Solar PV facility is to be located in the Siyathemba LM, which is one of the eight local municipalities making up the Pixley ka Seme DM situated in the Northern Cape.

The Northern Cape Province is geographically the largest province in South Africa covering an area of 372 889km², which constitutes approximately 30% of the country's total area. Despite

having the largest surface area, the Northern Cape Province is the least populated of all nine provinces. According to Census 2011, the province's population was 1 145 859 or 2.2% of the national population. The province is bordered by Namibia and Botswana in the north, while domestically, the North West Province in the north-east, the Free State Province in the east, the Eastern Cape Province in the south-east, and the Western Cape Province to the south and south-west. The Northern Cape consists of five districts, namely Frances Baard, Pixley ka Seme, Namakwa, ZF Mgcawu (previously known as Siyanda), and John Taolo Gaetsewe.

The Pixley ka Seme DM, which lies in the south-east of the Northern Cape Province is geographically the second largest of the five district municipalities and covers a surface area of 103 410km². It is bordered by the Free State in the east, ZF Mgcawu District in the north, the Eastern Cape Province to the south, and the Namakwa District in the west. The total population of the district, according to the 2011 Census, was approximately 186 349, making it the DM with the second lowest population in the province. The district comprises of eight LMs, such as the Thembelihle LM, Emthanjeni LM, Siyancuma LM, Umsobomvu LM, Ubuntu LM, Kareeberg LM, the Siyathemba LM, and Renosterberg LM.

The Siyathemba LM is located within the central eastern part of the Northern Cape Province and is traversed from the east to west by the Orange River, the country's largest river. The municipality covers a geographic area of 14 725km². Prieska functions as the administrative seat of the LM. Other notable towns and settlements include Marydale, Nierkerkshoop, and Copperton.

Location-wise, Siyathemba is very distant from South Africa's largest consumer markets. The area is traversed by the R357, which links the site to Prieska. Prieska has an access to the main railway line linking the country with Namibia, as well as good tarred road connections to Upington, Kimberley, and De Aar. It is located some 182km from De Aar (administrative seat of the Pixley ka Seme DM) and 236km from Kimberley.

- *Towns and Settlements*

Copperton was once a town that provided accommodation solely for the nearby copper and zinc mines' workers and their families. It was then sold to a private owner after the closing of the Copperton Mine and is currently on a long-term lease by the Request Trust. Some of the originally built houses were demolished, but after the lease agreement was signed with the Request Trust, an agreement was reached that the rest of the houses could be retained (Siyathemba LM, 2014). According to the Census 2011 results, the population of Copperton was 55 with 33 households. The most notable landmarks in the area is an all-purpose test range Alkantpan owned and operated by Armscor. The airport in Copperton is often hosts either an SA Air Force transport or a chartered aircraft bringing in equipment for testing as well as the people and instruments required for testing at Alkantpan the 2013/2014 annual report of Armscor suggests that a number of foreign and local clients used Alkantrop for ballistic testing, which is made possible due to among other the restricted airspace above the testing range.

The site is located in a rural area and as such the population density is very low, with major towns' located kilometres away. The closest major town to Copperton is Prieska, which is approximately 50km away in the same LM. Prieska is home to 14 248 people LM (Stats SA, 2014). Marydale, situated 60km north-west of Copperton, is also a rural service centre near the site also located in the Siyathemba LM. Nierkerkshoop, another rural service centre, is situated approximately 80km north-east.

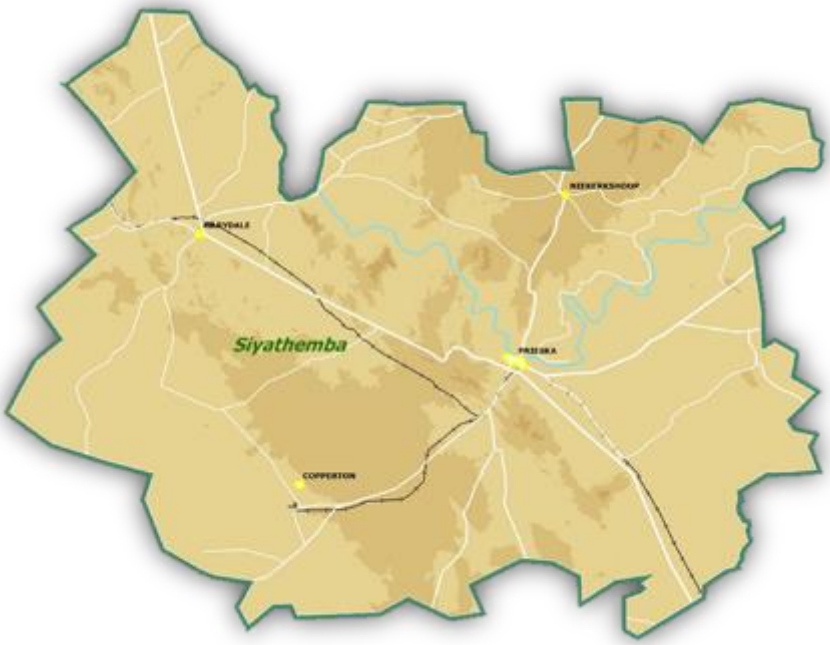

Figure 22: Settlements and towns near the project site

Prieska is the administrative seat of the Siyathemba LM and is located on the Southern Bank of the Orange River, approximately 50km northeast of the proposed site. While relatively isolated, Prieska has good access to the main railway line to Namibia, good tarred road connections to Upington, Kimberley, and De Aar, and two landing strips for light aircrafts. The Prieska area is also known for its high quality semi-precious stones, specifically tiger's eye.

- *Resources and land capability*

Generally, the area does not have any significant mineral deposits. To the south of Prieska, on the farm Doornfontein, a medium-sized mineral deposit of Phosphate can be found. Various small mineral deposits can be found near Niekerkshoop. These include Tiger's-eye and Crocidolite (Asbestos). Small deposits of Alluvial Diamonds can be found in the Orange River. Other small mineral deposits within the Municipal boundary include Salt, Gypsum, Iron and Uranium (Siyathemba LM, 2012).

The Orange River runs through the municipality and provides ideal conditions for irrigation farming in Siyathemba, especially the cultivation of grains and vegetables.

The town of Prieska is located on the south bank of the Orange River at the foot of the Doringberg. It was originally named Prieskap, a Khoisan word meaning, “lace of the lost she-goat”. The municipality also boasts a number of tourism attractions such as (Siyathemba LM, 2014):

- Die Bos Nature Reserve
- British Fort
- Green Valley Nuts
- The Oranjezicht and Keikamspoort Hiking Trails
- Khoisan Rock Art
- Memorial Garden
- Prieska Museum
- Ria Huysamen Aloe Garden Schumann Rock Collection
- Wonderdraai Island

- *Land-uses within the affected zone of influence*

The surrounding land uses are mainly agricultural, consisting mostly of sheep grazing. The main livestock farming in the region include cattle, sheep, and goat farming.

Table 15 provides land-use information for some of the farms where various components of the project will be established as sourced from initial interaction with the owners or managers of the farms. It is expected that more information will be provided after more in-depth discussions with the land owners to be undertaken in the next phase.

Table 15: Land use profile of the affected farm portions

Farm	Type of effect	Information
Portion 3 of Klipgats Pan 117	Directly affected (PV site)	▪ Small private sheep farm ▪ 4 people living on the farm ▪ 1 labourer ▪ Land owner opinion: the project will have a positive impact
Portion 4 of Klipgats Pan 117	Directly affected (power lines)	▪ No activities currently taking place ▪ No one lives on the land ▪ Land owner opinion: the project will have a positive impact due to the increased spending in the community
Portion 3 of Groot Fouries Kolk 116	Adjacent	▪ Commercial sheep farming ▪ 4 people living on the farm ▪ 4 labourers ▪ Land owner opinion: does not feel that the project will have any impact on them
Remainder of Slimes Dam 154	Adjacent	▪ Did not respond to call

Farm	Type of effect	Information
Portion 2 of Springbok Poortje 119	Adjacent	▪ Did not respond to call and e-mail sent
Portion 2 of Kaffirs Kolk 118	Adjacent	▪ Indifferent about the project and did not wish to provide any information
Portion 1 of Kaffirs Kolk 118	Adjacent	▪ Did not wish to be engaged telephonically and did not respond to e-mail enquiry
Portions 1, 2, 5 of Klipgats Pan 117	Adjacent	▪ No contact information available

5.13.2 Demographic Profile and Income Levels

The population of any geographical area is the cornerstone of the development process, as it affects the economic growth through the provision of labour and entrepreneurial skills, and determines the demand for the production output. Examining population dynamics is essential in gaining an accurate perspective of those who are likely to be affected by any prospective development or project.

The Siyathemba LM is home to approximately 21 593 people, with a total of 5 830 households (Stats SA, 2011). The population has increased by 14.9% from 18 376 in 2001. A large portion (87.2%) of the population in the LM resides in urban areas, while the rest (12.8%) lives on farms. Both urban to urban migration and rural to urban migration are observed in the Pixley ka Seme region, including the Siyathemba LM. Rural to DM, 2011). The large proportion of people living in the urban area can be explained by the ease of access to opportunities and services within the larger urban centres, in this case Prieska. The majority (72.2%) of the people in the municipality are Coloured with 18.5% of the population being Black, followed by White 8.4%), and Indians/Asians (0.5%). Afrikaans is the language most spoken in the LM. The municipality's sex ratios are not very skewed, the female population (50.1%) accounts for slightly more of the LM's population compared to the male population (49.9%).

The youth (age 15-34) make up the majority of the people living in the Siyathemba LM with 31.7%, followed by the group between the ages of 35 and 64 with 31.4%. Considering the working age group that is between the ages of 15 and 64, the municipality has a slightly bigger percentage of working age males than females (refer to Figure 23). The population in the area is characterised by a high dependency ratio (58.5%) with a total of 36.8% of the population being within the ages of 0 to 14 (30.6%) and over 65 years old (6.2%). 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.

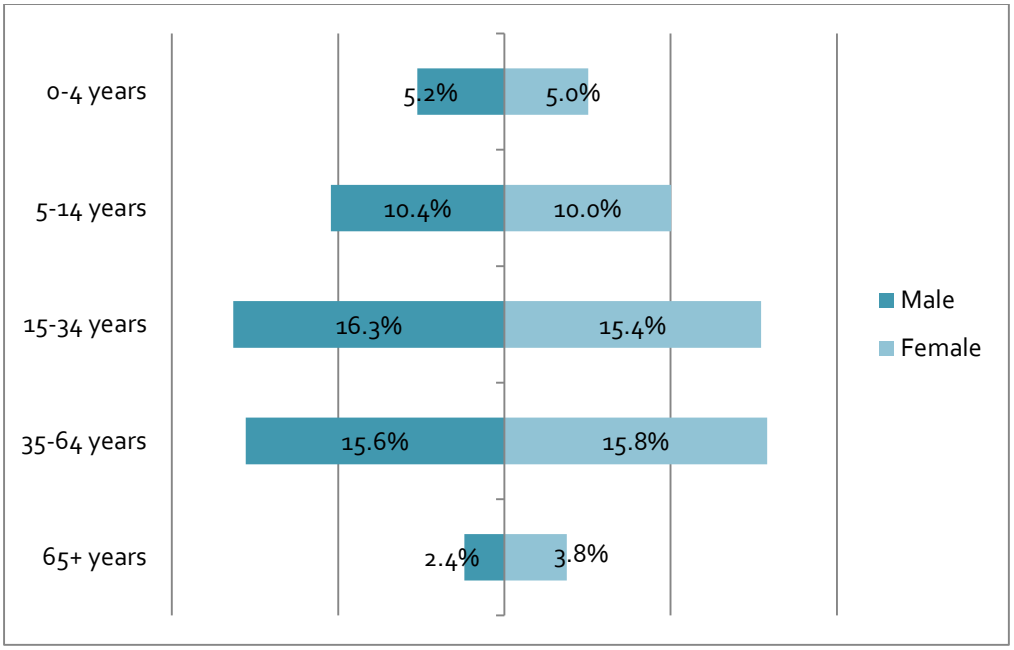

Figure 23: Age and gender profile

In terms of education levels in the LM, 11.5% of the adult population (over 20 years of age) had no education at all, while 64% have primary or secondary education (Stats SA, 2015).Those with higher educational qualifications accounted for 5.5% of the population. These figures indicate an increase in all categories since 2001, except for the no schooling, some primary, and some secondary categories. In general, there has been an improvement in the educational qualifications of the labour force in the LM. The no schooling category decreased by 10% indicating a higher percentage of people attending school. While the share of people with no schooling at district level is 14.1%, the percentage of people with no schooling is notably lower at provincial (11.1%) and LM (11.5%) level. Additionally, the number of people who have completed matric in Siyathemba is 17.3%, which is lower than the 20% and 22.1% at district and provincial levels, respectively.

The average monthly household income in the Siyathemba LM was R6 858 in 2014 prices. This was less than the national, provincial, and district levels, which had average household incomes of R9 743, R8 116 and R7 030, respectively. Overall, approximately two thirds of the population in the Siyathemba LM earns up to R3 400 a month, this is larger than the same group at district and provincial level. According to the Pixley ka Seme IDP, the cut-off monthly household income for indigence in the Siyathemba LM is R1 500. This means those households who due to a number of socio-economic factors are unable to afford basic services such as water, basic sanitation, basic energy, health care, housing, food and clothing. From income data obtained from the 2011 Census, approximately 39.4% of the households would qualify as indigent in the LM.

5.13.3 Structure of the Economy

The structure of the economy and the composition of its employment provide valuable insight into the dependency of an area on specific sectors and its sensitivity to fluctuations of global

and regional markets. Knowledge of the structure and the size of each sector are also important for the economic impact results' interpretation, as it allows the assessment of the extent to which the proposed activity would change the economy, its structure, and trends of specific sectors.

The Northern Cape Province contributes the least percentage (2.3%) to the country's Gross Domestic Product (GDP). However, although the Northern Cape Province has the smallest economy of the nine provinces, Gross Domestic Product per Region (GDPR) per capita is higher than national average, which were R59 917 and R58 533 respectively.

The Siyathemba LM economy was valued at R796 million in current prices in 2013. The LM contributed 10.9% to the economy of the Pixley ka Seme District and made a contribution of 1.2% to the province's economy. Over a period of ten years (2003-2013), the municipality's economy grew at a Compounded Average Growth Rate (CAGR) of 2.4% per year. This was slightly higher than the district and provincial average growth rates of 1.8% and 2.3%, respectively.

In terms of economic activities, the economy of the Northern Cape Province depends heavily on the primary sectors such as agriculture and mining, which made up 36.5% of GDP-R in 2013. The largest sector is mining, which has been fluctuating between periods of growth and decline in contribution to the GDP-R. Agriculture, on the other hand has declined in contribution from 8.7% in 2002 to 5.4% in 2013. A worrying characteristic of the Northern Cape Province is the limited amount of processing of the primary commodity output of agriculture and mining that takes place within its boundaries. This is evident in the fact that the manufacturing sector contributes only 2.4% towards GDP-R. All industries in the secondary sector have shown very little growth if any. The tertiary sector was the largest contributor to the economy of the Northern Cape Province, making up 56.8% of GDP-R. General government services (15.2%) were the second largest industry contributors after mining (31.2%).

Contrary to the province's economy, mining and quarrying continues to be a small contributor to the economy of the LM, making a meagre 3.1% contribution towards the local economy compared to the province's 31.2%. The mining sector historically played a major role in the local economy, with asbestos and copper mining being the key activities. Currently, mining activities are mainly related to alluvial diamond mining activities along the Orange River. The closure of the asbestos mines as well as the Copperton mine has had a major lasting negative impact on the Siyathemba LM economy.

On the other hand, the agricultural sector makes a significant contribution of 16.7%, making it the second largest single contributor after finance and business services. The most extensively cultivated crops in the municipality are maize, wheat, peanuts, lucerne, and table grapes. Stock farming activities are mainly based on sheep and goats. Overall, the economy of the Siyathemba LM is a service economy with the tertiary sector contributing 70% to the municipality's GDP-R.

5.13.4 Labour Force and Employment Structure

Employment is the primary means by which individuals who are of working age may earn an income that will enable them to provide for their basic needs and improve their standard of living. As such, employment and unemployment rates are important indicators of socio-economic well-being.

The Census 2011 data indicates that the Siyathemba LM had about 13 656 people in the working-age population. This amounts to 63% of the total population. Of these, 7 113 people were economically active, while roughly 48% of the working age population were not economically active (NEA), that is persons aged 15–64 years who are neither employed nor unemployed at the time of the survey, including discouraged job seekers . The employed labour in the LM was estimated at 5 356, while the unemployed population was estimated at 1 757, reflecting an unemployment rate of 24.7%. This was lower than the country's unemployment rate of 29.7% and lower than the provincial unemployment rate that was recorded at 27.4%.

In the town of Prieska, 3 094 of the working age population was employed and 1 212 were unemployed. This means that 28.1% of the labour force in Prieska was unemployed. On the other hand, 4 672 of the working age population was not economically active. In the smaller towns, the unemployment situation was worse, with unemployment rates ranging between 33.6% and 41% in Marydale and Nierkerkshoop respectively (Stats SA, 2014). The Copperton community is very small and isolated from employment opportunities and amenities.

More than three quarters of the employed individuals in the Siyathemba LM were employed in the formal sector and only 10.8% were employed in the informal sector. Private households provided for 11.8% of the employment opportunities in the municipality. In Prieska, 74.4% of the employment opportunities were provided by the formal sector and only 8.6% came from the informal sector. In Marydale, 86.5% of the population is employed in the formal sector while only 52.3% of the Nierkerkshoop employment opportunities come from the formal sector. A significant percentage (43.4%) of Nierkerkshoop's employment opportunities come from the informal sector while the same sector contributes only 7.7% towards employment in Marydale (Stats SA, 2014).

In terms of the structure of employment, the agricultural sector was the most important economic sector not only in the LM but in the district as well. In the Siyathemba LM, this sector contributed 27.8% of the total employment opportunities, while creating 27.1% of employment opportunities in the Pixley ka Seme District. This was followed by personal services and general government. These figures are almost similar to those of the province but general government is the largest contributor to employment in the Northern Cape Province. Table 16 below indicates the contribution of economic sectors to employment in the district and the LM.

Table 16: Employment by economic sectors in Ehlanzeni DM and Siyathemba LM

Economic Sector	Pixley ka Seme DM Employment		Siyathemba LM Employment	
	Employment	%	Employment	%
Agriculture	12 587	27.1%	1 637	27.8%
Mining and quarrying	342	0.7%	32	0.6%
Manufacturing	1 354	2.9%	219	3.7%
Electricity, gas and water	358	0.8%	24	0.4%
Construction	2 813	6.1%	596	10.1%
Trade	6 491	14.0%	774	13.1%
Transport and communication	839	1.8%	50	0.8%
Finance and business services	5 357	11.6%	751	12.8%
Personal services	8 489	18.3%	921	15.6%
General government	7 756	16.7%	888	15.1%
TOTAL	46 387	100%	22 3232	100%

5.13.5 Access to Housing and Basic Services

Access to shelter, water, electricity, sanitation, and other services are indicators that assist to determine the standard of living of the people in the area under investigation. Infrastructure and the state of local infrastructure are other indicators to contemplate when considering living standards. The availability of social and economic infrastructure including roads, educational facilities, and health facilities, further indicates the nature of the study area that is valuable in developing a complete profile of the circumstances in which communities are living. These measurements create a baseline against, which the potential impacts of the proposed project can be assessed.

- **Housing:** Approximately 85% of the households in the Siyathemba LM reside in formal housing that includes a house or other brick structures on a separate stand or yard. About 14.3% of the households live in informal dwellings. Furthermore, 0.7% of the municipality's households live in traditional dwellings. These numbers are similar to those of Prieska with about 85.3% households living in formal dwellings and 14.5% living in informal structures.
- **Access to water**: In terms of access to piped water, 88.7% of the households in the municipality have access to piped water either inside the dwelling or in the yard. The picture improves in Prieska, where 94.9% of the households have access to piped water inside their dwellings or yards. Only 1.2% of the households in the town do not have access to piped water at all. In terms of the supply, the bulk of the water in the LM is supplied by the municipality or other service providers. In Prieska, close to 97% of the households' water is supplied by the municipality or other water service providers while in the non-urban areas of the municipality only 1.1% of water is supplied by bulk water infrastructure connections. Two thirds of the households in non-urban areas used boreholes (Stats SA, 2014). The district's IDP note that water provision and availability is one of the issues that will have to

be addressed in order to improve the economic activity in most towns situated within the Pixley ka Seme District Municipal area (Pixley ka Seme DM, 2011).

- **Access to sanitation**: If not properly managed and monitored, sewerage and sanitation are basic needs of communities, which can pose serious health and hygiene risks. About 71.2% of the households in the Siyathemba LM have access to a flushing toilet, while 16.8% of the households use pit latrines. A further 7.7% of families have no access to toilet facilities and 3.8% are still using the bucket system. According to the Siyathemba LM IDP, the municipality has a sanitation backlog of 470 households.
- **Access to electricity:** The indicator "energy for lighting" was used as a proxy for measuring households' access to electricity. The majority of households (86.3%) in the municipality have access to electricity, while 13.7% use alternative forms of energy for lighting, mainly candles (11%).

5.13.6 Social and Recreational Infrastructure

The Siyathemba LM has the following social and recreational infrastructure available:

- Where education facilities are concerned, the municipality has one crèche, six primary schools and three combined schools and one secondary school.
- The municipality has five community halls.
- There are four libraries in the municipality.
- Recreational facilities are available in each of the three towns
- There is a police station in each of the three towns (Marydale, Prieska and Nierkerkshoop).
- There are five health facilities in the municipality, i.e. one hospital, three clinics and mobile clinic in Prieska, four clinics. It is indicated that the main challenge is the lack of ambulance services in Nierkerkshoop (Siyathemba LM, 2014).

5.14 Electromagnetic and radio frequency interference

During the scoping phase of the project the SKA submitted comments noting that based on distance to the nearest SKA station, detailed design of the solar installation, and the cumulative impact of multiple renewable energy facilities of a similar nature in the same vicinity, the proposed facility poses a high risk of detrimental impact on the SKA. The SKA project office recommended that EMI and RFI detailed studies be conducted as mitigation measures would be required to lower the risk of detrimental impact to an acceptable level. As per the SKA's request a baseline EMI and RFI study or Topographical Analysis has been undertaken and attached as Appendix 8B. From the results in the initial report, it is clear that at lower frequencies, emissions below the international special committee on radio interference's (CISPR) standards are required especially in the case of the closest telescope. This is mainly due to the absence of any terrain loss (TL) over this short distance. Towards telescopes in the core site, the allowable measured levels increase slightly due to the additional TL. The possibility exists that the overall lower levels would have to be achieved to limit interference to the closest telescopes as much as possible.

Further investigation will be carried out in consultation with the SKA when final layouts are selected and the results of the study will be adjusted accordingly. The requirement for mitigation measures will be determined in consultation with the SKA.

The full baseline EMI and RFI study, including the methodology, identified risks, analysis and results, is included in Appendix 8B.

6 ENVIRONMENTAL ISSUES, POTENTIAL AND CUMULATIVE IMPACTS

6.1 Identification of Potential Impacts

The proposed development is likely to result in a variety of positive and negative impacts. Moreover, the proposed development could potentially result in collective and long term impacts more commonly known as cumulative impacts. A cumulative impact is 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.

The Scoping report assists in the identification of these potential and cumulative impacts, which will then be assessed at a more detailed level during the EIA stage.

Moreover, further details associated with the construction and operation of the various activities (as listed in the Project Description) in light of the above types of impacts that become available later in the EIA process will be discussed in detail in the EIA Phase.

The impacts that have been identified as being potentially significant are elaborated on in the sub-sections below.

6.1.1 Biodiversity Impacts

The following potential impacts have been identified for the proposed solar energy facility development and will be further investigated in the EIA phase of the biodiversity assessment.

Table 17: Impacts on indigenous natural vegetation

ISSUE	**Impacts on indigenous natural vegetation**
DISCUSSION	Losses would be suffered where areas need to be cleared of natural vegetation.
EXISTING IMPACT	Limited loss of natural vegetation in the study area and beyond and limited degradation of vegetation.
PREDICTED IMPACT	Moderate as some natural vegetation will be lost and the loss will be permanent.

ISSUE	Impacts on indigenous natural vegetation
EIA INVESTIGATION REQUIRED	Yes (a formal impact assessment is required)
CUMULATIVE EFFECT	Predicted to be low to moderate as there is some loss of habitat in the previous mining area of Copperton nearby.

Table 18: Impacts on a near threatened plant species

ISSUE	Impacts on a near threatened plant species
DISCUSSION	There is one Near Threatened plant species that could potentially occur on site.
EXISTING IMPACT	Limited to previous mining areas off-site.
PREDICTED IMPACT	Moderate to Low as natural vegetation will be lost, but not sure whether species occur on site or not.
EIA INVESTIGATION REQUIRED	Yes (field investigation required to determine whether plant species occurs on site or not)
CUMULATIVE EFFECT	Populations of species of concern, if they occur on site, will probably not be affected or can be avoided.

Table 19: Impacts on a threatened plant species

ISSUE	Impacts on a near threatened plant species
DISCUSSION	There is one Near Threatened plant species that could potentially occur on site.
EXISTING IMPACT	Limited to previous mining areas off-site.
PREDICTED IMPACT	Moderate to Low as natural vegetation will be lost, but not sure whether species occur on site or not.
EIA INVESTIGATION REQUIRED	Yes (field investigation required to determine whether nationally protected plant species occurs on site or not. Additionally, field surveys are required to document all species protected according to the Provincial legislation)
CUMULATIVE EFFECT	Populations of protected species have probably already been affected by nearby mining activities, but this is impossible to determine.

Table 20: Loss of individuals of protected trees

ISSUE	Loss of individuals of protected trees
DISCUSSION	There is one protected tree species that could occur on site, but it is unknown whether it occurs there or not.
EXISTING IMPACT	None known.
PREDICTED IMPACT	Moderate to Low due to fact that low numbers probably occur on site.
EIA INVESTIGATION REQUIRED	Yes (field investigation required to determine whether species occurs on site or not)
CUMULATIVE EFFECT	Predicted to be low due to low number of individuals likely to be affected.

Table 21: Impacts on watercourses / drainage areas

ISSUE	**Impacts on watercourses / drainage areas**
DISCUSSION	Losses would be suffered where areas need to be cleared of natural vegetation.
EXISTING IMPACT	Limited loss of natural habitat in the study area and beyond and limited degradation of watercourses.
PREDICTED IMPACT	Moderate as some habitat will be lost and the loss will be permanent.
EIA INVESTIGATION REQUIRED	Yes (a formal impact assessment is required)
CUMULATIVE EFFECT	Predicted to be moderate as there is some loss of habitat in the previous mining area of Copperton nearby.

Table 22: Impacts on sedentary fauna

ISSUE	**Impacts on sedentary fauna**
DISCUSSION	For species resident on site, loss of habitat would lead to local extinction of populations currently on site. For all other species listed, the loss of habitat would be unlikely to have any significant effect, since the species are mobile and would utilize other adjacent habitat.
EXISTING IMPACT	Limited loss of natural habitat in the study area and beyond.
PREDICTED IMPACT	Moderate as some habitat will be lost and the loss will be permanent.
EIA INVESTIGATION REQUIRED	Yes (presence or potential presence of two species vulnerable to the impact, Littledale's Whistling Rat and the Giant Bullfrog, needs to be established)
CUMULATIVE EFFECT	Predicted to be low because there is adequate habitat in surrounding areas to support displaced populations.

Table 23: Impact of displacement of mobile fauna

ISSUE	**Displacement of mobile fauna**
DISCUSSION	Fauna may be displaced due to noise and habitat disturbances on site, as well as general activities on site.
EXISTING IMPACT	None known
PREDICTED IMPACT	Low as some individuals may be locally displaced, but it is unlikely to have any significant effect on any of the listed species.
EIA INVESTIGATION REQUIRED	No
CUMULATIVE EFFECT	Predicted to be low as populations will return to surrounding habitats after construction activities have been completed.

Table 24: Impact summary table for the mortality of birds by collision with power lines

ISSUE	Mortality of birds by collision with power lines
DISCUSSION	Vertical infrastructure may affect flying animals due to collisions. Some Red List species may be especially vulnerable to this impact.
EXISTING IMPACT	There are existing power lines in the study area, all of significantly greater length than the proposed power lines.
PREDICTED IMPACT	Low as most species will avoid vertical infrastructure.
EIA INVESTIGATION REQUIRED	Yes (presence of species vulnerable to the impact to be determined in the field)
CUMULATIVE EFFECT	Predicted to be low due to the existing presence of power lines that are of far greater length than the proposed power lines.

Table 25**:** Impact summary table for the establishment and spread of declared weeds

ISSUE	Establishment and spread of declared weeds
DISCUSSION	There is a moderate possibility that alien plants could be introduced to areas within the footprint of the proposed infrastructure from surrounding areas in the absence of control measures.
EXISTING IMPACT	Unknown to what extent alien invasive species currently occur on site, but existing transformation and disturbance on site has probably created conditions favourable for these species.
PREDICTED IMPACT	Moderate to Low due to existing conditions on site. Impact can be easily managed with control measures.
EIA INVESTIGATION REQUIRED	Yes (presence of alien plants on site and in surrounding areas to be investigated)
CUMULATIVE EFFECT	Predicted to be low due to existing impacts on site and high ability to control any additional impact.

6.1.1 Avifauna Impacts

Table 26: Impacts associated with mortality of priority species due to collisions with the PV panels.

ISSUE	Mortality of priority species due to collisions with the PV panels.
DISCUSSION	A total of 48 priority species could potentially be susceptible to this impact.
EXISTING IMPACT	Given the extensive farming practices which are currently used in the region, it can be surmised that the existing anthropogenic impacts on avifauna are low.
PREDICTED IMPACT	Minor negative, but could be moderate negative if flamingos are affected, or if mortality levels of priority species turn out to be high.
EIA INVESTIGATION REQUIRED	Yes

ISSUE	Mortality of priority species due to collisions with the PV panels.
CUMULATIVE EFFECT	Moderate at a local level (within 20km radius) and minor within a regional level (within a 35km radius).

Table 27: Impacts associated with the displacement of priority species due to habitat transformation and disturbance.

ISSUE	Displacement of priority species due to habitat transformation and disturbance.
DISCUSSION	A total of 51 priority species could potentially be susceptible to this impact.
EXISTING IMPACT	Given the extensive farming practices which are currently used in the region, it can be surmised that the existing anthropogenic impacts on avifauna are low.
PREDICTED IMPACT	Moderate negative.
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	High at a local level (within 20km radius) and moderate to low within a regional level (within a 35km radius)

Table 28: Impacts associated with the mortality of priority avifauna due to collisions with the associated power lines.

ISSUE	Mortality of priority avifauna due to collisions with the associated power lines.
DISCUSSION	A total of 11 priority species could potentially be susceptible to this impact.
EXISTING IMPACT	Given the extensive farming practices which are currently used in the region, it can be surmised that the existing anthropogenic impacts on avifauna are low. The one exception is power line mortality of Ludwig's Bustard, which is likely to be moderate to high.
PREDICTED IMPACT	Moderate negative.
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	Moderate at a local level (within 20km radius) and low within a regional level (within a 35km radius)

Table 29: Impacts associated with the disturbance of breeding raptors on the existing high voltage lines.

ISSUE	Disturbance of breeding raptors on the existing high voltage lines.
DISCUSSION	A total of 4 priority species could potentially be susceptible to this impact.

ISSUE	Disturbance of breeding raptors on the existing high voltage lines.
EXISTING IMPACT	It is unknown how many raptors are breeding on the existing high voltage lines in the study area, but if there are any, it is likely that they are not regularly disturbed, given the remoteness of the area.
PREDICTED IMPACT	Moderate to low, depending on the number of species and the number of nests.
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	Moderate to low at a regional level (within a 35km radius), depending on the number of species and the number of nests. Should a pair of Martial Eagles be affected, the impact could be high at a local level.

6.1.2 Surface Water Impacts

The following potential impacts (Table 30 to Table 40) have been identified for the proposed solar power facility development and will be further investigated in the EIA phase of the surface water assessment.

Table 30: Impacts associated with the construction lay-down area directly in the surface water resource(s)

ISSUE	Impacts associated with the construction lay-down area directly in the surface water resource(s)
DISCUSSION	Where the placement of the construction lay-down area for the proposed development extends into a surface water resource, the excavation of potential surface water resource soils could potentially result.
EXISTING IMPACT	No existing impacts are present in terms of construction lay-down areas.
PREDICTED IMPACT	Low predicted impact due to the high degree of available land to place the construction laydown area outside of any sensitive surface water resources.
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	Moderate predicted cumulative effect given that the size of the construction lay-down area may be significant and might need to be placed partially in or near the wetland and/or watercourse and associated buffer zones close to where construction areas are located.

Table 31**:** Impacts associated with establishing the foundations of the proposed development

ISSUE	Impacts associated with establishing the foundations of the proposed development
DISCUSSION	Where the placement of the foundations extend into the surface water resource areas, the excavation of potential surface water resource soils are likely to be affected.
EXISTING IMPACT	No structures have been identified in the surface water resource areas from a desktop level.
PREDICTED IMPACT	Moderate to high predicted impact. It is likely that the foundations of the various buildings and structures may need to be placed in the surface water resource areas (buffer zones included).
EIA INVESTIGATION REQUIRED	Yes.
CUMULATIVE EFFECT	Moderate to high predicted cumulative effect given the various buildings and structures that might need to be placed in or near the surface water resource areas and the associated buffer zones.

Table 32: Impacts associated with the clearing of vegetation for proposed development

ISSUE	Impacts associated with the clearing of vegetation for proposed development
DISCUSSION	Vegetation within the proposed development site will have be removed for the construction phase to take place.
EXISTING IMPACT	Minor current impacts. Clearing of vegetation has only taken place for the location of dirt roads.
PREDICTED IMPACT	Moderate to high predicted impact due to the need for vegetation to be removed which is expected to be surface water resource vegetation, including potentially vegetation in the buffer zones.
EIA INVESTIGATION REQUIRED	Yes.
CUMULATIVE EFFECT	Moderate to high predicted cumulative effect given that the proposed development is expected to occupy a large area.

Table 33: Impacts associated with abnormal/heavy vehicle access into surface water resource areas and associated buffer zones

ISSUE	Impacts associated with abnormal/heavy vehicle access into surface water resource areas and associated buffer zones
DISCUSSION	During the construction phase, vehicles of variable size will need to access the site. Such vehicles may include conventional construction vehicles in addition to abnormal heavy vehicles that will need to transport the component parts of the PV plant, substation and power line. Where these vehicles need to cross surface water resource areas (buffer zones included), degradation can be caused to these sensitive environments.
EXISTING IMPACT	Minor impacts associated with access roads currently crossing surface water resource areas are evident from a desktop level.

ISSUE	Impacts associated with abnormal/heavy vehicle access into surface water resource areas and associated buffer zones
PREDICTED IMPACT	Minor to moderate predicted impact due to the need for the various components to reach all areas of the study site in order to transport materials.
EIA INVESTIGATION REQUIRED	Yes.
CUMULATIVE EFFECT	Minor to moderate predicted cumulative effect should access and internal roads need to cross any surface water resource areas.

Table 34: Impacts associated with general access near or in surface water resource areas and the associated buffer zones

ISSUE	Impacts associated with general access near or in surface water resource areas and the associated buffer zones
DISCUSSION	General access into surface water resource areas refers to activities such as physical destruction of surface water resources caused by humans, excavation and degradation of surface water resources by construction machinery, use of surface water resources for sanitary facilities and ablutions, dumping of materials, waste and litter into surface water resources. This specifically relates to any construction areas that take place near surface water resources.
EXISTING IMPACT	From a desktop level no existing impacts could be identified.
PREDICTED IMPACT	Minor to moderate predicted impact due to the need for construction activities to take place in most areas of the study site.
EIA INVESTIGATION REQUIRED	Yes.
CUMULATIVE EFFECT	Minor to moderate predicted cumulative effect.

Table 35: Impacts associated with improper stormwater management effects on nearby surface water resources

ISSUE	Impacts associated with improper stormwater management effects on nearby surface water resources
DISCUSSION	Where the location of buildings, internal roads, the substation and the construction lay down area are to be situated near surface water resources, increased run-off caused by rainfall events can produce potential erosion and sedimentation impacts to nearby surface water resources.
EXISTING IMPACT	From a desktop level, no signs of erosion are present.
PREDICTED IMPACT	Moderate predicted impact due to the likelihood of this impact occurring.
EIA INVESTIGATION REQUIRED	Yes.

ISSUE	Impacts associated with improper stormwater management effects on nearby surface water resources
CUMULATIVE EFFECT	Moderate predicted cumulative effect.

Table 36: Impacts associated with the oil, fuels and other soluble substances from construction activities, vehicles and machinery into nearby surface water resources

ISSUE	Impacts associated with the oil, fuels and other soluble substances from construction activities, vehicles and machinery into nearby surface water resources
DISCUSSION	Use of fuels, oils, and other soluble substances (cement mix) which are necessary for construction. These pose a pollution risk to nearby surface water resources where spillage or leakage occurs.
EXISTING IMPACT	From a desktop level no such pollution impacts could be identified.
PREDICTED IMPACT	Minor to moderate predicted impact due to the likelihood of this impact occurring.
EIA INVESTIGATION REQUIRED	Yes.
CUMULATIVE EFFECT	Moderate to high predicted cumulative effect.

Table 37: Impacts associated with the 132kV power line installation into/over nearby surface water resources

ISSUE	Impacts associated with the 132kV power line installation into/over nearby surface water resources
DISCUSSION	It is anticipated that the 132kV power lines will feed the generated energy into the national grid. It is also envisaged that the underground cable may need to be an overhead line over surface water resource areas where appropriate. Where overhead crossing is not possible, underground cabling may be required to cross through wetlands and rivers.
EXISTING IMPACT	From a desktop level no power line impacts could be identified as the routes have not yet been established.
PREDICTED IMPACT	Minor to moderate predicted impact due to the likelihood of this impact occurring.
EIA INVESTIGATION REQUIRED	Yes.
CUMULATIVE EFFECT	Moderate to high predicted cumulative effect.

Table 38: Impacts associated with service roads through surface water resources

ISSUE	Impacts associated with service roads through surface water resources
DISCUSSION	Service roads for linear infrastructure will be required, and may require crossing identified surface water resources.
EXISTING IMPACT	There are no existing impacts related to service roads that could be identified from a desktop level.
PREDICTED IMPACT	Moderate predicted impact due to the likelihood of this impact occurring, and the associated permanent nature.
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	Moderate predicted cumulative effect.

Table 39: Stormwater run-off associated with PV plant, substation and associated infrastructure

ISSUE	Stormwater run-off associated with PV plant, substation and associated infrastructure
DISCUSSION	The impact of stormwater run-off is primarily related to the types of structures and surfaces that will need to be established for the proposed development. Hard impermeable surfaces and foundations are to be laid over the extent of the proposed development. Flat and hard surfaces aid with the acceleration and generation of run-off which can impact on nearby wetlands through the onset of erosion at the interface between the proposed development and the surface water resources.
EXISTING IMPACT	From a desktop level, no erosion is evident.
PREDICTED IMPACT	Moderate predicted impact due to the likelihood of this impact occurring.
EIA INVESTIGATION REQUIRED	Yes.
CUMULATIVE EFFECT	Moderate to high predicted cumulative effect.

Table 40: Oil leakages from substations

ISSUE	Oil leakages from substation
DISCUSSION	The main potential impact that may result from the operation phase of the substations is the potential spillage of oil from the transformers. If oil were to spill from the substations, it could be transported via storm water run-off into the adjacent surface water resources, thereby polluting not only the water but the soils as well causing possible groundwater and soil contamination.
EXISTING IMPACT	Pollution impacts were not identifiable from a desktop level.
PREDICTED IMPACT	Minor predicted impact due to the likelihood of this impact occurring.

ISSUE	Oil leakages from substation
EIA INVESTIGATION REQUIRED	Yes.
CUMULATIVE EFFECT	Minor to moderate predicted cumulative effect.

6.1.3 Soils and Agricultural Potential Impacts

The following potential impacts (Table 41) have been identified for the proposed solar power facility development and will be further investigated in the EIA phase of the soils and agricultural potential assessment.

Table 41: Summary of potential impacts from the Solar PV Energy Facility

ISSUE	Loss of agricultural potential
DISCUSSION	Soil would be impacted by the establishment of infrastructure.
EXISTING IMPACT	Only extensive grazing practiced at present.
PREDICTED IMPACT	Low, as soils are shallow and climate very unfavourable for cultivation.
EIA INVESTIGATION REQUIRED	No, but further studies recommended to refine management measures.
CUMULATIVE EFFECT	Predicted to be low as the loss of soil will not be significant once the infrastructure is in place and post-project rehabilitation should be possible.

6.1.4 Visual Impacts

The following potential impacts (Table 42) have been identified for the proposed solar power facility development and will be further investigated in the EIA phase of the visual assessment.

Table 42: Visual Impact Summary

ISSUE	**Visual Impact of the proposed solar PV plant**
DISCUSSION	Solar energy facilities have an extensive spatial coverage and can be visually intrusive especially when located in untransformed natural settings. Majority of the surrounding area has a natural rural visual character due to the uninhabited nature of the area. However, several solar energy facilities are proposed within relatively close proximity to the

	proposed development. These facilities and their associated infrastructure, typically consist of very large structures which are highly visible. As such, these facilities will significantly alter the visual character and baseline in the study area once constructed and make it appear to have a more industrial-type visual character. Four (4) potentially sensitive farmsteads were identified within 5km from the proposed PV development areas.
EXISTING IMPACT	There is a relatively low level of existing visual impact within the surrounding landscape. The most visually prominent visual impacts or degrading features include; the high voltage Aries-Kronos 1 400kV power line that traverses the site, Kronos Substation and infrastructure associated with the derelict mine (including an old slimes dams).
PREDICTED IMPACT	▪ The natural visual character of the surrounding area could be altered. ▪ The facility would likely be highly visible for great distances, thus altering the relatively untransformed rural sense of place within the surrounding area. ▪ The proposed development could adversely affect farmsteads / homesteads within the visual assessment zone. ▪ Vehicles and trucks travelling to and from the proposed site would increase dust emissions both during the construction and operational phases. The dust plumes could create a visual impact and may evoke negative sentiments from surrounding viewers. ▪ Surface disturbance during construction would expose bare soil which could visually contrast with the surrounding environment. In addition, temporarily stockpiling soil during construction may alter the flat landscape. Wind blowing over these disturbed areas could result in dust which would have a visual impact. ▪ Security and operational lighting at the PV facility could result in light pollution and glare, which could be an annoyance to surrounding viewers. ▪ Potential visual impacts as a result of the infrastructure associated with the proposed PV plant.
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	Several solar energy facilities are proposed within relatively close proximity to the proposed PV plant. These pending developments and their potential for large scale visual impacts could significantly alter the sense of place and visual character in the study area, if constructed.

6.1.5 Heritage Impacts

The following potential impacts (Table 43 to Table 45) have been identified for the proposed solar energy facility development and will be further investigated in the EIA phase of the heritage assessment.

Table 43: Impact on archaeological sites.

ISSUE	**Impact on archaeological sites**
DISCUSSION	As seen from the archival work and discussion in Chapter 5.12 the possibility of archaeological finds have been identified as being high and thus further field work is required to develop a comprehensive Heritage Management Plan. The high densities of archaeological finds to the east of the study area confirm the need for further in depth field studies.
EXISTING IMPACT	None known
PREDICTED IMPACT	Unidentified archaeological sites and the discovery of such sites during construction can seriously hamper construction timelines. Fieldwork can thus provide valuable information on such sites in the study area and provide timeous management of such sites through realignment of development or mitigation of such sites where needed.
EIA INVESTIGATION REQUIRED	Archaeological walk down of impact areas
CUMULATIVE EFFECT	None foreseen at this stage.

Table 44: Impact on palaeontological sites.

ISSUE	**Impact on palaeontological sites**
DISCUSSION	The palaeontological potential of the area has been confirmed as being low
EXISTING IMPACT	Site impacted by existing developments such as transmission lines and road networks.
PREDICTED IMPACT	Unidentified palaeontological sites and the discovery of such sites during construction can seriously hamper construction timelines.
EIA INVESTIGATION REQUIRED	Further palaeontological desktop work will be conducted to augment the information for the HIA
CUMULATIVE EFFECT	None foreseen at this stage.

Table 45: Impact on historical sites.

ISSUE	Impact on historical sites
DISCUSSION	As seen from the archival work and discussion in Chapter 5.21 the possibility of historical finds have been identified and thus further fieldwork is required to develop a comprehensive Heritage Management Plan.
EXISTING IMPACT	None known
PREDICTED IMPACT	Unidentified historical structure and the discovery of such structures during construction can seriously hamper construction timelines. Fieldwork can thus provide valuable information on such sites in the study area and provide timeous management of such sites through realignment of development or mitigation of such sites where needed.
EIA INVESTIGATION REQUIRED	Archaeological walk down of impact areas will identify possible impacted sites
CUMULATIVE EFFECT	None foreseen at this stage.

6.1.6 Socio-economic Impacts

The following potential impacts identified in Table 46 have been identified for the proposed solar power facility development and will be further investigated in the EIA phase of the socio-economic assessment.

Table 46: Impact of the increase in production and GDP-R of the national and local economies due to project capital expenditure

ISSUE	Increase in production and GDP-R of the national and local economies due to project capital expenditure
DISCUSSION	The impact takes place due to the investment on the project that will be spent in the country. Besides the direct impact, it involves the indirect and induced effects that are created when either suppliers of goods and services to the project experience an increase in demand or when businesses servicing households experience an increase in demand for their products.
EXISTING IMPACT	The local economy has a small economic base.
PREDICTED IMPACT	High Positive
EIA INVESTIGATION REQUIRED	Yes

CUMULATIVE EFFECT	Could be high considering other renewable energy projects planned for the Pixley ka Seme DM and also in the province in general.

Table 47: Impact of the creation of temporary employment in the local communities and elsewhere in the country

ISSUE	**Creation of temporary employment in the local communities and elsewhere in the country**
DISCUSSION	The impact is generated through capital expenditure that shocks the economy. It involves the creation of direct new job opportunities related to the construction of the proposed solar PV and employment opportunities that will be indirectly created through the increased expenditure in sectors supplying goods and services to the construction activity and in sectors benefiting from the increase of consumer expenditure.
EXISTING IMPACT	The local and national economies have high unemployment rates and government set a target to create 11 million jobs by 2030. Limited employment opportunities exist in the Siyathemba LM.
PREDICTED IMPACT	Moderate Positive
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	Could be high considering other renewable energy projects planned for the Pixley ka Seme DM and also in the province in general.

Table 48: Impact of skills development due to the creation of new employment opportunities

ISSUE	**Skills development due to the creation of new employment opportunities**
DISCUSSION	The impact takes place during construction and will last beneficiaries for an entire lifetime.
EXISTING IMPACT	The LM has a very limited skills base and low educational levels.
PREDICTED IMPACT	Moderate Positive
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	Could be high considering other renewable energy projects planned for the Pixley ka Seme DM and also in the province in general

Table 49: Impact of improved standard of living of households directly or indirectly benefiting from created employment opportunities

ISSUE	**Improved standard of living of households directly or indirectly benefiting from created employment opportunities**
DISCUSSION	The impact takes place during construction as a result of jobs created through direct, indirect and induced impacts.
EXISTING IMPACT	The households in the LM are on average worse off than in the country in general.
PREDICTED IMPACT	Moderate Positive
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	Could be high considering other renewable energy projects planned for the Pixley ka Seme DM and also in the province in general.

Table 50: Impact of the increase in government revenue due to investment

ISSUE	**Increase in government revenue due to investment**
DISCUSSION	The impact will take place as a result of domestic spending on construction activities and will be acquired by government through indirect and direct taxes on the project's activity.
EXISTING IMPACT	Due to limited economic base and low income levels, the LM's revenue base is limited, which in turn negatively impacts on its ability to provide adequate services to its residents.
PREDICTED IMPACT	Moderate Positive
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	Could be high considering other renewable energy projects planned for the Pixley ka Seme DM and also in the province in general.

Table 51: Impact of the potential sterilisation of agricultural land

ISSUE	**Potential sterilisation of agricultural land**
DISCUSSION	The footprint of the proposed project will sterilise the land from potential use for agricultural activities
EXISTING IMPACT	Based on telephonic conversations with land owners, some commercial agricultural farming takes place on certain portions of the site where the project is to be located.
PREDICTED IMPACT	Low Negative
EIA INVESTIGATION REQUIRED	Yes

CUMULATIVE EFFECT	The agricultural sector is a key economic driver in the area; its employment in the municipality is on a decline and further losses of agricultural land could worsen the situation.

Table 52: Impact of a change in demographics of the area due to influx of workers and job seekers

ISSUE	**Change in demographics of the area due to influx of workers and job seekers**
DISCUSSION	The construction activities will attract job seekers and will involve the migration of construction workers to the site.
EXISTING IMPACT	The local area's labour force is not sufficiently diversified to provide all skills necessary during construction.
PREDICTED IMPACT	Moderate Negative
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	Could be high considering the other renewable energy projects that are planned for the Siyathemba LM.

Table 53: Impact of an increase in social pathologies associated with influx of migrant labourers and job seekers to the area (health, crime, prostitution, xenophobia, etc.)

ISSUE	**Increase in social pathologies associated with influx of migrant labourers and job seekers to the area (health, crime, prostitution, xenophobia, etc.)**
DISCUSSION	The construction activities may attract job seekers and may involve the migration of construction workers to the site. The increase in the number of job seekers and migrants in the municipality could cause an increase in social pathologies.
EXISTING IMPACT	The local area is not sufficiently diversified to provide all skills and workers necessary during construction. Some farms where the project is to be built also host some residents and livestock.
PREDICTED IMPACT	Moderate Negative
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	Could be high considering the other renewable energy projects that are planned for the Siyathemba LM.

Table 54: Impact of added pressure on basic services and social and economic infrastructure

ISSUE	**Added pressure on basic services and social and economic infrastructure**
DISCUSSION	If the project attracts a great number of workers and job seekers, this could put further pressure on the LM as it will

ISSUE	Added pressure on basic services and social and economic infrastructure
	increase the demand for basic services, social and economic infrastructure.
EXISTING IMPACT	The situation regarding access to services in the area appears to be well managed; however, gaps in certain service provision do exist.
PREDICTED IMPACT	Low Negative
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	Could be high considering the other renewable energy projects that are planned for the Siyathemba LM.

- Operational phase impacts to be investigated

Table 55: Impact of the sustainable increase in production and GDP-R of the national and local economies through operation and maintenance activities

ISSUE	Sustainable increase in production and GDP-R of the national and local economies through operation and maintenance activities
DISCUSSION	The impact will take place as a result of operational expenditure on the solar PV farm, which will also create sustainable multiplier effects.
EXISTING IMPACT	The local economy has a small economic base and the need to diversify the economy is dire.
PREDICTED IMPACT	Moderate to High Positive
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	Could be high considering the other renewable energy projects that are planned for the Pixley ka Seme district and province.

Table 56: Impact of the creation of long-term employment in local and national economies through operation and maintenance activities

ISSUE	Creation of long-term employment in local and national economies through operation and maintenance activities
DISCUSSION	The impact will take place as a result of operational expenditure on the solar PV facility, which will also create sustainable multiplier effects
EXISTING IMPACT	The local economy has a high unemployment rate, which means that the area is in need for investment that would create new sustainable employment opportunities.
PREDICTED IMPACT	Moderate Positive

ISSUE	**Creation of long-term employment in local and national economies through operation and maintenance activities**
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	Could be high considering the other renewable energy projects that are planned for the district and province.

Table 57: Impact of skills development due to the creation of new sustainable employment opportunities

ISSUE	**Skills development due to the creation of new sustainable employment opportunities**
DISCUSSION	The impact takes place during operations of the solar PV farm and occurs due to on-job training.
EXISTING IMPACT	The LM has a very limited skills base and poor educational levels.
PREDICTED IMPACT	Low to Moderate Positive
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	Could increase considering the other renewable energy projects that are planned for the district and province.

Table 58: Impact of improved standard of living of households directly or indirectly benefiting from created employment opportunities

ISSUE	**Improved standard of living of households directly or indirectly benefiting from created employment opportunities**
DISCUSSION	The impact takes place as a result of jobs created through direct, indirect and induced impacts
EXISTING IMPACT	The households in the LM are on average worse off than in the country in general.
PREDICTED IMPACT	Moderate Positive
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	Could increase considering the other renewable energy projects that are planned for the district and province.

Table 59: Impact of an increase in government revenue stream

ISSUE	**Increase in government revenue stream**
DISCUSSION	The project, through its operations, will contribute to government revenue through payments of income taxes and payroll taxes.
EXISTING IMPACT	The local tax base is small, which limits the ability of the municipalities to provide quality services.

PREDICTED IMPACT	Moderate Positive
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	Could be high considering the other renewable energy projects that are planned for the district and province.

Table 60: Impact of investment in the local communities and economic development projects as part of a Social Economic Development and Enterprise Development plan

ISSUE	**Investment in the local communities and economic development projects as part of a Social Economic Development and Enterprise Development plan**
DISCUSSION	The project will form part of the Independent Power Producer Procurement Programme that implies that the operating company allocates a certain percentage of the project's revenue towards community development.
EXISTING IMPACT	The closest populated community to the project is Copperton, followed by Prieska; both have a very small economic base and poor levels of education.
PREDICTED IMPACT	Moderate to High Positive
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	Could be high considering the other renewable energy projects that are planned for the Siyathemba LM.

Table 61: Impact of an altered sense of place

ISSUE	**Altered sense of place**
DISCUSSION	The project is expected to have some visual impact, which will alter the landscape and ultimately affect the sense of place among local residents and possibly business visitors to the Alkantpan Testing Range.
EXISTING IMPACT	The area where the project is to be located is sparsely populated and does not possess any tourist attractions.
PREDICTED IMPACT	Negligible Negative
EIA INVESTIGATION REQUIRED	No
CUMULATIVE EFFECT	Could be increased considering the other renewable energy projects that are planned for the Siyathemba LM.

7 PUBLIC PARTICIPATION PROCESS

Public participation is the cornerstone of any EIA. The principles of NEMA as well as the EIA Regulations govern the EIA process, including public participation. These include provision of

sufficient and transparent information on an ongoing basis to stakeholders to allow them to comment, and ensuring the participation of previously disadvantaged people, women and the youth.

The public participation process is primarily based on two factors; firstly, ongoing interaction with the environmental specialists and the technical teams in order to achieve integration of technical assessment and public participation throughout. Secondly, to obtain the bulk of the issues to be addressed early on in the process, with the latter half of the process designed to provide environmental and technical evaluation of these issues. These findings are presented to stakeholders for verification that their issues have been captured and for further comment.

Input into the public participation process by members of the public and stakeholders can be given at various stages of the EIA process. Registration on the project can take place at any time during the EIA process up until the final EIA report is submitted to DEA. There are however set periods in which comments are required from Interested and / or Affected Parties (I&APs) in order to ensure that these are captured in time for the submission of the various reports. The comment periods during the scoping phase were implemented according to NEMA EIA Regulations. The comment periods during the scoping phase (as set out by DEA) are as follows:

- Background Information Document (BID): 4 Calendar weeks, but also as and when an I&AP registers.
- Comment period for the Draft Scoping Report (DSR): 4 Calendar weeks (30 days).
- Comment on the Amended DSR: should there be a significant change from the DSR an appropriate comment period will be set out in consultation with DEA. This period may be seven (7) days, fourteen days (14), etc., as to be approved or set by DEA. Should there be no significant changes, then the Final Scoping Report (FSR) will be submitted to DEA.

The EIA regulations emphasise the importance of public participation. In terms of the EIA regulations, registered interested and/or affected parties –

- may participate in the application process;
- may comment on any written communication submitted to the competent authority by the applicant or environmental consultant;
- must comment within the timeframes as stipulated by the EIA Regulations;
- must send a copy of any comments to the applicant or Environmental Assessment Practitioner (EAP) if the comments were submitted directly to the competent authority; and
- must disclose any direct business, financial, personal or other interests that the person has in the application being granted or refused.

Further, in terms of the EIA regulations, the EAP:

- manages the application process;
- must be independent;
- must undertake the work objectively – even if this results in views and findings that are not favourable to the applicant;

- must disclose material information that may influence the decision; and
- must conduct a public participation process.

The following actions were taken upon receiving comments/queries/issues:
- The contact details provided were entered into the project database for use in future notifications.
- Confirmation of receipt of comments.
- Addressed comments in the Issues & Response Report.

7.1 Objectives of Public Participation

An understanding of what the public participation is, and is what it is not, needs to be explored and must be clarified.

- Public Participation is:
    - A communication mechanism to inform I&APs regarding a proposed project.
    - A communication mechanism to record comments and/or concerns raised during the relevant phase of the EIA by I&APs regarding a proposed project.

- What Public Participation is not:
    - A marketing exercise.
    - A process to address grievances but rather to record comments raised.
    - One-on-one consultation with each I&AP during the EIA process (not relevant to possibly affected landowners identified).

The primary aims of the PPP are:
- To inform interested and affected parties (I&APs) and key stakeholders of the proposed development.
- To initiate meaningful and timeous participation of I&APs.
- To identify issues and concerns of key stakeholders and I&APs with regards to the proposed development
- To promote transparency and an understanding of the proposed project and its potential environmental impacts.
- To provide information used for decision-making.
- To provide a structure for liaison and communication with I&APs and key stakeholders.
- To assist in identifying potential environmental impacts associated with the proposed development.
- To ensure inclusivity (the views, needs, interests and values of I&APs must be considered in the decision-making process).
- To focus on issues relevant to the project and issues considered important by I&APs and key stakeholders.
- To provide responses to I&AP queries.
- To encourage co-regulation, shared responsibility and a sense of ownership.

In addition to the guidance of the PPP in the EIA Regulations, every effort was also made to conform to the requirements of the Promotion of Administrative Justice Act 2000 (Act 3 of 2000).

7.2 Overview of the Public Participation Process to date

The public participation process for the EIA was initiated on Wednesday the 18th of February 2015 with the issuing of the BID. The proposed project is located approximately 10km south of Copperton and 60km south-west of Prieska. However, Copperton is an abandoned town which previously serviced a mine that has subsequently shut town, and therefore the PPP for the proposed project will be focused on the inhabited town of Prieska. The stages that typically form part of the public participation process during the scoping phase are reflected in Figure 24 below.

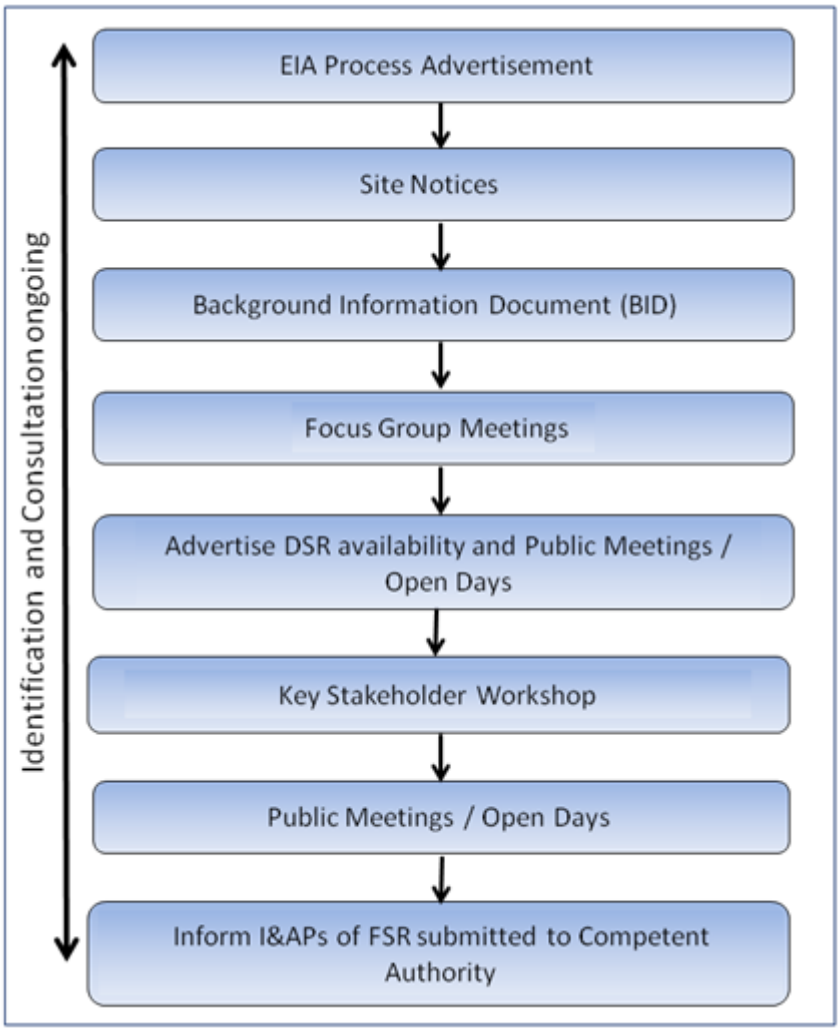

Figure 24: Public Participation Process

Members of the public who wished to be registered on the database as an I&AP were able to do so via telephone, fax, email, mail or SiVEST's website (www.sivest.co.za).

On-going consultation with key stakeholders (e.g. provincial, district and local authorities, relevant government departments, local business etc.) and identified I&APs ensured that I&APs were kept informed regarding the EIA process. Networking with I&APs will effectively continue throughout the scoping phase of the project until the Final Scoping Report and EIA Plan of Study are submitted to DEA. Where required, stakeholders and I&APs were engaged on an individual basis.

During the environmental studies, consultations were held with individuals, businesses, institutions and organisations, and the following sectors of society have been identified and were afforded the opportunity to comment (the full stakeholder database list is included in Appendix 7F):

- National Authorities;
- Provincial Authorities;
- Siyathemba LM;
- Pixley ka Seme DM;
- Government Structures such as SAHRA, SANRAL, Telkom, etc.;
- Agriculture Associations;
- Regional and local media (advertisements and public documents e.g. BID);
- Business and commerce;
- Environmental bodies / NGOs;
- Community representatives, CBOs, development bodies;
- Landowners; and
- Civil Aviation Authority (CAA).

7.3 Consultation and Public Involvement

Through the consultation process, issues for inclusion within the DSR will be identified and confirmed. Telephonic discussions and one-on-one consultation will be undertaken where relevant. Meetings and focus group meetings will take place during the comment period of the DSR in order to identify key issues, needs and priorities for input into the proposed project. Special attention will be paid to the consultation with possibly affected landowners and communities within the study area to try and address their main concerns.

7.4 Stakeholders and I&APs

In order to identify possible I&APs, use was made of:

- print media – EIA process advertisements
    - The Gemsbok newspaper (advertised on the 18th of February 2015)
- site notices throughout the study area (Proofs included in Appendix 7A)
- referrals
- requesting databases and/or contact information from NGOs / CBOs and other organisations

A full database list of registered I&APs was compiled and is included in Appendix 7F.

7.5 Announcing the Opportunity to Participate

The opportunity for stakeholders to participate in the EIA were as follows:

- EIA process advert (18 February 2015).
- I&APs with e-mail addresses and fax numbers were sent copy of the BID.
- BIDs were delivered to various locations within the study area:

The letter of invitation to participate as well as the Registration and Comment Form accompanied the BID.

7.6 Notification of the Potential Interested and Affected Parties

Communication with I&APs were conducted by means of telephone, faxes and email in order to obtain the necessary background information to compile this report. The advertising process was followed in terms of regulation 56 of the EIA Regulations published in R543 in Government Gazette No. 33306 of 18 June 2010, as amended.

An advertisement was placed in the Gemsbok newspaper on the 18th of February 2015.

In addition, many site notices (as per regulations) were placed near the study area during a site visit on Tuesday the 24th of February 2015. The site notices were placed at the following locations:

Table 62: Site notice locations

Location	Latitude	Longitude
Siyathemba Municipality Offices	29°40'1.03"S	22°44'59.31"E
Elizabeth Vermeulen Public Library	29°40'3.36"S	22°44'57.45"E
Entrance to proposed PV site property	30° 3'34.82"S	22°16'30.24"E
Fence of proposed PV development	30° 2'47.31"S	22°16'58.01"E

As stakeholders respond to these advertisements, they will be registered on the project database and sent letters of invitation to participate as well as the BID.

7.6.1 Summary of Comments Received

I&AP	Date received	Summary of comments	Response
John Geeringh - Eskom	18 February 2015	Mr Geeringh provided the Eskom requirements for works at or near Eskom infrastructure.	These requirements will be taken into consideration during layout planning of the development.
Jacoline Mans - DAFF	19 February 2015	DAFF is concerned about the potential impact of the project on protected tree species. As per the National Forests Act (NFA), no protected tree, as per the recent list published in GN 908 of 21 November 2014, is allowed to be damaged, disturbed, cut or destroyed without a valid Forest Act license. Notice must be taken of the National Veld and Forest Fires Act.	The Biodiversity Specialist studies to be conducted during the EIA phase will assess the potential impact of the project on NFA listed protected tree species, and a copy of the biodiversity specialist report will be sent to DAFF for comment. The National Veld and Forest Fires Act will be taken into consideration during the construction and operational phase of the development.
Adrian Tiplady - SKA	23 February 2015	Dr. Tiplady notified the project team that the nearest SKA station has been identified SKA-Ant-190, at approximately 23km from the project site. Based on distance to the nearest SKA station, detailed design of the solar installation, and the cumulative impact of multiple renewable energy facilities of a similar nature in the same vicinity, the proposed facility poses a high risk of detrimental impact on the SKA. The SKA project office recommends that further detailed EMI and RFI studies be conducted as significant mitigation measures would be	Baseline EMI and RFI studies have been undertaken as a result of SKA comment, and these have been included in this report. The South African SKA Project Office will be kept informed of progress with this project.

		required to lower the risk of detrimental impact to an acceptable level. It is not guaranteed that sufficient mitigation measures would be available. The South African SKA Project Office would like to be kept informed of progress with this project, and reserves the right to further risk assessments at a later stage.	
Francois Ekkerd, landowner	24 February 2015	Mr Ekkerd informed Focus Group Meeting attendees that the water quality in the area is brackish, and enquired as to the proposed water source to be used for panel maintenance. He also referred to a water pipeline being planned by Bloemwater from Prieska to Van Wyksvlei to address the water shortage in the area.	It is expected that water will be obtained from boreholes or from the municipality. This fact will be confirmed during the EIA phase. The developer will be notified of the proposed water pipeline.
		He also enquired as to whether the dirt road would be tarred to prevent dust deposits on the solar panels, which would increase the need to clean the panels with associated increased water usage.	It is not anticipated that the roads will be tarred, however dust suppression methods will be implemented during construction and if necessary during operation. This will also be included as a requirement in the EMPr.
		Mr Ekkerd mentioned that there is word of the upgrading of the Kronos Substation and asked whether the project team was aware of this.	Grid connection will be established through consultation between the developer and Eskom during the EIA phase of the project.
		Mr Ekkerd asked what precautions would be taken to prevent or reduce the impact of dust on the adjacent homes.	The issue of dust will be addressed during the EIA phase of the project. Dust suppression methods will be employed during construction, and if necessary during operation. This will also be

			included as a requirement in the EMPr.
Johannes Human, landowner	24 February 2015	Mr Human , raised the following: a) Was the development planned for only the northern portion of the farm and no development on the southern portion? b) How will the safety aspect of especially the residents of the area be addressed by the specialist, mainly during the construction phase? c) How would the possibility of stock theft be addressed by the specialist, especially during the construction phase? d) The request is made that the biodiversity specialist should not disturb fauna and flora during the site visit. e) It is requested that landowners be informed timeously of when the specialists would undertake their site visits.	The development is intended to take place on the northern half of Portion 3 of Klipgats Pan No 117. Socio-economic issues will be addressed as part of the EMPr in the EIA phase of the project. The biodiversity specialist will be informed of Mr Human's request and will endeavor to minimise disturbance to fauna and flora in the project area. Landowners will be notified in advance when specialists intend to conduct field studies.
Gerrie Rudolph, landowner	24 February 2015	Mr Rudolph asked what precautionary measures would be taken to prevent or reduce the impact of dust on their home since the reestablishment of the vegetation could take between 10 to 20 years.	The issue of dust will be addressed during the EIA phase of the project. Dust suppression methods will be employed during construction, and if necessary during operation.
Francois Ekkerd, landowner	25 February 2015	Mr Ekkerd requested that the road from the R357 to Klipgatspan Portion 1 must not be closed, as it is his access route to the land.	The project developers will be made aware of Mr Ekkerd's request.
Simphiwe Masilela, ATNS	26 February 2015	Mr Masilela acknowledged receipt of the notification letter and requested that they be updated on any project developments.	ATNS will continue to be notified as the project progresses.

Heleen van den Heever - Telkom	27 February 2015	Telkom has approved the proposed project as no Telkom SA SOC Ltd infrastructure will be affected by the proposed project. However they have requested to be contacted before commencement of work, and notified if there are any changes from the original planning.	Telkom will be kept informed of project progress, and will be notified if there are any changes to the proposed project.

7.7 Proof of Notification

Appendix 7 includes all proof of notification of Interested and Affected Parties. More specifically, the types of proofs are as follows:

- Site notice text (Appendix 7A)
- Photographs of site notices (Appendix 7A)
- Proof of advertisements in the newspapers (Appendix 7C)
- Background Information Document (Appendix 7B)
- Correspondence to registered I&APs and key stakeholders (Appendix 7D)

7.8 Focus Group Meetings

A Focus Group Meeting (FGM) was held in Copperton with affected landowners on Tuesday the 24th of February 2015. Additional FGMs were also be held with the District and Local Municipalities as well as affected landowners on Thursday the 21st of May 2015 and Friday the 22nd of May 2015, respectively. FGMs are smaller meetings with specific groups or organisations who have similar interests in or concerns about the project. This process is ongoing and will continue throughout the EIA phase.

Following all meetings, minutes will be compiled and forwarded to all attendees for their review and comment. The primary aim of these meetings was to:

- disseminate information regarding the proposed development to I&APs
- provide I&APs with an opportunity to interact with the EIA team and the BioTherm representatives present.
- supply more information regarding the EIA process;
- answer questions regarding the project and the EIA process;
- receive input regarding the public participation process and the proposed development.

7.9 Public Meetings

A Public Meeting will took place on Thursday evening the 21st of May 2015.

Invitation letters will be sent by mail and e-mail to all registered I&APs on the project's database.

The Public Meetings was held in order to provide I&APs with information regarding the proposed development, present the environmental findings (desk-top) and invite I&APs to raise any further comments and/or concerns that they may have.

Draft minutes of this meeting will be compiled and forwarded to all attendees, and the final minutes will be included in the Final Scoping Report submitted to the Competent Authority.

7.10 One-on-One Consultation

Where possible, potentially directly affected landowners were consulted on a one-on-one basis and informed about the proposed project. Any comments and/or concerns received will be noted and included in the Comments and Responses Report.

This consultation process is seen as one of the important aspects of the EIA and Public Participation process. Should the proposed project be granted an Environmental Authorisation, these particular stakeholders will be directly affected and their properties impacted upon. The consultation process will also ensure that as many uncertainties and concerns as possible are raised upfront and channelled to BioTherm to ensure that the stakeholders and the applicant are informed about these issues throughout the process.

7.11 Comments and Response Report

Issues, comments and concerns raised during the public participation process were captured in the Comments and Response Report (C&RR) included as Appendix 7E. This C&RR provides a summary of the issues raised, as well as responses which were provided to I&APs. This information will be used to feed into the evaluation of social impacts. A separate section to the C&RR will be added to the Final Scoping Report to reflect the comments received during the review period from I&APs on the DSR.

7.12 Comments on Draft Scoping Report

The Draft Scoping Report will be made available for public review after submission to DEA, the competent authority.

The report will be out for public review and comment for a period of 30 calendar days. Written notice will be given to all registered I&APs as well as all key stakeholders on the database that the DSR will be available for public review.

Electronic copies (CD) of the report will also be made available and will be distributed on written request.

8 ASSESSMENT IN TERMS OF EQUATOR PRINCIPLES

The Equator Principles ("EP") is a financial industry benchmark for determining, assessing and managing social & environmental risk in project financing. A number of banks, exchanges and organisations worldwide have adopted the Principles as a requirement to be undertaken for funding to be granted. However, certain funding institutions may not have formally adopted the Principles, although will require clients to be compliant with them in order to qualify for loans. The principles are summarised below:

Principle 1: Review and Categorisation
When a project is proposed for financing, the Equator Principles Funding Institution ("EPFI") will categorise the project based on the magnitude of its potential impacts and risks.

Principle 2: Social and Environmental Assessment
For each project assessed as being either Category A or Category B, the client / borrower must conduct a Social and Environmental Assessment ("Assessment") process to address the relevant impacts and risks of the proposed project. The Assessment should also propose mitigation and management measures relevant and appropriate to the nature and scale of the proposed project.

Principle 3: Applicable Social and Environmental Standards
The Assessment will refer to the applicable IFC Performance Standards and applicable Industry Specific EHS Guidelines.

Principle 4: Action Plan and Management System
The client / borrower must prepare an Action Plan ("AP") or management system that addresses the relevant findings, and draws on the conclusions of the Assessment. The AP will describe and prioritise the actions needed to implement mitigation measures, corrective actions and monitoring measures necessary to manage the impacts and risks identified in the Assessment. The management measures are required to comply with applicable host country, social and environmental laws and regulations, and requirements of the applicable Performance Standards and EHS Guidelines, as defined in the AP.

Principle 5: Consultation and Disclosure
The client / borrower or third party expert must consult with project affected communities in a structured and culturally appropriate manner. For projects with significant adverse impacts on affected communities, the process will ensure their free, prior and informed consultation and facilitate their informed participation as a means to establish, to the satisfaction of the EPFI, whether a project has adequately incorporated affected communities' concerns.
In order to accomplish this, the non-technical summaries must be made available to the public by the borrower for a reasonable minimum period in the relevant local language and in a culturally appropriate manner.

Principle 6: Grievance Mechanism

To ensure that consultation, disclosure and community engagement continues throughout construction and operation of the project, the borrower must, scaled to the risks and adverse impacts of the project; establish a grievance mechanism as part of the management system. This will allow the borrower to receive and facilitate resolutions of concerns and grievances about the project's social and environmental performance raised by individuals or groups from among project-affected communities.

Principle 7: Independent Review

For all Category A projects and, as appropriate, for Category B projects, an independent social or environmental expert not directly associated with the borrower must review the Assessment, AP and consultation process documentations in order to assist the EPFIs due diligence, and assess Equator Principles compliance.

Principle 8: Covenants

An important strength of the Principles is the incorporation of covenants linked to compliance. For Category A and B projects, the client / borrower will covenant in financing documentation:

- To comply with all relevant host country, social and environmental laws, regulations and permits in all material respects
- To comply with the AP (where applicable) during the construction and operation of the project in all material respects
- To provide periodic reports in a format agreed with EPFIs (with the frequency of these reports proportionate to the severity of impacts, or as required by law, but not less than annually), prepared by in-house staff or third party experts, that i) document compliance with the AP (where applicable), and ii) provide representation of compliance with relevant local, state and host country social and environmental laws, regulations and permits
- To decommission the facility, where applicable and appropriate, in accordance with an agreed decommissioning plan

Principle 9: Independent Monitoring and Reporting

To ensure ongoing monitoring and reporting over the life of the loan, EPFIs will, for all Category A projects, and as appropriate, for Category B projects, require appointment of an independent environmental and/or social expert, or require that the borrower to retain qualified and experienced external experts to verify its monitoring information, which would be shared with EPFIs.

Principle 10: EPFI Reporting

Each EPFI adopting the Equator Principles commits to report publicly at least annually about its Equator Principles implementation processes and experience, taking into account appropriate confidentiality considerations.

8.1 Assessment Results

This section details the current compliance level with which the solar PV energy facility projects meets with the Equator Principles and the related Performance Standards which are outlined below.

Table 63: Solar PV energy facility Compliance Level in terms of Equator Principles and Related Performance Standards.

The coding key is as follows:

Compliance Level			
Clear			
Not assessed/ determined	Not compliant	Partially compliant	Compliant

Principles	**Compliance Level**	**Reference**
General, Performance Standard 1 Environmental & Social Reporting		
1. Baseline Information		Refer to Chapter 2
2. Impacts and risks		Refer to Chapter 3
3. Global impacts		N/A
4. Transboundary		N/A
5. Disadvantaged / vulnerable groups		To be addressed as part of the EMP during the EIA phase (CSI and Labour Plan)
6. Third party		Refer to section 1.1.
7. Mitigation measures		To be addressed as part of the EMP during the EIA phase
8. Documentation process		Refer to section 1.2
9. Action Plans		To be addressed during the EIA phase
10. Organisational capacity		To be addressed as part of the EMP during the EIA phase (CSI and Labour Plan)

Principles	Compliance Level	Reference
11. Training		To be addressed as part of the EMP during the EIA phase
12. Grievance mechanism		To be addressed during the EIA phase
13. Report content		To be addressed as part of the EMP during the EIA phase
Performance Standard 2, Labour & Working Conditions		
1. Human Resource Policy		To be addressed as part of the EMP during the EIA phase (CSI and Labour Plan)
2. Working relationship		To be addressed as part of the EMP during the EIA phase (CSI and Labour Plan)
3. Working conditions with and terms of employment		To be addressed as part of the EMP during the EIA phase
4. Workers organisation		To be addressed as part of the EMP during the EIA phase (CSI and Labour Plan)
5. Non-discrimination and equal opportunities		Refer to Chapter 2, section 2.15. This issue will also be addressed as part of the EMP during the EIA phase (CSI and Labour Plan)
6. Grievance mechanism		To be addressed during the EIA phase
7. Occupational Health and Safety		To be addressed during the EIA phase
8. Non-employee workers		To be addressed as part of the EMP during the EIA phase
9. Supply Chain		N/A
10. Labour Assessment Component of a Social and Environmental Assessment		To be addressed as part of the EMP during the EIA phase (CSI and Labour Plan)
Performance Standard 3, Pollution		
1. Pollution Prevention, Resource Conservation & Energy Efficiency		To be addressed as part of the EMP during the EIA phase

Principles	Compliance Level	Reference
2. Wastes		To be addressed as part of the EMP during the EIA phase
3. Hazardous material		To be addressed as part of the EMP during the EIA phase
4. Emergence preparedness & response		To be addressed as part of the EMP during the EIA phase
5. Technical guidance – ambient considerations		To be addressed as part of the EMP during the EIA phase
6. Greenhouse gas emissions		N/A
Performance Standard 4, Health & Safety		
1. Hazardous materials safety		To be addressed as part of the EMP during the EIA phase
2. Environmental and natural resource issues		Refer to sections 2.3-2.15
3. Emergency preparedness and response		To be addressed in the EMP during the EIA phase
Performance Standard 5, Land Acquisition		Refer to Chapter 4
Performance Standard 6, Biodiversity		Refer to Chapter 2, section 2.7
Performance Standard 7, Indigenous People		Refer to Chapter 4
Performance Standard 8, Cultural Heritage		Refer to Chapter 2, section 2.12 and 2.13

It is important to note that, most of the issues listed per performance standard in the table above will only be addressed during the EIA phase. Therefore at this stage (scoping phase), most of the issues are categorised as “not assessed/ to be determined”. Full compliance with the EPs will only be realised following EIA assessments.

9 CONCLUSIONS AND RECOMMENDATIONS

The above report provides a broad introduction to the issues that are pertinent to the proposed Helena solar PV energy facility, and highlights important issues to be investigated during the EIA Phase of the project. The EIA Phase will draw on the above information and make use of the recommended specialist studies to reach an objective decision on the overall impact of the proposed development.

The EIA Phase will culminate in the compilation of mitigation measures to reduce impacts, the identification of the least impactful routing of the power lines, the identification of least impactful locations for the solar PV arrays, the identification of least impactful locations for building structures and the identification of sensitive areas within the study area which may require more specific management measures. The EIA Phase will also aim to optimise and improve potential positive impacts that may result from the proposed development.

9.1 Conclusions

No specialist study conducted during the Scoping phase for the proposed development has identified any fatal flaws for the proposed Helena 1 project site.

However, a number of potentially significant (positive and negative) environmental impacts have been identified and will need to be evaluated during the detailed EIA phase of the project. In addition, the EIA Phase will provide a more detailed comparative analysis of these potential impacts against the “no-go” alternative.

Detailed mitigation and management measures will be developed during the Environmental Management Programme (EMPr) phase of the project, in response to the detailed assessment, and will be run towards the end of EIA phase of the project. Should this project receive a positive environmental authorisation, the EMPr will guide the project proponent and appointed contractor(s) through the final design, construction and operational phases of the proposed project.

9.1.1 Layout Alternatives

One of the aims of the Scoping report is to identify alternatives to carry through to the EIA phase of the investigation for detailed assessment (as was discussed in Chapter 2). The selection of alternatives during the scoping phase of the project usually helps to focus future investigations, both in terms of the environmental investigations required and the scope of the public participation process.

Various specialists identified preliminary site specific sensitive areas during the scoping phase of the EIA that may need to be precluded from the buildable area. These include the avifaunal, heritage, biodiversity and surface water specialists. The sensitive areas identified by these specialists were used to guide the design of PV panel layouts, where practical. During the EIA phase, following the detailed specialist studies, the proposed layouts will be further refined to avoid highly sensitive and no-go areas identified by the specialists on the proposed development site.

Due to the limited space available for each phase as well as the constraints of the sensitive areas, no alternative PV panel layouts were identified. It was felt that it would be environmentally preferable to assess one viable panel layout rather than two panel layouts that are not technically or environmentally viable. Other design or layout alternatives have been identified. Two alternative site locations for the substation were also proposed, as well as two alternative route corridors for the proposed power line. Additionally, two road and cabling layout alternatives were identified. Based on the scoping phase specialist findings the substation assessment area was eliminated as an appropriate area for the proposed substation as most of this site was found to be potentially sensitive by the specialists. As such, two alternative substation sites that cover an area of 3 ha each were proposed to be assessed in the EIA phase. Should the other two PV projects that are being proposed by BioTherm on the same farm also be granted EAs and be awarded preferred bidder status by the DoE the possibility of sharing the substation site to reduce the environmental impact will be considered.

These layouts, as well as the respective sensitive areas, are presented in Figure 25 and Figure 26.

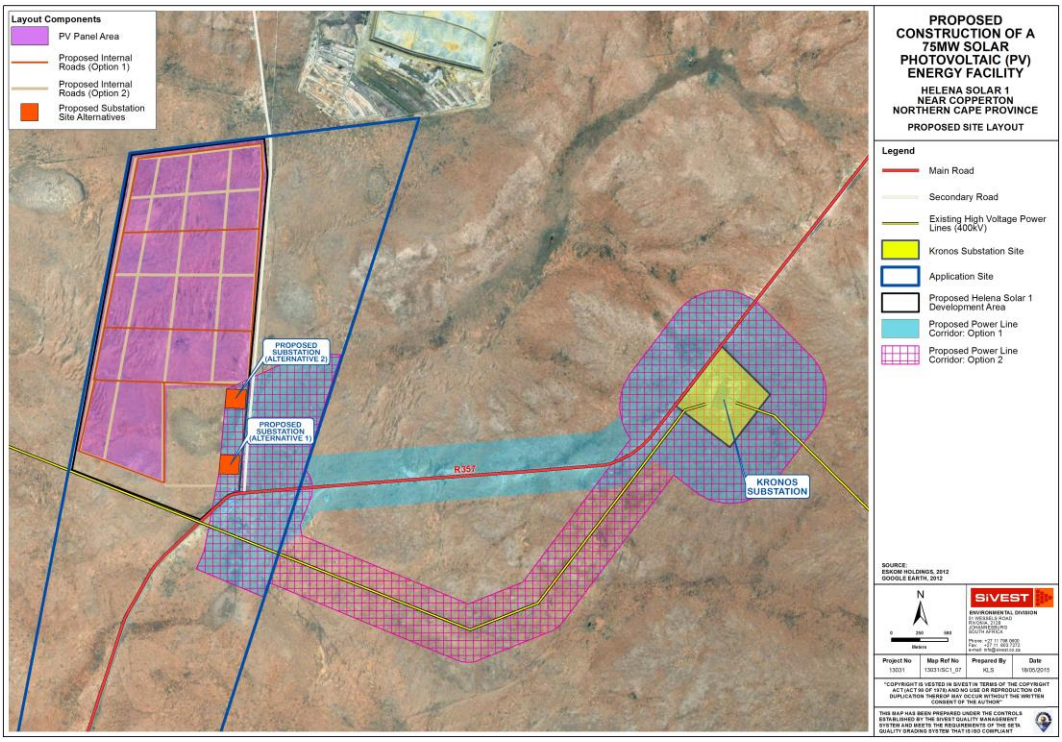

Figure 25: Proposed Layout Alternatives

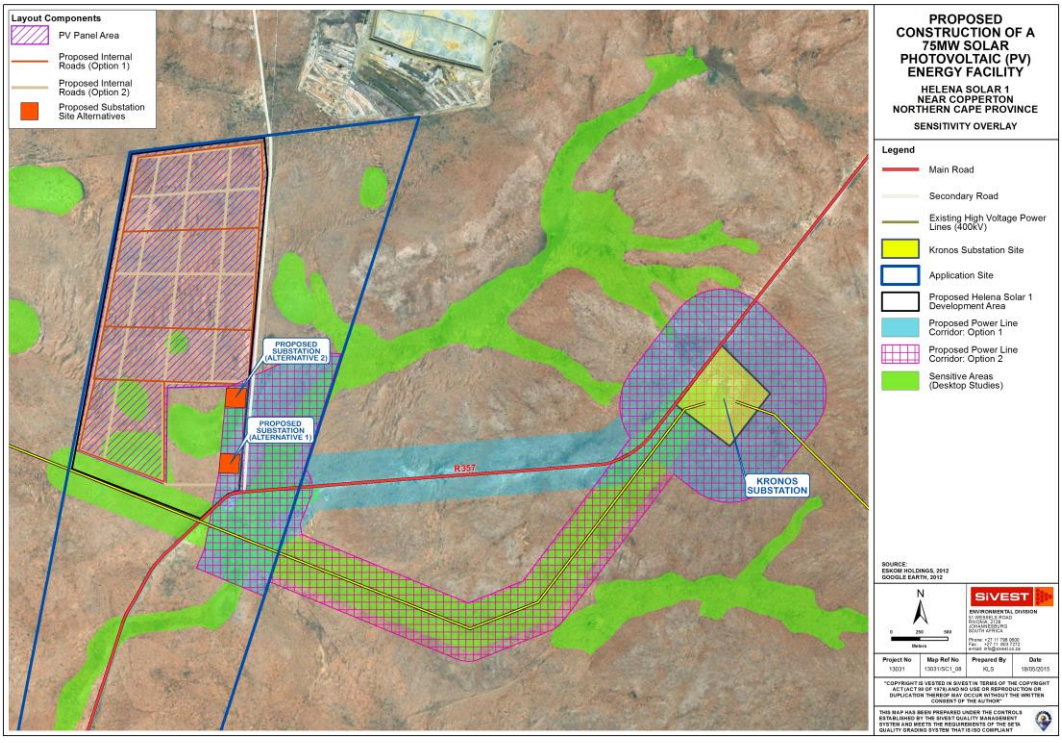

Figure 26: Proposed Layout Alternatives in relation to the Sensitive Areas

All the identified alternatives are considered to be beneficial from an environmental perspective as they have been positioned to avoid most of the sensitive areas that were identified by the specialists during the scoping phase. The potential negative environmental impacts that may need to be mitigated are summarised below. These will be further assessed in the EIA Phase.

9.1.2 Summary of Findings

A summary of the findings for each identified environmental impact evaluated in the context of the proposed development (both biophysical and social) is provided in the table below.

Table 64: Summary of environmental issues identified in Specialist Studies.

Aspect	Potential impacts
Biodiversity	▪ Loss of indigenous natural vegetation during construction; ▪ Impacts on a near threatened plant species; ▪ Impacts on protected plant species; ▪ Impacts on a protected tree species; ▪ Impacts on watercourses / drainage lines; ▪ Mortality of populations of sedentary species during construction (terrestrial and aquatic); ▪ Displacement of populations of mobile species (terrestrial); ▪ Mortality of bird species of concern due to secondary factors, such as collisions with overhead power lines; ▪ Introduction and/or spread of declared weeds and alien invasive plants in terrestrial habitats.
Avifauna	▪ Collisions with the heliostats or solar panels; ▪ Displacement due to habitat transformation and disturbance associated with the construction of the plant; ▪ Mortality on associated power line infrastructure ; ▪ Disturbance of breeding raptors on the existing high voltage network; ▪ Sociable Weavers may nest on the plant infrastructure.
Surface Water	▪ Impacts associated with the construction lay-down area directly in the surface water resource(s); ▪ Impacts associated with establishing the foundations of the proposed development; ▪ Impacts associated with the clearing of vegetation for the proposed development; ▪ Impacts associated with the abnormal/heavy vehicle access into surface water resource areas and the associated buffer zones; ▪ Impacts associated with the general construction access near or in surface water resource areas and the associated buffer zones; ▪ Impacts associated with improper stormwater management effects on nearby surface water resources;

Aspect	Potential impacts
	▪ Impacts associated with the oil, fuel and other soluble substances from construction activities, vehicles and machinery into nearby surface water resources; ▪ Impacts associated with the 132kV power line installation into/over nearby surface water resources; ▪ Impacts associated with power line service roads through surface water resources; ▪ Stormwater run-off associated with the PV plant, substation, power line and associated infrastructure; and ▪ Oil leakages from the substation.
Soils and Agricultural Potential	▪ Loss of agricultural potential because soil would be impacted by the establishment of infrastructure; ▪ Low impact, as soils are shallow and climate very unfavourable for cultivation.
Visual	▪ The natural visual character of the surrounding area could be altered. ▪ The facility would likely be highly visible for great distances, thus altering the relatively untransformed rural sense of place within the surrounding area; ▪ The proposed development could adversely affect farmsteads / homesteads within the visual assessment zone; ▪ Vehicles and trucks travelling to and from the proposed site would increase dust emissions both during the construction and operational phases. The dust plumes could create a visual impact and may evoke negative sentiments from surrounding viewers; ▪ Surface disturbance during construction would expose bare soil which could visually contrast with the surrounding environment. In addition, temporarily stockpiling soil during construction may alter the flat landscape. Wind blowing over these disturbed areas could result in dust which would have a visual impact; ▪ Security and operational lighting at the PV plant could result in light pollution and glare, which could be an annoyance to surrounding viewers; ▪ Potential visual impacts as a result of the infrastructure associated with the proposed PV plant.
Heritage	▪ Unidentified archaeological, palaeontological, or historical sites and the discovery of such sites during construction can seriously hamper construction timelines; ▪ Fieldwork can thus provide valuable information on such sites in the study area and provide timeous management of such sites through realignment of development or mitigation of such sites where needed.
Socio-economic	▪ Increase in production and GDP-R of the national and local economies due to project capital expenditure and maintenance;

Aspect	Potential impacts
	▪ Creation of temporary employment in the local communities and elsewhere in the country; ▪ Skills development due to the creation of new employment opportunities; ▪ Improved standard of living of households directly or indirectly benefiting from created employment opportunities; ▪ Increase in government revenue due to investment; ▪ Potential sterilisation of agricultural land; ▪ Change in demographics of the area due to influx of workers and job seekers; ▪ Increase in social pathologies associated with influx of migrant labourers and job seekers to the area (health, crime, prostitution, xenophobia, etc.); ▪ Added pressure on basic services and social and economic infrastructure; ▪ Investment in the local communities and economic development projects as part of a Social Economic Development and Enterprise Development plan; ▪ Altered sense of place.

Based on the specialist studies, the following conclusions can be reached for each environmental parameter assessed.

Table 65: Conclusions of Specialist Studies.

Biodiversity	The project is unlikely to have highly significant impacts on the ecological receiving environment and impacts that will occur can be controlled and reduced to low significance. The seriousness of many of these impacts can be determined during the field investigation of the site. Some impacts require permits to be issued, either by National or Provincial authorities and field data is required for the permit applications.
Avifauna	The proposed project is located in the region with the highest number of endemics in southern Africa. With over a quarter of all southern African endemics or near endemics potentially occurring in the study area, the study area as a whole should be regarded as moderately sensitive from an avifaunal perspective. Within the study area, potential high sensitive, no-go areas were identified, i.e. surface water (water troughs and dams) and high voltage lines, as both these micro-habitats are potential focal points of bird activity. Water troughs (boreholes) could potentially be declassified as high sensitivity should it be confirmed that they will be removed and therefore cease to function as potential focal points for bird activity after the construction of the solar panels. In the case of the existing Aries-Kronos 400kV line, the sensitivity and potential no-go areas will only become apparent once a field investigation has been conducted. Should no priority

	raptor nests be present, there will be no need for buffer zones. However, if there are nests present, an appropriate buffer zone will be required around the nest, depending on the species. In the case of a Red Data species such as a Martial Eagle, this would necessitate a buffer zone of at least 1.5km.
Surface water	The scoping level surface water assessment incorporated a database (GIS databases) and desktop (Google™ satellite imagery overlaid upon 1:50 000 topographical images) assessment of the entire study area. Database findings revealed that two (2) non-WETFEPA natural depression wetlands, and two (2) non-perennial rivers are located within the study area. In terms of the proposed development, a depression wetland was identified within both Helena Solar 1 and Power Line Option 2. A non-perennial river was identified within Power Line Option 1. Desktop findings revealed a depression wetland within Helena Solar 1 and a non-perennial river coursing Power line Options 1 and 2.
Soils and Agricultural Potential	Virtually all of the study area comprises shallow, calcareous soils with rock (land type Ah93). Coupled with these shallow soils, the very low rainfall in the area means that the only means of cultivation would be by irrigation and the Google Earth image of the area shows absolutely no signs of any agricultural infrastructure and certainly none of irrigation. The climatic restrictions mean that this part of the Northern Cape is suited at best for grazing and here the grazing capacity is low, around 20 ha/large stock unit. Therefore the expected impact is low, as soils are shallow and climate very unfavourable for cultivation.
Visual	The study area has a rural visual character with a low visual sensitivity. However, several solar energy facilities are proposed within relatively close proximity to the proposed PV facilities. These facilities and their associated infrastructure, will significantly alter the visual character and baseline in the study area once constructed and make it appear to have a more industrial-type visual character. The proposed PV facility is likely to visually influence four farmsteads identified within the visual assessment zone, therefore these are regarded to be potentially sensitive visual receptor locations. The sensitivity of the receptor locations will need to be confirmed through further assessment in the next phase of the study. The nature of the visual impacts associated with a development of this size on a receptors in the study area could be significant.
Heritage	The possibility of archaeological finds have been identified as being high. The palaeontological potential of the area has been confirmed as being low. As seen from the archival in the heritage scoping report, the possibility of historical finds has been identified. Thus further fieldwork is required to develop a comprehensive Heritage Management Plan.
Socio-economic	No fatal flaws or contraventions from a socio-economic policy perspective exist for the implementation of the proposed project. The national, provincial, and to some extent local governments do prioritise the development of renewable energy projects to reduce carbon emissions,

	create new jobs, increase economic growth and security of electricity supply. However, it is very clear that these developments need to be undertaken in a sustainable manner and should not jeopardise the growth of the other sectors, mainly agriculture that is considered to be an economic driver in the local area, where the project is to be developed. Instead, harnessing of renewable energy sources is considered to be the means to drive development and expansion of the local agricultural activities and development of other industries. The economy is in dire need for investment that would diversify its economic base and lead to the improvement of standards of living among local households through the increased income levels and access to improved services, which can be achieved by raising the LM's revenue base through taxes and rates paid by new businesses. The proposed project is therefore likely to create a positive impact on the local economic development and the socio-economic environment in the municipality in general.

9.2 Recommendations

Table 66: Outcomes and Recommendations of Specialist Studies

Aspect	Fatal flaws	Site refinement / Recommendations	Further Investigations
Biodiversity	None	The displacement of mobile fauna is considered to be unlikely to be important for this site and project. All other potential impacts should be investigated in the EIA phase or should be assessed using formal methodology.	Yes
Avifauna	None	The sensitivity map provided in the avifauna specialist report is based on a desk top analysis and general knowledge of the area and avifaunal diversity and abundance. The study area will be surveyed in the EIA phase in order to get detailed information on the micro-habitat, and to ground truth the preliminary sensitivity delineations.	Yes
Surface water	None	Several potential impacts may affect the surface water resources within the Helena PV facility's study site where the buildings, power lines and associated structures encroach on these sensitive environmental features. It is therefore, provisionally	Yes

Aspect	Fatal flaws	Site refinement / Recommendations	Further Investigations
		recommended that all structures and associated infrastructure be located outside of any surface water resources as well as to avoid and minimise potential impacts adequately. As a final recommendation, detailed in-field delineations and assessment in the impact phase will therefore be required to investigate and verify the desktop findings of this report.	
Agricultural potential	None	Due to the occurrence of shallow soils, coupled with the extremely hot and dry nature of the climate, it is not anticipated that a detailed soil survey will be required.	Yes, these will be going ahead despite the low likelihood of impacts.
Visual	None	Further assessment will be required in the EIA-phase to investigate the sensitivity of the receptor locations to visual impacts associated with the proposed development and to quantify the impacts that would result.	Yes
Heritage	None	The findings of the heritage scoping study provide the basis for the recommendation of further field truthing through an archaeological walk down and palaeontological desktop study covering the site. The aim of this will be to compile a comprehensive database of heritage sites in the study areas, with the aim of developing a heritage management plan for inclusion in the Environmental Management Programme as derived from the EIA.	Yes
Socio-economic	None	The previously listed potential impacts will need to be investigated in the EIA phase in greater detail.	Yes

It is therefore recommended that the following studies be taken through to the EIA Phase:

- Biodiversity (flora and fauna) Assessment (Dr. David Hoare – David Hoare Consulting)
- Avifauna Assessment (Chris van Rooyen - Chris van Rooyen Consulting)
- Surface Water Impact Assessment (Shaun Taylor and Alistair Fyfe– SiVEST) – including external peer review by Dr Martin Ferreira – Jeffares and Green

- Soils and Agricultural Potential (D.G. Paterson – ARC Institute for Soil, Climate and Water)
- Visual Impact Assessment (Andrea Gibb – SiVEST) – including external peer review by Keagan Allan – SRK Consulting
- Heritage Assessment (Wouter Fourie – Professional Grave Solutions)
- Socio-economic Impact Assessment (Elena Broughton – Urban-Econ Development Economists)

In addition, further EMI and RFI will be undertaken in the EIA phase should this be requested by the SKA. Baseline EMI and RFI studies have been undertaken as a result of comments received from SKA prior to the DSR being released for public comment. The South African SKA Project Office will be kept informed of the project progress and will be provided the baseline Baseline EMI and RFI studies for further comment.

The proposed scope of work and methodology to assess each of the above impacts has been detailed in the plan of study to undertake an EIA, as per the EIA Regulations. The Plan of Study is included below.

10 PLAN OF STUDY FOR ENVIRONMENTAL IMPACT ASSESSMENT

Issues identified during the Scoping phase will be investigated further during the EIA phase of the project. Various specialist studies will be conducted during the EIA phase to assess these issues. Mitigation measures will be formulated and these will be included in the Environmental Management Programme.

This information will assist DEA in making an informed decision with regards to the proposed development.

10.1 Aim of the EIA Phase

The aim of the impact assessment phase is to:

- Conduct a detailed impact assessment of the issues identified
- Identify potential mitigation measures to reduce impacts
- Ensure information is disseminated to Interested and / or Affected parties and there is a constant flow of communication

The following tasks will form part of the Environmental Impact Assessment Phase:

- A comprehensive Public Participation Process (as above)
- Conduct specialist studies
- Conduct alternatives assessment on the alternative layouts identified in this DSR
- Compilation of an Environmental Impact Report (EIR)
- Compilation of an Environmental Management Programme
- Make Final EIR available for public comment
- Submit Final EIR to DEA
- Await decision

The following specialist studies will form part of the Environmental Impact Report:

- Biodiversity (flora and fauna) Assessment (Dr. David Hoare – David Hoare Consulting)
- Avifauna Assessment (Chris van Rooyen - Chris van Rooyen Consulting)
- Surface Water Impact Assessment (Shaun Taylor and Alistair Fyfe– SiVEST) – including external peer review by Dr Martin Ferreira – Jeffares and Green
- Soils and Agricultural Potential (D.G. Paterson – ARC Institute for Soil, Climate and Water)
- Visual Impact Assessment (Andrea Gibb – SiVEST) – including external peer review by Keagan Allan – SRK Consulting
- Heritage Assessment (Wouter Fourie – Professional Grave Solutions)
- Socio-economic Impact Assessment (Elena Broughton – Urban-Econ Development Economists)

Further EMI and RFI will be undertaken in the EIA phase should this be requested by the SKA. Baseline EMI and RFI studies have been undertaken as a result of comments received from SKA prior to the DSR being released for public comment. The South African SKA Project Office will be kept informed of the project progress and will be provided the baseline Baseline EMI and RFI studies for further comment.

The terms of reference for these studies involve assessing the potential impacts that have been identified in the Scoping Report in addition to any new issues that are identified during the detailed assessments. The qualifications of these specialists are included in their CV's which are included in Appendix 2.

10.2 Authority Consultation

The stages at which the competent authority will be consulted are as follows:

- Submission of Draft Scoping Report;
- Submission of Final Scoping Report;
- Receipt of comments and confirmation of approval of the Final Scoping Report;
- Submission of draft Environmental Impact Report for comment;
- Submission of final Environmental Impact Report with comments; and
- Response from competent authority regarding acceptance of final Environmental Impact Report.

Additional consultation may occur with DEA during the EIA process should the need arise.

10.3 Proposed Method of Assessing Environmental Issues

The EIA Methodology assists in evaluating the overall effect of a proposed activity on the environment. The determination of the effect of an environmental impact on an environmental parameter is determined through a systematic analysis of the various components of the impact. This is undertaken using information that is available to the environmental practitioner through the process of the environmental impact assessment. The impact evaluation of predicted impacts was undertaken through an assessment of the significance of the impacts.

A brief Terms of Reference for each specialist study is included below:

10.3.1 Biodiversity Assessment

The scoping study provided a general assessment of potential impacts on flora, vertebrate fauna and ecology by the proposed project. The ecological impact assessment will aim to determine potential impacts of the proposed project on the ecological receiving environment.

The general approach that will be adopted for this study will be to identify any critical biodiversity issues that may lead to the decision that the proposed project cannot take place, i.e. to specifically focus on red flags and/or potential fatal flaws. Biodiversity issues will be assessed by documenting whether any important biodiversity features occur on site, including species, ecosystems or processes that maintain ecosystems and/or species. The assessment will be based on a combination of desktop studies, field-based studies and detailed mapping from aerial photographs.

During the scoping study a description and characterisation of the broad study area was undertaken. A description of the receiving environment was provided and any major sensitivities within the study area were identified. Potential impacts on biodiversity, sensitive habitats and ecosystem function were listed and described.

During the EIA phase the study area will be visited and assessed in order to confirm patterns identified from the desktop assessment. Specific features of potential concern will be investigated in the field, including the following:

- General vegetation status;
- Presence of habitats of conservation concern;
- Presence of protected trees;
- Potential presence of species of concern.

The EIA phase will also consider an assessment of alternatives and the cumulative impacts associated with other renewable energy projects in the area.

Impacts identified from the Scoping (Desktop) Phase will be assessed according to standard criteria (nature, extent, duration, magnitude, probability, significance, status as well as the degree to which impacts can be reversed, the degree to which impacts will cause irreplaceable loss of resources and the degree to which impacts can be mitigated).

10.3.2 Avifauna Assessment

For purposes of the EIA phase of the study, the following methods will be employed:

- The study area will be inspected and the avifaunal habitat classes will be recorded and described.
- Transect counts will be conducted to establish the abundance and variety of priority avifauna at the site to supplement the existing SABAP2 data.

- The existing high-voltage power lines in the study area will be inspected for breeding raptors.
- The potential impacts will be assessed according to the prescribed assessment methods and mitigation measures will be proposed.

10.3.3 Surface Water Impact Assessment

The surface water assessment during the EIA phase would primarily entail more detailed field investigation of surface water bodies (identified during the scoping phase) within the project site.

The fieldwork would be focused on:

- Larger wetland and drainage systems;
- Those wetland systems identified as sensitive or as having a high functionality; and
- Riparian zones of larger river systems.

The primary aim of the EIA-level assessment would be to determine the boundaries of the relevant wetland / riparian systems so that the solar PV energy facility can be placed outside of the wetlands / riparian areas. The wetland / riparian area boundary delineation would be undertaken using the DWAF guideline 'A practical field procedure for the identification and delineation of wetlands and riparian areas'.

The surface water analysis would propose measures to mitigate any identified potential negative impacts associated with the solar PV energy facility, and these would inform the EMPr phase. Mitigation measures would possibly entail slight changes to the proposed locations and extent of the solar PV energy facility to avoid impacts on surface water bodies, where significant or likely impacts have been predicted.

Input will be given to the proposed layout and buffers recommended.

The study will culminate in the compilation of a Surface Water Impact Assessment as well as mitigation measures which will feed into the Environmental Management Programme (EMPr).

The Surface Water Impact Assessment Report will be peer reviewed by an external surface water specialist and the report will be updated based on the peer reviewers' comments prior to finalisation.

10.3.4 Soils and Agricultural Potential Assessment

A full agricultural assessment during the EIA Phase will encompass the following:

- More detailed assessment of soil conditions

The EIA phase assessment will include a field investigation of soils and agricultural conditions across the site. This field investigation will be aimed at ground proofing the existing land type information and understanding the specific soil and agricultural conditions on site. It will not be based on a grid spacing of test pits but will comprise a reconnaissance type of soil mapping exercise based on an assessment of surface conditions, topography, and hand augered samples in strategic places, if necessary. Such a soil investigation is considered adequate for the purposes of this study. A more detailed soil investigation is not considered likely to add anything significant to the assessment of agricultural soil suitability for the purposes of determining the impact of the development on agricultural resources and productivity.

- Assessment of erosion and erosion potential on site

  The field investigation will involve a visual assessment of existing erosion and erosion potential on site, taking into account the proposed development layout.

- Assessment of the impacts of specific construction activities and layout on soil conditions

  The EIA phase will include an assessment of the specifics of construction activities and the proposed development layout on potential loss of topsoil.

- Assessment of specific on-site agricultural activities

  The EIA phase will gather more detail on agricultural activity on the site and identify any locally important soil and agricultural issues.

The study will culminate in the compilation of an Agricultural Impact Assessment as well as mitigation measures which will feed into the Environmental Management Programme (EMPr).

10.3.5 Visual Impact Assessment

The focus of the EIA phase VIA will be to undertake a more detailed GIS-based assessment, to quantify the magnitude and significance of the visual impacts of the proposed development in both a day-time and night-time context.

This assessment will focus on areas where potential sensitive receptors are located. Should data be available, digital terrain models and viewsheds will be generated for the areas of focus. This analysis will be conducted using the ArcView 10, Spatial Analyst and 3D Analyst extensions where necessary. The assessment will rely on site visits to each potentially sensitive receptor location to identify the extent of visual impact of the proposed PV facility from these locations. A further assessment of the intensity of potential visual impact, expressed in terms

of bands of differing visual significance will be undertaken. The fieldwork will also allow for the correction and refinement of the baseline information.

The overall significance of visual impacts associated with the proposed PV facility will be assessed through a rating matrix. Once this has been undertaken, measures to mitigate potential visual impacts will be identified, and if practical, layout alternatives within the application site will be considered and suggested to minimise visual impact of the proposed development.

A separate rating matrix will be used to assess the visual impact of the proposed development on the sensitive receptor locations, as identified. This matrix is based on the distance of a receptor from the proposed development, the primary focus / orientation of the receptor, the presence of screening factors, the visual character and sensitivity of the area and the visual contrast of the development with the typical elements and forms in the landscape.

Thereafter, the alternatives will be comparatively assessed, in order to ascertain the preferred alternative from a visual perspective.

Interested and Affected Parties will be consulted through the public participation process being undertaken as part of the EIA process, in order to establish how the proposed PV facility will be perceived from the various receptor locations and the degree to which this impact will be regarded as negative.

It is envisaged that the main deliverable of the study would be the generation of a spatial databases / maps indicating the zones of visual impact, as well as a detailed report indicating the findings of the study.

The Visual Impact Assessment Report will be peer reviewed by an external visual specialist and the report will be updated based on the peer reviewers' comments prior to finalisation.

10.3.6 Heritage Assessment

The Heritage Impact Assessment (HIA) report to be compiled by PGS Heritage (PGS) for the proposed Helena Solar project will assess the heritage resources found on site. This report will contain the applicable maps, tables and figures as stipulated in the NHRA (no 25 of 1999), the National Environmental Management Act (NEMA) (no 107 of 1998) and the Minerals and Petroleum Resources Development Act (MPRDA) (28 of 2002). The HIA process consists of three steps:

- Step I – Literature Review: The background information to the field survey leans greatly on the Heritage Scoping Report completed by PGS for this site.

- Step II – Physical Survey: A physical survey was conducted on foot through the proposed project area by qualified archaeologists, aimed at locating and documenting sites falling within and adjacent to the proposed development footprint.

- Step III – The final step involved the recording and documentation of relevant archaeological resources, as well as the assessment of resources in terms of the heritage impact assessment criteria and report writing, as well as mapping and constructive recommendations

The significance of heritage sites was based on four main criteria:

- **site integrity** (i.e. primary vs. secondary context),
- **amount of deposit, range of features** (e.g., stonewalling, stone tools and enclosures),
    - Density of scatter (dispersed scatter)
        - Low - <10/50m^2
        - Medium - 10-50/50m^2
        - High - >50/50m^2
- **uniqueness** and
- **potential** to answer present research questions.

Management actions and recommended mitigation, which will result in a reduction in the impact on the sites, will be expressed as follows:

A - No further action necessary;
B - Mapping of the site and controlled sampling required;
C - No-go or relocate pylon position
D - Preserve site, or extensive data collection and mapping of the site; and
E - Preserve site

Site Significance

Site significance classification standards prescribed by the South African Heritage Resources Agency (2006) and approved by the Association for Southern African Professional Archaeologists (ASAPA) for the Southern African Development Community (SADC) region, were used for the purpose of this report.

Table 67: Site significance classification standards as prescribed by SAHRA

FIELD RATING	GRADE	SIGNIFICANCE	RECOMMENDED MITIGATION
National Significance (NS)	Grade 1	-	Conservation; National Site nomination
Provincial Significance (PS)	Grade 2	-	Conservation; Provincial Site nomination

Local Significance (LS)	Grade 3A	High Significance	Conservation; Mitigation not advised
Local Significance (LS)	Grade 3B	High Significance	Mitigation (Part of site should be retained)
Generally Protected A (GP.A)	Grade 4A	High / Medium Significance	Mitigation before destruction
Generally Protected B (GP.B)	Grade 4B	Medium Significance	Recording before destruction
Generally Protected C (GP.A)	Grade 4C	Low Significance	Destruction

10.3.7 Socio-economic Impact Assessment

A socio-economic impact assessment will be conducted during the EIA phase in order to:

- Delineate the zone of influence that stretches beyond the directly affected sites following the discussions with other specialists on the team
- Collect primary socio-economic data (through personal or telephonic interviews) of the communities and economic activities that will be directly or indirectly affected (positively or negatively) by the proposed developments (per project and its components)
- Quantify the potential positive and negative effects of the proposed project and its alternatives (if applicable) on the socio-economic environment in the delineated study area in terms of the following:
    - Changes in production (direct, indirect and induced)
    - Changes in value added (direct, indirect and induced)
    - Changes in employment (direct, indirect and induced)
    - Changes in household income (direct, indirect and induced)
    - Changes in government revenue (direct, indirect and induced)
    - Changes in living standards
    - Changes in access to infrastructure
    - Changes to social fabric
- Evaluate the change in the size and composition of the local and regional economies that will be stimulated by the proposed development, as well as the state of local communities
- Evaluate the potential positive and negative impacts following the environmental specialist's methodology
- Assess cumulative impacts
- Develop a management and mitigation plan by proposing mitigation measures for negative effects and enhancement measures for positive impacts, supported by methods for the implementation, timeframes, costs and responsibilities information

The following methods will be employed in undertaking the study.

- Surveys and interviews

Surveying is one of the fastest ways to obtain primary information. Surveys can be conducted over the telephone, internet, e-mail, or personal interviews. The latter is relatively expensive but since it involves one person interviewing another, it is a way to get in-depth and comprehensive information. The use of surveys and interviews is particular applicable for collecting primary data of the community that could potentially be affected by the project or collecting specific data from an identified official or stakeholder.

The following data will be sourced using surveys and interviews:

- Land use information and type of economic activity on properties within the affected environment
- Economic profiles of the activities within the affected environment
- Demographic and social characteristics of the local environment (population, income levels, crime levels, etc.)

- Mapping

Land use mapping technique would be used to illustrate and analyse the land uses in the affected area. The map will be created based on the information collected during the surveys and include the following data:

- Types and location of tourism facilities in the area
- Land uses in the area surrounding the facility (defined by the visual impact)

- Economic modelling and impact assessment

Assessment of economic impacts will be done using economic models developed for the South African economy and the Northern Cape. The former will be used to assess the impacts on the country's economy, whilst the latter will be used to estimate the impact on the provincial and local economies.

Economic models are compiled on the basis of Social Accounting Matrices that illustrate the linkages between various economic agents. The use of economic models allows identifying the industry-specific multipliers on production, capital formation, Gross Domestic Product (GDP), employment, and income. Such multipliers can also be broken in terms of various effects that can be observed as a result of an exogenous change introduced into the economy, be it capital investment or operating expenditure. Three types of effects are distinguished, inter alia:

- Direct – these represent the original purchases for the project's establishment or operations
- Indirect – these are effects that spill over the industries that supply goods and services required for the implementation of the project or for its operation, whether directly to the contractor or operator, or through their suppliers
- Induced – these are the effects that are stimulated by the change in income levels of households that would directly or indirectly be affected by the project and businesses.

10.4 Cumulative Impact Assessment

The potential cumulative impact of the proposed solar facility in combination with other renewable energy facilities in the area will be identified and assessed per environmental aspect and mitigation measures will be identified to address the cumulative impact, where possible. Cumulative impacts will also be rated as part of the impact rating system and used to determine the significance of the impacts.

10.5 Determination of Significance of Impacts

Significance is determined through a synthesis of impact characteristics which include context and intensity of an impact. Context refers to the geographical scale i.e. site, local, national or global whereas Intensity is defined by the severity of the impact e.g. the magnitude of deviation from background conditions, the size of the area affected, the duration of the impact and the overall probability of occurrence. Significance is calculated as shown in Table 69.

Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The total number of points scored for each impact indicates the level of significance of the impact.

10.6 Impact Rating System

Impact assessment will take account of the nature, scale and duration of effects on the environment whether such effects are positive (beneficial) or negative (detrimental). Each issue / impact will also be assessed according to the project stages:

- Planning;
- Construction;
- Operation; and
- Decommissioning.

Where necessary, the proposal for mitigation or optimisation of an impact will be detailed. A brief discussion of the impact and the rationale behind the assessment of its significance is also been included.

10.6.1 Rating System Used To Classify Impacts

The rating system will be applied to the potential impact on the receiving environment and includes an objective evaluation of the mitigation of the impact. Impacts will be consolidated

into one rating. In assessing the significance of each issue the following criteria (including an allocated point system) is used:

Table 68: Description of terms.

NATURE		
Include a brief description of the impact of environmental parameter being assessed in the context of the project. This criterion includes a brief written statement of the environmental aspect being impacted upon by a particular action or activity.		
GEOGRAPHICAL EXTENT		
This is defined as the area over which the impact will be expressed. Typically, the severity and significance of an impact have different scales and as such bracketing ranges are often required. This is often useful during the detailed assessment of a project in terms of further defining the determined.		
1	International and National	Will affect the entire country
2	Province/region	Will affect the entire province or region
3	Local/district	Will affect the local area or district
4	Site	The impact will only affect the site
PROBABILITY		
This describes the chance of occurrence of an impact		
1	Unlikely	The chance of the impact occurring is extremely low (Less than a 25% chance of occurrence).
2	Possible	The impact may occur (Between a 25% to 50% chance of occurrence).
3	Probable	The impact will likely occur (Between a 50% to 75% chance of occurrence).
4	Definite	Impact will certainly occur (Greater than a 75% chance of occurrence).
REVERSIBILITY		
This describes the degree to which an impact on an environmental parameter can be successfully reversed upon completion of the proposed activity.		
1	Irreversible	The impact is irreversible and no mitigation measures exist.
2	Barely reversible	The impact is unlikely to be reversed even with intense mitigation measures.
3	Partly reversible	The impact is partly reversible but more intense mitigation measures are required.
4	Completely reversible	The impact is reversible with implementation of minor mitigation measures

IRREPLACEABLE LOSS OF RESOURCES		
This describes the degree to which resources will be irreplaceably lost as a result of a proposed activity.		
1	No loss of resource.	The impact will not result in the loss of any resources.
2	Marginal loss of resource	The impact will result in marginal loss of resources.
3	Significant loss of resources	The impact will result in significant loss of resources.
4	Complete loss of resources	The impact is result in a complete loss of all resources.
DURATION		
This describes the duration of the impacts on the environmental parameter. Duration indicates the lifetime of the impact as a result of the proposed activity		
1	Short term	The impact and its effects will either disappear with mitigation or will be mitigated through natural process in a span shorter than the construction phase (0 – 1 years), or the impact and its effects will last for the period of a relatively short construction period and a limited recovery time after construction, thereafter it will be entirely negated (0 – 2 years).
2	Medium term	The impact and its effects will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).
3	Long term	The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 50 years).
4	Permanent	The only class of impact that will be non-transitory. Mitigation either by man or natural process will not occur in such a way or such a time span that the impact can be considered transient (Indefinite).
CUMULATIVE EFFECT		
This describes the cumulative effect of the impacts on the environmental parameter. A cumulative effect/impact is an effect which in itself may not be significant but may become significant if added to other existing or potential impacts emanating from other similar or diverse activities as a result of the project activity in question.		
1	Negligible Cumulative Impact	The impact would result in negligible to no cumulative effects
2	Low Cumulative Impact	The impact would result in insignificant cumulative effects
3	Medium Cumulative impact	The impact would result in minor cumulative effects
4	High Cumulative Impact	The impact would result in significant cumulative effects

INTENSITY / MAGNITUDE		
Describes the severity of an impact		
1	Low	Impact affects the quality, use and integrity of the system/component in a way that is barely perceptible.
2	Medium	Impact alters the quality, use and integrity of the system/component but system/ component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).
3	High	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation.
4	Very high	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component permanently ceases and is irreversibly impaired (system collapse). Rehabilitation and remediation often impossible. If possible rehabilitation and remediation often unfeasible due to extremely high costs of rehabilitation and remediation.

SIGNIFICANCE

Significance is determined through a synthesis of impact characteristics. Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. This describes the significance of the impact on the environmental parameter. The calculation of the significance of an impact uses the following formula:

(Extent + probability + reversibility + irreplaceability + duration + cumulative effect) x magnitude/intensity.

The summation of the different criteria will produce a non-weighted value. By multiplying this value with the magnitude/intensity, the resultant value acquires a weighted characteristic which can be measured and assigned a significance rating.

Points	Impact Significance Rating	Description
6 to 28	Negative Low impact	The anticipated impact will have negligible negative effects and will require little to no mitigation.
6 to 28	Positive Low impact	The anticipated impact will have minor positive effects.

29 to 50	Negative Medium impact	The anticipated impact will have moderate negative effects and will require moderate mitigation measures.
29 to 50	Positive Medium impact	The anticipated impact will have moderate positive effects.
51 to 73	Negative High impact	The anticipated impact will have significant effects and will require significant mitigation measures to achieve an acceptable level of impact.
51 to 73	Positive High impact	The anticipated impact will have significant positive effects.
74 to 96	Negative Very high impact	The anticipated impact will have highly significant effects and are unlikely to be able to be mitigated adequately. These impacts could be considered "fatal flaws".
74 to 96	Positive Very high impact	The anticipated impact will have highly significant positive effects.

The table below is to be represented in the Impact Assessment section of the report.

Table 69: Rating of impacts.

IMPACT TABLE	
Environmental Parameter	*A brief description of the environmental aspect likely to be affected by the proposed activity e.g. Surface water*
Issue/Impact/Environmental Effect/Nature	*A brief description of the nature of the impact that is likely to affect the environmental aspect as a result of the proposed activity e.g. alteration of aquatic biota The environmental impact that is likely to positively or negatively affect the environment as a result of the proposed activity e.g. oil spill in surface water*
Extent	*A brief description indicating the chances of the impact occurring*
Probability	*A brief description of the ability of the environmental components recovery after a disturbance as a result of the proposed activity*
Reversibility	*A brief description of the environmental aspect likely to be affected by the proposed activity e.g. Surface water*
Irreplaceable loss of resources	*A brief description of the degree in which irreplaceable resources are likely to be lost*
Duration	*A brief description of the amount of time the proposed activity is likely to take to its completion*
Cumulative effect	*A brief description of whether the impact will be exacerbated as a result of the proposed activity*
Intensity/magnitude	*A brief description of whether the impact has the ability to alter the functionality or quality of a system permanently or temporarily*

IMPACT TABLE		
Significance Rating	*A brief description of the importance of an impact which in turn dictates the level of mitigation required*	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	4	1
Probability	4	1
Reversibility	4	1
Irreplaceable loss	4	1
Duration	4	1
Cumulative effect	4	1
Intensity/magnitude	4	1
Significance rating	-96 (high negative)	-6 (low negative)
Mitigation measures	*Outline/explain the mitigation measures to be undertaken to ameliorate the impacts that are likely to arise from the proposed activity. Describe how the mitigation measures have reduced/enhanced the impact with relevance to the impact criteria used in analysing the significance. These measures will be detailed in the EMPR.*	

10.7 Environmental Management Programme (EMPr)

In accordance with the EIA Regulations, 2010 a draft Environmental Management Programme (EMPr) will be included within the Environmental Impact Assessment Report. The EMPr will include the mitigation measures formulated by the various specialists.

10.8 Alternative Assessment

In accordance with the EIA Regulations, 2010 and as discussed in Chapter 2 of this report, all the layout alternatives identified within this DSR will be described and comparatively assessed in the EIA phase. These layouts are presented in Figure 27 and Figure 28, and they include the following:

- Two (2) alternative sites for the substation
- Two (2) alternative corridors for the power line
- Two (2) alternative road and cabling layouts

As previously discussed, due to the limited size available for each phase and the occurrence of potentially sensitive areas it was not possible to assess two alternative laydown areas per

phase. It was felt that it would be environmentally preferable to assess one viable panel layout rather than two panel layouts that are not technically or environmentally viable. The sensitive areas used to determine the layouts were based on desktop studies, specialist studies in the EIA phase will provide a more detailed assessment of sensitive areas. If necessary, the layout will be amended at this stage to more accurately avoid highly sensitive or no-go areas.

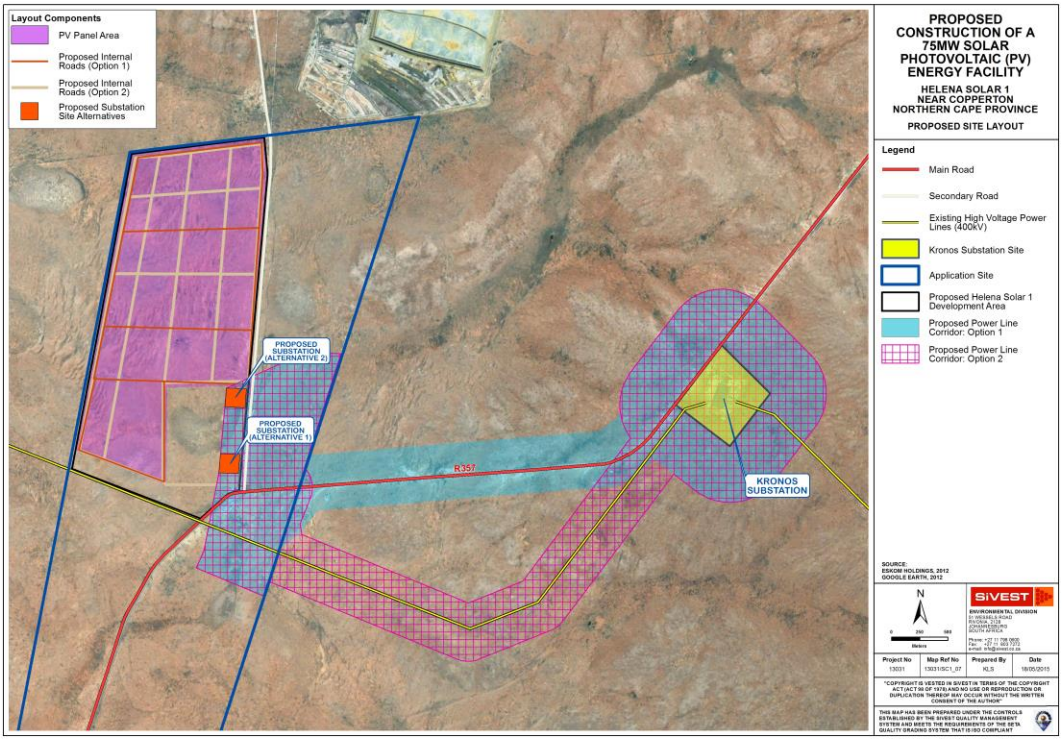

Figure 27: Proposed Layout Alternatives

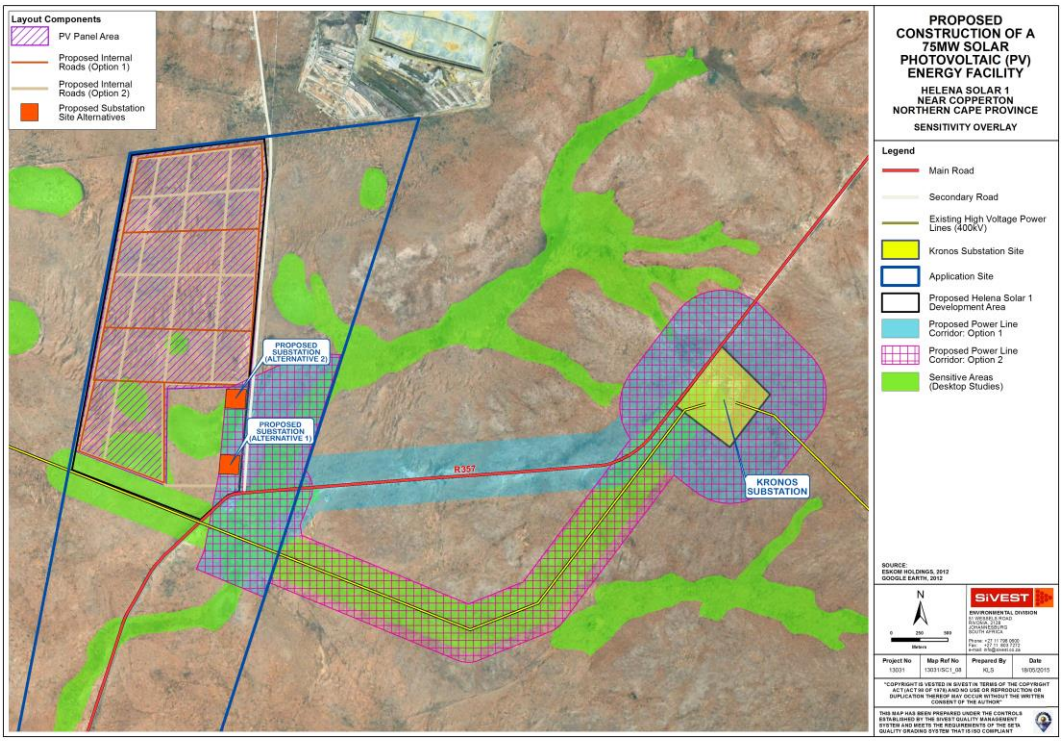

Figure 28: Proposed Layout Alternatives in relation to the Sensitive Areas

10.9 Recommendations

It is recommended that the specialist studies pertaining to certain aspects be carried forward into the EIA Phase, namely, those studies mentioned above. Various issues and concerns have been identified which require detailed assessment and thus it is recommended that the EIA phase be allowed to continue in order to assess these and the impacts associated.

10.10 Public Participation

The Public Participation during the EIA Phase will involve the following:

Table 70: Public Participation activities still to take place.

ACTIVITY	FUNCTION
Prepare and distribute EIA newsletter	Notify registered I&APs of outcome of the Scoping Phase (including timeframes and when their input is required).
Focus Group Meeting	Meeting to report back to key stakeholders (specifically the Local and District Municipalities)

ACTIVITY	FUNCTION
Public Meetings	Report back on the process to the general public.
Public comment period	Notification of I&APs of the availability of the EIR reports for public comment.
Notification of granting or refusal of Environmental Authorisation	Informing of all registered I&APs of the EA
Environmental Authorisation appeal period	Receive any appeals and forward to DEA

10.11 Proposed Project Schedule going forward

The table below represents the proposed schedule of events for the project till closure upon DEA's decision.

Table 71: Proposed Project Schedule

	May 2015	June 2015	July 2015	August 2015	September 2015	October 2015	January 2016
Start of DSR Comment period	Dates to be confirmed in the impact phase						
Submission of FSR to DEA			Dates to be confirmed in the impact phase				
DEA Decision on FSR				Dates to be confirmed in the impact phase			
Distribution of EIA Newsletter				Dates to be confirmed in the impact phase			
DEIR Comment period				Dates to be confirmed in the impact phase			
Hold Meetings (FGM, PM and KSW)					Dates to be confirmed in the impact phase		
Submission of FEIR to DEA						Dates to be confirmed in the impact phase	
DEA Decision							Dates to be confirmed in the impact phase

11 REFERENCES

1. ALMOND, J.E. 2011. Palaeontological Specialist Assessment: Combined Desktop & Field Assessment Study. Proposed Photovoltaic Energy Plant on Farm Klipgats Pan (Portion 4 of Farm 117) near Copperton, Northern Cape Province
2. ARC-ISCW, 2004. Overview of the status of the agricultural natural resources of South Africa (First Edition). ARC-Institute for Soil, Climate and Water, Pretoria
3. ATWELL, M. 2011. Heritage Assessment Proposed Wind Energy Facility And Related Infrastructure, Struisbult: (Farm 103, Portions 4 And 7), Copperton, Prieska, Atwell & Associates
4. BARNES, K.N. (ed.) 1998. The Important Bird Areas of southern Africa. BirdLife South Africa: Johannesburg.
5. BREEDLOVE, G., 2002. A systematic for the South African Cultural Landscapes with a view to implementation. Thesis – University of Pretoria.
6. BROUGHTON, E., 2015: Environmental Impact Assessment for the Three Proposed 75MW Solar Photovoltaic (PV) Plants near Copperton, Northern Cape, Socio-Economic Impact Study: Scoping Phase Input, Urban-Econ Development Economists
7. BRUCE, R.W. & GEERS, B.C., 2005. Field information. In: Land types of the maps 2922 Prieska and 3022 Britstown. Mem. Agric. nat. Res. S. Afr. No. 33. ARC-Institute for Soil, Climate and Water, Pretoria.
8. DE WIT, M.C.J., 1993: Cainozoic evolution of drainage systems of the north-west Cape. Unpublished PhD thesis, University of Cape Town. 371 pp.
9. Dennis Moss Partnership. (2012). Northern Cape Provincial Spatial Development Framework: First Consultative Draft, March 2012.
10. Department of Economic Development. (2010). New Growth Path: Framework.
11. Department of Energy. (2003) Integrated Energy Plan for the Republic of South Africa
12. Department of Energy. (2011). Integrated Resource Plan 2010 - 2030.
13. Department of Energy. (2013). IRP 2010-2030 Update Report.
14. Department of Environmental Affairs (2013) Guideline for Renewable Energy
15. Department of Minerals and Energy. (2003). White paper on Renewable Energy.
16. Department of Trade and Technology. (2013). Industrial Policy Action Plan.
17. DOLLAR, E.S.J., James, C.S., Rogers, K.H. & Thoms, M.C. 2007: A framework for interdisciplinary understanding of rivers as ecosystems. Geomorphology, 8, 147–162.
18. DRIVER, A., MAZE, K., ROUGET, M., LOMBARD, A.T., NEL, J., TURPIE, J.K., COWLING, R.M., DESMET, P., GOODMAN, P., HARRIS, J., JONAS, Z., REYERS, B., SINK, K and STRAUSS, T. 2005. National Spatial Biodiversity Assessment 2004: priorities for biodiversity conservation in South Africa. Strelitzia 17. South African National Biodiversity Institute, Pretoria.
19. FAIRBANKS, D.H.K., THOMPSON, M.W., VINK, D.E., NEWBY, T.S., VAN DEN BERG, H.M & EVERARD, D.A. 2000. The South African Land-Cover Characteristics Database: a synopsis of the landscape. S.Afr.J.Science 96: 69-82.
20. FOURIE, W. 2012. Heritage Impact Assessment for the proposed Eskom Cuprum to Kronos Double Circuit 132kv Power line and Associated Infrastructure, Prieska, Northern Cape.

21. FOURIE, W., 2015: THREE 75MW SOLAR PHOTOVOLTAIC (PV) ENERGY FACILITIES – HELENA PROJECTS: Heritage Scoping Report, PGS Heritage
22. FYFE, A., and TAYLOR, S., 2015: Proposed Development of Three 75MW Solar Photovoltaic (PV) Energy Facilities near Copperton, Northern Cape Province: Surface Water Assessment Scoping Report, SiVEST
23. Geological Survey, 1984. 1:1 million scale geological map of South Africa. Department of Mineral and Energy Affairs, Pretoria.
24. GIBB, A., 2015: Proposed Construction of the Helena 3x75MW Solar Photovoltaic (PV) Energy facilities near Copperton, Northern Cape Province: Visual Impact Assessment Report – Scoping Phase, SiVEST
25. HARRISON, J.A., ALLAN, D.G., UNDERHILL, L.G., HERREMANS, M., TREE, A.J., PARKER, V & BROWN, C.J. (eds). 1997. The atlas of southern African birds. Vol 1 & 2. BirdLife South Africa, Johannesburg.
26. HOARE, D., 2015: Ecological study on the potential impacts of the proposed BioTherm Helena 3 x 75MW Phased Solar PV Plants near Copperton in the Northern Cape, David Hoare Consulting
27. HOCKEY P.A.R., DEAN W.R.J., AND RYAN P.G. 2005. Robert's Birds of Southern Africa, seventh edition. Trustees of the John Voelcker Bird Book Fund, Cape Town.
28. International Finance Corporation's Social and Environmental Performance Standards (2006).
29. IUCN (2001). IUCN Red Data List categories and criteria: Version 3.1. IUCN Species Survival Commission: Gland, Switzerland.
30. JENKINS, A., DE GOEDE, J.H. & VAN ROOYEN, C.S. 2006. Improving the products of the Eskom Electric Eagle Project. Unpublished report to Eskom. Endangered Wildlife Trust.
31. KAPLAN, J.M. 2010. Archaeological Scoping Study and Impact assessment of a proposed photovoltaic power generation facility in Copperton Northern Cape. Agency for Cultural Resource Management
32. KAPLAN, J.M. & WILTSHIRE, N. 2011. Archaeological Impact Assessment of a proposed wind energy facility, power line and landing strip in Copperton, Siyathemba municipality, Northern Cape. Agency for Cultural Resource Management
33. MACLEAN, G.L. 1999. Southern African endemic birds: their distribution and conservation. An invited evening public lecture. http://www.int-ornith-union.org/files/proceedings/durban/South%20African%20Papers/SApaper1.htm.
34. MACVICAR, C.N., de Villiers, J.M., Loxton, R.F, Verster, E., Lambrechts, J.J.N., Merryweather, F.R., le Roux, J., van Rooyen, T.H. & Harmse, H.J. von M., 1977. Soil classification. A binomial system for South Africa. ARC-Institute for Soil, Climate & Water, Pretoria.
35. MONNIK, K.A. & MALHERBE, J., 2005. Climate data. In: Land types of the maps 2922 Prieska and 3022 Britstown. Mem. Agric. nat. Res. S. Afr. No. 33. ARC-Institute for Soil, Climate and Water, Pretoria.
36. MOSELEY, S., and NAUDE-MOSELEY, B., 2008. Getaway Guide to the Karoo, Namaqualand and Kalahari, Sunbird.
37. MUCINA, L., RUTHERFORD, M.C., PALMER, A.R., MILTON, S.J., SCOTT, L., VAN DER MERWE, B., HOARE, D.B., BEZUIDENHOUT, H., VLOK, J.H.J., EUSTON-

BROWN, D.I.W., POWRIE, L.W. & DOLD, A.P. 2006. Nama-Karoo Biome. In: Mucina, L. & Rutherford, M.C. (eds.) the vegetation of South Africa, Lesotho and Swaziland. Strelitzia 19. South African National Biodiversity Institute, Pretoria.

38. MUCINA, L. AND RUTHERFORD, M.C. (editors) 2006. Vegetation map of South Africa, Lesotho and Swaziland: an illustrated guide. Strelitzia 19, South African National Biodiversity Institute, Pretoria.
39. MUCINA, L., RUTHERFORD, M.C. AND POWRIE, I.W. (editors) 2005. Vegetation map of South Africa, Lesotho and Swaziland, 1:1 000 000 SCALE SHEET MAPS South African National Biodiversity Institute, Pretoria.
40. NFEPA, 2010
41. Northern Cape ENPAT, 2001
42. Northern Cape Government. (2008). Provincial Growth and Development Strategy.
43. Northern Cape Government, Provincial Spatial Development Framework
44. OBERHOLZER, B. 2005. Guideline for involving visual & aesthetic specialists in EIA processes: Edition 1. CSIR Report No ENV-S-C 2005 053 F. Republic of South Africa, Provincial Government of the Western Cape, Department of Environmental Affairs & Development Planning, Cape Town.
45. ORTON, JAYSON. 2012a. Heritage Impact assessment for a proposed photovoltaic energy plant on the farm Klipgats Pan near Copperton, Northern Cape. Archaeology Contracts Office Department of Archaeology. University of Cape Town
46. ORTON, JAYSON. 2012b. Heritage Impact Assessment for a proposed photovoltaic energy plant on the farm Hoekplaas near Copperton, Northern Cape. Archaeology Contracts Office Department of Archaeology. University of Cape Town
47. ORTON, J & WEBLEY, L. 2013. Heritage Impact Assessment for Multiple Proposed Solar Energy Facilities on the Remainder of Farm Klipgats Pan 117, Copperton, Northern Cape
48. PARSONS, I. 2003. Lithic expressions of Later Stone Age lifeways in the Northern Cape. South African Archaeological Bulletin 58: 33-37.
49. PARTRIDGE, T.C., Dollar E.S.J., Moolman, J. and Dollar, L.H., 2010: The geomorphic provinces of South Africa, Lesotho and Swaziland: A physiographic subdivision for earth and environmental scientists. Transactions of the Royal Society of South Africa, 65:1, 1-47.
50. PARTRIDGE, T.C. & Maud, R.R., 2000: The Cenozoic of Southern Africa. New York, Oxford Monographs on Geology and Geophysics. 406 pp.
51. PATERSON, D.G., 2015: SOIL INFORMATION FOR PROPOSED HELENA SOLAR ENERGY PLANT, NEAR COPPERTON, NORTHERN CAPE, ARC-Institute for Soil, Climate and Water
52. Pixley ka Seme District Municipality. (2011). Pixley ka Seme District Municipality Integrated Development Plan for 2011-2016.
53. RUTHERFORD, M.C. & WESTFALL, R.H. (1994). Biomes of southern Africa: an objective categorization. Memoirs of the Botanical Survey of South Africa No. 63.
54. SANBI, 2013: Classification System for Wetlands and other Aquatic Ecosystems in South Africa. User Manual – Inland Systems. South African National Biodiversity Institute (SANBI).

55. Siyathemba Local Municipality. (2012). Siyathemba Local Municipality Local Economic Development Strategy.
56. Siyathemba Local Municipality. (2014). Integrated Development Plan 2014/15.
57. Siyathemba Local Municipality. (2014). Siyathemba Municipality Integrated Development Plan 2014/15.
58. SOUTH ARFIACN WIND ENERGY ASSOCIATION (SAWEA): 2010, "Our Sustainable Future" The Case for Wind Energy: Proposed Integrated Resource Plan 2010
59. Stats SA. (2015). Census 2011.
60. THOMPSON, M.W., 1999. South African National Land-cover Database Project. CSIR Environmental, ENV/P/C 98136, Pretoria.
61. Treasure Karoo Action Group website http://treasurethekaroo.co.za/).
62. UNESCO. 2005. Operational Guidelines for the Implementation of the World Heritage Convention. UNESCO World Heritage Centre. Paris.
63. VAN DER WALT, Jaco. 2012. Archaeological Impact Assessment Report for the proposed Garob Wind Energy Facility Project, located close to Copperton in the Northern Cape. Heritage Contracts and Archaeological Consulting CC (HCAC)
64. VAN ROOYEN, C., 2015: Ecological study on the potential impacts of the proposed BioTherm Helena 3 x 75MW Phased Solar PV Plants near Copperton in the Northern Cape, Chris van Rooyen Consulting
65. VAN RYNEVELD, K. 2006. Phase 1 Archaeological Impact Assessment - Vogelstruisbult 104, Prieska District, Northern Cape, South Africa. National Museum Bloemfontein
66. VAN WYK, A.E. & SMITH, G.F. 2001. Regions of floristic endemism in southern Africa. Umdaus press, Hatfield.
67. VICTOR, J. E. & KEITH M. 2004. The Orange List: a safety net for biodiversity in South Africa. South African Journal of Science 100: 139-141.

SiVEST Environmental Division
51 Wessels Road, Rivonia. 2128. South Africa
PO Box 2921, Rivonia. 2128. South Africa

Tel + 27 11 798 0600
Fax +27 11 803 7272
Email info@sivest.co.za
www.sivest.co.za

Contact Person: Andrea Gibb
Cell Number: 011 798 0600
Email: andreag@sivest.co.za